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Articles

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Aims and scope

This journal raises and debates all issues related to the political economy of personal, communal, national, international, and global conflict, peace and security. The scope includes implications and ramifications of conventional and nonconventional conflict for all human and nonhuman life and for our common habitat. Special attention is paid to constructive proposals for conflict resolution and peacemaking. While open to noneconomic approaches, most contributions emphasize economic analysis of causes, consequences, and possible solutions to mitigate conflict.

The journal is aimed at specialist and nonspecialist readers, including policy analysts, policy and decisionmakers, national and international civil servants, members of the armed forces and of peacekeeping services, the business community, members of nongovernmental organizations and religious institutions, and others. Contributions are scholarly or practitioner-based, but written in a general-interest style.

Articles in *The EPS Journal* are solicited by the editors and subject to peer review. Readers are, however, encouraged to submit proposals for articles or symposia (2 to 4 articles on a common theme), or to correspond with the editors over specific contributions they might wish to make. In addition, comments on published articles (<500 words) are welcome. Write to us at editors@epsjournal.org.uk or contact us via the journal's home page at www.epsjournal.org.uk.

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Abstracts

J. Paul Dunne and **Nan Tian**. "Military expenditure and economic growth: A survey." Until recently, a long-standing, impressively large, and growing literature on the effects of military expenditure on economic growth appeared to have failed to result in a scholarly consensus. But the availability of 20 more years of data since the thawing of the cold war has helped researchers to make progress in identifying any relation of military expenditure with economic factors. The literature is complex and difficult to summarize, with studies differing in their theoretical approach, in the empirical methods used, in the coverage of countries and time periods employed, and in their quality and statistical significance. This article extends and updates an earlier survey, now covering almost 170 studies. It finds that more recent studies provide stronger evidence of a negative effect of military expenditure on economic growth.

Piotr Lis. "Armed conflict, terrorism, and the allocation of foreign aid." Armed conflict and terrorism damage economic development through disruption of economic activity, trade, and the destruction of human and physical resources. They also can affect foreign aid allocation, but the likely net effect of this is not obvious. On the one hand, donors may be discouraged and reduce aid. On the other hand, donors may provide more aid, for instance as a reimbursement for counter-terrorism efforts that benefit the donor country. This article aims to identify the net effect using data for a panel of countries. It finds that armed conflict does have a large and negative effect on bilateral and multilateral aid, but that bilateral donors seem to turn a blind eye to violence occurring in oil-exporting countries. Further, the article finds that while transnational terrorism tends to increase bilateral aid, bilateral donors seem indifferent to domestic terrorism. In contrast, multilateral aid is found not to react to transnational terrorism, but does react to domestic terrorism.

Ron Smith. "The defense industry in an age of austerity." Reductions in military expenditure will generate pressures to restructure the defense industry. This article explores the implications of a more peaceful evolution of military expenditure for the economic structure of this industry. For example, since military expenditure and defense industry concentration have moved in opposite directions in the past, future cuts in such spending might be expected to lead to a more concentrated industry. Although eventually thwarted in 2012, the proposed merger of defense industry giants BAE and EADS—which would have created the world's largest defense firm—is discussed in some detail as a potential harbinger of defense consolidation to come.

Jurgen Brauer. "Demand and supply of commercial firearms in the United States." The article establishes methods by which to estimate demand and supply in the commercial firearms market in the United States. For the first time, this includes the number of used firearms resold via federally licensed retailers. For 2010, for example, total unit sales are estimated at 9.8 million pistols, revolvers, rifles, and shotguns, about 1.5 million of which were used weapons. The total number of military and nonmilitary firearms that entered commerce between 1986 and 2010 is estimated at about 150 million units. Allowing for pre-1986 production and imports, this lends credence to the notion that the total stock of firearms in the U.S. averages about one firearm per person. The article further shows rising firearms imports. In 2010, these amounted to about one-third of the total market. In addition to imports, foreign brands also produce at U.S. locations and, in 2010, captured well over 20 percent of the U.S. commercial pistol market.

Military expenditure and economic growth: A survey

J. Paul Dunne and *Nan Tian*

This article extends and updates an earlier survey of the literature on the relation between military expenditure and economic growth. Covering nearly 170 works, it finds that the more recent studies—those making use of data since the end of the cold war—provide increasingly strong evidence of an overall negative effect of military expenditure on economic growth.

Until recently, a long-standing, impressively large, and growing literature appeared to have failed to result in a scholarly consensus on the effects of military expenditure on economic growth. But the availability of 20 more years of data since the end of the cold war has helped researchers to make progress in identifying any relation of military expenditure with economic factors. The literature is complex and difficult to summarize, with studies differing in their theoretical approach, in the empirical methods used, in the coverage of countries and time periods employed, and in their quality and statistical significance. This article extends and updates an earlier survey by Dunne and Uye,[1] now covering almost 170 studies. It finds that more recent studies provide increasingly stronger evidence of a negative effect of military expenditure on growth. The following sections discuss the general nexus between military expenditure and economic growth, reviews general theoretical issues and the empirical literature, and evaluates the effect of adding the more recent studies to the older ones. The final section presents some conclusions.

Military expenditure and economic growth

Military expenditure is an important issue for the international economy. It has influence beyond the resources it takes up, especially when it facilitates conflict. Of course, countries need some level of security to deal with internal and external threats, but any resource use carries an opportunity cost in that it prevents money and other resources from being alternatively employed for purposes that might directly improve the pace of development. This is particularly important for developing countries as in the post-cold war world most wars have taken place there, and this is unlikely to change any time soon.

When governments undertake military expenditure, they provide wage income and cover other expenses for the armed forces and procure arms for them. Unfortunately, the only reliable data is on military expenditure *per se*, not on any of its components, and in reviewing the literature one can do no more than simply recognize that arms transfers are an important part of military expenditure.[2] In developing countries, it is likely that the arms will be imported, particularly advanced weapon systems, and will drain precious reserves of foreign exchange. This suggests that the opportunity cost of military expenditure is likely to be higher than the expenditure itself.

The end of the cold war brought considerable reductions in military expenditure, although not consistently across all of the world's regions. However, as SIPRI's *Yearbooks* show, in recent years the declining trend has bottomed out and military expenditure is rising again. While there have been armed conflicts, the major pressure to increase military expenditure seems not to result from any obvious strategic need but from internal pressures by vested interests.[3]

General trends do of course hide more complex patterns. For example, some states have increased military expenditure because of local insecurity or due to encouragement from arms- producing companies pushing for arms exports. There has also been continued use of economic arguments to justify security expenditures, or to argue against reductions. Within developing countries, especially, much heterogeneity exists regarding their stage of development, the nature of development, the state of their neighbors, their military burden, whether or not they have an arms industry, and the degree of the military's involvement in the governance of the state.

It is worth noting that the military burden—the share of military expenditure in GDP—is low in most states as compared to other GDP components such as health and education. As a result, when there are other and more weighty influences, one may not find a statistically significant effect of military expenditure on the path of national income even if such an effect actually exists. Aside from when countries are actively engaged in conflict, one also might not expect to find statistically significant effects of arms transfers and military expenditure on growth, which makes it all the more interesting that in many cases one does find such effects.

Theoretical issues

Theory (should) precede empirics, but much of economic theory does not assign an explicit role for military expenditure as a distinctive economic activity. Consequently, one finds a wide range of theoretical specifications in the empirical work.[4] The neoclassical approach views the state as a rational actor, balancing opportunity costs and security benefits of military expenditure to maximize a national interest. Captured in a social welfare function, arms-related spending is seen as a public good and the economic effects on military expenditure is determined by its opportunity cost, the trade off between it and other spending. Early models of economic growth, which assumed exogenous technical change, have been extended to allow for the effects of changes in education and technology that produce endogenous growth.[5]

In contrast, Keynesian approaches view military expenditure as one aspect of state

spending to possibly increase output through multiplier effects in the presence of ineffective aggregate demand. In this way increased military expenditure can lead to increased capacity utilization, increased profits, and hence to increased investment and growth. The institutionalist approach combines a Keynesian perspective with a focus on the way in which military expenditure can lead to industrial inefficiencies and to the development of a powerful interest group composed of individuals, firms, and organizations who benefit from defense spending, often referred to as the military industrial complex (MIC). The MIC increases military expenditure through pressure on the state even when there is no threat to justify such expenditure.[6] Another perspective comes from the Austrian School, questioning military expenditure as a form of statism and collective action leading to war and long-term economic damage.[7]

Writers in the Marxist tradition generally see the role of military expenditure in capitalist development as important, but contradictory. Strands in this tradition differ in their treatment of crisis, the extent to which they view military expenditure as necessary to capitalist development, and the role of the MIC in class struggle. One offshoot, the underconsumptionist approach by Baran and Sweezy,[8] provides the only theory in which military expenditure is both important in itself and is an integral component of the theoretical analysis. Here, military expenditure is both necessary to maintain capitalism and to prevent stagnation. Monopolistic companies produce goods and control labor costs, leading to inadequate consumption. While military expenditure is wasteful, in the sense of not creating any further output, it does create substitute demand to allow companies to sell goods and realize profits.[9]

The absence of an agreed theory of economic growth means that there is no standard framework into which empirical work on military expenditure can be fitted. Yet, clearly, military expenditure, conflict, and economic capacity (e.g., education, governance, institutions, natural resources) all interact to influence growth. The theoretical work has identified a number of possible channels through which military expenditure might affect an economy, but the relative importance and sign of any such effects and the overall impact on growth can only be ascertained by empirical analysis. An important issue in empirical work concerns the identification problem which results when security threats influence changes in both military expenditure and economic growth so that it is difficult to know whether any relation between the latter two is due to the underlying security threat or whether an additional relation between military expenditure and economic growth exists. All this suggests the need for much skill and caution in interpreting the results of empirical studies.[10]

Empirical findings

In empirical work, certain choices need to be made. Many of these are conditioned on the theoretical perspective adopted and the data available. The results are likely to be sensitive to the measurement and definition of the variables, to the specification of the estimated equations (especially the other variables included), to the type of data used, and to the estimation method. The resulting variety of studies does make a comparison rather difficult and explains some of the seemingly contradictory findings.

In a now classic correlational study, Emile Benoit started the empirical debate in 1973 by finding a positive association between military expenditure and development in developing countries.[11] There were two responses to this. One criticized Benoit's approach, arguing that the complexities and specificities of the underlying processes call for detailed, individual country case studies. The second argued that the empirical work was flawed, and this led to a plethora of econometric studies. Some early contributions employed models with both Keynesian and neoclassical features, within simultaneous equation systems. This approach emphasized the interdependence between military expenditure, growth, and other variables, with the majority of the studies tending to confirm the existence of a negative effect of military expenditure on economic growth and development. Varying in their use of data, some dealt with cross-section averages, others with time-series estimates for individual countries, and others were more comprehensive still.[12] These types of modeling approaches have become rarer and neoclassical and New Keynesian models more dominant.[13]

A studies used neoclassical-type, but single-equation growth models, introducing military expenditure (in forms such as burden, per capita, or absolute value) as the, or one of the, independent variables. For example, Peter Frederiksen and Robert Looney re-examined Benoit's data in this manner but divided the sample of countries into resource-constrained and resource-unconstrained. They found that a statistically significant positive relation for military expenditure on growth held for the resource-unconstrained group.[14] But the relation was negative for the resource-constrained set of states. Other studies tended to find a positive or insignificant effect of military expenditure on growth, although there were studies that did find adverse effects.[15] To address certain limitations of the earlier studies, some authors then used extended growth models, including a World Bank study which found that high levels of military expenditure detract from growth by reducing the formation of productive capital and distorting resource allocation.[16] More recently, Rati Ram, using a large panel of countries, found no evidence of crowding out but clear differences across groups of countries.[17] And in a forthcoming study, Dunne and Tan find a statistically significant negative effect of military spending on growth and found this result to be surprisingly robust when using a range of potentially important variables (such as conflict and foreign aid) to stratify a large panel using post-cold war data.[18]

An important concern with the single-equation approach was how to determine causality.[19] This led to a number of studies using Granger-causality techniques. A critical review of this work argued that the lack of theoretical underpinnings means it is very difficult to interpret the results of these studies. Also, inherent limitations of the Granger-causality test often lead to unstable estimates over different time periods or countries, suggesting this method is unreliable in testing for causal links.[20]

Some recent contributions deal with the possibility of a nexus between military expenditure and growth by testing for a nonlinear relationship, or different effects at

different levels of expenditure. Given the complexity of such models, these studies tend to focus on small numbers of states. For example, one study estimates threshold regressions and shows a level-dependent effect of military expenditure on growth, namely, positive effects for low levels of military expenditure but negative ones for high levels.[21] But another study finds clear negative effects at both high and low levels of military expenditure.[22]

A further concern of researchers was to allow for the opportunity cost of military expenditure, the trade-off between this and other forms of state expenditure. Early studies found weak evidence of military expenditure crowding out spending on education and health in developing countries, and later studies found no such evidence of trade-offs at all.[23]

An alternative to all of these studies was provided by the existence of large-scale country macroeconometric models, multi-country models, and even world models. Although originally developed for other purposes, the effect of using funds spent on the military for alternative purposes can be analyzed. A collection of such studies was assembled by Nils Petter Gleditsch and colleagues. Jointly, they demonstrated the benefits of a post-cold war "peace dividend".[24] Because of their complexity, relatively few such studies are available for developing countries. This type of analysis does not search for long-run determinants of growth, as conventional models tend to do, but instead focuses on short- to medium-run peace dividend effects by allowing expenditure policy to shift reductions in military expenditure into alternatives such as debt reduction, tax reduction, or alternative (i.e., non-military) spending.

Many developed economies posses some degree of arms production capacity. While developing countries generally sport limited arms production capabilities, they do have some and many have aspirations to become important arms exporters in their own right. For a limited number of states, the trade in weapons is hugely important in providing foreign exchange; for others, it is a drain on foreign exchange reserves and increases their debt burdens. To circumvent this, a burgeoning market in defense offsets has develop. Brauer and Dunne commissioned a range of studies on the role of offsets in development but found not a single case where offsets yielded unambiguous net benefits for a country's economic development.[25] A number of studies have considered the effect of military spending on debt. For example, Michael Brzoska found that while indebtedness due to arms imports had not increased as much during the 1990s as it did during the 1970s, the increased commercialization of the post-cold war market meant that developing countries now were expected to pay for weaponry rather than receiving them as military "aid". Nonetheless, for a panel of 11 small industrialized economies, another study found military burden increases the share of external debt in GDP.[26]

Previous surveys of the military expenditure and economic growth literature include Steve Chan (1986), who found a lack of consistency in the results, and Rati Ram (1995), who reviewed 29 studies and concluded that there was little evidence of a positive effect of defense outlays on growth, but that it was also difficult to say the evidence supported a negative effect. J. Paul Dunne (1996), then covering 54 studies, concluded that military expenditure had at best no effect on growth and was likely to have a negative effect; certainly there was no evidence of any positive effect, he argued. Ron Smith (2000) concluded that the literature did not indicate any robust empirical regularity, positive or negative; if anything, however, likelihoods would point toward a small negative effect in the long run, but one that would require considerably more sophistication to find. Joseph Smaldone (2006), in a review of Africa, considered military expenditure to be heterogeneous, elusive, and complex in its effect on the economy, but felt that variations can be explained by intervening variables. For him, effects can be both positive and negative but are usually not pronounced. Negative effects, however, do tend to cut wider and deeper in Africa, and are most severe in countries experiencing legitimacy or security crisis as well as economic and budgetary constraints. In a survey of 103 studies, Dunne and Uye (2010) show that negative effects of military expenditure on growth were reported in 39 and 35 percent of cross-country and case studies, respectively. Only 20 percent found positive effects for both types, while over 40 percent found unclear results.

Table 1 reports the results of an update and extension of Dunne and Uye (2010). It dramatically increases the studies covered from 103 to 168 and now includes non-developing economies. "Case study/ies" refers to single country or to small groups of countries, and the "unclear" category means mixed or insignificant results. Almost 44 percent of the cross-country studies, and 31 percent of the case studies, find a negative effect of military expenditure on economic growth, with only around 20 and 25 percent finding positive effects for cross-country and case studies, respectively.

Dunne and Uye (2010) suggested that the increasing use of post-cold war data might be providing more consistency in the results, and this does seem to be the case. When the 168 studies are split into those using predominately cold war-period data and those with more equal or predominately post-cold war data, the results in Table 1 are striking.[27] Almost 53 percent of post-cold war cross-country studies find military expenditure to exert a negative effect on growth, compared to only 38 percent for the cold war-data period. For case studies, the percentage of studies showing a positive effect also increased, from 21.4 to 30.0 percent.

Table 2 divides the studies into those published between 1973 to 2006 (Panel A) and those published since then (Panel B). Panel A shows results similar to those in Dunne and Uye (2010), with 39 percent of cross-country studies being negative and 40 percent unclear. Case studies show a higher proportion of unclear results, at 46 percent. In either case, only about one-fifth of studies report a positive effect on growth. This is even more strongly apparent for the most recent post-cold war studies: Panel B shows that 55 percent of recent cross-country studies find a negative impact on growth, with only 17 percent finding positive, and 28 percent unclear, results. The proportion of case studies showing a positive relation between military expenditure and growth, however, was higher at 41 percent, with around 18 percent negative and the remaining 41 percent unclear as well. In sum, it appears that while recent cross-

country studies tend to find negative effects on growth, case studies tend to find positive effects, making them the main driver of the increase in the proportion of studies finding a positive effect. Importantly, however, this cannot been seen as a significant change as there is a selection bias involved. Of the 72 case studies, a remarkable 63 percent are based on just five countries: Greece, India, Pakistan, Turkey, and the United States.[28] It seems that the case studies are finding positive effects of military expenditure on economic growth only for a specific subset of countries, four of whom form two conflict dyads: Greece and Turkey, and India and Pakistan.[29]

Conclusions

Military expenditure caries influence beyond the direct resources it takes up, especially when it facilitates conflict. Evaluating its likely economic effects is important, particularly for developing economies, and this has led to a vast and growing literature. It has also led to a variety of results, reflecting the lack of theoretical consensus, issues over data quality and availability, and the development of econometric methods.

Dunne and Uye (2010) provided a comprehensive review of the literature and concluded that there was little or no evidence for a positive effect, and that it is more likely for there to be negative effect, or at best no statistically significant effect at all. In updating their survey, this article adds 65 studies—bringing the total to 168 surveyed studies—and finds that the more recent studies provide increasingly strong evidence of a negative effect of military expenditure on economic growth. It also finds that cross-country studies that use a relatively large amount of post-cold war data are more likely to find negative effects. It is starting to look as though the increased variation in the data after the end of the cold war provides a higher signal-to-noise ratio in the data and thus improves the performance of econometric analyses. When combined with improved panel data techniques, this has allowed researchers to identify what on the whole is a robust negative effect of military expenditure on economic growth. While the case studies do not support this finding, this may well be due to the preponderance of just five countries in the covered studies.

Overall, the findings reported here suggest that reducing military expenditure need not be costly and may contribute to improved economic performance, especially in developing countries. There are outstanding issues in that some countries possess characteristics such that they may not benefit from cuts in military expenditure. Moving to a lower level of militarization does not automatically lead to development, as Brauer observed long ago (1990). Any such change will require good governance, management, and support. Even earlier, Dan Smith and Ron Smith (1980) argued that if there is a relationship between disarmament and development, it may be one that has to be constructed politically, not one that is pre-given by economic forces. It would appear from this survey that these conclusions remain relevant.

Table 1: Comparisons of pre- and post-cold war studies on the effect of military expenditure on economic growth or development

	Total number of studies	*Findings (in percent)*		
		Positive	*Negative*	*Unclear*
Type				
Cross-country	96	19.8	43.8	36.4
Case study/ies	72	25.0	30.6	44.4
Total	168	23.0	38.1	39.8
Pre-end to cold war				
Cross-country	60	20.0	38.3	41.7
Case study/ies	42	21.4	33.3	45.2
Total	102	21.6	35.3	43.1
Post-cold war				
Cross-country	36	19.4	52.8	27.8
Case study/ies	30	30.0	26.7	43.3
Total	66	24.2	40.9	34.9

Table 2: Comparison of studies published pre- and post-2007

Panel A: 1973-2006				
Type				
Cross-country	67	20.0	38.8	40.3
Case study/ies	55	20.0	34.5	45.5
Total	122	20.5	36.9	42.6
Panel B: 2007-early 2013				
Type				
Cross-country	29	17.2	55.2	27.6
Case study/ies	17	41.2	17.6	41.2
Total	46	26.1	41.3	32.6

What does seem increasingly clear is that military expenditure does in general come at an economic cost. The lesson might be that if one wants to have any hope of becoming (militarily) strong, one should invest in one's economy. Once states are economically strong, too much is at stake to risk in war. States may also gain security by becoming important to the world economy, with the major powers protecting them from attack because of the impact any attack would have on the world economy, and thus on them. The best way to security may be through economic growth.

Dunne and Uye stated that "it seems unfortunate that after 25 years of work or so,

the findings of the review should be so hedged" and that "as we get more post- cold war data we can hopefully better distinguish the trends in the data and so provide more careful analyses of the contemporary world."[30] It would appear from this update of their study that their wishes have been met. The more recent literature is moving toward a commonly accepted, if not yet consensus, view: Military expenditure has a negative effect on economic growth.

Notes

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1. Dunne and Uye (2010).

2. It is important to note that there still are considerable conceptual issues and measurement errors as regards military expenditure. Legacy costs for example are not usually included.

3. Dunne, Perlo-Freeman, and Smith (2008).

4. Dunne and Coulomb (2008).

5. See d'Agostino, Dunne, and Pieroni (2012).

6. See Dunne and Sköns (2010).

7. Westley, Anderson, and Kjar (2011).

8. Baran and Sweezy (1966).

9. See Dunne and Uye (2010).

10. Smith (2000). If the economic determinants of growth are constant, but there are variations in the security threat, a negative relationship between military expenditure and output will be observed. In contrast, if the threat is constant and the economic variables are changing, a positive relationship will be observed. This can be used to explain some country experiences with different combinations of growth and military expenditure.

11. Benoit (1973). The book was mostly neglected, and the debate did not commence until Benoit published a summary in journal form in 1978.

12. Dunne (1996).

13. Dunne and Uye (2010).

14. Frederiksen and Looney (1983).

15. See Dunne (1996).

16. Knight,Loayza, and Villanueva (1996).

17. Ram (2003).

18. Dunne and Tan (2013).

19. Joerding (1986).

20. Dunne and Smith (2010).

21. Cuaresma and Reitschuler (2004).

22. Pieroni (2009).

23. Dunne and Uye (2010).

24. Gleditsch, et al. (1996)

25. Brauer and Dunne (2004).

26. Brzoska (2006); Dunne, Perlo-Freeman, and Soydan (2004).

27. Using 1990 as the cold war reference period, any study that used less than 10 years of data post-1990, or post-cold war data that amounted to less than one-third of the overall sample, was classified as "pre-end to cold war", and vice-versa.

28. The number of studies per country are: USA (19 studies), Greece (12), Pakistan and India (7 in total), Turkey (7), plus 27 other cases.

29. The isolate the effect of the preponderance of just five countries in the case studies, one would have "average" the findings for each of them and set this against an average for the remaining case studies. This has not yet been done.

30. Dunne and Uye (2010, p. 303).

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Armed conflict, terrorism, and the allocation of foreign aid

Piotr Lis

Using data for a panel of countries, this article considers the causal effect of armed conflict and terrorism on foreign aid flows. Distinguishing between bilateral and multilateral aid and, separately, between oil-exporting and non-oil exporting countries, it finds that different types of aid flows do respond differently to different types of violence and differently to oil- and non-oil exporting countries.

Foreign aid is often said to be targeted at promoting economic growth and social development, which in turn are likely to depend on the existence of peace and stability.[1] Yet donors may be deterred from providing aid because latent and actual conflicts are often accompanied by internal tensions that may increase the risk of corruption associated with the spending of aid, and the destruction of physical and human capital stock may directly disturb commercial interests of foreign donors. In addition, if there are two or more competing political groups within a country, foreign donors may be afraid of being accused of interfering in internal politics by supporting any one of them. This makes political violence potential determinants of aid flows and ones that are generally not considered in the aid literature. The occurrence of armed conflict or of terrorism is therefore likely to hinder economic development and may well reduce the potential effectiveness of foreign aid.[2]

Some scholars argue that the effect of foreign aid on development is not the main determinant of aid allocation, that donors take a number of factors into consideration, including strategic interests and colonial past. One potential strategic goal for donors can be aiding regimes adversely affected by terrorism, possibly as a reimbursement for counter-terrorism efforts. In the resulting principal-agent relation, the donor wants the receiving government to contain terrorism before it spreads to the donor's homeland or affects its interests elsewhere. Indeed, it has been suggested from a theoretical perspective that it would be sensible policy for states with global interests to offer preventive measures, through counter terrorism-oriented tied aid, to countries where transnational terrorist organizations reside, and some find evidence that increased assistance does lead to reduced levels of terror events originating from the receiving country.[3]

This article considers the causal effect of armed conflict and terrorism on aid, using data for a panel of countries. It distinguishes between bilateral and multilateral aid. Multilateral aid is likely to be more responsive to the quality of government and its policies in the receiving countries, and to promote military expenditure reductions, with intergovernmental institutions being less influenced by commercial interests, strategic alliances, and geopolitical or historical considerations. In contrast, bilateral donors are more likely to be influenced by any such factors and are more likely to use aid as a tool for combating terrorism. Another issue to be considered is whether the determinants of aid flows to oil exporters are different, given how important their stability is for the world economy.[4]

A large body of literature discusses the determinants of the distribution of foreign aid and its effects on socio-economic development. Recently, studies have focused on the effect of instability in receiving states on aid flows. One such study finds that violent instability (coups, civil wars, guerrilla warfare, riots, strikes, and the like) had a positive effect on aid allocation. But it also suggests the existence of an inverted-U relation where, on the one hand, low levels of instability result in increased aid as donors attempt to safeguard their interests and, on the other hand, increasing instability poses a threat to donors' interests and persuades them to shift their attention to more stable countries. Some studies use game theoretic models. These allow aid to be conditioned on the undertaking of counter-terrorism efforts by receiving governments. In a 2011 study, Bandyopadhay, Sandler, and Younas note that a recipient's efforts can demonstrate substitutability with a donor's own counter-terrorism measures, intended to thwart transnational terrorism at its origin. Nonetheless, count terrorism-tied aid may result in protests and internal unrest in the receiving country, and if the regime becomes sufficiently weakened, its ability to fight against terrorism may become limited, and the threat to both the donor and recipient may rise. Estimating an attack supply curve, Jean-Paul Azam and his co-authors find that increased aid leads to reduced levels of terrorism originating from the receiving country. Unfortunately, their models do not allow for the possibility of a reverse relationship, one in which terrorism determines aid levels, and this is the hypothesis investigated in this article.[5]

Method and data

Data for the study covers 161 recipient countries from 1973 to 2007 and is drawn from a number of sources. Aid per capita is based on the Project-Level Aid 1.9.1 database, made available by AidData.org. This includes development finance in the form of loans or grants from governments, aid agencies, and intergovernmental organizations. Population, real GDP per capita, and country openness are drawn from the Penn World Table Version 6.3. Because previous studies show a relation between aid and recipients' level of civil liberties and democracy, the Freedom House's Civil Liberties Index is used. This grades states on a scale from one (free) to seven (not free). Terrorism event data comes from ITERATE and from the Global Terrorism Database (GTD). ITERATE includes only transnational events. In contrast, GTD contains transnational and domestic terror events. Using both measures should help

to distinguish, at least to some extent, the effects of the two types of terrorism. Between 1973 and 2007, ITERATE and GTD recorded 11,506 and 78,762 events, respectively.[6] Assuming that both track transnational incidents in an adequate manner, the overwhelming majority of attacks in GTD should stem from domestic terrorism events. Indeed, it is estimated that only around 14 percent of events recorded in GTD constitute transnational terrorism. Finally, data on armed conflicts is taken from the UCDP/PRIO Armed Conflict Dataset Version 4-2009.[7]

The empirical analysis is based on two-way panel data estimation. The choice of this method is motivated by related literature.[8] The estimated model has the following form:

$$(1) \quad \ln(AID)_{i,t} = \alpha + \alpha_i + \alpha_t + \beta_1 \ln P_{i,t-1} + \beta_2 X_{i,t-1} + \beta_3 T_{i,t-1} + \beta_4 (T_{i,t-1})^2 + \beta_5 C_{i,t-1} + \beta_6 L_{i,t-1} + \epsilon_{i,t}.$$

AID is aid per capita received by a recipient *i* in year *t*. The coefficients α_i and α_t denote recipient-specific and year-specific effects, respectively. $X_{i,\,t-\,1}$ represents recipients' economic variables, i.e., GDP per capita in constant dollars and economic openness. The latter is measured as the sum of recipients' exports and imports as a share of GDP. $L_{i,t-1}$ represents Freedom House's Civil Liberties Index. The choice of explanatory socio-economic conditions such as population, income, economic openness, and level of democracy is motivated largely by the findings of earlier studies.[9] The number of terrorism incidents per capita in a receiving country is denoted by $T_{i,t-1}$, while $C_{i,t-1}$ is an indicator variable taking a value of 1 in the presence of non-terrorist armed conflict (e.g., war or civil war) in country *i* and period *t–1*, and 0 otherwise. Finally, $\epsilon_{i,t}$ stands for the error term.

This is a reduced form model and therefore should not be interpreted purely in either demand or supply terms. Panel data methods are used. This means dealing with a number of potential issues. One is heterogeneity across countries. This is controlled for by introducing recipient-specific fixed effects which are likely to arise because donors assign different weights to recipients based on characteristics which remain constant over time, for instance colonial ties, geographical location, or landmass. In addition, time effects are allowed for which may arise because aid allocation decisions are typically made every year and can be affected by global economic cycles.

A second issue is endogeneity. One cannot rule out some beneficial influence of foreign aid in stabilizing societies or inducing recipient governments to take more effective counter-terrorism measures. Thus, aid could help governments to satisfy the needs of dissident interest groups, and the resulting improved economic growth could increase the opportunity cost of joining rebel or terrorist organizations while increased military and security expenditure could make successful atrocities less likely. Yet aid could also lead to increased violence by raising potential gains to rebels from taking over the government and make the receiving government appear as serving foreign interests, leading to social unrest and destabilization. To deal with this potential problem, all explanatory variables are lagged by one year. Foreign aid in a current year cannot affect earlier years' volume of terrorist attacks or number of armed conflicts. An additional benefit is that lags capture the aid allocation dynamics of donors' budget planning procedure, which takes place in advance. Finally, the estimates are based on yearly observations. Averaging observations over longer periods could blur the measured effects of conflict or terrorism.[10]

Results

Non-oil exporters

Table 1 presents the estimates for the effects of terrorism and armed conflict on aid to non-oil exporting countries. The first two columns show results for bilateral aid and the next two for multilateral aid. The ITERATE data is considered to represent transnational terrorism events and the GTD estimates domestic terrorism. The coefficient estimates for the non-conflict variables are generally consistent with expectations, with larger countries tending to get shares of foreign aid that are lower than their populations might suggest (although this effect is only marginally significant for bilateral aid). Aid is increasing in GDP (income) but at a decreasing rate, as donors tend to favor poorer countries with the exception of a number of the poorest states, which are likely to have very limited ability to use received aid efficiently. Donors also seem to reward economic openness. The evidence on civil liberties is mixed, with bilateral donors favoring freer countries, but there is no such drive among multilateral donors. This latter finding is in line with Chauvet (2003).

Terrorism and armed conflict appear to have opposing effects on the allocation of bilateral aid. The results shown in column 1 suggest that countries suffering from transnational terrorism can count on increased assistance, and the positive coefficient on the squared log of transnational attacks per capita indicates increasing aid. This suggests that countries experiencing high levels of transnational terrorism may hope for a proportionally larger increase in bilateral aid when faced with additional attacks. This is consistent with the principal-agent framework in which aid constitutes a reimbursement for recipient's efforts to fight terrorism. As donor's defensive counter-terrorism measures increase security at home, they may induce terrorist organizations to seek softer targets in other countries, making the donor's assets abroad more vulnerable. Thus, to protect its political and economic interests, a donor may try to convince other states to exert more counter-terrorism efforts. One way to do this may be through conditional aid, but a test of this hypothesis is not practical as it is not possible to establish how much aid is conditioned on fighting terrorism. Even aid that is not explicitly tied to counter-terrorism can contribute to the eradication of terrorism, by improving the economy and the population's living conditions and so increasing the opportunity cost of joining terrorist groups. Other scholars offer similar reasoning, relating terrorism to a lack of economic opportunities.[11]

Table 1: Foreign aid: The effects of armed conflict and terrorism (non-oil exporters, two-way panel estimates, recipient-specific effects)

	Bilateral aid		*Multilateral aid*	
	(1)	*(2)*	*(3)*	*(4)*
Terrorism dataset	*ITERATE*	*GTD*	*ITERATE*	*GTD*
Ln(population)	–0.31	–0.33	–1.05**	–1.20***
	(0.36)	(0.37)	(0.43)	(0.42)
Ln(GDP per capita)	8.37***	8.36***	13.55***	13.47***
	(1.11)	(1.13)	(1.44)	(1.43)
Squared ln(GDP per capita)	–0.56***	–0.56***	–0.88***	–0.88***
	(0.07)	(0.07)	(0.09)	(0.09)
Ln(Openness)	0.36***	0.38***	0.52***	0.50***
	(0.09)	(0.09)	(0.12)	(0.13)
Ln(Attacks per capita)	0.79**	0.10	–0.72	–0.48***
	(0.37)	(0.18)	(0.58)	(0.15)
Squared Ln(Attacks per capita)	0.03**	0.00	–0.03	–0.02***
	(0.01)	(0.01)	(0.02)	(0.00)
Conflict	–0.30***	–0.32***	–0.80***	–0.77***
	(0.08)	(0.08)	(0.12)	(0.13)
Civil liberties [a]	–0.14***	–0.15***	–0.06	–0.07*
	(0.03)	(0.03)	(0.04)	(0.04)
Observations [b]	4,027	3,893	3,993	3,860
R-squared	0.62	0.62	0.57	0.57

Notes: All explanatory variables lagged by one period. Robust standard errors in parentheses. All numbers rounded to two decimal places. [a] Scale from 1 (free) to 7 (not free). [b] The difference in the number of observations between ITERATE and GTD is caused by GTD missing records for 1993. *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Foreign aid: The effects of armed conflict and terrorism (oil exporters, two-way panel estimates)

	Bilateral aid		*Multilateral aid*	
	(1)	*(2)*	*(3)*	*(4)*
Terrorism dataset	*ITERATE*	*GTD*	*ITERATE*	*GTD*
Ln(population)	–2.15**	–2.27**	–4.51***	–4.71***
	(1.02)	(1.05)	(0.84)	(0.88)
Ln(GDP per capita)	3.34	2.96	–13.96***	– 13.64***
	(4.13)	(4.23)	(4.24)	(4.34)
Squared ln(GDP per capita)	–0.24	–0.23	0.64***	0.61***
	(0.22)	(0.23)	(0.22)	(0.23)
Ln(Oil exports)	0.22***	0.23***	0.06	0.05
	(0.07)	(0.08)	(0.11)	(0.11)
Ln(Openness)	0.05	0.26	0.30	0.47
	(0.70)	(0.74)	(0.69)	(0.70)
Ln(Attacks per capita)	–0.08	–0.01	–0.08*	–0.03
	(0.05)	(0.05)	(0.05)	(0.05)
Conflict	–0.53	–0.58	–0.75**	–0.76*
	(0.54)	(0.48)	(0.38)	(0.41)
Civil liberties [a]	–0.16	0.13	0.17	0.24
	(0.15)	(0.16)	(0.15)	(0.16)
Observations [b]	500	487	500	488
R-squared	0.58	0.58	0.69	0.69

Notes: All explanatory variables lagged by one period. Robust standard errors in parentheses. All numbers rounded to two decimal places. [a] Scale from 1 (free) to 7 (not free). [b] The difference in the number of observations between ITERATE and GTD is caused by GTD missing records for 1993. *** p<0.01, ** p<0.05, * p<0.1.

In contrast, the estimates in column 2 of Table 1 suggest that bilateral donors may be insensitive to domestic terrorism, suggesting that they perceive the risk of attacks spreading to their homelands or interests to be much lower than that associated with transnational terrorism. This should be interpreted cautiously, however, as GTD includes transnational attacks. In addition, any global database is likely to miss a number of domestic attacks as they may not be captured in the global media. Furthermore, nondemocratic regimes may find it relatively easy to suppress information on such events. Bilateral donors do, however, appear to be conflict-averse, with armed conflict in an aid-receiving country reducing bilateral aid by nearly one-third, *ceteris paribus*. This suggests that a relatively low risk of a conflict spreading to donor countries reduces the incentive to support conflict resolution efforts within countries or that aid reductions may be intended to exert pressure on governments to be more accountable. This can also reflect worries over an excessive influence of exploitative military strongmen.[12] Cutting aid to troubled recipients, and shifting it to peaceful ones, may be intended to show the benefits of maintaining social peace and stability.

Multilateral aid flows are not affected by transnational terrorism, as measured by ITERATE (column 3), but they seem to show a significant and negative response to domestic terrorism (column 4). They are very strongly affected by armed conflict, with a conflict-affected country likely to see a reduction of around 80 percent in received aid. There are a number of possible explanations for this. Multilateral donors are less likely to heed geopolitical interests than bilateral ones and pay more attention

to the efficient use of aid as well as the promotion of economic and social development. Consequently, they tend to limit assistance to countries affected by terrorism and armed conflict. As some scholars show, violent instability significantly reduces economic growth, and this is likely to be associated with smaller investment, poorer policies, and higher risks of resource misuse. For example, Gaibulloev and Sandler (2009) put the effect of armed conflict at twice the size of the impact of terrorism, and so multinational agencies may be inclined to use aid as a tool in the promotion of peace and stability, punishing violent states and rewarding those that find peaceful solutions. They may also be less sensitive to transnational terrorism as it occurs less frequently (and thus is less destructive than domestic terrorism), poses a lesser threat to the efficient use of aid, and affects their own citizens to a lesser degree. However, decisions of multilateral institutions are of course affected by member governments. Mallaby (2002) argues, for instance, that in spite of being multinational in principle, both the World Bank and the International Monetary Fund reflect the thinking and priorities of the United States, a country that is the target of about 40 percent of all transnational attacks.[13]

Oil exporters

One issue that has not been considered in the literature concerns the treatment of oil-exporting countries. Effects may differ, relative to non-oil exporting countries, because of donors' interest in the stability of oil exporters. Table 2 shows that bilateral and multilateral donors respond in different ways to recipient characteristics. The recipients' income per capita is not important for bilateral donors, but multilateral donors react to increases in income with aid cuts. As expected, multinational organizations are not influenced by the size of oil exports, while bilateral donors reward a one percent increase in oil exports (valued in constant 2005 dollars) with around a 0.22 percent rise in aid.

Surprisingly, despite the common perception that oil importers are ready to provide assistance to ensure stability of oil-producing regimes, bilateral donors appear to be neutral to terrorism and armed conflict occurring in oil-exporting countries. It is possible that bilateral donors do not want to appear to be supporting nondemocratic regimes in exchange for oil, but to investigate this would require donor-by-donor case studies. Multilateral donors, free of strategic interests, are consistent in their aversion to armed conflict, reducing multilateral aid to an oil exporter by approximately 75 percent. But there is no evidence that they react to terrorism. Although the coefficients are negative, only the estimate on ITERATE is marginally statistically significant.

Conclusions

This article considers the effects of armed conflict and terrorism on bilateral and multilateral aid flows by analyzing a panel of aid recipients. It adds to the literature that considers foreign aid as a means of engaging countries that are sources of terrorism in the fight against this security threat.[14] The empirical results show that with the exception of bilateral assistance to oil-exporting states, armed conflict has a strong negative effect on foreign aid receipts. However, bilateral and multilateral donors seem to differ in their reactions to terrorism. Episodes of transnational terrorism are associated with increased bilateral aid, while donor countries do not seem to be sensitive to domestic terrorism. In contrast, multilateral donors appear to react strongly to domestic terrorism by reducing aid flows, but remain indifferent to transnational terrorism. Thus, this article adds to the evidence that bilateral donors may use foreign aid as a tool in pursuing strategic interests, highlighted by their focus on the size of oil exports when allocating aid to oil-exporting states.

The findings of this study lead to policy implications for aid-receiving nations. To ensure optimal aid, they should intensify their conflict-resolution efforts. This is particularly important for countries relying on multilateral aid which can be cut by up to 80 percent in response to armed conflict. Given that receiving nations react to such incentives, aid can have peace-promoting effects. The type of aid may also influence receiving governments' reactions to terrorism. For countries reliant on multinational assistance, there seems to exist no additional aid-related benefit in combating transnational terrorism. However, multilateral donors are likely to reward a reduction in domestic terrorism, thus increasing the potential payoffs from efforts to combat this type of violence.

The policy implications appear to be very different for countries that rely on bilateral aid. Since donor countries are more likely to pursue their own strategic goals, it seems sensible for recipients to align themselves with the interests of donor nations. One such goals is to combat transnational terrorism, whereby a donor may use aid to convince other states to participate in the fight against transnational terrorism. The empirical results suggest that a country affected by transnational terrorism is likely to receive a disproportionately large amount of aid. Although it seems right that some states get more aid because they face more complicated threats than others, there is a danger of creating perverse incentives for a receiving government to exert effort below the level desired by the donor in order to maintain the terrorism threat at a level that ensures its desired level of aid receipts. This serves as a warning for donor governments to develop a cautious approach when designing incentives for other nations to engage in counter-terrorism activities. They should introduce clear conditions and targets for the receipt of bilateral aid and consider implementing safeguards so as not to inadvertently instigate more violence in aid-receiving nations.

The analysis reported here shows how international aid flows respond to terrorism and armed conflict. Although it has shed some light on the relation between these variables, a number of questions are left to future research. For example, because the two categories of aid are associated with different policy implications, it would be of interest to learn how effectively recipients dependent on either bilateral or multilateral aid respond to transnational and domestic terrorism. Future studies should also look

at micro-level changes in aid allocation in the presence of political violence.

Notes

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1. Blomberg, Hess, and Orphanides (2004); Gaibulloev and Sandler (2009).

2. Collier (2006). Terrorism is a form of armed conflict of course but conventionally understood to be different from armed conflict such as interstate war and civil war.

3. A number of factors: Burnside and Dollar (2000); Alesina and Dollar (2000). Reimbursement and sensible policy: Bandyopadhyay, Sandler, and Younas (2011). Evidence: Azam and Thelen (2008).

4. Multilateral: Boyce and Pastor (1998). Bilateral aid and oil markets: Yergin (2006).

5. Inverted-U: Chauvet (2003). Game-theoretic: For example, Mandler and Spagat (2003); Bandyopadhay, Sandler, and Younas (2011). Azam and co-authors: Azam and Delacroix (2006); Azam and Thelen (2008).

6. The GTD dataset is missing records for 1993. This is reflected in a lower number of observations used in the following GTD regressions.

7. Aid per capita data: Nielson, Powers, and Tierney (2010). Penn World Tables: Heston, Summers, and Aten (2009). Civil liberties and index: For instance, Alesina and Dollar (2000); Chauvet (2003); Freedom House (2010). ITERATE: Mickolus, Sandler, *et al*. (2008); GTD: Global Terrorism Database (START 2011). The number of terrorist attacks is normalized by recipients' population. This is justified by the fact that ten attacks in a country of 100 million should have a smaller economic impact than the same number of attacks in a country of five million. On ITERATE and GTD, see, e.g., Gaibulloev and Sandler (2009). 14 percent: Kis-Katos, Liebert, and Schulze (2011). Armed conflict data: Gleditsch, *et al*. (2002).

8. Trumbull and Wall (1994); Alesina and Dollar (2000); Alesina and Weder (2002); Chauvet (2003); Blomberg, Hess, and Orphanides (2004); Gaibulloev and Sandler (2009).

9. In particular Alesina and Dollar (2000); Alesina and Weder (2002); and Chauvet (2003).

10. Recipient-specific fixed effects: Frees (2004). Aid and decreased violence: Collier and Hoeffler (2000). Aid and increased violence: Bandyopadhyay, Sandler, and Younas (2011). Use of lagged values: An outbreak of violence in one year could result in a reduction in received aid; however, if a conflict was mitigated within a year or two, a country could consequently experience higher aid flows designated for reconstruction and as an incentive for maintaining stability. This process would be indistinguishable when using longer periods.

11. Principal-agent framework: Bandyopadhyay, Sandler, Younas (2011). Softer targets: Lis (2011). Other scholars: Blomberg, Hess, and Orphanides. (2004); Bueno de Mesquita (2005).

12. Mallaby (2002).

13. Some scholars show: Blomberg, Hess, and Orphanides (2004); Gaibulloev and Sandler (2009). Punishing violent states: Boyce and Pastor (1998). 40 percent: Enders and Sandler (2006).

14. Azam and Thelen (2008; 2010); Bandyopadhyay, Sandler, and Younas (2011).

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The defense industry in an age of austerity

Ron Smith

Reductions in military expenditure will generate pressures to restructure the defense industry. This article explores the implications of a more peaceful evolution of military expenditure for the economic structure of this industry. For example, since military expenditure and defense industry concentration have moved in opposite directions in the past, future cuts in such spending might be expected to lead to a more concentrated industry.

Even without the U.S. budget battles, with their fiscal cliffs and sequestration, deficit-reduction pressures and withdrawal from Afghanistan would have constrained future U.S. military expenditure, just as austerity constrains European military expenditure. Reductions in military expenditure will generate pressures to restructure the defense industry. The proposed merger of BAE Systems and EADS, announced in September 2012 and killed by German government opposition a month later, is an early indication of such pressures. While history does not repeat itself, it may be informative to examine an earlier period of restructuring, between the end of the cold war in 1990 and the beginning of the "war on terror" in 2001, to see what we might expect in response to future cuts. The structure of the industry at the end of the cold war is reviewed in Smith (1990) and just before the "war on terror" in Smith (2001). Hartley (2007) and Brauer (2007) have more general discussions of the industry.

While reductions in U.S. and European military expenditure are likely, they are not inevitable and the actual course of future military expenditure will depend on future security scenarios. There are many flash points which might erupt into conflict driving up military spending. These include the Middle East, India-Pakistan, and, in East Asia, North Korea and China's territorial disputes with many of its neighbors. Nonetheless, this note explores the implications for industrial structure of a more peaceful evolution of military expenditure.

World military expenditure peaked in the mid-1980s, started to fall gently at first and then rapidly after the dissolution of the Soviet Union, before rising again in the first decade of the 21st century with the invasions of Afghanistan and Iraq. SIPRI estimates that world military expenditure, measured in 2010 prices, was US$1,511 billion in 1988 and fell to $994bn in 1998. By 2011, it rose again to $1,625bn, with the U.S. responsible for a 42 percent share.

The arms trade showed similar trends. The SIPRI trend indicator value for arms exports, measured in 1990 prices, was $46bn in 1982, fell to $18bn in 2002, and rose to almost $30bn in 2011. The value of the arms trade is small relative to military expenditure, so arms exports are unlikely to be a solution to any reduction in demand that the industry faces. In the U.S., the U.K., and in some other countries the cuts in military expenditure after the cold war were associated with a long economic boom during the last decade of the twentieth century with lower interest rates, higher investment, and higher productivity growth. Brzoska (2007) provides a survey of defense conversion during the "long decade of disarmament" after the end of the cold war.

The trends in military expenditure and in arms exports were reflected in the output of the arms industry. SIPRI (2000, p. 315) estimated that arms production (domestic demand plus exports minus imports) in 1997 was only 56 percent of its 1987 level in the U.S., 77 percent in France, and 90 percent in the U.K. Arms sales by the top-100 companies in the SIPRI list measured in 2010 prices rose from $257bn in 2002 to $411bn in 2010, and then fell by 5 percent in 2011.

The U-shaped pattern in military expenditure was matched by an inverted U-shaped pattern in industry concentration. Dunne (2009) discusses the evolution of concentration in the arms industry, which at the end of the cold war was very low. The five largest companies in the SIPRI top-100 list accounted for almost 23 percent of arms sales in 1990. This is a low proportion by comparison with other high technology industries. During the 1990s falling demand, rising fixed costs, and a merger wave increased concentration, and by 1998, the five largest arms firms accounted for 45 percent of the total. Concentration then stabilized, and in 2003 it was 44 percent. However, increasing military expenditure during the following years diluted the concentration, and in 2010 the five largest arms firms accounted for 37 percent, falling further to 35 percent in 2011. One might expect that future cuts in military expenditure would cause concentration to stop falling and start rising again. Had BAE and EADS merged, the top-5 firms would have accounted for 41 percent of sales, still below the 1998 share.

Of the 2010 total for the 100 largest arms firms, over half, $250bn, was by U.S. companies and another quarter, $120bn, by European countries. Of the European total, the U.K. accounted for $50bn, France for $23bn, the trans-European EADS (European Aeronautics, Defence and Space) for $16bn, Italy for $15bn, Germany for $7bn, and other European countries for $9bn. Among the top-20 arms companies on the SIPRI list for 2010, 13 are from the U.S. The largest U.S. companies and their arms sales are: Lockheed Martin ($36bn), Boeing ($31bn), Northrop Grumman ($28bn), General Dynamics ($24bn), and Raytheon ($23bn). Of the remaining 7 companies, one is trans-European, EADS ($16bn), two are from the U.K. (BAE systems, $33bn, and Rolls Royce, $4bn), one is Italian (Finmeccanica, $14bn, and 30 percent owned by the Italian state), two are French (Thales, $10bn, and 27 percent owned by the French state, and Safran, $5bn, and 30 percent owned by the French state), and one company is Russian (Almaz-Antei, $4bn).

Faced with the reduction in military demand, these large arms firms have to

consider their industrial options, such as to convert, diversify, divest, cooperate, or concentrate. Their strategic options are constrained by government regulation and by the nature of the financial systems within which they operate. We begin with regulation.

Regulation

The arms industry is inherently political and subject to state regulation. Many arms firms are wholly or partly state owned, but even when there is no state shareholding, governments can regulate them through their procurement policy—governments being the only buyers of major weapons systems. Governments regulate and promote arms exports, approve mergers and acquisitions, and fund research and development spending in order to develop a defense industrial base.

Determining the appropriate defense industrial base is difficult. The defense ministry must decide on (1) the number of different systems required and the quality and quantity of each, (2) the extent to which it can trust allies to collaborate in production or to provide imports, in particular whether they would supply in conflict, and (3) the potential export market for the systems, the degree to which exports are taxed or subsidized, and the security consequences of those exports. All these judgments have to be made subject to a budget constraint. In fact, for most countries, their budget constraint is such that they cannot afford the massive R&D required to develop and produce major weapons systems. There are a few large producer countries and the remainder import all their major weapons systems. Even the largest producer, the U.S., has to import some systems. Dunne (1995) discusses the defense industrial base and Dunne, *et al*. (2007) provide a model of the process.

The high fixed R&D costs mean that average cost fall sharply with each further unit produced, so major weapons producers can gain economies of scale and the minimum efficient scale is large relative to the size of the market. Having a single producer for any type of system takes advantage of this economy of scale but having multiple competing firms may help keep down prices and stimulate innovation. This tension between the benefits of scale and the benefits of competition has been a central defense industrial policy dilemma for the last 50 years. Other dilemmas include the fact that technical advances raise costs and this interacts with constrained budgets to mean that fewer units can be produced in each generation, further raising unit costs. One response is to keep the equipment in service longer. Thus, the B52 aircraft introduced in the 1950s, are still in service, meaning that technological jumps between generations are larger, introducing further uncertainty.

One relatively new issue in regulation is how national governments should treat corruption in defense contracts, given that payment of bribes seems common in the international arms trade. Traditionally, governments ignored such payments, but anti-corruption activity is increasing for various reasons. There have been a range of allegations about bribery by BAE and in 2006 the U.K. government stopped a Serious Fraud Office investigation into allegations that BAE paid bribes over the al-Yamamah contract with Saudi Arabia. In 2010, BAE paid criminal fines to the U.S. and U.K. authorities over alleged corruption. In early 2013, EADS was being investigated over allegations that its Cassidian subsidiary paid bribes in Austria to sell Eurofighter Typhoon aircraft and that its U.K. subsidiary, GPT Special Projects, bribed Saudi officials over a project to supply military communications equipment. In an October 2012 report by Transparency International, EADS ranked well below peers like BAE for vigilance against corruption, and in November 2012 it commissioned an external review of its compliance systems. Giuseppe Orsi, the chief executive of Finmeccanica, was arrested in 2013 on alleged corruption charges.

Traditionally, because the state, which had strong national preferences, was the customer, major countries largely relied on their domestic defense industries. Unlike most manufacturing industries, which went multinational, the arms industry remained national. Smaller countries which could not afford the large fixed costs imported major weapons systems. With the fall in demand, the ability of even the major countries to maintain a domestic defense industrial base was called into question, making them more willing to import. As a result, domestic and foreign weapons came to be regarded as closer substitutes than in the past.

Consolidation

The impact of industrial policy is illustrated by the U.S. merger wave which started in 1993 when then-Deputy Secretary of Defense, William Perry, told a dinner meeting of defense industry executives—dubbed “the last supper”—that there were too many companies. The wave ended in 1997 when the Pentagon decided it had gone far enough and blocked the merger of Lockheed Martin with Northrop Grumman. As of early 2013, there is no indication that the U.S. Department of Defense would support major mergers, but that may change if cuts start to bite.

In Europe, the merger process came later and was more complicated, but produced four large groups—BAE, EADS, Thales, and Finmeccanica—and many joint ventures. For instance, BAE and EADS collaborate on the production of the Eurofighter Typhoon and as owners with Finmeccanica of the MBDA missile producer. The collaboration extends beyond Europe, and there are longstanding links between the state-owned French aero-engine company SNECMA and GE of the U.S. SNECMA is now part of Safran, formed from the merger of SNECMA with the security company SAGEM in 2005.

The earlier consolidation process had involved Daimler Aerospace, DASA, in talks to merge with then-BAe during 1998. But when BAe instead acquired the defense divisions of GEC to form BAE Systems in 1999, Daimler merged DASA with Aerospatiale-Matra and CASA to form the transnational EADS. BAE was a shareholder in EADS by virtue of its 20 percent stake in Airbus, but disposed of this holding in 2006 to concentrate on defense. Daimler was subsequently a reluctant

shareholder in EADS. The multinational Thales was formed in 2000 when the French company Thompson CSF acquired Racal's U.K. defense operations. In early 2013, the French state held 27 percent of Thales. In 2009, the largest private shareholder in Thales— Alcatel-Lucent—sold its stake to Dassault which now holds 26 percent of the shares and is the dominant influence on Thales. Finmeccanica completely acquired the helicopter manufacturer Agusta-Westland in 2004. Caruso and Locetelli (2013) review Finmeccanica and the Italian defense industrial base.

Options for the industry

Faced with reductions in military demand, arms firms have five options on a civilian-military axis: Convert, diversify, divest, cooperate, or concentrate. For the first of these, the conversion of plants producing military products into ones producing civilian products,.there are very few historical examples of a successful conversion strategy of this sort. Conversion of plants is difficult because the markets and cultures are so different in the military and commercial arenas. For instance, whereas the military emphasis is on performance maximization, the commercial emphasis is on cost minimization. In addition, defense companies are specialists in selling to a single bureaucratic political customer, which is very different to selling to a mass market.

Diversification involves the development of new commercial activities either through the organic growth of new businesses or the acquisition of existing businesses. This is more likely to work if the firm can build synergies between the military and civil parts of the business. Probably the most impressive piece of diversification was the U.K. defense company Racal, building the Vodaphone mobile phone business in the late 1980s, which it then spun-off. There are far more examples of unsuccessful diversification. For example, after privatization, British Aerospace bought a construction company, a property company, and a car company. There were plausible tactical justifications for each, but they did not work and BAe divested them and became more focused as a defense company. Finmeccanica, which has been making losses, is trying to divest its energy and transport divisions.

Where competition regulations made it possible, divesting defense divisions by selling them to competitors is in many cases an attractive proposition, since they are worth more to the competitor who gains increased monopoly power. In the U.S. during the 1990s General Dynamics was an early exponent of this strategy and initially shrank itself rapidly and profitably. In the U.K., GEC sold its defense divisions to BAe in 1999 and turned itself into a purely commercial company, Marconi, which subsequently failed.

Cooperation has always been common, and aerospace and defense companies use joint ventures, collaboration, and strategic alliances to gain the benefits of scale without losing independence. The final strategy is concentration on the core weapons business. A group of companies have focused on defense, acquiring the defense divisions others divested, and often shedding civil activities. The concentrating companies, like BAE, have tended to diversify into other weapons systems to allow them to market a full product range, rather than into civil work. For instance, BAE sold its shareholding in Airbus in 2006 to concentrate on defense.

BAE Systems and EADS

The issues that arose in the proposed merger of BAE and EADS are informative. The fact that the Dassault Rafale fighter aircraft had beaten the Eurofighter Typhoon (produced by EADS, BAE Systems, and Finmeccanica) for a large Indian contract in 2012 prompted EADS and BAE to discuss merging. The discussion leaked in September 2012, and there was an intense international debate before the merger was blocked in October by the German government, apparently because there would be no German head office. A merger would have created the world's largest arms producer. On SIPRI (2012) figures for 2010, BAE+EADS would have arms sales of almost $50bn, compared with $36bn for Lockheed Martin.

Ian King and Tom Enders, the chief executives of BAE and EADS, respectively, said in a joint article that the merger discussion did not reflect weakness because the two firms "are both strong businesses with clearly defined strategies that have enabled them to make progress in the past five years, and which would take them forward as independent companies" (*Financial Times*, 1 October 2012). (Tom Enders, the German CEO of EADS, had been involved in the attempt to merge DASA with BAe before the formation of EADS.) However, both companies are perceived to have certain weaknesses. BAE was seen as too dependent on defense, which looks to be a declining market. EADS was seen as too dependent on the political influence of the French and German states. Indeed, EADS has argued that state involvement in its ownership had inhibited its efforts to make a big acquisition in the U.S. and may have hindered its bid to win a U.S. military tanker order. King and Enders hoped that a merger would reduce both weaknesses: To create a normal company without state influence and equally balanced between civil and defense work.

EADS is registered as a company in the Netherlands. France and Germany each hold 22.35 percent of the company, one through the Lagardère company and the French state, the other through Daimler. The Spanish state has 5.45 percent. Both Daimler and Lagardère are reluctant owners, but are forced to maintain their position to keep the German and French holdings equal. There have been recurrent rumours that French and German government holdings would each be reduced to 12 percent.

The EADS Vision 2020 Strategy, set out in 2007 by Louis Gallois, Tom Ender's predecessor as CEO, was to turn EADS's revenue stream into something similar to Boeing's, with half coming from civil aircraft and half coming from defense, which was seen as less cyclical. The EADS defense subsidiary, Cassidian, the German-based defense business, is relatively small. EADS also produces the troubled A400M military transport and a range of military helicopters through Eurocopter. Boeing and EADS both produce military aircraft, electronics, missiles, and space equipment. BAE

has a much wider defense portfolio, also including military vehicles, artillery, small arms and ammunition, and warships, both surface and submarine. Thus the BAE defense portfolio has a less good fit with aerospace than that of Boeing or EADS.

Many were skeptical of the merger on commercial grounds given the difficulty of successfully merging two very different companies and the fact that academic studies indicate that most merger and acquisition activity destroys value. BAE's past history of deal-making does not inspire confidence. Many had questioned the wisdom of its recent U.S. purchases, its 2006 sale of its Airbus stake, or further back its acquisition and divestment of a car company, a construction company, and a property company.

The shareholders in the two companies chose to own them for rather different reasons. For instance, BAE pays a much higher dividend than does EADS, and BAE's largest shareholders expressed opposition to the deal. There were concerns that the proposed 60:40 split did not reflect the true value of the companies and this caused a sharp decline in EADS's share price after the merger announcement.

While there were commercial questions about the wisdom of the merger, and questions about what the merged company would be called, the main arguments tended to be political rather than commercial. Merger would have required approval by the governments of France, Germany, Spain, the U.K., and the U.S. (since BAE produces so much in the U.S.) and of the European Commission under EU Competition Law. One tension in the case for the merger was that commercial weaknesses were political strengths, and vice versa. For instance, because the companies did not overlap very much, there were few economic gains from synergies or rationalization, a commercial disadvantage, but there would consequently be few losses of jobs or sovereignty, a political advantage.

The merger would have had significant implications for the future structure of the European defense industrial base, and many were surprised that it was the German government that vetoed the merger and that the French and British governments were more supportive. Successive U.K. governments have been rather relaxed about consolidation, for instance allowing Thales to take over Racal, preferring to leave the evolution of the industry to market forces. The situation in France has been more complex. While the French *direction générale de l'armement* (DGA)—France's arms procurement agency—has tried to encourage consolidation and rationalization, progress has been slow. French military industrial politics can be quite complex. Although the French state has a 27 percent shareholding in Thales, Dassault, with a 26 percent stake, effectively controls Thales. There have been recent changes in management at both Thales and Dassault. EADS had wanted to acquire Thales, but was stopped by the French state. In what the *Financial Times* (16 February 2012, p. 19) calls "one of those strange quirks of French industry," EADS owns 46 percent of Dassault Aviation but has no control. Thus it might make more sense for EADS to take control of the defense part of Dassault and Thales. This might stop European aerospace firms competing against each other as they did in the Indian bid where the Eurofighter Typhoon lost out to Dassault's Rafale. There was also speculation in 2012 about a merger of Dassault, Thales, and Safran into "France Aerospace," speculation which Dassault dismissed. The evolution of the European defense industry is likely to be interesting and controversial.

Conclusion

In the absence of new security threats, measures to reduce deficits and debt in western countries are likely to put downward pressure on their military expenditure. When this last happened at the end of the cold war, concentration in the defense industry increased substantially, then fell again in the early years of the 21st century when military expenditure increased. With falling military spending, it is likely that concentration will increase again, but the process will be complicated by national defense industrial policies in Europe, making prediction difficult.

Notes

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Demand and supply of commercial firearms in the United States

Jurgen Brauer

If they are concerned with weapons of war at all, economists who study the topics of conflict, war, peace, and security tend to focus on the production and trade of major conventional arms and of weapons of mass destruction. Small arms rarely capture their attention, or only in the context of the economics of crime, addressed in a different literature. But as the Small Arms Survey in Geneva, Switzerland, has documented, the carrying out of war, and also of violence in postconflict economies that are nominally at "peace", relies far more on small arms, especially firearms, than on major conventional weapons. For both crime (including organized crime) and war, it is important to learn more about small arms, and especially firearms. This includes a characterization of the whole of the firearms industry, not just of the part that is implicated in the misuse and abuse of its products. Yet virtually the only country for which it is possible to obtain relevant data on firearms demand and supply, and on the industrial dynamics of the industry, is the United States.[1] Learning about the U.S. firearms industry may generate important insights about established or emerging industries elsewhere, such as Brazil, India, Pakistan, and South Africa.

Although the available data are somewhat chancy and contingent, it is possible to establish a proximate record of the annual demand for and supply of firearms in the United States, in actual units rather than in revenue terms. Demand can be estimated with data going back to 1999. Some supply go further back, to 1986. Albeit more problematic, subtracting exports and including imports is possible as well, back to 1989. As it turns out, in the process it is possible to estimate a number for the annual resale of used firearms via federally licensed dealers and to gain a sense of an important metric of competition, namely the domestic market penetration by imports and also of the share of foreign brands in domestic production (i.e., production in the United States by non-U.S. brands). Another benefit of looking at these data is that it becomes possible to examine for its plausibility the standard claim that the stock of firearms in the U.S. amounts to "one gun per person." This is important because this claim is based on a household survey rather than on market information.[2]

Knowledge of both the quantity of new, domestically produced and retained weapons and of imported firearms would establish a benchmark for annual market supply. Matched against estimates of domestic firearms demand via federally licensed firearms dealers implies that any excess of demand over supply would need to be filled from the resale of used weapons. In round numbers, for the year 2010, firearms demand is estimated at 9.8 million units. On the supply side, firearms imports (both new and used) amounted to 2.9 million units, and domestically produced and retained new firearms (i.e., not exported) ran to about 5.4 million units, for a total supply of 8.3 million weapons. This leaves 1.5 million firearms, a little over fifteen percent of demand that year, to be supplied via the resale of used firearms. Spot interviews with dealers confirm that firearms resale is both common and an appreciably large and profitable part of the retail business.

Prefaced by a discussion on the quality of and restrictions on the data, the following sections address some of the detail and complexities by which to arrive at estimates of units of firearms annually traded in the U.S. and of the total stock to which they may have cumulated.

The article establishes methods by which to estimate U.S. commercial firearms demand and supply. For the first time, this includes the number of used firearms resold via federally licensed retailers. For 2010, for example, total unit sales are estimated at 9.8 million firearms (pistols, revolvers, rifles, and shotguns), about 1.5 million of which were resales of used weapons. The article also shows rising firearms imports in general as well as a growing market share of non-U.S. brands produced within the United States, especially in the pistol segment of the firearms market.

Data and definitions

A detailed discussion of data and data sources is available in Brauer (2013). For the time period 1986 to 2010, and based on data derived from the Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF), one can document the sale of about 98 million new, domestically produced and retained firearms, defined as pistols, revolvers, rifles, and shotguns. In addition, complex data purchased from the U.S. Census Bureau suggest the net import into the United States of another 48 million firearms for the same time period.

While unit sale data can be extracted from ATF paper records, they are known to be incomplete.[3] For instance, even prominent, large-scale firearms manufacturers at times report production for one year, then the record stops for a year, and then starts up again. Thus, the figure of 98 million firearms reflects underreporting although, in percentage terms, perhaps not by a huge amount.[4] The ATF defines "production" as that part of production that is *released into domestic commerce*. Production into inventory is not counted. Even as it is odd, this definition turns out to be useful in that we know the number of firearms released into *commerce*. This includes sales to law enforcement agencies such as municipal and state police forces, and federal forces such as the Fish and Wildlife Service. Military sales, however, are excluded from the reporting requirement. Likewise, the emphasis on "release into commerce" means that sales from contract manufacturers for other manufacturers are excluded. This is because the law's main concern lies with the tracing of weapons used in crime. Thus,

the intent is to count only the "street release," so to speak, from manufacturers' stocks to law enforcement agencies, private security firms, retailers, wholesalers, direct end-customer, or any other nonmilitary customer.

The net import data are harder to understand and to handle. U.S. Customs and Border Protection (Customs) reports data on firearms imports and exports based on tariff schedules published by the U.S. International Trade Commission (USITC). But neither Customs nor the USITC collect all of the raw data. Instead, raw export data is collected by the U.S. Census Bureau (Census), with Customs serving as the reporting agency. Yet if one wishes to *purchase* data, import or export, this again is handled by Census! Further, the tariff schedules have changed repeatedly over time, and so has the classification of various types of firearms. Unfortunately, Customs does not differentiate between new and used imported weapons nor does it always cleanly separate military from nonmilitary firearms. Inevitably, to use its data, a number of judgment calls have to be made (see Brauer, 2013, for details).

On the demand side, the primary data source comes from the National Instant Criminal Background Check System (NICS), which generates a record maintained by the Federal Bureau of Investigation (FBI). Full monthly data are available as from December 1998. Background checks do not translate one-for-one into retail sales and, again, judgment calls have to be made to estimate firearms demand. For example, from November 1998 to March 2013 NICS recorded over 12.5 million so-called permit checks for the state of Kentucky. For the same state, NICS also recorded an additional 1.2 million handgun checks and 1.8 million long gun checks. A permit refers to a firearms-carrying licence issued by the state of Kentucky. Each month, the state checks whether any of its permit holders may no longer be eligible for firearms possession, e.g., as a result of having committed a felony. Thus, Kentucky conducts continued eligibility checks unrelated to a prospective customer's intent to purchase a firearm from a licensed dealer. Similarly, Utah checks its permits every 90 days against FBI records. Each state maintains its own rules regarding the frequency, if any, with which its issued permits are checked. Thus, to compute firearms demand, the NICS numbers must be adjusted in some way.[5]

Estimating firearms demand and supply

The magnitude of the nonmilitary demand for firearms in the United States can be estimated if one is willing to make two assumptions: First, that all NICS permit checks are routine procedural checks by states against FBI records and are not associated with an intent to purchase a gun; and, second, that all checks by licensed firearms dealers (mostly retailers) against FBI records result in at least one firearms purchase. With these assumptions, the percentage of "in-store" checks out of all NICS checks yields an estimated annual demand.

More specifically, NICS also reports data on "multiple" background checks. This means that a potential customer's record is checked for both a handgun *and* for a long-gun purchase. Dealer interviews in Georgia, Ohio, and South Carolina suggest that, as a rule of thumb, an average of 1.1 firearms are sold per in-store customer. This will include multiple handguns only (with a single handgun check), multiple long guns only (with a single long-gun check), or a combination of handguns and long guns (with a "multiple" check). As estimates go, one may then add handgun checks, plus long gun checks, plus two multiple checks (for at least one handgun and one long gun), and augment the resulting number by a factor of 1.1, termed here the *multiple gun sales factor* (MSGF). This may overstate demand, but it is easy to employ a smaller factor such as 1.05. For example, of the 14,409,616 total NICS checks conducted in 2010, a total of 8,700,794 were under the handguns, long guns, and multiple designations. Counting the multiples twice and augmenting the resulting total by 1.1 leads, for 2010, to the aforementioned estimated demand of 9,769,543 million firearms via federally licensed firearms dealers.[6]

If this is a reasonable way to estimate retail demand, then the sources of market supply can now be computed as well, as shown in Table A2. For example, for 2010, ATF-reported domestic unit production amounted to 5,391,311 domestically retained nonmilitary new firearms (column 1). Adding in the 2010 Census-reported import figure of 2,880,333 new and used nonmilitary units (column 2) yields an overall supply of 8,271,644 firearms (column 3). Call this the commercial supply, and recognize that some unknown but probably relatively small portion of this goes to law enforcement agencies and into wholesale and retail inventories. But since retail demand was 9,769,543 (column 4), a difference of at least 1,497,899 firearms (column 5) must have been filled from domestic firearms resales at the dealer level. (The logic of this is roughly analogous to new and used automobile sales via car dealerships and excludes private party and fleet sales.)[7]

From all this, one may then compute—in columns (6) and (7) of Table A2—the percentage of new and imported firearms (column 6) and the remainder (column 7) which is the percentage of retail market demand filled by domestic firearms resales. Averaged over the 12 years of data, the split is roughly 75/25. Interestingly, in a small number of nonrandom, spot interviews with a variety of retailers in Georgia, Ohio, and South Carolina (pawn shops, specialist firearms retailers, a shooting range with retail segment), the (unprompted) dealers routinely referred to a number of around 25 percent as their used firearms unit sales out of overall firearms unit sales and, in 2011 when the interviews were conducted, they unanimously bemoaned the shortage of used firearms available for resale. (This is because the sales margin on used firearms is much higher than that on the sale of new firearms.[8])

Regarding the plausibility of the "one gun per person" survey-based number, for the years 1986 to 2010, the combined supply data of ATF and Census suggests total commercial supplies of about 98 million domestically produced and retained firearms, plus about 48 million imported firearms, for a total of 146 million firearms over this 25-year period. Adding "miscellaneous" firearms and firearms for the U.S. military brings the total to little more than 150 million.[9] Attrition rates are not known: Theft

merely recycles a weapon and military and police forces resell older weapons to help finance the procuring of new ones. For true attrition from the existing stock, one would need to know the number of weapons destroyed or damaged beyond repair, irretrievably discarded, or otherwise rendered unusable. No one knows this number. But even if one assumes a cumulative attrition rate of ten percent (older weapons at higher rates than newer ones), a total flow of 150 million firearms from 1986 to 2010 would result in a 2010 stock of 135 million firearms. Since firearms are long-lasting, large numbers of firearms that entered commerce before 1986 would still be in stock as well. If one could extend the exercise of harvesting ATF and Customs data by another 25 years, back to 1961, the "one gun per person" then appears quite plausible.

Domestically produced versus imported firearms

ATF data on new, nonmilitary, domestically retained firearms entering commerce and the import data from Census can also be used to compute the changing composition of commercial supplies (domestic versus foreign origin). The findings are shown in Figure 1. Due to substantial tariff schedule reclassifications of firearms imports, the Census data for (mostly) nonmilitary imports are displayed only as from 1989 (and, for comparative convenience, so are the ATF data). In Figure 1, then, the solid bottom (green) line shows the import numbers, on the left-hand side (LHS) scale, per 100,000 people. These rose from 489 firearms per 100,000 people in 1989 to almost twice as many, namely 931 imported firearms per 100,000 people in 2010. In contrast, supplies from domestic sources (the solid blue line, 2nd from the bottom) stayed fairly constant, at 1,769 firearms per 100,000 in 1989 and 1,743 in 2010. Unlike imported firearms, domestically supplied arms show a strong decline for much of the 1990s and through to about 2005 before rising again to their earlier level. The solid top (red) line adds the numbers for domestic and imported firearms. Starting in 1989 at 2,272 units per 100,000 people, annual additions to the firearms stock declined precipitously through the mid-1990s, then flattened out for about ten years, before rising rapidly to 2,674 firearms per 100,000 people in 2010.

Importantly, however, the composition of the origin of firearms has changed markedly. Using the right-hand side (RHS) scale, the purple dashed line in Figure 1 shows that in 1989 U.S.-based manufacturers provided nearly 80 percent of the firearms. During the 1990s, this percentage fell steadily to around 60 percent, a level that then prevailed throughout most of the 2000s. This does not tell the whole story of market penetration by foreign brands, though. While ATF records do not contain ownership information, the major non-U.S. brands are of course well known. In the pistol segment of the market they captured 21.9 percent of the top-20 sellers' market share in 2010. (The top-20 themselves accounted for 92.3 percent of the total pistol market.) The foreign brands among the top-20 pistol makers were Sig Sauer (Germany; 266,316 pistols), Beretta (Italy; 133,397), Taurus (Brazil; 128,160), Glock (Austria; 31,395), and Chiappa (Italy; 26,278), selling a total of well over half a

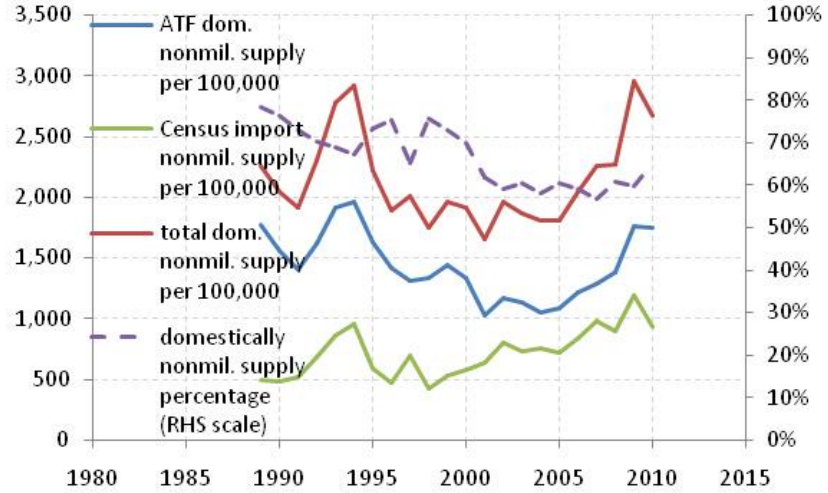

Figure 1: The share of imported firearms, 1989-2010 (nonmilitary firearms, in units per 100,000 people).
Source: Brauer, 2013.

million pistols in 2010 alone. For comparison, ten years earlier, in 2001, only Beretta (58,151) and Taurus (7,114) were ranked in the top-20 list of pistol makers.

Foreign-brand penetration is not evident in the revolver segment (only Chiappa shows up in the top-20) or the shotgun segment (only Beretta), and the rifle segment is only beginning to be affected (Sig Sauer and FN Herstal, Belgium). Nevertheless, it is clear that a fundamental change on the supply side of the U.S. firearms market has occurred. Figure 1 shows massive, and massively increasing, firearms imports, and a closer look at the firearms market segments shows that even among "domestic," i.e., U.S.-based producers, foreign brands have gained much market share.[10] These observations would appear to be restricted to the pistol market in particular, but the trade press suggests that U.S. rifle and shotgun manufacturers increasingly source parts from abroad, e.g., from Mexico, Russia, and Turkey.

Conclusion

The findings reported in this article suggest that United States firearms producers have experienced import pressures not unlike those that have affected other branches of U.S. manufacturing, such as commercial shipbuilding, automobile manufacturing, consumer electronics, and household furniture. From the point of view of industrial economics, and in marked contrast to major conventional arms, the U.S. firearms industry likely functions much like other branches of U.S. commercial manufacturing.

This probably implies, for instance, that any firearms import restrictions would be countered by resurgent domestic manufacture, even if at possibly increased end-user prices. Similarly, if restrictions were placed on production within the United States, this likely would lead to displacement of manufacturing facilities from "gun-unfriendly" to "gun-friendly" states or to an even greater reliance on firearms imports.

In addition to the rising market share of imports and of foreign-brands in domestic production, a completely new aspect of firearms research reported here concerns the share of firearms resales in total firearms sales. A rough estimate suggests that around one-quarter of dealer-level firearms sales may stem from used firearms. The research further suggests that the notion of a firearms stock of an average of "one gun per person" in the United States is likely a reasonable approximation.

The contours on firearms quantities having been established, further research will need to generate knowledge of wholesale or retail prices and better understand the nature of competition in the firearms market. For the whole of the 1986 to 2010 time period, Brauer (2013) traced well over 2,000 U.S.-based firearms manufacturers but showed that just three brands—Ruger, Remington, and Smith & Wesson—supplied over 40 percent of the market. Even so, in all market segments entry and exit can readily be observed and, as pointed out for the case of foreign-brand penetration in the pistol segment of the market, successful entry into the list of top-20 sellers has been possible. All this speaks to the roles of technology and product innovation, marketing, and brand reputation effects, certainly topics to which economists have much to contribute. Additionally, since location data by state, city, and street is available from the ATF for all U.S.-based firearms manufacturers, it should be possible to learn about the economics of agglomeration in the firearms market or if changes in firearms legislation affect manufacturers' location or relocation decisions.

Finally, most firearms manufacturers are privately-held firms. But shares for a very few are, or have at times been, publicly traded. For such firms, substantial financial records can be obtained from the U.S. Securities and Exchange Commission (SEC). Among other things, one would learn much about costs, including R&D and labor costs and, given the apparently competitive nature of the market, one probably could draw reasonable inferences about the market at large.

Altogether, it appears that much can in fact be learned about the industry *per se*, rather than only about those aspects having to do with the misuse or abuse of its products. And to understand the development and dynamics of the firearms industry in one market (the United States) could then conceivably assist in understanding the development of dynamics of the firearms market elsewhere, such as in Brazil, India, Pakistan, or South Africa.

Notes

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1. Small Arms Survey: See, e.g., the annual yearbooks, published since 2001. Misuse and abuse: I distinguish among firearms use, misuse, and abuse. Misuse includes, e.g., accidental shootings or suicides; abuse includes criminal use especially, but not only, homicide. Use includes collecting, target shooting, hunting, and legitimate self-defense.

2. One gun per person: Hepburn, *et al*. (2007) report the number of firearms in individual possession in 2004 as 283 million. (At the time, the U.S. population was about 293 million, hence the "one gun per person" shorthand.) This estimate is based on a nationally representative sample, conducted in spring 2004 by four researchers at the Department of Health Policy and Management, Harvard School of Public Health, of 2,770 adults of age 18 and older. To this must be added stocks of law enforcement and similar agencies. Earlier estimates, discussed in Hepburn, *et al*. (2007), reported stocks of 192 million firearms in 1994 and 258 million firearms in 1999, respectively. Quite a bit of controversy surrounds these and other survey-based estimates, such as those conducted by the General Social Survey, Gallup, Pew Research, ABC News/Washington Post, and by academic researchers. See the summative discussion and numbers in Bialik (2013a; 2013b). See also Legault and Lizotte (2009).

3. ATF publishes its data in the Annual Firearms Manufacturers and Export Report (AFMER), see http://www.atf.gov/statistics/index.html [accessed 21 April 2013]. At the time of writing, AFMER was available for 1998 to 2010. Data back to 1986 were obtained via a Freedom of Information Act (FIA) request.

4. The ATF attempts to audit all manufacturers' records once every five years. Any omissions or errors are then said to be reflected in updated AFMER's so that AFMER more than five years old are deemed correct by the ATF.

5. Table A1 lists the monthly NICS totals for November 1998 to December 2010.

6. The National Shooting Sports Foundation (NSSF), an industry group, also adjusts the monthly NICS numbers. At less five percentage points, the difference to the adjustment used in this article is not large.

7. Whereas the estimated *retail* demand necessarily excludes figures for the demand stemming from law enforcement agencies, the total supply of 8,271,644 must be reduced by the unknown diversion to law enforcement ("fleet" sales) and inventories thus reducing the *retail* supply. Hence, the gap between retail demand and retail supply becomes wider, so that the resale of used firearms will be larger than the estimated 1.5 million units reported in the text. The figure of 1.5 million would be the estimated minimum of firearms resales at the dealer level.

8. Sales margins: See NSSF (2010, p. 21). For the year 2009, NSSF retail survey respondents (n=228) reported an average sales margin of 19% for new firearms (handguns, rifles, and shotguns). In contrast, the average sales margin was 29% for used firearms (n=211). Over 20 percent of gross sales derived from the sale of used firearms (n=245).

9. Adding in "miscellaneous" commercial firearms brings the total from 98.2 to 99.3 million units. The flow of firearms to the military is relatively small. For a generous approximation, assume an average of two firearms per person and an average force level of 1.5 million personnel and also assume a ten-year firearms replacement cycle (a factor of 2.5 over 25 years). The total would then come to 7.5 million firearms. Half that, or say four million, might be a more realistic number.

10. Foreign- and, especially, European-brand firearms are increasingly used in crime as well which, as Nicholas Marsh of the Peace Research Institute, Oslo (PRIO) suggests, should make Europeans less smug about high levels of U.S. firearms crime. See http://www.dw.de/european-arms-money-fuel-us-gun-addiction/a-16540687 [accessed 18 April 2013].

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[NSSF] National Shooting Sports Foundation. 2010. *2010 Firearms Retailer Survey*. Prepared by Southwick Associates (Fernandina Beach, FL) for the NSSF.

Table A 1: Total NICS background checks by month, November 1998 to December 2010

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total/year
1998											21,196	871,644	892,840
1999	591,355	696,323	753,083	646,712	576,272	569,493	589,476	703,394	808,627	945,701	1,004,333	1,253,354	9,138,123
2000	639,972	707,070	736,543	617,689	538,648	550,561	542,520	682,501	782,087	845,886	898,598	1,000,962	8,543,037
2001	640,528	675,156	729,532	594,723	543,501	540,491	539,498	707,288	864,038	1,029,691	983,186	1,062,559	8,910,191
2002	665,803	694,668	714,665	627,745	569,247	518,351	535,594	693,139	724,123	849,281	887,647	974,059	8,454,322
2003	653,751	708,281	736,864	622,832	567,436	529,334	533,289	683,517	738,371	856,863	842,932	1,008,118	8,481,588
2004	695,000	723,654	738,298	642,589	542,456	546,847	561,773	666,598	740,260	865,741	890,754	1,073,701	8,687,671
2005	685,811	743,070	768,290	658,954	557,058	555,560	561,358	687,012	791,353	852,478	927,419	1,164,582	8,952,945
2006	775,518	820,679	845,219	700,373	626,270	616,097	631,156	833,070	919,487	970,030	1,045,194	1,253,840	10,036,933
2007	894,608	914,954	975,806	840,271	803,051	792,943	757,884	917,358	944,889	1,025,123	1,079,923	1,230,525	11,177,335
2008	942,556	1,021,130	1,040,863	940,961	886,183	819,891	891,224	956,872	973,003	1,183,279	1,529,635	1,523,426	12,709,023
2009	1,213,885	1,259,078	1,345,096	1,225,980	1,023,102	968,145	966,162	1,074,757	1,093,230	1,233,982	1,223,252	1,407,155	14,033,824
2010	1,119,229	1,243,211	1,300,100	1,233,761	1,016,876	1,005,876	1,069,792	1,089,374	1,145,798	1,368,184	1,296,223	1,521,192	14,409,616
Total													124,427,448

Source: http://www.fbi.gov/about-us/cjis/nics [accessed 17 April 2013]

Table A2: Approximate demand and supply of U.S. commercial firearms, 1999-2010

Year	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1999	4,007,910	1,482,990	5,490,900	8,757,843	3,266,943	62.7	37.3
2000	3,763,345	1,625,996	5,389,341	7,879,752	2,490,411	68.4	31.6
2001	2,907,580	1,807,001	4,714,581	8,035,308	3,320,727	58.7	41.3
2002	3,345,195	2,308,853	5,654,048	7,084,617	1,430,569	79.8	20.2
2003	3,277,426	2,132,623	5,410,049	7,075,868	1,665,819	76.5	23.5
2004	3,079,517	2,217,721	5,297,238	7,371,405	2,074,167	71.9	28.1
2005	3,218,315	2,117,859	5,336,174	7,750,274	2,414,100	68.9	31.1
2006	3,614,452	2,497,273	6,111,725	8,240,265	2,128,540	74.2	25.8
2007	3,867,152	2,948,421	6,815,573	8,640,641	1,825,068	78.9	21.1
2008	4,195,873	2,713,303	6,909,176	9,473,556	2,564,380	72.9	27.1
2009	5,417,003	3,641,952	9,058,955	10,053,577	994,622	90.1	9.9
2010	5,391,311	2,880,333	8,271,644	9,769,543	1,497,899	84.7	15.3

Notes: (1) ATF-reported domestic nonmilitary production (“new”) (in units); (2) Census-reported nonmilitary imports (“new” and “used”) (in units); (3) column 1 + column 2 = domestic nonmilitary, commercial market supply (in units); (4) NICS-adjusted background checks with MGSF = 1.1 (in units); (5) column 4 – column 3 = domestic “used” gun purchases (in units); (6) new + imported gun purchases (%); (7) domestic used gun purchases (%).
Source: Source: Author's calculations from ATF (AFMER), USCB, and FBI data for the relevant years.

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