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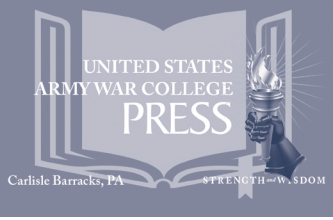

EMERGING POWERS AND FUTURE THREATS: IMPLICATIONS FOR THE U.S. AND GLOBAL DEFENSE INDUSTRY

Terrence R. Guay

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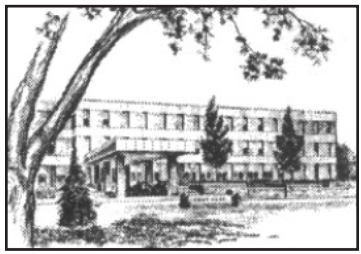

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FOREWORD

This Letort Paper evaluates the defense industrial capabilities of six emerging market countries: Brazil, Russia, India, China, South Africa (BRICS), and Turkey. These six countries represent the primary non-Western (that is, not the United States or Western and Central European) countries that are active in either importing or exporting weapons or both, and currently have or hold the conditions to develop a vibrant defense industrial base over the next 2 decades. The prominence of these and other countries reflects the economic changes, investment opportunities, and future potential of some of the world's largest countries (in population). Clearly, a different global environment now exists than that of just 30 years ago, before the fall of the Berlin Wall and end of the Cold War. To the extent that economic power translates into political and military power, the United States will be faced with multidimensional challenges from these countries in the years to come.

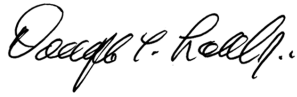
Given this multipolar global environment, Dr. Terrence R. Guay evaluates the implications for the United States and the global defense industry. This Letort Paper begins with an overview of global arms production and trade. From there, the direction turns to BRICS and Turkey, with an overview of each country's most significant current issues, or "macro-variables." Dr. Guay describes and evaluates the political, economic, and social context that has aided the rising global influence of these countries, and the challenges they will face in the near term. This evaluation is followed by an overview of each country's defense industrial base, with an assessment of their capabili-

ties and economic orientation regarding domestic versus global sales and, at the international level, the likely recipients based on the global interests of these countries.

Dr. Guay makes four recommendations to address the developments in these six countries. First, the United States must maintain its global dominance in the defense sector, which will face challenges in light of budgetary constraints in the coming years. Second, the United States should seek to build industrial alliances with allies, especially in Europe, Japan, South Korea, India, and possibly Turkey. Third, the United States needs to minimize technology transfers to likely industry rivals, although this may be difficult, given commercial pressures in the aerospace sector. Finally, the United States needs to continue to use weapons exports to achieve political objectives, especially in Africa and Latin America, where China is seeking similar goals.

The issues raised by Dr. Guay in this Letort Paper are wide-ranging and relevant to a number of U.S. national security issues, including: the regions and countries of the world that are most important for Army engagement; the impact of technological inferiority on Army operations; the future impact of Chinese and Russian interests in oil, arms shipments, and economic matters in the Middle East; whether the Department of Defense (DoD) is fueling an arms race in an unsettling environment; whether and how the Army should restructure, invest in, or preserve sec-

tors of the defense industrial base; and the national security objectives and risks for which the Army should prepare over the 2030-40 landscape.



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ABOUT THE AUTHOR

TERRENCE R. GUAY is a Clinical Professor of International Business in the Smeal College of Business at The Pennsylvania State University, where he teaches undergraduate and M.B.A. international business courses. He has published three books on global issues, including: *At Arm's Length: The European Union and Europe's Defence Industry* (Macmillan and St. Martin's Presses, 1998); *The United States and the European Union: The Political Economy of a Relationship* (Sheffield Academic Press, 1999); and, *The Business Environment of Europe: Firms, Governments, and Institutions* (Cambridge University Press, 2014). Guay co-authored a fourth book, entitled *European Competition Policy and Globalization* (Palgrave, 2016). Additionally, he published two monographs with the Strategic Studies Institute, U.S. Army War College: *The Transatlantic Defense Industrial Base: Restructuring Scenarios and their Implications* (2005); and, *Globalization and its Implications for the Defense Industrial Base* (2007). He has published more than a dozen academic journal articles and book chapters on transatlantic relations, political economy, business-government relations, and security. He holds a B.S. from Clarkson University, an M.B.A. from The Ohio State University, and an M.A. and a Ph.D. from Syracuse University. Previously, he was a faculty member in the Maxwell School of Syracuse University and the School of International Service at The American University.

SUMMARY

One defining phenomenon of the 21st century to date is the ascent of new countries in the global economic, political, and security environment. While the so-called BRICS (Brazil, Russia, India, China, and South Africa) receive most of the attention in business, government, security, and media circles, several other countries have become influential regional—if not yet global—players, including Indonesia, Mexico, Nigeria, and Turkey. The prominence of these and other countries reflects the economic changes, investment opportunities, and future potential of some of the world's largest countries (in population). Clearly, this is a different global environment than existed just 30 years ago, before the fall of the Berlin Wall and the end of the Cold War. As long as these countries continue to experience healthy economic growth, and avoid the negative effects of war, it is likely that the relative global economic position of the United States will decline over the next few decades. To the extent that economic power translates into political and military power, the United States will be faced with multidimensional challenges in the years to come.

Given this multipolar global environment, this Letort Paper evaluates the implications for the U.S. and global defense industries. At one level, the rise of new powers is leading to an expansion in the global distribution of armaments production. Enhanced general industrial sophistication is spilling over to more specialized defense-related industries, which is enhancing the military capabilities of these countries. While this has progressed furthest in China, India and Brazil have developed stronger defense industrial bases than those that existed just a decade ago. At another level, the addition of new countries and companies in

the global arms market presents serious challenges to the United States in two significant ways. First, this addition enhances the military capabilities of other countries (especially in the Middle East) who import weapons systems, thereby posing additional challenges to U.S. security interests. It also has the potential to strengthen nonstate actors, like terrorist groups, who purchase armaments directly from countries or acquire them on the battlefield from defeated national militaries.

The second challenge relates to the economic importance that armaments exports play in reducing the per-unit cost of weapons. The United States relies heavily on export markets to produce economies of scale, thereby lowering the acquisition costs for the Department of Defense (DoD). In the current period of uncertainty over funding levels for future defense budgets, weapons acquisition costs (and, therefore, exports) become critical. However, the same economics of armaments production applies globally: BRICS and other countries reduce weapons acquisition costs for their militaries by increasing arms exports, too. Consequently, it is becoming increasingly likely that the global arms trade will become even more competitive in the coming decades, with implications for the U.S. defense industrial base, U.S. Army, and other military branches.

This Letort Paper starts out with an overview of global arms production and trade. From there, the direction turns to BRICS and Turkey, with an overview of each country's most significant current issues, termed "macro-variables." The purpose is to provide the political, economic, and social context that has aided the rising global influence of these countries, and the challenges they will be facing in the near term. The

six countries analyzed in this Letort Paper represent the primary non-Western (that is, not the United States or Western and Central European) countries that are active in either importing or exporting weapons or both, and either currently have or hold the conditions to develop a vibrant defense industrial base over the next decade or two. This evaluation is followed by an overview of each country's defense industrial base, with an assessment of their capabilities and economic orientation regarding domestic versus global sales and, at the international level, the likely recipients based on the global interests of these countries.

Four recommendations are made to address the developments in these six countries. First, the United States must maintain its global dominance in the defense sector, which will face challenges in light of budgetary constraints in the coming years. Second, the United States should seek to build industrial alliances with allies, especially Europe, Japan, South Korea, India, and possibly Turkey. Third, the United States needs to minimize technology transfers to likely industry rivals, although this may be difficult, given commercial pressures in the aerospace sector. Finally, the United States needs to continue to use weapons exports to achieve political objectives, especially in Africa and Latin America, where China is seeking similar goals.

EMERGING POWERS AND FUTURE THREATS: IMPLICATIONS FOR THE U.S. AND GLOBAL DEFENSE INDUSTRY

INTRODUCTION

One defining phenomenon of the 21st century to date is the ascent of new countries in the global economic, political, and security environment. While the so-called BRICS (Brazil, Russia, India, China, and South Africa) receive most of the attention in business, government, security, and media circles, a number of other countries have become influential regional (if not yet global) players. There are also the MINT countries (Mexico, Indonesia, Nigeria, and Turkey) and the Next Eleven ([N-11] consisting of the four MINT countries, along with Bangladesh, Egypt, Iran, Pakistan, the Philippines, South Korea, and Vietnam). All three acronyms were developed by the investment bank Goldman Sachs to raise awareness about the economic changes, investment opportunities, and future potential of some of the world's largest countries (in population).

This is clearly a different global environment than existed just 30 years ago, prior to the fall of the Berlin Wall and the end of the Cold War. Research by the consultancy firm PwC suggests that the ranking of the world's largest economies will change quite dramatically between 2030 and 2050 (see Table 1). Using the purchasing power parity (PPP) method to calculate gross domestic product (GDP), China already has the world's largest economy, and its lead over other countries will only increase in the coming decades.[1] By 2050, India is expected to be the world's second-largest economy, and Indonesia, Brazil, Mexico, and Nigeria will be among the top ten. As long as these

countries continue to experience healthy economic growth, and avoid the negative effects of war, it is likely that the relative global economic position of the United States will decline over the next few decades. To the extent that economic power translates to political and military power, the United States will be faced with multidimensional challenges in the years to come.

Rank	Country	2014 GDP	Country	2030 GDP	Country	2050 GDP
1	China	17,632	China	36,112	China	61,079
2	United States	17,416	United States	25,451	India	42,205
3	India	7,277	India	17,138	United States	41,384
4	Japan	4,788	Japan	6,006	Indonesia	12,210
5	Germany	3,621	Indonesia	5,486	Brazil	9,164
6	Russia	3,559	Brazil	4,996	Mexico	8,014
7	Brazil	3,073	Russia	4,854	Japan	7,914
8	France	2,587	Germany	4,590	Russia	7,575
9	Indonesia	2,554	Mexico	3,985	Nigeria	7,345
10	United Kingdom	2,435	United Kingdom	3,586	Germany	6,338
11	Mexico	2,143	France	3,418	United Kingdom	5,744
12	Italy	2,066	Saudi Arabia	3,212	Saudi Arabia	5,488
13	South Korea	1,790	South Korea	2,818	France	5,207
14	Saudi Arabia	1,652	Turkey	2,714	Turkey	5,102
15	Canada	1,579	Italy	2,591	Pakistan	4,253
16	Spain	1,534	Nigeria	2,566	Egypt	4,239
17	Turkey	1,512	Canada	2,219	South Korea	4,142
18	Iran	1,284	Spain	2,175	Italy	3,617
19	Australia	1,100	Iran	1,914	Canada	3,583
20	Nigeria	1,058	Egypt	1,854	Philippines	3,516
21	Thailand	990	Thailand	1,847	Thailand	3,510
22	Egypt	845	Pakistan	1,832	Vietnam	3,430
23	Poland	841	Australia	1,707	Bangladesh	3,367

Table 1. Current and Projected Rankings of Countries by Gross Domestic Product (U.S. Dollars [USD] in Billions, Purchasing Power Parity Method).[2]

Rank	Country	2014 GDP	Country	2030 GDP	Country	2050 GDP
24	Argentina	827	Malaysia	1,554	Malaysia	3,327
25	Pakistan	884	Poland	1,515	Iran	3,224
26	Netherlands	798	Philippines	1,508	Spain	3,099
27	Malaysia	747	Argentina	1,362	South Africa	3,026
28	Philippines	695	Vietnam	1,313	Australia	2,903
29	South Africa	683	Bangladesh	1,291	Colombia	2,785
30	Colombia	642	Colombia	1,255	Argentina	2,455

Table 1. Current and Projected Rankings of Countries by Gross Domestic Product (U.S. Dollars [USD] in Billions, Purchasing Power Parity Method).[2] (Cont.)

Given this multipolar global environment, this Letort Paper aims to evaluate the implications for the U.S. and global defense industries. At one level, the rise of new powers is leading to an expansion in the global distribution of armaments production. Enhanced general industrial sophistication is spilling over to more specialized defense-related industries, which is enhancing the military capabilities of these countries. While this phenomenon has progressed furthest in China, India and Brazil have developed stronger defense industrial bases than existed just a decade ago. At another level, the addition of new countries and companies in the global arms market presents serious challenges to the United States in two significant ways. First, it enhances the military capabilities of other countries (especially in the Middle East) who import weapons systems, thereby posing additional challenges to U.S. security interests. It also has the potential to strengthen

nonstate actors, like terrorist groups, who purchase armaments directly from countries or acquire them on the battlefield from defeated national militaries.

The second challenge relates to the economic importance that armaments exports play in reducing the per-unit cost of weapons. The United States, for example, relies heavily on export markets to produce economies of scale, thereby lowering the acquisition costs for the Department of Defense (DoD). In the current period of uncertainty over funding levels for future defense budgets, weapons acquisition costs (and, therefore, exports) become critical. However, the same economics of armaments production applies globally; BRICS and other countries lower weapons acquisition costs for their militaries by increasing arms exports, too. Consequently, it is becoming increasingly likely that the global arms trade will become even more competitive in the coming decades, with implications for the U.S. defense industrial base, U.S. Army, and other military branches.

This Letort Paper starts out with an overview of global arms production and trade. From there, the direction turns to BRICS and Turkey, with an overview of each country's most significant current issues, termed "macro-variables." The purpose is to provide the political, economic, and social context that has aided the rising global influence of these countries, and the challenges they will be facing in the near term. This is followed by an overview of each country's defense industrial base, with an assessment of their capabilities and economic orientation in terms of domestic versus global sales and, at the international level, the likely recipients based on the global interests of these countries. This Letort Paper then assesses the implications for the U.S. defense industry and U.S. global security interests. Finally, the report will provide recommen-

dations for U.S. military and government officials to respond to this changing global environment in ways that will support U.S. security and industrial interests. The six countries analyzed in this Letort Paper represent the primary non-Western (that is, not the United States or Western and Central European) countries that are active in importing or exporting weapons (or both), and either currently have or hold the conditions to develop a vibrant defense industrial base over the next decade or two.

The issues raised in this Letort Paper are wide-ranging and are relevant to a number of U.S. national security issues, including the following topics on the *Key Strategic Issues List* 2014-15:[3]

> **ADDITIONAL ARMY PRIORITIES FOR STRATEGIC ANALYSIS. . . . Globally Responsive and Regionally Engaged Army**. . . . What regions/countries of the world are most important for Army engagement [emphasis in original]?[4]
>
> **Ready and Modern Army**. . . . Given defense austerity and the post-conflict drawdown, what should be at the top and at the bottom of the Army's priorities? . . . How would technological inferiority in some areas affect Army operations [emphasis in original]?[5]
>
> **U.S. CENTRAL COMMAND** [CENTCOM]. . . . **Operational Issues**. . . . What is the future impact of Chinese interests in Middle East oil and economic matters in the Middle East? . . . What is the future impact of Russian interests in Middle East oil, arms shipments and economic matters in the Middle East? . . . **Legislative Affairs**. . . . What are the short-, mid-, and long-term threats of the current foreign military financing (FMF) and foreign military sales (FMS) programs in light of the growing ethnic divides in the CENTCOM [Area of Responsibility] AOR? Is DoD fueling an arms race in an unsettling environment [emphasis in original]?[6]

U.S. ARMY MATERIEL COMMAND. . . . **HQ** [Headquarters] **U.S. Army Materiel Command** [AMC]. . . . Should the Army restructure support to the industrial base? If so, how? . . . **HQ AMC, G-3/4 Strategic Integration**. . . . 1) What Commercial Defense Industrial Base sectors are critical enough to warrant preferential investment or preservation, and which commercial industrial base sectors can diminish without affects to Army operation? 2) Within the critical sector, what industrial base capabilities are required to maintain new and legacy weapon systems to support the anticipated future force structure that includes Defense unique requirements and new technologies? 3) What capabilities can we divest which can be rapidly regenerated or procured? 4) What is the acceptable level of risk from divestiture of unnecessary weapon systems [emphasis in original]?[7]

U.S. ARMY TRAINING AND DOCTRINE COMMAND. . . . **Army Capabilities Integration Center**. . . . As the Army transitions from execution to preparation, for what national security objectives and risks must the Army prepare? . . . Given national security documents, operational environment estimates, and international relations and military theory, what is the national security strategic landscape in 2030-40? What will challenge U.S. vital interests and describe the corresponding military problem? . . . Are the institutions that dictate current "world order," or at least contain disorder, enduring? What threatens the legitimacy and utility of international institutions that have been established and supported by the United States and our allies [emphasis in original]?[8]

This Letort Paper obviously will not fully respond to all of the questions posed above. However, it is important to note that the breadth of this Letort Paper suggests that the defense industrial implications of a

world comprised of countries experiencing relatively new political and economic prominence, with interests often conflicting with those of the United States, affects a wide range of U.S. Army concerns.

OVERVIEW OF GLOBAL DEFENSE INDUSTRY

Leading Countries and Companies.

In a world where globalization is the dominant economic buzzword, 38 countries each exported more than $100 billion in goods in 2014, and U.S. and European firms are facing fierce competition in world markets, with the defense industry remaining remarkably concentrated in a handful of countries.[9] Table 2 shows the world's top 100 companies ranked by defense revenues. Companies are ranked using two of the most-cited sources: *Defense News* and the Stockholm International Peace Research Institute (SIPRI). Although the methodologies used by the two organizations are slightly different, the companies do not vary much in their standings. Neither do the countries in which they are headquartered. The United States is home to the most defense firms by far; about 40 of the top 100 firms are located there. The United Kingdom, Russia, Japan, France, South Korea, Germany, and Israel combined account for about 40 more companies. This contrasts with the general trend of a more diverse group of multinational corporations (MNCs) that compete internationally across all industries. Table 3 compares the change in the rankings of the global Fortune 500 firms by country of origin in 2005, versus 2014. The rankings, based on a firm's total revenues, shows a sharp decline (from 431 total companies to 324) over the past 10 years in the number of U.S., European,

and Japanese firms comprising the world's 500 largest. Chinese firms increased more than six-fold over this period (from 16 to 98), while those from Brazil, India, Russia, and other emerging markets more than doubled (from 17 to 37). As shown in Table 4, about 21-22 countries (depending on whether *Defense News* or SIPRI data are used) are represented among the top 100 defense firms. However, most of the countries have only one or two firms, leaving about 80 percent of the world's 100 largest defense companies concentrated in just eight countries.

Rank	*Defense News*	Country	2014 Defense Revenues (USD millions)	SIPRI	Country	2014 Arms Sales (USD millions)
1	Lockheed Martin	U.S.	40,128	Lockheed Martin	U.S.	37,470
2	Boeing	U.S.	29,000	Boeing	U.S.	28,300
3	BAE Systems	UK	25,449	BAE Systems	UK	25,730
4	Raytheon	U.S.	22,228	Raytheon	U.S.	21,370
5	General Dynamics	U.S.	18,561	Northrop Grumman	U.S.	19,660
6	Northrop Grumman	U.S.	18,400	General Dynamics	U.S.	18,600
7	Airbus	Netherlands	14,610	Airbus Group	Trans-European	14,490
8	United Technologies	U.S.	13,020	United Technologies Corp	U.S.	13,020
9	Finmeccanica	Italy	10,561	Finmeccanica	Italy	10,540
10	L3 Communications	U.S.	9,808	L-3 Communications	U.S.	9,810
11	Almaz-Antey	Russia	9,210	Almaz-Antey	Russia	8,840
12	Thales	France	8,462	Thales	France	8,600
13	Huntington Ingalls Industries	U.S.	6,818	Huntington Ingalls Industries	U.S.	6,680
14	United Aircraft Corporation	Russia	6,244	United Aircraft Corporation	Russia	6,110

Table 2. Largest Global Defense Companies (Ranked by Defense Revenues).[10]

Rank	*Defense News*	Country	2014 Defense Revenues (USD millions)	SIPRI	Country	2014 Arms Sales (USD millions)
15	Rolls-Royce	UK	5,434	United Shipbuilding Corp	Russia	5,980
16	Honeywell	U.S.	4,754	Rolls-Royce	UK	5,430
17	Textron	U.S.	4,719	SAFRAN	France	5,130
18	AECOM	U.S.	4,433	Honeywell	U.S.	4,750
19	Booz Allen Hamilton	U.S.	4,100	Textron	U.S.	4,700
20	Safran	France	4,081	DCNS	France	3,920
21	DCNS	France	4,075	Mitsubishi Heavy Industries	Japan	3,920
22	GE	U.S.	4,000	Booz Allen Hamilton	U.S.	3,900
23	Russian Helicopters	Russia	3,960	Russian Helicopters	Russia	3,890
24	Leidos	U.S.	3,627	United Instrument Manufacturing Corp	Russia	3,640
25	Babcock International	UK	3,559	Babcock International	UK	3,560
26	United Engine-Building	Russia	3,324	Leidos	U.S.	3,390
27	Bechtel	U.S.	3,000	General Electric	U.S.	3,210
28	Rheinmetall	Germany	2,977	Science Applications International Corp	U.S.	3,170
29	Elbit Systems	Israel	2,958	Harris	U.S.	3,110
30	Saab	Sweden	2,829	AECOM Technology Corp	U.S.	3,080
31	Tactical Missiles	Russia	2,813	Rheinmetall	Germany	2,970
32	Israel Aerospace Industries6	Israel	2,785	Israel Aerospace Industries	Israel	2,880
33	Orbital ATK	U.S.	2,750	Elbit Systems	Israel	2,810
34	SAIC	U.S.	2,735	Tactical Missiles Corp	Russia	2,810
35	Exelis	U.S.	2,644	Bechtel	U.S.	2,760
36	Mitsubishi Heavy Industries	Japan	2,627	CACI International	U.S.	2,730
37	CACI International	U.S.	2,578	Saab	Sweden	2,710
38	Hindustan Aeronautics	India	2,480	United Engine Corp	Russia	2,600
39	Harris	U.S.	2,385	High Precision Systems	Russia	2,350

Table 2. Largest Global Defense Companies (Ranked by Defense Revenues).[10] (Cont.)

Rank	*Defense News*	Country	2014 Defense Revenues (USD millions)	SIPRI	Country	2014 Arms Sales (USD millions)
40	Hewlett-Packard	U.S.	2,241	Alliant Techsystems	U.S.	2,340
41	Rockwell Collins	U.S.	2,209	Hindustan Aeronautics	India	2,330
42	CSC	U.S.	2,177	ThyssenKrupp	Germany	2,310
43	Serco	UK	2,175	Hewlett-Packard	U.S.	2,300
44	ST Engineering	Singapore	2,013	CEA	France	2,290
45	Rafael Advanced Defense Systems	Israel	1,965	KRET	Russia	2,240
46	Kawasaki Heavy Industries	Japan	1,909	Rockwell Collins	U.S.	2,230
47	Cobham	UK	1,860	Computer Sciences Corp	U.S.	2,230
48	Oshkosh	U.S.	1,725	Exelis	U.S.	2,230
49	General Atomics	U.S.	1,655	Serco	UK	2,180
50	Aerojet Rocketdyne	U.S.	1,591	Kawasaki Heavy Industries	Japan	2,080
51	DynCorp	U.S.	1,579	ST Engineering	Singapore	2,010
52	Uralvagonzavod	Russia	1,545	Rafael	Israel	2,000
53	Hanwha	South Korea	1,545	Cobham	UK	1,860
54	Engility	U.S.	1,530	Oshkosh	U.S.	1,730
55	Embraer	Brazil	1,460	ManTech International	U.S.	1,690
56	Fincantieri	Italy	1,407	Korea Aerospace Industries	South Korea	1,660
57	Nexter	France	1,393	General Atomics	U.S.	1,630
58	Dassault Aviation	France	1,332	Indian Ordnance Factories	India	1,560
59	LIG Nex1	South Korea	1,330	Fluor	U.S.	1,500
60	Fluor	U.S.	1,319	Embraer	Brazil	1,470
61	Korea Aerospace Industries	South Korea	1,160	Uralvagonzavod	Russia	1,450
62	Aselsan	Turkey	1,109	Fincantieri	Italy	1,410
63	Accenture	U.S.	1,060	LIG Nex1	South Korea	1,330
64	ManTech	U.S.	1,047	Nexter	France	1,320

Table 2. Largest Global Defense Companies (Ranked by Defense Revenues).[10] (Cont.)

Rank	*Defense News*	Country	2014 Defense Revenues (USD millions)	SIPRI	Country	2014 Arms Sales (USD millions)
65	QinetiQ	UK	1,018	Dassault Aviation Groupe	France	1,320
66	NEC	Japan	1,011	DynCorp International	U.S.	1,270
67	GKN Aerospace	UK	990	Polish Armaments Group	Poland	1,270
68	Ultra Electronics	UK	952	Austal	Australia	1,240
69	RTI	Russia	947	GenCorp	U.S.	1,180
70	Krauss-Maffei Wegmann	Germany	935	IHI	Japan	1,180
71	Kongsberg	Norway	930	Jacobs Engineering Group	U.S.	1,140
72	Ana Holdings	Japan	926	QinetiQ	UK	1,140
73	Samsung Techwin	South Korea	905	ASELSAN	Turkey	1,110
74	PAE	U.S.	895	Hyundai WIA Corp	South Korea	1,040
75	Meggitt	UK	889	Mitsubishi Electric Corp	Japan	1,040
76	Bharat Electronics	India	876	Triumph Group	U.S.	1,010
77	Mitsubishi Electric	Japan	860	NEC	Japan	1,010
78	Turkish Aerospace Industries	Turkey	854	Precision Castparts	U.S.	1,000
79	Moog	U.S.	838	GKN	UK	990
80	AAR Corp	U.S.	827	Pilatus Aircraft	Switzerland	960
81	Cubic	U.S.	799	Bharat Electronics	India	950
82	CAE	Canada	756	Hanwha Corp	South Korea	950
83	Alion Science and Technology	U.S.	754	Krauss-Maffei Wegmann	Germany	940
84	Curtiss-Wright	U.S.	750	ASC	Australia	930
85	Chemring	UK	724	Kongsberg Gruppen	Norway	920
86	Ruag	Switzerland	718	Samsung Techwin	South Korea	920
87	Ball Aerospace & Technologies	U.S.	681	Meggitt	UK	890
88	Indra	Spain	676	Moog	U.S.	860
89	Wyle	U.S.	651	Turkish Aerospace Industries	Turkey	850

Table 2. Largest Global Defense Companies (Ranked by Defense Revenues).[10] (Cont.)

Rank	*Defense News*	Country	2014 Defense Revenues (USD millions)	SIPRI	Country	2014 Arms Sales (USD millions)
90	Diehl Defence Holding	Germany	649	UkrOboronProm	Ukraine	840
91	IHI	Japan	618	RTI	Russia	840
92	Ukroboronprom	Ukraine	576	RUAG	Switzerland	840
93	Battelle	U.S.	569	CNH Industrial	Trans-European	820
94	Patria	Finland	556	MIT	U.S.	800
95	Day & Zimmerman	U.S.	555	Cubic Corporation	U.S.	800
96	ViaSat	U.S.	536	Patria Industries	Finland	800
97	Nammo	Norway	527	The Aerospace Corp	U.S.	790
98	Fujitsu	Japan	526	Alion Science & Technology	U.S.	770
99	Israel Military Industries	Israel	476	Hyundai Rotem	South Korea	770
100	Denel	South Africa	455	Mitre	U.S.	760

Note: Chinese companies are excluded due to lack of comparable and sufficiently accurate data; and, Airbus is considered a Netherlands company by *Defense News*, and Trans-European by SIPRI.

Table 2. Largest Global Defense Companies (Ranked by Defense Revenues).[10] (Cont.)

	2005	2014
United States	176	128
Europe	174	142
Japan	81	54
Other Organization for Economic Cooperation and Development (OECD) Countries	36	41
China	16	98
Brazil, India, Russia	11	19
Other Emerging Markets	6	18
Total	500	500
Note: Fortune 500 rankings were based on company revenues; and, other OECD countries include Australia, Canada, Chile, Mexico, South Korea, and Turkey.		

Table 3. Global Fortune 500 Firms by Country of Origin.[11]

Country	Number of Companies in Top 100 (*Defense News*)	Defense Revenues (*Defense News*, 2014)	Number of Companies in Top 100 (SIPRI)	Total Employment (SIPRI, 2014)
U.S.	42	225,676	38	1,933,630
UK	10	43,050	8	348,140
Japan	7	8,477	5	345,380
Russia	7	28,043	11	566,100
France	5	19,343	6	174,630
Israel	4	8,184	3	11,850
South Korea	4	4,940	6	6,590
Germany	3	4,561	3	183,680
India	2	3,356	3	N/A
Italy	2	11,968	2	76,070
Norway	2	1,457	1	7,730
Turkey	2	1,963	2	11,370

Table 4. Total Revenues and Employment for Countries with the most Defense Companies in the Top 100.[12]

Country	Number of Companies in Top 100 (*Defense News*)	Defense Revenues (*Defense News*, 2014)	Number of Companies in Top 100 (SIPRI)	Total Employment (SIPRI, 2014)
Australia			2	2,600
Brazil	1	1,460	1	19,170
Canada	1	756		
Finland	1	556	1	2,450
Netherlands	1	14,610		
Poland			1	17,500
Singapore	1	2,013	1	22,670
South Africa	1	455		
Spain	1	676		
Sweden	1	2,829	1	14,720
Switzerland	1	718	2	9,990
Ukraine	1	576	1	122,000
Trans-European			2	207,830
Total	**100**		**100**	
Note: Chinese companies are excluded due to lack of comparable and sufficiently accurate data; Airbus is considered a Netherlands company by *Defense News*, and Trans-European by SIPRI.				

Table 4. Total Revenues and Employment for Countries with the most Defense Companies in the Top 100.[12] (Cont.)

Exports and Global Armaments Trade.

Globalization and the rise of non-Western economies have produced a range of categories in which the United States is no longer number one, including tallest buildings, casinos, and shopping malls (not even in the top 25!). However, since the end of the Cold War, the United States has led the world in armaments exports. In the five most recent years (2011-2015), the United States exported almost 33 percent of all conventional weapons (see Table 5). Only Russia came close, with a 25 percent share of arms exports. China and France each held about a 6 percent share, followed by Germany and the United Kingdom at 5 percent. Together, these six countries accounted for almost 79 percent of all weapons exports in the most recent 5-year period, again illustrating the high level of concentration in the defense industry. Exports are essential for all of these countries, since they allow their companies to produce larger quantities of fighter planes, tanks, warships, and other weapons systems, thereby driving down the per-unit cost, which ultimately benefits the DoD (in the case of the U.S.) and national defense ministries in other countries. While arms exports also help to achieve national security and foreign policy goals, they provide significant economic benefits as well, particularly for the workers and communities where the production is located and the spillover effect on civilian products (e.g., technologies developed to build fighter planes being later used in commercial aircraft) are realized.

Rank	Country	Exports (USD millions)
1	United States	46,908
2	Russia	36,232
3	China	8,447
4	France	8,034
5	Germany	6,722
6	United Kingdom	6,476
7	Spain	5,047
8	Italy	3,843
9	Ukraine	3,686
10	Netherlands	2,791
11	Israel	2,594
12	Sweden	2,095
13	Canada	1,490
14	Switzerland	1,440
15	South Korea	1,051
16	Turkey	856
17	Norway	713
18	Belarus	453
19	South Africa	448
20	Australia	446
	Others	3,119
	Total	142,890
Note: Figures are SIPRI Trend Indicator Values (TIVs) expressed in USD in millions, at constant (1990) prices.		

Table 5. Top 20 Suppliers of Major Conventional Weapons (2011-2015).[13]

One of the most significant global trends is the increased defense spending and weapons trade by emerging market economies.[14] India was the largest importer of weapons from 2011-15, accounting for 14

percent of all global arms imports, followed by Saudi Arabia, China, and the United Arab Emirates (see Table 6). Africa, which has experienced some of the world's most impressive economic growth over the past decade, saw arms imports increase 19 percent over the past 5 years compared to 2005-10 levels. China solidified its third place standing—a position it has held for just 2 years—in weapons exports, signifying the growing importance the country plays in international affairs.

Rank	Country	Imports (USD millions)
1	India	20,107
2	Saudi Arabia	9,932
3	China	6,680
4	UAE	6,552
5	Australia	5,204
6	Turkey	4,926
7	Pakistan	4,723
8	Vietnam	4,114
9	United States	4,109
10	South Korea	3,761
11	Algeria	3,500
12	Egypt	3,430
13	Singapore	3,325
14	Iraq	3,296
15	Indonesia	3,088
16	Taiwan	2,940
17	Morocco	2,921
18	Venezuela	2,774

Table 6. Top 20 Importers of Major Conventional Weapons (2011-2015).[15]

Rank	Country	Imports (USD millions)
19	Azerbaijan	2,176
20	Bangladesh	2,082
	Others	43,252
	Total	142,890
Note: Figures are SIPRI TIVs expressed in USD in millions, at constant (1990) prices.		

Table 6. Top 20 Importers of Major Conventional Weapons (2011-2015).[15] (Cont.)

As countries in Asia and Africa become more economically developed, larger sums are being spent on defense, particularly for weapons imported from the world's largest producers. Data in Table 7 show that military expenditures have increased in every global region between 2005 and 2015, except for North America and Western Europe. Globally, expenditures rose 22 percent over this 10-year period, but in Africa, they almost doubled to $39.1 billion. The Middle East also saw large increases in percentage terms (59 percent), and in value ($67 billion). Combined spending for all Asian regions rose from $236 billion to $420 billion, or 78 percent. Therefore, there are two opposing trends taking place in the global armaments market. On the one hand, more countries are spending greater sums of money on defense, and there is little reason to expect this to slow over the next 10-20 years. At the same time, more countries and companies are entering this lucrative market, raising competitive pressures on U.S., European, and Russian companies that have dominated the global arms trade for decades.

Region	2005	2010	2015	Percent Change (2005-2015)
Africa	**21.3**	**31.3**	**39.1**	**+83.6**
North Africa	7.4	11.4	18.4	+148.6
Sub-Saharan Africa	13.9	20.0	20.7	+48.9
Americas	**679**	**847**	**689**	**+1.5**
Central America and the Caribbean	5.3	7.8	10.6	+100.0
North America	627	777	613	-2.2
South America	47.3	62.0	65.4	+38.3
Asia and Oceania	**258**	**357**	**450**	**+74.4**
Central and South Asia	46.4	61.7	67.8	+46.1
East Asia	164	235	310	+89.0
South-east Asia	25.8	33.2	42.2	+63.6
Oceania	22.1	27.7	30.4	+37.6
Europe	**370**	**397**	**397**	**+7.3**
Central Europe	22.7	22.0	25.2	+11.0
Eastern Europe	47.3	67.4	101	+113.5
Western Europe	300	307	271	-9.7
Middle East	**114**	**142**	**181**	**+58.8**
TOTAL	**1,443**	**1,774**	**1,760**	**+22.0**
Note: Figure is for 2014, expressed in USD in billions, at constant (2014) prices.				

Table 7. Regional Military Expenditures.[16]

COUNTRY ANALYSIS

This section of this Letort Paper is intended to focus on new entrants in the global defense industry since the end of the Cold War. There has been much written about the U.S. and European defense industries, which along with the Soviet Union (now Russia), dominated global production and exports for over 50 years.[17] The countries below are not meant to be an exhaustive list. Nevertheless, they do represent the non-Western countries that are playing an increasingly influential role, not just in the production and trade of armaments, but in global political, economic, and security affairs.

China.

Macro-Variables.

The economic, political, and military rise of China has been perhaps the most significant change in the global political economy over the past 30 years. The country has been transformed from one of the world's poorest in the 1970s to the world's second-largest economy today—or first if using the PPP method of calculating GDP. It contains the world's largest middle class, and consumes more luxury goods than any other country. There are 98 Chinese companies among the world's 500 largest. The Chinese Government has developed a state capitalism economic development model that uses state-owned enterprises (SOEs), the allocation of financial resources, and a regulatory system that favors domestic companies. The government also offers support for Chinese firms to: expand

in global markets to foster the growth of key sectors, including: aerospace, energy, finance, mining, and transportation; to provide jobs to millions of workers; and, to maintain social stability. Although the state capitalism model has its critics, by almost any measure, China's government-led industrial policies, gradual opening of economic sectors to suit planners' goals, currency controls, and sometimes harsh domestic measures (such as the one-child policy to manage population growth and the hukou system of registration to slow internal migration by restricting access to social services) have produced a vastly improved standard of living for hundreds of millions of citizens, and a country whose global influence is far wider than it ever was less than 40 years ago.[18]

Yet, China's problems are manifold. The most significant is a relative slowing of the country's economic growth. For more than 30 years prior to 2010, China's annual economic growth rate averaged more than 10 percent.[19] Yearly GDP growth since then has been under 8 percent. While even 7 percent GDP growth would be a huge achievement for many countries around the world, China's slower growth has global implications. The decline in growth is largely due to structural shifts in the country's economy. Manufacturing, especially for export, was the key ingredient for the country's unprecedented growth rates. In 1990, Asia accounted for 26.5 percent of global manufacturing output.[20] By 2013, this had reached 46.5 percent, with China accounting for half of this figure. However, since 2001, hourly manufacturing wages in China have increased by an average of 12 percent per year. Although Chinese labor costs remain much lower than in the United States and Europe, and increased automation in Chinese factories has boosted productiv-

ity, manufacturing in China is no longer the cheapest option for global companies, even in Asia. The manufacturing growth model moved millions of workers from rural poverty to an urban middle class that has made China the largest global market for luxury goods and services; and MNCs are responding. According to AmCham China, a lobbying group for U.S. companies, the primary strategy for 71 percent of U.S. companies in China is to produce or source goods and services in China for the Chinese market.[21] Just 12 percent of U.S. firms are in China, primarily to produce or source goods or services for the U.S. market. Among the other factors for a relative decline in industrialization is that, in recent years, the government has acknowledged the environmental cost of rapid manufacturing growth, and is seeking to promote manufacturing in less dirty sectors, as well as services.

Demographic changes will play a key role in the country's evolution. According to the United Nations (UN) Population Division, in 1980, just 7.2 percent of China's population was over the age of 60.[22] By 2015, 15.2 percent was. By 2035, it is projected to be 29.1 percent, and 36.5 percent by 2050, before settling at just under 40 percent for the remainder of the 21st century. While the age imbalance is largely the result of the country's one-child policy, it is unlikely to be reversed, even though the policy was substantially revised in 2015 to allow two children per couple.[23] Urbanization and the high cost of living for many families in Chinese cities are considered by many demographers to be more influential than government policies in determining how many children couples have. The implications are wide-ranging. First, the cost of labor is likely to rise, due to a shrinking pool of working-age manufacturing workers. Second, services will com-

prise a larger portion of China's economy. Services accounted for just 32.4 percent of the country's GDP in 1990, while manufacturing made up 40.9 percent and agriculture, 26.7 percent.[24] By 2015, services were the largest component, at 50.5 percent, followed by manufacturing (40.5 percent), and agriculture (9.0 percent). If China follows the path of more developed countries, the services sector will continue to grow (for example, services accounted for 78.0 percent of the U.S. economy in 2014). This will be particularly important in health care (given the aging population) and in financial services.

Defense Sector.

Chinese companies are rapidly expanding their exports, reaching the position of the world's third-largest arms exporter for the first time for the 5-year period ending in 2014, and solidifying its place in 2015.[25] Exports grew by 88 percent in 2011-15, compared with the previous 5-year period, reflecting the country's production of more highly advanced equipment than was the case a decade ago. China's biggest client was Pakistan, which bought 35 percent of the country's weapons exports, followed by Bangladesh (20 percent), and Myanmar (16 percent).[26] China has long been Pakistan's main weapons supplier, since other exporters fear that New Delhi would retaliate by closing India's market to them. China, like Russia, has few political litmus tests when selling arms, meaning that issues like human rights grievances within buying countries or concerns within the international community that governments are violating global norms such as nuclear proliferation are rarely factors in deciding whom they sell arms to.

As the Chinese Government increases its military spending (it has been above 2 percent of GDP every year since 2001), defense firms can produce arms in greater quantities, thereby lowering unit costs and making exports more competitive. China's defense budget—now second in size only to that of the United States—has kept pace with the country's dizzying economic growth, and is scheduled to exceed annual GDP growth, at least in the short term. It increased 10 percent in 2015 to around $145 billion, after increasing 12.2 percent in 2014 over 2013 levels.[27] Although China is rapidly building an indigenous industrial base, there remains a need to import key weapons systems. Unlike the other countries discussed in this Letort Paper, China's arms imports ($6,680 million) and exports ($8,447 million) were roughly similar over the past 5 years.[28] Fifty-nine percent of Beijing's weapons imports from 2011-15 came from Russia, followed by France (14 percent) and Ukraine (14 percent).[29] The United States imposed export controls of defense and dual-use goods and technologies in 1989, following the Tiananmen Square incident. The European Union (EU) also maintains an arms embargo on China, but there is room for different interpretations by national governments of what products should be banned. As a result of neither the United States nor the EU having airtight restrictions on military-relevant goods and technologies, China has become adept at integrating what it has been able to procure from abroad into Chinese weapons systems.[30]

The Chinese defense industry is comprised of SOEs. Because of this, and the associated difficulty in obtaining verifiable revenues, breakdown of defense versus civilian segments, employment, and other statistics, neither *Defense News* nor SIPRI includes Chinese com-

panies in their rankings of the world's largest defense companies. As a result of heavy government spending on research and development, Chinese companies are moving up-market with their products. In October 2015, the state-owned Aviation Industry Corporation of China unveiled the capabilities of the J-31 advanced stealth fighter jet—an airplane the company plans to position directly with Lockheed Martin's F-35—even as it was still being tested.[31] Countries that cannot buy weaponry from the United States for technology transfer, or cost reasons, have increasingly turned to China. However, there remain significant gaps in China's defense industry, which hamper international sales. Although China has several aerospace companies, the country's defense industry cannot make reliable engines or avionics, so they must import these products from abroad (usually Russia).[32] This can be an advantage, since not having to develop and produce jet engines can save about half of the research and development (R&D) costs for a modern military aircraft, as well as considerable time in the development schedule.[33] Still, being able to produce all major armaments components is what separates the U.S. and Russian defense industries from other countries. China is almost certainly going to want to join this select group.

Outlook.

China is likely to be a game changer in the global defense industry and arms trade for several reasons. First, Chinese defense spending grew by 169 percent between 2005 and 2015, accounting for $135 billion of the $146 billion increase for all of East Asia during that time period (Table 7). As China continues to leverage

its economic weight toward global political and military influence, military spending will increase, albeit at slower rates than during the past decade. Still, this will provide a growing national market for weapons systems, which will allow for steady growth of the Chinese defense industrial base. Second, as China's economy transitions from low-technology manufacturing to higher-value-added goods and services, there will be spillover to the country's defense industry, enabling firms to produce weaponry that is more advanced. Third, China's appetite for raw materials from Africa and Latin America, although declining in recent years, gives the country significant leverage over the economies and governments in these two continents. This should help Chinese defense firms wedge their way into the procurement process of these countries, at the expense of Western and Russian companies, by offering the carrot of foreign investment, as well as greater access to the Chinese market. Finally, as China's growing military budget allocates more funds for weaponry, neighboring countries will be inclined to spend more, too. This will provide ready markets mainly for U.S. and European defense companies, since countries like South Korea, Japan, Singapore, and Australia rarely buy Russian arms.

India.

Macro-Variables.

India, the world's second most populous country, has seen mostly strong economic growth over the past quarter century (though not as consistent as China's). This is a result of the implementation of economic reforms in the early-1990s, which were inspired by a

financial crisis (and the imposition of the International Monetary Fund's structural reforms), a decline of the Soviet Union as an economic model, and concerns about the rapid economic growth in neighboring China. The country has achieved between 5-10 percent annual GDP growth for every year but one from 2006-14. Despite the country's recent economic success, only seven Indian companies are represented in the Fortune Global 500 rankings—the same as Brazil and more than Russia's 5, but still just a fraction of China's 98 companies.

Structurally, India's economy is overly dependent on the service sector. According to the World Bank, in 2014 services contributed 52 percent of the country's GDP, with manufacturing accounting for just 17 percent (agriculture was 18 percent, and other industries, such as mining, construction, electricity, water, and gas, made up 13 percent).[34] In China, manufacturing accounted for 36 percent of GDP, a figure that has steadily declined for more than a decade as the country's economy has matured, with services growing to 48 percent. Recognizing the relative weakness of India's manufacturing base, and the role that jobs in this sector play in economic development and the expansion of a middle class, the Narendra Modi government initiated its "Make-in-India" plan in September 2014 to promote foreign investment in 25 economic sectors.[35]

Politically, India is the world's largest democracy, albeit a messy one. According to the anti-corruption non-governmental organization Transparency International, India ranks as 76th out of 167 countries for public corruption.[36] While this is a serious problem in India, the country fares better than China (ranked 83) and Russia (119), but worse than South Africa

(61), Turkey (66), or Brazil (76). As a multiparty democracy, coalition governments are the norm, which often makes it difficult to formulate coherent policies, especially in the economic realm. The political system is federal in structure, which leads to very different political and economic environments across the country. For example, among the 29 states and 7 union territories, some such as Gujarat are very pro-business in orientation, while others like West Bengal often have been governed by democratically elected communist parties and/or influenced by politically active groups. Consequently, companies (both domestic and foreign) have been treated to a wide range of receptivity, from generous financial incentives and regulatory reforms to invest in particular locales, to abandoning multimillion dollar projects as Tata Motors did in 2008.[37]

In terms of demographics, India has a young population. In 2015, over 47 percent of the population was under the age of 25—a figure that will gradually drop to about one-third by 2050. By contrast, only 31 percent of China's population is currently under 25 years old, and that age group is expected to drop to under 23 percent by 2050.[38] The upshot is that India is positioned to have a large and growing workforce for the next few decades, and that, along with its large population (projected to surpass China's by mid-century), are among the key factors that are likely to propel the country to become the world's second-biggest economy by 2050 (see Table 1).

Defense Sector.

India's geography plays an important role in shaping its military strategy and weapons procurement decisions. India was the largest importer of weapons

from 2011-15, accounting for a 14 percent share of world imports (Saudi Arabia was second, with 7 percent, and China was third, with 5 percent).[39] Between 2006-10 and 2011-15, India's weapons imports increased by 90 percent, reflecting the country's security concerns vis-à-vis its neighbors, particularly China and Pakistan, as well as a need to replace Soviet-era equipment with modern weaponry. The country is expected to spend $120-130 billion over the next decade to update its obsolete and aging fleets of fighters, sea vessels, and various war machinery.[40] Imports are also essential because India has thus far failed to produce competitive indigenous-designed weapons that fully satisfy India's military needs, or the demands of foreign markets. In July 2014, the Indian Government increased the foreign investment limit in the domestic defense industry from 26 percent to 49 percent, in the hope of drawing greater interest from its primary weapons suppliers to help build the country's defense industrial base.[41] The defense sector had attracted a mere $5 million in foreign investment to that point in time.[42] For most foreign companies, such low equity participation provided little control over managerial decision-making, and virtually no incentive to share proprietary technology with Indian partners.[43] The government is expecting to leverage some of its buying power to obtain greater access to foreign technologies and, over time, reduce its reliance on imported weapons systems. The new policy seems to be working. India's Defense Ministry agreed in May 2015 to purchase 56 transport aircraft from Airbus in a deal valued at $1.87 billion.[44] A critical component of the transaction is that Airbus will assemble 40 of the planes in India after the first 16 have been delivered from the existing Spanish production facility. In Sep-

tember 2015, the Indian Government agreed to spend $2.5 billion to purchase 22 Apache and 15 Chinook helicopters from Boeing, over Russian competitors, with defense collaboration projects still to be negotiated.[45] A month later, France's Dassault agreed to sell 36 Rafale fighter aircraft to India for about $10 billion, in return for half of that amount, matched by offsets involving purchases from the Indian aerospace sector.[46]

Although India's increased funding for defense is putting the country on course to soon become the fourth-largest spender in the world—behind the United States, China, and Russia—its defense industry is dominated by state-run local companies whose products are of low quality and often long delayed.[47] Of the top 100 companies in Table 2, India is represented by only two (*Defense News*) or three (SIPRI)—a poor showing for a country with 1.2 billion people. Even private Indian firms were barred from the defense sector until 2001. Although India is the largest global buyer of weapons, its companies have only once exported more than $50 million of armaments in a year. While that figure was expected to double in 2015, it still represents a major weakness for the country's defense industrial base, which has struggled to produce weapons systems that anybody other than India's Ministry of Defense wants to buy.[48] After 32 years of work and almost $10 billion, the first-ever India-made fighter aircraft, the Tejas, developed by state-owned Hindustan Aeronautics, made its public debut in early-2015, but it will be at least 3 more years before the planes will be ready to be put into service.[49] The country also completed its first indigenous aircraft carrier and nuclear submarine, which are expected to soon be deployed. Despite these successes, India remains unprepared to be a major arms exporter. Domestic pro-

duction accounts for about 30 percent of the country's defense equipment procurement, with the rest coming from imports. This is particularly disappointing, given the talent and skills of Indian engineers and scientists employed in the high-technology sector.

Outlook.

India is poised to be a key U.S. partner in Asian security policy, as well as in defense industry collaboration. The country was the second-biggest buyer of U.S. arms in 2014, after Saudi Arabia, acquiring 11.2 percent of all U.S. weapons exports.[50] Significantly, India bought hardly any arms from the United States just 5 years previously. Prime Minister Modi has taken several important steps to re-orient his country's security, foreign, and economic policies from Russia toward the West, and particularly the United States. The strategy serves several purposes. First, it reduces India's long-standing dependence on Russian weapons, which had supplied about 70 percent of India's arms imports since 1950. Second, it upgrades India's military to counter regional threats, especially those posed by China. Third, it allows for the transfer of technology, not just to India's defense industrial base that is in dire need of modernization, but also to the wider manufacturing sector as well. In a joint statement from September 2015, U.S. Secretary of State John Kerry and India's External Affairs Minister Sushma Swaraj declared, "ties between the United States and India have never been stronger."[51]

Russia.

Macro-Variables.

Russia faces some of the most difficult challenges of the countries evaluated in this report. Economically, the country is facing difficult times. According to the World Trade Organization (WTO), 70 percent of Russia's exports are categorized as fuels and mining products, with just 20 percent consisting of manufactured goods. About half of the Federal Government's budget revenues come from taxes and duties on extracted oil, gas, and minerals. When Putin first became prime minister in August 1999, the global price for oil was about $30. Prices peaked at about $146 per barrel in the summer of 2008, dropped to about $44 several months later as much of the world entered recession, hovered around $100 from 2011-14, and sunk to about $35 in early-2016 before rebounding to about $50 in October. The point is that for the first 15 years of Putin's leadership, Russia experienced rising and relatively high global oil prices, as well as high commodity prices. The Russian economy grew at an average annual rate of 7 percent from 1999-2008.[52] If global oil prices continue to stay at such low levels, and most analysts believe they will remain below $60 per barrel through 2016, Russia's economy will continue to struggle.[53] Global commodity prices also have fallen precipitously, driven largely by slowing economic growth in China.

Overdependence on natural resources such as oil, gas, and commodities is only one factor affecting Russia's economy. Economic sanctions imposed in 2014 by the EU and the United States in response to Rus-

sia's intervention in Crimea is another. Aimed mainly at banks and energy companies, the sanctions are intended to restrict Russian access to Western finance and oil and gas technology. The Russian economy shrank by 3.7 percent in 2015, and is expected to shrink by a further 1.2 percent in 2016 as a result of all of these pressures.[54] The Russian ruble has lost half of its value in less than 2 years, going from about 36 rubles per USD in early-2014 to 70 rubles per dollar by December 2015. As a result, the price of imported goods has skyrocketed, making the country's limited manufacturing sector even less competitive. Russia's automobile industry, for example, relies on imported components. Due to the increased cost, companies have been forced to raise prices (contributing to inflationary pressures) and cut employment.[55] The increased cost of imports has depleted foreign exchange reserves. Even though a weaker ruble in theory should help Russian exporters, a reliance on more expensive foreign components (Ford and Volkswagen, for example, import more than half of all parts used to assemble cars in Russia) has offset the advantages a weaker currency should offer.

Like China, Russia is facing an aging population. As seen in Table 8, about 20 percent of Russians are over the age of 60, and the percentage will continue to increase over the next few decades. A big part of the reason is declining fertility rates, with the fertility rate of Russian women declining from about 2.0 in the 1970s to 1.25 during the second half of the 1990s, before stabilizing at about 1.7 during the 2010s. The aging percentage would be even higher if Russians lived longer. At about 65 years, Russian men have the lowest life expectancy of any country in this Letort Paper except South Africa (61 years).[56] Declining life expec-

tancy began with the end of the Cold War, as health services deteriorated and alcoholism increased. The U.S. Census Bureau projects that Russia's working-age population will fall by nearly 20 percent by 2030, putting a strain on the economy's output, government finances (including defense spending), military forces, and need for skilled workers, particularly in the defense industry.[57]

	1990	2000	2010	2020	2030	2040	2050
Brazil	6.4%	7.7%	9.9%	13.9%	18.8%	23.9%	29.3%
China	8.2	9.9	12.4	17.5	25.3	30.9	36.5
India	6.1	6.9	7.8	10.0	12.5	15.5	19.4
Russia	16.2	18.4	18.0	22.1	24.0	25.6	28.8
South Africa	5.1	6.2	7.4	8.5	10.5	11.9	15.4
Turkey	7.2	8.8	10.1	13.0	17.0	22.0	26.6
United States	16.8	16.2	18.4	23.1	26.1	26.9	27.9

Table 8. Demographic Trends (Percent of Population Age 60 and Over).[58]

Defense Sector.

The Russian defense industry has long been a major player in the global arms trade. During the Cold War, the Soviet Union and the United States alternated positions as the top exporter of weapons. With the end of the Cold War, and the tumultuous domestic environment within Russia during the 1990s, arms sales dropped dramatically to a low of $1.5 billion in 1994, compared to $11.5 billion by the United States that year, according to SIPRI.[59] Since 2001, however, Russian arms sales have rebounded, placing the country solidly in second place behind the United States—$92

billion in Russian weapons exports as compared to $114 billion by the United States from 2001-15. The biggest buyers of Russian weapons exports are Asian countries (including Vietnam, Indonesia, Myanmar, India, and China), Venezuela, and increasingly African countries (such as Ghana and Tanzania).[60] Russian weapons offer considerable "bang for the buck," since they are technologically advanced and much cheaper than those offered by their U.S. and European counterparts.

The resurgence in arms exports coincides with the leadership of Vladimir Putin. Having served since 1999, almost 5 years as prime minister and more than 12 years as president, Putin has put his stamp on Russian foreign policy, making it more assertive and, to many critics, aggressive.[61] A centerpiece of this policy is building the country's defense industry and increasing arms sales abroad. Russian defense spending grew by 112 percent between 2005 and 2015, accounting for $48.1 billion of the $53.7 billion increase for all of Eastern Europe during that time period (Table 7).

Russia has seven companies among the *Defense News* top 100 (SIPRI counts 11). The two largest firms are Almaz-Antey, a state-owned company that specializes in air defense systems, and United Aircraft Corporation, 80 percent owned by the government and maker of the well-known Sukhoi, MiG, and Irkut planes. Virtually all of Russia's defense firms have benefited from Putin's decade-long $350 billion military rearmament drive (begun in 2011), including an all-time high of about $33.2 billion spent on new equipment in 2014, and growth in exports, which reached a record $13.2 billion in 2014. Despite Western sanctions, currency devaluation, inflation, and other economic challenges described above, Almaz-Antey

and United Aircraft Corporation saw revenues rise 10 percent and 7 percent, respectively, in 2014 over 2013 levels. Other firms experienced equally impressive increases, including the Tactical Missile Corporation (48.6 percent), Russian Helicopters (16 percent), United Engine-building Company (25 percent), and electronics component maker RTI (15 percent).[62] Since few Russian armaments are exported to Europe or the United States, sanctions had little impact on foreign sales, much of which are destined for China, India, Algeria, and Venezuela.

The future, however, may not be so rosy for Russian defense companies.[63] Economic sanctions are likely to have a bigger impact in the coming years, as advanced components become more difficult to import from Western sources. Even if they can be obtained elsewhere, the weak ruble will make them expensive, reducing firms' global competitiveness and limiting the quantity procured by the Russian Ministry of Defense. The government is undertaking an import-substitution strategy to manufacture key components within the country's borders, but it will take time before defense firms can obtain the necessary quantity and quality from domestic contractors. For example, the Russian defense industry has had a long history of procuring parts from Ukraine. However, with Russia supporting separatists in eastern Ukraine, and Russian intervention in Crimea, Kiev imposed sanctions barring military exports to Russia.[64] This action, in some ways, has hurt Ukraine more than Russia, since about 70 percent of the country's defense exports, which total about one billion dollars each year, goes to Russia.[65] Thus, Ukraine, ranked by SIPRI as the world's ninth-largest weapons exporter between 2011-15, will face serious challenges finding alternative export markets that will sustain its domestic defense industrial base.

Nonetheless, sanctions have had a significant impact on Russian shipbuilding, since gas turbines for a number of frigate classes had been manufactured in Ukraine, and German-made engines were used in corvettes, causing a sharp production slowdown and even order cancellations. In a decision that created significant domestic and international controversy, the French Government decided in August 2015 to cancel a contract to deliver two Mistral warships to Russia, agreeing to reimburse Moscow about $1.3 billion.[66] Had the deal gone ahead, it would have been the biggest purchase of military equipment by Russia from a Western country since the fall of the Soviet Union, and given the country an opportunity to better understand Western technologies. The lessons the Russian government has learned from the Ukraine conflict and associated sanctions are twofold: find other countries from which to source parts and components and, in the view of President Putin, make Russia's arms industry entirely self-sufficient.[67]

Sanctions aimed at Russian financial institutions may also affect defense companies' access to loans and credit, since banks (prior to the sanctions) had borrowed Western monies at cheap rates to lend to defense companies. With access to low-cost funds cut off, the cost of borrowing is now higher for Russian firms. Additionally, eight defense companies are cut off from dollar trade, after U.S. financial institutions were forbidden by the U.S. Treasury from carrying out transactions with them.[68] The sanctions complicate and raise the costs of dollar-based exports and imports associated with Russian companies, since dollar transactions are carried out with a U.S.-based correspondent bank.

Diversification is necessary, but problematic for Russian defense companies. As of 2011, the industry received 22 percent of its combined revenue from weapons exports, 45 percent from military equipment sales within Russia, and 33 percent from civilian goods and services.[69] Over the longer term, the Russian Government wants to increase the share of civilian products to about 50 percent of total revenues. It is not obvious, however, that Russian defense companies can achieve the same kind of success as such Western peers as Boeing (which earns only 32 percent of its revenues from defense), Airbus (18 percent), United Technologies (20 percent), Finmeccanica (54 percent), Thales (49 percent), or Textron (34 percent).[70] Weapons produced for export have political, security, and economic dimensions, while civilian-oriented goods and services do not. In other words, Russian companies benefit from foreign policy relationships between Moscow and recipient countries that play no role in the market for civilian products. Until Russian manufacturing processes, marketing skills, and global supply chains that incorporate the highest levels of technology improve, diversification to any significant level will be a major challenge.

A more viable strategy is creating strategic partnerships with countries that can provide economic and political advantages. With Ukraine, the United States, Europe, and other Western-aligned countries off-limits as long as sanctions remain in place (and there are few signs that this will change in the near future), Russia is looking to China and India to strengthen defense ties. In April 2015, China became the first country to be allowed to purchase Russia's advanced S-400 air defense system; a month earlier, United Aircraft Corporation announced that a jointly developed

wide-body passenger plane with Commercial Aircraft Corporation of China should be ready by 2021 at a cost of $13 billion—most of which would come from China.[71] As discussed above, China's defense industry receives massive amounts of government funding, so it is understandable that Russian firms would want to benefit from that. However, it will be harder for Russian firms to make inroads in areas where China can obtain equivalent (or better) products, like engines and avionics, from Western companies that are eager to expand commercial relationships in the Chinese market. The situation is similar in India. Until 2013, India accounted for almost 40 percent of Russia's major weapons exports, and imported 75 percent of its weapons from Russian defense companies.[72] However, since the Modi government is looking to expand the country's economic ties with Western countries and their lucrative markets, deals with U.S. and European firms offer more potential for Indian companies. New laws permitting up to a 49 percent foreign share of investments in the defense sector also make India more attractive to non-Russian defense companies.

Outlook.

The Russian defense industry plays an important role in the country's export and industrial profile. Although well behind oil, gas, and certain minerals in value, weapons are Russia's most technologically advanced exports and one of very few of the country's goods or services for which there is global demand. Domestically, the defense industry provides a vital source of employment for scientists, technicians, and engineers who might otherwise emigrate in search of better job opportunities.[73] While Russia

likely will maintain its number two position in global arms exports for a number of years, it faces significant challenges as a result of Western-imposed sanctions, increasing competition from low-cost weapons producers like China, and a strategy of expanding military and civilian economic partnerships with BRICS countries that faces stiff challenges from the world's other top weapons exporters.

Turkey.

Macro-Variables.

Although not a country included in the BRICS acronym, Turkey is a country that merits inclusion in this Letort Paper for two reasons. One, the country has experienced some of the strongest economic growth rates in the world over the past two decades. Second, Turkey is quickly becoming a major player in the global defense industry as both an importer of arms and an aspiring exporter in its own right. From 2002-6, economic growth increased an average of 7.2 percent per year before slowing somewhat since then. Global investors have been impressed. Foreign direct investment stocks increased from $15 billion in 1995 (just 6.6 percent of GDP) to $145 billion in 2015 (19.8 percent of GDP).[74]

Despite its impressive economic record, Turkey is experiencing several important political and security challenges. The country's location is a precarious one, bordering Iran, Iraq, and Syria, with all of the spillover threats from the Islamic State (IS) and internal instability in the latter two countries. Despite having the largest army in the North Atlantic Treaty Organization (NATO) after the United States, the country's

military is ill-equipped to deal with the range of security threats around the country's borders. In October 2015, over 100 people were killed when two suicide bombers linked to the IS blew themselves up outside Ankara's central train station in the deadliest terrorist attack in the country's history.[75] The migrant crisis that exploded in 2015, as refugees mainly fleeing Syria sought refuge in Europe, placed Turkey directly in the route of nearly one million people traveling north and west.

Domestically, the Justice and Development Party, *Adalet ve Kalkınma Partisi* (AKP), has governed Turkey since 2002. While the AKP deserves considerable credit for stabilizing the macro-economy and fostering an environment that has stimulated both domestic and foreign investment, the situation has deteriorated over the past few years.[76] While not as dramatic as Brazil's situation described below, Turkey is experiencing slower growth, rising inflation, foreign exchange pressure, and decreased global competitiveness, to name a few challenges. Observers are becoming increasingly concerned about the growing authoritarian features of President Recep Tayyip Erdogan's (Prime Minister from 2003-14) leadership. Crackdowns on protesters and restrictions on free speech, the press, and social media—all of which intensified after an attempted coup in July 2016—have led many Turks and outsiders to question the government's commitment to democratic principles and civil liberties. Relations with the EU have soured since negotiations to join the organization were suspended in 2006 due to disagreements over Cyprus. The Syrian migrant crisis has made matters worse, with the EU blaming Turkey for facilitating the movement of refugees to member countries' borders.

Defense Sector.

With only two companies (Aselsan and Turkish Aerospace Industries) among the 100 largest defense firms in Table 2, Turkey is not yet a major player in the global defense industry. However, Turkey's President Erdogan has been very outspoken about his goal of establishing a vibrant defense industry by the centenary of the republic's foundation. According to Erdogan, "Our goal is to completely rid our defense industry of foreign dependency by 2023."[77] By that date, he also wants at least $25 billion in arms exports. This appears rather ambitious, given that Turkey exported only $856 million between 2011 and 2015, and only the United States and Russia exported more than $25 billion over this period (see Table 5). Yet, Defense Minister Ismet Yilmaz foresees markets in South America and Africa that cannot afford premium-grade offers from the world's top defense contractors as good opportunities for Turkish exports.[78] A little over half of the country's military equipment is currently made domestically. Turkey raised concerns amongst its NATO allies in 2013 when it chose China Precision Machinery Import and Export Corporation, a company sanctioned by the United States for selling missile technology to Iran and Pakistan, as the preferred bidder for a $4 billion long-range missile system.[79] The government justified its decision based on prioritizing the acquisition of new technology, which China was more willing to share than were U.S. and European defense companies. From 2011-15, U.S. companies supplied 63 percent of Turkey's armaments imports.[80] Muharrem Dortkasli, chief executive of Turkish Aerospace Industries, argues that, "We are talking about a country that will have its own national tank, national ship, national helicopter, satellite, and war plane. We

are aiming to have everything the five permanent members of the UN Security Council have."[81]

Outlook.

Turkey is positioned to play a critical role in the global defense industry in the coming years. On the one hand, the country borders Syria, Iraq, and Iran—three of the most volatile states in the world. Turkey's primary security interests lie in preventing the Islamic State of Iraq and Syria (ISIS) from expanding beyond their bases in Syria and Iraq and infiltrating the country's borders, and minimizing conflict with Kurdish groups in the southeastern part of the country. Thus, Turkey's defense spending is likely to increase in the short to medium term. On the other hand, Turkey's relationship with Europe is strained due to disagreements on whether and when the country may join the EU and the ongoing migrant situation. However, as long as Turkey remains a key member of NATO, the country and its defense industry are likely to follow its Western allies more often than not on security, weapons production, and procurement issues.

South Africa.

Macro-Variables.

South Africa is least like the other BRICS. While China, India, Russia, and Brazil all rank among the world's seven largest economies (see Table 1), South Africa comes in at 29th. Even Turkey's economy is more than twice as large. Within Africa, South Africa is the second-largest economy after Nigeria. However, until Nigeria moved into first place in 2014, South Africa was the continent's economic giant for decades.

This was due to its abundance of natural resources, as well as the continent's most advanced industrial base, which contributed to the country's high standard of living—at least for the white minority that controlled the politics and economics of the country until the apartheid system ended in 1994. Nevertheless, South Africa's economic growth has lagged behind most of sub-Saharan Africa in recent years. Slumping commodity prices and slower growth in China are the primary external factors, but declining competitiveness, increasing (and more violent) worker strikes, and increasing inequality both between and within racial groups are adversely affecting the country's political risk. The shadow of apartheid continues to affect many aspects of the country's economy, politics, and social structure more than 20 years after Nelson Mandela became South Africa's first black president.

South Africa was not a part of the BRICS acronym when it was coined in 2001. With its total population and economy far behind those of the other four countries, South Africa joined the meetings amongst the quartet in 2010 due to political expediency.[82] At the time, South Africa was Africa's largest economy and, more importantly, each of the four traded more with South Africa than with each other. In return for granting membership in BRICS, the other four countries received political capital, increased trade ties, and gained a key African ally in global politics and institutions such as the UN. On the trade front, the four original BRICS obtained greater access to South Africa's natural resources and—especially for China—a gateway to selling more consumer goods to one of the world's fastest-growing regions in sub-Saharan Africa.

Demographics are in South Africa's favor. The country has the youngest population of the six coun-

tries discussed in this Letort Paper, and is projected to remain so at least to mid-century. The World Bank projects that this could help the country achieve 5.4 percent annual growth rates that would double per capita incomes and virtually eliminate poverty by 2030.[83] The country's working-age population that is between 15 and 64 years has grown by 11 million since 1994, and is expected to increase by another 9 million over the next 5 decades. The problem, however, is that jobs have not kept pace with population growth. Only a little over 40 percent of South Africa's working-age population has jobs. The official unemployment rate is stuck at around 25 percent, although the figure is much higher for blacks (around 40 percent) than for whites (under 10 percent), with about half of citizens under 25 years old without jobs.[84] This presents two problems for the country. First, increasing amounts of government funds will need to be allocated toward the education and training of South African citizens to improve the quality of the workforce. This may well come at the expense of military spending, which has hovered around 1.1 percent of GDP for the past decade. Second, the instability associated with persistently high unemployment rates may deter foreign investors in a range of sectors, including defense. The stock of foreign direct investment in South Africa peaked at $163.5 billion in 2012, and has declined each year since to $124.9 billion in 2015—an unusual development, and even more so for a country that is supposedly one of the world's rising economic stars.[85]

Defense Sector.

The defense industry in Africa is fairly limited. This is in large part due to the continent's absence of a tradition in manufacturing. Long associated with the

export of oil, gold, diamonds, minerals, rubber, and other commodities, African countries are far more frequently purchasers of armaments than producers. The lone country on the continent with a significant defense industry is South Africa. Isolated during the apartheid years and barred by UN sanctions from buying weapons systems from many foreign companies, South Africa developed an indigenous defense industry centered around Armscor. Armscor's subsidiaries were split off in the post-apartheid years, with state-owned Denel becoming the country's largest defense firm, focusing on aerospace and missile technology. Paramount is the country's (and continent's) largest privately-owned defense company with a shipbuilding and aerospace operation, and is a global leader in developing landmine and improvised explosive device (IED)-resistant vehicles.[86] These technologies were honed decades ago when South Africa was at war in Namibia and Angola, and there was a need for blast-resistant trucks; these were a precursor to the armored vehicles used by the U.S. military in Afghanistan and Iraq.[87]

South Africa's defense industry went into decline once Mandela became the country's president and defense spending was slashed in favor of social programs. The country was spending about half as much in the late-1990s as it did at the beginning of the decade, and some of the industry's best engineers emigrated and joined foreign manufacturers. However, the industry may be poised for a turnaround as the government gradually increases the military budget in light of a new security environment. Although South Africa is not a big spender on defense, much of the equipment it needs (like Brazil below) is designed to address non-traditional security concerns, such as illegal cross-border activities, combating wildlife traf-

ficking, and related security threats. This suggests a need for land-, air-, and sea-border surveillance solutions.[88] This creates a market for niche products that larger defense contractors do not produce. Paramount and Aerosud are jointly making a compact plane that merges the capabilities of a drone, an attack helicopter, and a surveillance aircraft.[89] It is aimed at African governments involved in combat, peacekeeping, and humanitarian work, but at a cost that is one-third to one-half that of a Boeing Apache helicopter.

Outlook.

South Africa is unlikely to become a major player in the global arms trade like the United States, Russia, China, and the larger European countries. However, it is well positioned to produce equipment designed specifically for African needs in a market comprised of many small countries that have largely been ignored by Western arms contractors. South Africa has a history of producing reasonably good and sometimes innovative weapons. The main problems for domestic firms include operating in a country that is experiencing slow growth, and whose government seems incapable, due to corruption and complacency (the African National Congress has been the dominant political party since the end of the apartheid era), of offering long-term solutions to South Africa's persistent economic and social challenges. For foreign companies, South Africa and much of the region do not offer the market opportunities and economies of scale that usually justify the hard work of creating joint ventures, especially when there are so many other regions, like Asia and the Middle East, where more (and more profitable) weapons systems can be sold.

Brazil.

Macro-Variables.

Until recently, Brazil's economy had been a model for much of Latin America. With rapid growth in the 2000s, a reduction in the country's persistently high inequality and poverty rates, and a huge expansion of exports (particularly raw materials and agricultural products destined for China and East Asia), the country appeared to be transforming itself beyond the import substitution-based and highly regulated bureaucratic economy of previous decades. Nevertheless, annual growth slowed to 2.7 percent from 2009-13 and the country entered a recession in 2014. Slowing economic growth in China has had a ripple effect on Brazil, and the decline in the global price and demand for commodities has hit the country particularly hard. Inflation is rising and topped 10 percent in 2015. In response, the central bank has raised interest rates, thereby slowing growth further, and the central government is trying to restore fiscal discipline to the government's finances. Former President Dilma Rousseff, engulfed in a wide-ranging corruption scandal that also includes some of the country's top corporate names, including state-owned energy giant PetroBras, was impeached in August 2016. The World Bank's "Doing Business" rankings place Brazil at 123 out of 190 countries in terms of how regulations affect the ease of doing business.[90] This puts Brazil among the bottom half of Latin American countries, and behind Russia (ranked 40), Turkey (69), South Africa (74), and China (78), but ahead of India (130).

Unlike China, India, and Turkey, Brazil's security environment is relatively stable and unthreatening. Like South Africa, Brazil's security needs are non-

traditional. While conflict with neighboring countries is not imminent, Brazil's military equipment requirements are aimed primarily at protecting its vast natural resources, including offshore oil and gas reserves and facilities, monitoring encroachment in the Amazon basin, and dealing with drug and arms trafficking and cross-border crime.

Demographics are, in some ways, more problematic for Brazil than for other countries in this Letort Paper. The percentage of the population over age 60 is projected to go from 7.7 percent in 2000 to 29.3 percent in 2050. This is due to a dramatic change in fertility rates, as more women enter the workforce, urbanization (and the costs of raising children) increases, and greater access to contraceptive health services expands. Whereas the average woman had about 4.5 children in the 1970s, that figure had dropped to about 2.5 in the 1990s, then to approximately 1.8 over the past decade. That figure is projected to level off at about 1.66 through mid-century.[91] While this has an obvious effect on the size and stability of the workforce, it has an even bigger impact on government finances. Brazil spends more than 10 percent of its GDP on public pensions, similar to what southern European countries with much older populations spend, as compared to just 1.5 percent on military expenditures.[92] Given that Brazilian pensions are among the most generous in the world, and millions more citizens will be expecting to receive them in the coming years, the political challenge to reform the pension system will be daunting. The country's military and defense industry will have a difficult time persuading future governments to increase spending on updating weapons systems and modernizing forces in such a fiscal environment.

Defense Sector.

The fortunes of Brazil's defense industry have fluctuated in recent decades. During the 1980s, Brazil was the world's fifth largest exporter of defense products and services, sending some 80-90 percent of its output to Latin America, Africa, Asia, and the Middle East.[93] This was part of a wider industrial policy implemented by the military ruling elite that sought to make the country more self-sufficient, without having to rely on foreign firms (and the foreign currencies necessary to pay for imports)—thereby producing indigenous technologies. In the 1990s and 2000s, the country's access to missile technology and supercomputers was curtailed by an embargo imposed by Western countries, and global defense spending declined following the end of the Cold War. As a result, Brazil's defense firms saw foreign sales opportunities shrink. Since domestic military spending was insufficient to pick up the slack, the country's defense industrial base shrank and several important firms went out of business.

Governments, particularly since the start of Luiz Inácio Lula da Silva's presidency in 2003, have focused far more attention on social policy than on defense. This has begun to change over the past few years, as the government is once again seeking to develop an indigenous defense industrial base that is less reliant on arms imports. Brazil's defense sector had about $3.7 billion in revenue in 2014, almost half of which ($1.7 billion) was export sales.[94] This is a rather small figure, given that more than 20 of the world's largest defense companies listed in Table 2 have greater defense revenues than the entire Brazilian defense industry, and that Brazil had a higher level of military spending than all but 9 countries in the world in 2014 (with almost three-quarters of the budget allocated to

pay and pensions). The Brazilian Government aims to increase weapons exports to $40 billion over the next 20 years. Today, Brazil has only one company, the aerospace giant Embraer, among the world's top 100 defense firms.

Brazil has been buying increasing amounts of defense equipment from Russia in recent years, including helicopters and air defense systems.[95] However, French, Italian, and British companies have made inroads as well. From 2008-10, French defense companies secured deals that included submarines and helicopters valued at €15-20 billion.[96] Even Sweden was actively courting Brazil, which paid off in 2015 when both countries' governments agreed to the sale of 36 Gripen fighter planes valued at $4.7 billion. The agreement comes with a strong technology commitment from Sweden to transfer "everything" that Brazil will need to develop its own next-generation military jets.[97] About 29 of the planes will be produced in Brazil, with Embraer and Akaer as major partners. Price was a key consideration, given Brazil's precarious government finances, as was the technology transfer arrangements—terms that Dassault's Rafale and Boeing's F/A-18E/F Super Hornet could not meet.[98] For Sweden, the Gripen contract with Brazil is the biggest Swedish export deal to date; there are expectations that there will be spillover benefits for some of the 200 or so Swedish-owned companies currently operating in Brazil, employing more than 70,000 workers. Saab regards the plane sale to Brazil as a stepping stone for additional orders in Latin America and as expanding the company's industrial cooperation arrangements with other countries in the region. Like India, Brazil views relationships with foreign defense contractors as a means to foster wider economic development, particularly in manufacturing.

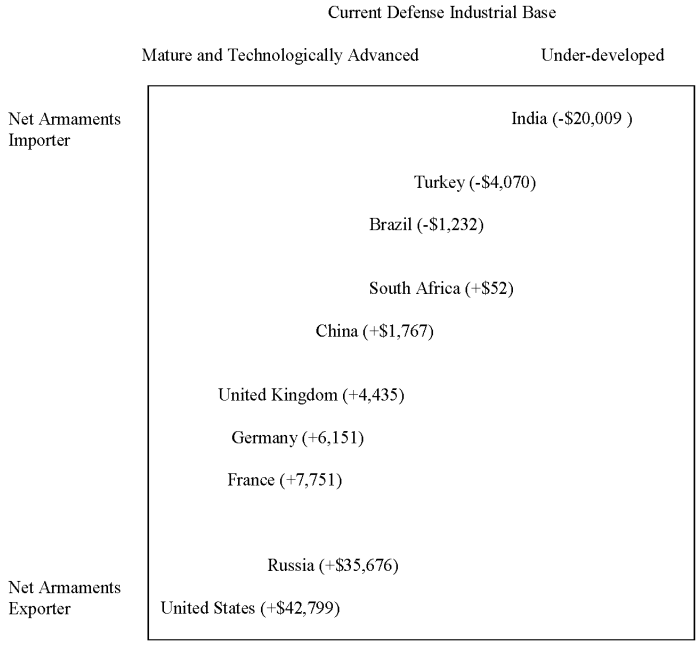
Outlook.

The biggest concern now for foreign companies is how Brazil's economic woes will affect the government's budget priorities. It will take time for President Michel Temer, Rousseff's successor, to implement the economic, regulatory, and social reforms necessary to return Brazil to a more promising growth path. Ongoing corruption probes, combined with a general election in 2018, will obfuscate where defense stands in spending priorities. In the meantime, Brazil's defense industry is likely to do better than South Africa's, but perhaps not as well as Turkey's, assuming the Middle Eastern country can achieve its president's goal of making the country an armaments production and exporting powerhouse. On paper, Brazil has the numbers in terms of population, industrial experience, and economic leverage to expand its role in the global defense industry. However, the country's challenges may thwart that from happening.

RECOMMENDATIONS

Figure 1 maps the six countries in terms of whether they tend to import or export weapons (on the vertical axis) and a subjective assessment of the maturity and technological sophistication of their defense industrial bases based on the previous analysis (on the horizontal axis). For comparative purposes, the United States is also included, as well as the world's third (France), fourth (Germany), and fifth (United Kingdom) ranked net arms exporters. One would expect that, over time, countries would seek to move from the upper-right portion of the figure to the lower left, since this would provide additional export earnings and the political influence that accompanies arms sales, and provide

for the employment, financial/budgetary, and technological spillover advantages that a more developed defense industrial base provides. As discussed above, China has made large strides in this direction in recent years, but remains in a distant third place behind the United States and Russia. The other four countries analyzed in this Letort Paper have considerably more work to do before they will join the ranks of the leading net exporters of defense equipment.



Note: Figures are SIPRI TIVs expressed in USD in millions, at constant (1990) prices, and reflect arms exports minus imports for the period of 2011-15.

Figure 1. Defense Industry Profile of Non-Western Countries.[99]

The previous sections reviewed the current state of six countries in the global political economy. All six are regarded in business, policymaking, and academic circles as either aspiring economic powers or major players in global arms production and trade. Given the developments in these countries, here are the following recommendations for the United States:

1. Maintain Defense Industry Technological Dominance.

First and foremost, the U.S. must maintain its global dominance in the defense sector. In the post-9/11 world, military leaders are prioritizing command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR), over the more traditional weapons systems like aircraft, ships, and tanks. As a result, less-well-known companies such as L-3 Communications (#10), Leidos (#24), and Exelis (#35) are quickly moving up the global rankings (Table 2, *Defense News* ranking). In response to cuts in U.S. defense budgets, in the years following the Iraq and Afghanistan drawdowns, most defense firms have diversified their sales to more non-defense applications, or to other countries by way of exports. These trends have made competition for Pentagon weapons contracts even more intense, since fewer and higher-priced items are being acquired. In recent months, Congress has called for increases in defense spending in light of heightened levels of global insecurity from the likes of terrorist groups, provocations by Russia, rivalries in Asia, and nuclear ambitions in Iran and North Korea. The main winners of global insecurity are likely to be defense companies; especially those that can produce the most state-of-the-art systems. To

maintain battlefield advantages over potential adversaries, technological dominance is essential, but must be prioritized in the current budgetary climate.

2. Develop Strategic Alliances.

Second, the U.S. should seek to build industrial alliances with allies. European firms, although discussed relatively little in this report, are among the most technologically advanced in the world and represent the most viable strategic partners, given strong political and military relations between the United States and individual countries, and between the United States and organizations such as the EU and NATO.

Alliances also should be constructed with emerging markets where the U.S. shares similar regional security interests. In Asia, these include Japan, South Korea, and India, the first two of which already have strong industrial bases and, combined, are home to 11 of the top 100 global defense companies. In the Middle East, Turkey represents a key partner. It is essential for the U.S. Government, military, and industry to cooperate in seeking foreign markets for defense exports, since governments in other countries are aggressively courting contracts on behalf of their firms. Steep cuts in the UK defense budget, for example, have prompted the British Government to promise that it will help the industry sell its equipment and services abroad, mainly to developing countries such as India and Brazil.[100] While it is difficult to imagine circumstances whereby the United States would want to forge defense industrial alliances with Russia or China, the other four countries would be reasonable options that would further U.S. political, foreign policy, and strategic considerations.

There are, of course, reasons to be cautious. Some countries, like India, are wary of becoming overly dependent on any one country when acquiring weapons from abroad. In some cases, opportunities for export will be minimized because the technological sophistication of U.S. defense companies makes products prohibitively expensive. Indeed, some critics contend that focusing on cutting-edge technology to satisfy DoD requirements prices U.S.-made planes, missiles, naval ships, helicopters, and tanks out of the global market—creating opportunities for low-cost producers.[101] One way to drive down costs is for the Pentagon to procure more products from abroad, thereby creating more competition with U.S. firms and making a more convincing case to foreign firms and governments that there is a "two-way street" in the arms trade.[102] However, the political obstacles to such a policy are formidable, especially from U.S. states, their representatives in Washington, and their workers who benefit from the status quo.

3. Minimize Technology Transfer to Likely Industry Rivals.

While it seems obvious that the U.S. defense industry should avoid sharing technology with foreign firms that are likely to be rivals, this is difficult to do where there is significant military-civilian overlap, or where dual-use technologies represent a significant portion of a product's value. This is particularly true in aerospace. Boeing projects that China will purchase 6,330 new planes from 2015 to 2034 valued at $950 billion.[103] Airbus projects similar growth, with 32,585 planes to be sold globally over the next 20 years, with the Asia/Pacific region accounting for 39 percent of

sales.[104] Both companies need to be wary of chasing short-term revenues, which will lead to long-term costs. Given the growth in the demand for commercial aircraft, especially in China, Beijing will not sit idly by while Boeing and Airbus reap the rewards from global sales. China will seek to do what Japan, Brazil, and others have failed to do—add a third manufacturer of large commercial aircraft to the current global duopoly. Airbus built an assembly line for the A320 in Tianjin in 2008, and Boeing announced in 2015 that it would build a plant to assemble 737 jets in China.[105] Given the concerns many companies have had about the dissemination of proprietary technologies to Chinese competitors, Airbus and Boeing may find themselves competing with a lower-cost, but equally capable, rival in the medium term.

4. Use Weapons Exports to Achieve Political Objectives.

It is not a new concept that weapons exports are tied to political and foreign policy objectives. This relationship played out during the Cold War, as the United States and the Soviet Union armed countries that were allies or served foreign policy goals (or both), such as supporting rebel groups in efforts to overthrow undesirable regimes. The difference in the 21st century is that, instead of being a two-dimensional process, arms suppliers operate in a multidimensional arena in which several countries are positioned to play influential supplier roles. Russia's military support to Syria, for example, illustrates a continuation of the U.S.-Russia rivalry for influence. India and Brazil are likely to be smaller players for the short term. Japan's interests in Asia, mainly countering China's influ-

ence, may lead to an expansion of weapons exports to neighboring countries with similar concerns, such as the Philippines and Vietnam. However, it is China that is almost certainly going to be the primary armaments exporting rival to the United States for the near future, especially in Latin America and Africa, where value and "good enough" qualities are prioritized before the need for technical superiority over neighboring countries' weapons. Maintaining U.S. influence on these continents will require a greater willingness on behalf of U.S. defense firms and the DoD to share some technologies with countries identified as key political partners.

Given the economic benefits associated with cooperating with U.S. defense companies, there are opportunities to use such collaborations as leverage to achieve political goals. For example, if the domestic environment of Turkey becomes more unstable, restrictions or even prohibitions on industrial relationships may be warranted. Likewise, developing closer collaboration with India's Modi government by encouraging industrial cooperation between U.S. and Indian defense firms may serve to reduce Russian influence in that country, which has been particularly strong with respect to the arms trade.

ENDNOTES

1. A country's economic output, the gross domestic product (GDP), can be calculated using market exchange rates or purchasing power parity (PPP). The latter is regarded by most economists as a better indicator or average of living standards or volumes of output, because it corrects for price differences across countries at different levels of development. PPP is the method used in Table 1 of this Letort Paper.

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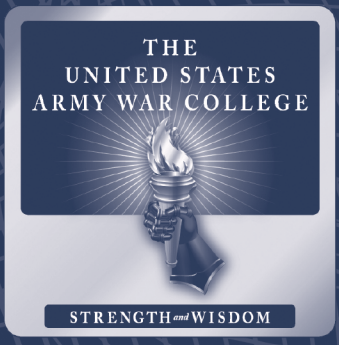

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