

Twenty Questions for Peace Economics: A Research Agenda

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This paper constructs a matrix of the effects of the economy on military affairs and vice versa. Each cell of the matrix is filled with five research questions that either have not yet yielded conclusive answers, or only partial answers, or have barely been addressed at all in the literature. The paper thus constructs a useful research agenda for current and future students.

Keywords: peace economics; military affairs; research agenda; students; Hilbert

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INTRODUCTION

At the Second International Mathematics Congress in Paris in 1900, David Hilbert (1902, 1932) presented a list of 10 unsolved mathematical problems.² This list helped stimulate subsequent research by inviting mathematicians to try out their skills on difficult problems. The purpose of this paper is to pose, like Hilbert, a set of questions that we hope will stimulate research. We pose twenty questions on how military affairs affect the economy, and vice versa, and what it will take to reorient military resources toward meeting human needs. Unlike mathematical problems, few of these questions will lead to clear-cut, universally accepted answers, but efforts to find answers are likely to carry more far-reaching consequences for our well-being, indeed our survival. Jan Tinbergen (1985) challenged economists not to treat war simply as an external variable, which disrupts normal economic activity from time to time, like bad weather, but to apply the tools of economic analysis to the questions of what causes wars and how they can be avoided. Although Brauer (1995) has assembled a global directory of economists and members of other professions who are working on such issues, too few economists have so far focused their attention on these important questions. Generating a list of research questions may therefore be helpful, especially so for

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² This was expanded to 23 in the speech's published version (Reid 1996, pp. 74, 81-82). Some of Hilbert's questions have been answered only recently.

advanced students who might be looking to address some important, but unsolved, puzzle.

Switching to a different analogy, for physicians – and so for economists – a task is not complete if he or she simply describes the symptoms of a disease. It is also necessary to analyze the underlying causes and to find and apply effective therapies. Galtung, Jacobsen, and Brand-Jacobsen (2002) analyze conflicts in an analogous way through *diagnosis* (what is wrong and why), *prognosis* (what is likely to happen if nothing is done to prevent it), and *therapy* (who needs to do what to transform a conflict so that it does not lead to violence but can be handled by peaceful means). Conflict itself is not necessarily harmful; indeed, it can sometimes play a constructive role in helping improve unjust conditions, but violent, destructive conflict can and must be avoided. Along similar lines, Robert C. Tucker (1981) distinguishes among three main tasks that are necessary to help bring about change: *analysis* (where are we, what is wrong with the present situation, why), *prescription* (where do we want to go and what steps are necessary to get there, a vision of a better future and a strategy to achieve it, who needs to do what, when, where and how to bring it about), and *persuasion* (how can we interest others in our vision and inspire them to help us implement it).

One way to study the relation between military and economic affairs (but there are clearly many others) is to explore how the military affects the economy and vice versa. Within each of these two categories, we can distinguish between potentially desirable and potentially undesirable effects. This yields the four-fold classification displayed in table 1. In each of these four broad categories, a number of questions are listed, upon which we elaborate in the text of this paper. Of course, neither is this list exhaustive, nor is the 2x2 classification without its problems. To most readers of this journal, a number of questions will sound rather more familiar. But, upon thought, most will also agree that while much work has been done, really solid and universally conclusive answers are often not at hand so that research needs to continue. In addition, there are a number of questions that are relatively new even for well-seasoned researchers – for instance, the questions of if and how markets and auctions might be used to resolve conflict, or why there is no market for peace.

POTENTIAL EFFECTS OF MILITARY ON ECONOMIC AFFAIRS

1. What, actually, is security and how do we measure it?

The “mother of all questions” is this: what is being produced by military expenditure in the first place? Many researchers model military expenditure as a variable that enters

Table 1: A classification of relations between military and economic affairs

	<i>Potentially desirable effects</i>	<i>Potentially undesirable effects</i>
Effects of military on economic affairs	<ol style="list-style-type: none"> 1. What, actually, is security and how do we measure it? 2. What is the feasible set of alternative security arrangements and what are their respective characteristics? 3. What is the contribution of military expenditure to labor, capital, and economic growth? 4. If there is a peace dividend, why is there so little peace? 5. What is the future role of the military? 	<ol style="list-style-type: none"> 6. What is the full opportunity cost of the military sector? 7. What are causes and consequences of military expenditure inertia and competitive arms races? 8. What are the economic consequences of war? 9. What are the non-economic consequences of war? 10. What are the mechanisms by which armed power is controlled or fails to be controlled?
Effects of economic on military affairs	<ol style="list-style-type: none"> 11. How can markets and auctions be used to resolve conflicts? 12. What is the role of economic cooperation and trade to help overcome hostilities? 13. How can economic incentives become an effective method to deter aggression and violations of international law? 14. What are the underlying economic mechanisms by which democracy and the free flow of information inhibit violent conflict? 15. Do we need a world treasury to finance peace? 	<ol style="list-style-type: none"> 16. What are the links between natural resources and conflict? 17. How do austerity measures, shock therapy, and bad policy increase social tensions? 18. What are properties of an economic system that meets the human needs of all? 19. To what extent does the profit motive and rent-seeking activity promote unneeded military expenditure? 20. To what extent does the spread of knowledge and technology contribute to weapons proliferation?

a security function which, in turn, enters a social welfare function. But what is security? And how do we usefully measure it? If we measure security by military expenditure it is like measuring health by medical expenditure. Just as clean water, nutritious food, and adequate shelter and clothing contribute more to health than does medical expenditure, likewise security is not appropriately modeled if military expenditure is the only argument in the function.

If one country increases its military spending, it may enhance its own security (or the security of its elites), while at the same time reducing the security of other countries

or groups. But if all countries increase their military spending, all are less secure. For this reason, while military expenditure sometimes is a “public good” at the national level, it is a “public bad” at the global level (Mendez, 1997). To address the problem of security in a realistic way, we must not limit ourselves to a narrow nationalist perspective, but analyze the issue from a global viewpoint.

2. What is the feasible set of alternative security arrangements and what are their respective characteristics?

Military expenditure is a flow variable whereas security, it would appear, must be provided from a stock of capabilities. That stock of capabilities might include men and machines of war but might also include non-military alternatives, such as diplomatic skill, to prevent others from threatening one’s security. Further, to prevent, or at least limit, credible threat by others, military expenditure could favor offensive or retaliative arrangements but could also favor primarily defensive provisions.

One factor contributing to arms races is the aforementioned security dilemma, that if a country acquires weapons to increase its own security, it decreases the security of potential opponents (see, e.g., the security function modeling in Sandler and Hartley, 1995). In contrast, non-offensive defense is designed to break out of that dilemma. If a country adopts a purely (or primarily) defensive military posture that increases its own security without threatening the security of others, it can unilaterally find a way out of an arms race caused by mutual fear. There is an appreciable literature on non-offensive defense (e.g., Møller, Däniker, Limone, and Stivachis, 1998; Møller and Scheetz, 1997; Gates, 1991; Fischer, Nolte, and Oberg, 1989; Galtung, 1984; Fischer, 1984). What are the economic characteristics of such purely defensive military postures in various contexts? What are the relative costs compared with offensive military postures, or deterrent postures that seek to prevent aggression through the threat of retaliation? Can economists design superior, feasible, and viable security systems?

3. What is the contribution of military expenditure to labor, capital, and economic growth?

If there is widespread unemployment, military expenditure can help create jobs. But so could non-military spending, e.g., on health care, education, infrastructure, or if tax burdens were reduced and spending decisions left to the private sector. Oil spills, like military expenditure, also create jobs – on cleanup work – but this does not mean that we therefore welcome oil spills. Instead, we prefer to use the same resources for more

productive purposes, if we can. Quantitative studies of employment creation per unit of military spending in various sectors can provide insights, but there are too few such studies, especially with regard to developing nations. Moreover, in the newly resurgent area of arms trade “offset” arrangements the consensus appears to be that they are bad deals, but relatively little research has been done on a country-by-country, case-by-case basis (see, e.g., Matthews, 2002; US Department of Commerce, 1998; Martin, 1996), in part because official sources are unwilling to release pertinent data. If governments truly were interested in assessing the economic impact of such deals, data would be released. One therefore surmises (see question #19) that rent-seeking rather than job-creation is at stake.

Regarding the effect of developing military technology, again there is some literature available (e.g., Hughes, 1993). Just as civilian inventions (e.g., engines, steel manufacturing, and products of modern materials research) have been and are appropriated for military usage, so undoubtedly were certain military inventions later usefully passed on to the civilian sector (e.g., radar, computers, the Internet, and GPS). The underlying economic question is not one of spin-off (military to civilian) or spin-in (civilian to military) but one of creating effective demand for research and development. Thus, the spin-off argument appears wrong-headed on theoretical grounds. Empirically, the question is how to convincingly demonstrate the counterfactual: would comparable technologies have been discovered if research funds expended on the military had been spent directly on civilian research?

Regarding economic growth, *The Wall Street Journal* (27 March 2002, p. B5B) recently quoted Thomas Scheetz: “From an economist’s perspective, military spending should have a positive impact on growth and it should guarantee local and international investors that a situation is stable.” Exceptions notwithstanding, econometric findings rarely confirm this outcome. To the contrary, the econometrics generally finds that military expenditure reduces economic growth (e.g., Dunne, 1996, Scheetz, 2002). One draws the logical conclusion that military expenditure is not optimal. Scheetz reports, e.g., that Argentina finances seven division generals but its army has no divisions at all. And Bolivia and Paraguay, landlocked as they are, each have a Navy!

The research question then is not what is the contribution of military expenditure to labor, capital, and economic growth but what is its contribution to security which, in turn, would permit investment in human and physical capital. A related but entirely different question, especially for developing nations, is whether we should not switch the focus from economic growth to human development indicators (e.g., Brauer, 1996). On this, too, far too little work has been done.

4. If there is a peace dividend, why is there so little peace?

There is no question that a peace dividend exists: if the US still spent six percent of GDP, its military expenditure would be roughly \$600 billion instead of \$300 billion in 2002. Not surprisingly, plenty of work has been done on conversion of military resources to civilian uses (e.g, Dumas and Thee, 1989; Brauer and Marlin, 1992; Dumas, 1995), and prompted the creation of the Bonn International Center for Conversion (BICC). It soon became clear that the fabled peace dividend is, in the short-run, much more likely a peace penalty as society needs to bear adjustment costs. Intriligator (1992) therefore rightly compared conversion with investment, which requires some initial sacrifice for rewards in the future.

But the peace dividend appeared earmarked for northern hemisphere countries. Relatively little research has been conducted on developing nations where by far most of the daily carnage of war takes place. In the early 1990s, Nicole Ball and others carried out a series of country case studies on demobilization and reintegration of soldiers of internal wars in Africa. These pointed to many failures to convert. Failure to convert also points to its opposite: what, exactly, are the costs of war? (see question #8). Economists have done little to assist with the accounting.

Another aspect of conversion, rarely discussed, is that – normatively – the ultimate aim must be its irreversibility. Can economists devise feasible schemes of irreversibility that lock in more security at lower expenditure?

5. What is the future role of the military?

Ideally, military units are characterized by hierarchical organization able to perform difficult tasks that require centralized planning and large numbers of people cooperating in a highly coordinated way. This type of organization is not only suitable to fight wars, but also to keep peace, and to respond rapidly to natural or industrial disasters. An American soldier deployed in Kosovo to protect returning refugees said, “It is a lot more pleasant to feed people than to kill them.” What, actually, has been the experience of deploying military units for non-military tasks?

With the end of the cold war, NATO lost its original purpose. Georgy Arbatov, head of the Moscow Institute for USA-Canada Studies, once said, “We will do a terrible thing to you. We will deprive you of your enemy.”³ NATO needs to find a new purpose to avoid becoming obsolete (Sandler and Hartley, 1999). It needs to

³ Echoing Abraham Lincoln’s “Am I not destroying my enemies when I make friends of them?”

build bridges to its former adversaries, particularly Russia, to ensure that the cold war never returns, in the same way as Germany and France are closely cooperating today.

In today's interdependent world, no country can be safe so long as there is severe suffering and frustration elsewhere in the world. What new roles military organizations ought to assume in our changing world is an important issue that has not yet been sufficiently explored. Once they take on non-military tasks, we may not wish to refer to these organizations as "military" anymore. Is the future military better thought of as an "emergency response" organization, and what would be the implications?

6. What is the full opportunity cost of the military sector?

Opportunity costs are foregone benefits, namely the benefits that could have been derived had resources used for one purpose been employed elsewhere. By taxing its population to finance the military sector, government reduces the private sector's resources and may affect investment and consumption. Alternatively, given a certain amount of taxation, allocation to the military budget implies foregoing allocation to the non-military budget. The early literature for developing countries initially suggested a trade-off between military budgets and social expenditure (such as on health and education) but this literature is now somewhat dated, and it would be useful to produce new or updated country studies to see if these results still hold. For the developed countries, the early literature suggested a strong one-to-one trade-off between military expenditure and private investment. Lately, this has been called into question, not because the trade-off is unlikely to exist but because it is econometrically difficult to measure. Instead, new evidence suggests that the trade-off appears to come with private consumption.

Even the most basic of calculations shows that if the US had been able to invest in the civilian economy the roughly six percent it spent for military purposes over the 40 years of the cold war from 1945-1985, assuming a 3:1 capital-to-output ratio and a ten percent annual depreciation rate, US national income could be more than double what it is today. If research had focused on developing better civilian technology instead of new weapons, the gain in net output would be even greater. Further, the costs of the US nuclear weapons enterprise alone, including development, testing, and manufacture of nuclear weapons and their delivery vehicles since 1940, has been calculated as \$5.48 trillion in 1996 dollars (Schwartz, 1998). A single B-2 (stealth) bomber costs \$2.1 billion. Less than ten percent of that would pay to inoculate every child born per year in the world between 1990 and 1995 (UNICEF, 1990; United Nations, 1994). Military expenditure may save lives under certain conditions, but economists always look at opportunity costs, how many lives could be saved if the

same resources were invested differently.

Another important, but unstudied, area is the opportunity cost of conscription. If a government drafts its young, they are coerced to forego whatever else they would have done. Their nation thereby foregoes the benefits of whatever education its young might have acquired, or whatever level of work experience they might have gained, and therefore whatever subsequent economic contribution they would have made. Of course, foregone earnings are not captured in military budgets. It would be worthwhile to conduct a few country studies to obtain a “handle” on the order of magnitude of just how large the opportunity cost of conscription might be.

7. What are causes and consequences of military expenditure inertia and competitive arms races?

Arms races arise on account of mutual fear (Brito and Intriligator, 1995), and military expenditure is justified on the argument that it deters war. Empirical evidence suggests otherwise. Michael Wallace (1979, 1998) has found that among 99 cases of “serious disputes or military confrontations” between 1820 and 1964, 23 of the 28 preceded by an arms race ended in war, whereas 68 of the 71 not preceded by an arms race ended without war. This does not prove that war broke out because of the arms race; it could also be that where tensions were particularly acute, greater pressure was felt to acquire arms on both sides. Nevertheless, it is plausible that where great quantities of arms are available, war is more likely than if they are absent. Wallace studied international wars, which fortunately have become rare. How is the presence of arms linked to the occurrence of civil wars?⁴

Equally important, what is the role of inertia in military budgets and arms acquisition? It should concern economists that the level of next year’s military budgets can be predicted better by simple time-series analysis and extrapolation than by the variety of structural, explanatory models we have built. This is especially worrisome when military expenditure does not actually appear to buy any defensive or protective capabilities, as Scheetz has argued for Latin America and as the discussion surrounding the recent NATO-Europe fiasco in the former Yugoslavia shows. Likewise, inertia rather than mutual fear appears to play an important role in mutual arms races: given the rapidity with which the US-USSR arms race collapsed, are we expending resources on the military sector today simply because we did so yesterday?

⁴ Noting that “at least 500,000 people are killed each year by small arms and light weapons,” the *Small Arms Survey* calls such arms “the real weapons of mass destruction” (2001, p. 1).

8. *What are the economic consequences of war?*

Surprisingly, one of the least studied aspects concerns the economic consequences of war.⁵ Economists can make many useful contributions by calculating the losses. Some forty years of civil war in Angola, nearly forty years in Colombia, and nearly twenty years in Sri Lanka surely negatively affected their economic fortunes and prospects. Hacking limbs off children in Liberia creates a generation of disabled people whose economic contribution to the future of their societies will likely be minimal. Interminable fighting in southern Sudan that closes schools, damages health clinics and other expensive infrastructure, and destroys live-stock keeps generations of people in perpetual bondage to poverty. If economics is, in part, about ways and means to increase the material welfare of all humans, economists can make a useful contribution by assisting with the accounting of the cost of war. Few attempts have been made. For instance, what is the reduction in average life expectancy in sub-Saharan Africa in war-ravaged countries relative to those not affected by war? “Natural experiments” of this sort should provide us with at least proximate answers.

9. *What are the non-economic consequences of war?*

Ultimately, all consequences can be construed as economic, but here we mean non-economic in a narrower sense: consequences in terms of the polity, social cohesion, mental and physical health, and the ecological consequences of war (and of preparing for war). Galtung (1982) and Westing (1986, 1988), among others, have investigated the effects of war on the environment but the accounting is far from complete. Unexploded ordnance and land mines often remain decades after war, killing farmers working in the field or children at play. The French-Belgium-German border area is still littered with unexploded mines and shrapnel left from World War II. Defoliants like agent orange have devastated forests in Vietnam. What are estimates of these losses, not only in monetary terms but also in lives lost? The adverse health consequences of nuclear weapons manufacturing and testing are only gradually becoming known, since cancers caused by radiation take many years to develop. The costs of cleaning up radioactively contaminated US nuclear weapons production facilities have been estimated to amount to \$340 billion over the next 80 years (Weida, 1997).

⁵ The consequences of preparing for war are captured in question #6 (the full opportunity cost of the military sector).

10. What are the mechanisms by which armed power is controlled or fails to be controlled?

If the military is not under the control of democratically elected leaders, it may seize control of the government (Dumas, 1997). It takes a combination of firmly rooted institutions to prevent the concentration of power in a few hands, so that the economy can thrive (North, 1991). If there is a culture of widespread corruption, if it is easier to acquire wealth by seizing control of the army or police than by producing goods people want to buy, if wealth created through economic activity can be seized by force at any time, the most enterprising people in society will not invest in manufacturing, but plot coups or banditry. For example, average annual incomes from crime have been variously estimated at up to \$70,000 per person in Colombia, a huge premium over Colombia's *per capita* 1995 GDP of around \$1,800 (Bejarano, 1997, p. 12).

What institutions are needed in society to ensure that production and investment is rewarded and wealth and power cannot be seized by force? The theoretical work of Jack Hirshleifer (2001), Mancur Olson (1993), McGuire and Olson (1996), Wintrobe (1998), and others, on the economics of conflict urgently needs to be supplemented by empirical work and empirical estimates.

POTENTIAL EFFECTS OF ECONOMIC ON MILITARY AFFAIRS

11. How can markets and auctions be used to resolve conflicts? And what self-regulating elements exist to contain conflict?

One of the most important aspects of a market system is that it makes the orderly arbitration of conflicting interests possible. Given some widely accepted and enforced rules of the games, markets contain and channel conflict. Without resort to violence, auctions allocate scarce resources that many want to the highest bidder, who is likely to put them to the most productive use. The market mediates between sellers who prefer high prices and buyers who prefer low prices to find an equilibrium. How can such principles be applied to conflict resolution? Why is there no market for peace (Brauer, 2001)?

Any trade brings benefits to both buyer and seller, otherwise the transaction would not take place. Economists have devised methods of fair division, even "superfair," in the sense that each side feels it is better off under its own preferences than its counterpart (Baumol, 1986). An example of a mutually beneficial agreement that ended a series of wars is the joint natural park being developed by Ecuador and Peru in the contested area over which they fought four wars since 1941. When Johan

Galtung (see Galtung, Jacobsen, and Brand-Jacobsen, 2002) suggested this idea in 1995 to Ecuador's President Mahuad, he was at first skeptical but did propose it to Peru. To his surprise, Peru accepted the proposal with only minor modifications, leading to the 1998 Peace Treaty of Brasilia. Creative ideas, which often can help resolve an impasse, cost essentially nothing.

12. What is the role of economic cooperation and trade to help overcome hostilities?

If mutually beneficial economic cooperation endures in peace time, but would be interrupted in case of war, this helps preserve peace. By contrast, dependence on imports (e.g., oil) can become a source of war if a country is cut off from vital supplies but can restore access through the use of military force. Can a deliberate policy of shifting, when necessary, to more expensive but more reliable domestic supplies of vital goods eliminate this factor as a potential cause of war? Switzerland, which imports about half of its food in peacetime, had to rely completely on its own agriculture during World War II when it was cut off from food imports. Under what condition does dependence on trade contribute to war (as in the Gulf) or to peace (as in the European Union)?

After World War II, Jean Monnet sought for a way to tie France and Germany together through mutually beneficial economic cooperation, to overcome the century-old hostility that had produced a series of wars between them. He conceived of the European Coal and Steel Union, founded in 1952, which has since developed into the European Union and has indeed made another war between Germany and France almost unthinkable. As important as mutually beneficial trade was the construction of supranational institutions, where emerging disputes can be discussed and peacefully resolved. There exists a fairly active area of research on trade and conflict, but trade alone is not a panacea (Rotte, 1997). Likewise, Sandler (e.g., 1997) and others have done important work on institutional design, and it would be useful to combine these two research areas.

13. How can economic incentives become an effective method to deter aggression and violations of international law?

Because modern societies have become more interdependent, it was thought that trade sanctions may offer an alternative method to enforce international law and deter aggression or serious human rights violations. One problem is that they tend to hurt the poor more than the elites who make policy-decisions. Another problem with the way

sanctions have been applied in the past is that they were used irregularly and arbitrarily, without clear laws indicating what the consequences will be for certain violations of international norms. If decision-makers cannot reliably foresee what consequences they will suffer for given infractions, sanctions tend to be ineffective. How can they be made into a just and reliable instrument to deter violations of basic norms (Dumas, 1990; Cortright, 1997, 2000)? What role, if any, can be played by positive sanctions, i.e., rewards for desirable behavior?

Small countries have on occasion been able to deter aggression not by assembling military forces that were superior to those of a potential adversary, but by providing a useful service that would naturally be lost in case of war. Can that strategy be developed and made more effective? What lessons can be learned from countries that have long been able to avoid war? Economists are experts on the role and function of incentives. Can we come up with clever and feasible incentive schemes that prevent violent conflict and promote non-violent alternative dispute resolution?

14. What are the underlying economic mechanisms by which democracy and the free flow of information inhibit violent conflict?

Sen (1981) famously observed that famines do not occur in democracies, because a government that allows some of its people to starve would not be reelected. There have also been significantly fewer wars among democracies than one could expect statistically (Russett, 1993). The worst environmental records have been found in countries with press censorship and without free elections, because any criticism was silenced. Corruption thrives in a climate of secret deals, outside of public scrutiny. If those who are affected by the consequences of policy decisions have a voice in making them, they can ensure that their interests are taken into account.

It would appear, then, that two critical criteria are political competition and equal access to information, criteria familiar to economists who study successful markets (see question #11). What additional light can economists shed on the relation between and among democracy, peace, development, and protection of the environment?

15. Do we need a world treasury to finance peace?

Jan Tinbergen (in Tinbergen and Fischer, 1987; see also Fischer, 1997) observed that to almost any ministry at the national level, there exists a corresponding international organization, with the exception of a treasury. Yet without a treasury, which collects the revenue used to finance the rest of the government, any government would soon collapse. He called therefore for the creation of a world treasury to fund international

peacekeeping, development projects, and protection of the global environment.

Possible sources of funding for such a treasury could include revenue raised from auctioning the rights to the exploitation of mineral resources on the deep seabed, outside of any country's jurisdiction. No country can arrogate to itself the right to auction such resources, only a universal body would be an acceptable auctioneer. Besides raising revenue, such a measure could help prevent future wars over these resources.

Another potential source of revenue is the "Tobin-tax." Originally proposed to curb drastic swings in international currency trading (Tobin, 1978), such a tax would raise substantial revenues. More than \$1 trillion is exchanged from one currency into another every business day, most of it on currency speculation. If such a tax were collected by national governments on their territory and used partially to replace contributions to the World Bank, IMF, UN, and other international organizations, that would make unnecessary the lengthy and contentious negotiations about how much each country should contribute to those organizations. The richer countries would automatically pay a higher share. Similarly, this would provide a ready source of funding for a standing international peacekeeping force. This proposal has never been tested, but simulation models suggest that it would work as predicted. What is necessary to persuade one or more governments to charge such a tax on an experimental basis? And, as mentioned before, just what are the factors that make useful and successful institutions, such as a World Treasury, emerge?

16. What are the links between natural resources and conflict?

Collier (2000) and Collier and Hoeffler (1998) have tested the hypothesis whether civil wars are caused primarily by greed or grievances. Using all civil wars in the world since 1965 as the data base, they found that "greed" is a much better explanatory variable than grievances, which are nearly ubiquitous, almost like the background noise of the universe. Two variables in particular were highly correlated with the occurrence of civil wars: the availability of easily exploitable natural resources (such as timber, oil, diamonds, and other precious minerals and metals) and the availability of unemployed young men who can easily be recruited for war, for low pay or merely the promise that they may keep what they can loot. Some warlords profit handsomely from civil wars through the export of resources over which they gain control, at the expense of other people's lives. These findings suggest research into how the international community can reduce civil wars, by not rewarding the violent conquest of resources.

Externalities, which cause people to bear the consequences of somebody else's decisions, are a familiar cause of economic inefficiency. They are also a frequent cause

of conflicts. A typical form of externalities at the international level are cross-border pollution and conflicts over scarce resources. If a country suffers from acid rain or polluted water emanating from another country, or if radioactive waste is dumped in its fishing grounds, this can lead to international frictions. Similarly, if two countries share the same resource, such as fresh water from a river or fishing grounds offshore, or if two countries claim the same territory or islands in the proximity of expected oil or mineral deposits, the competition over limited resources can lead to war (but see Gleditsch, 1998). What are reasonable principles to share limited resources, and to share the costs of abating pollution? How can externalities be internalized so as to avoid such conflicts? There is a literature on this (most prominently, perhaps, Ostrom, 1990) but again it would seem important to combine the literature on institutional design specifically with research on conflict and conflict resolution, preferably on an empirical footing and based on field-research.

17. How do austerity measures, shock therapy, and bad policy increase social tensions?

What are ways to reduce government deficits and end price controls without adversely affecting the most vulnerable members of society, especially children and the old? When at the World Bank, Joseph Stiglitz famously made the case that overly harsh measures may precipitate conflict (e.g., in Indonesia and East Timor). Indeed, critics of the IMF and World Bank have long argued that their respective policies may contribute to conflict and warfare but surprisingly little research exists to ferret out the pathways by which this may have happened, or could be circumvented.

On a related matter, it turns out that the world has no contingency plans for peace. For example, the US had detailed plans how to obliterate the Soviet Union in case of a nuclear war, but had no plan whatsoever how it could assist it if it chose to make a transition to democracy and a market economy! All over Central and Eastern Europe, privatization was misunderstood and – in the absence of proper institutions – lapsed into monopolization with adverse consequences that are likely to last several decades.

18. What are properties of an economic system that meets the human needs of all?

Poverty and high unemployment, especially in the presence of conspicuous wealth, contribute to frustration, social unrest, and sometimes civil war. It is easy to design an economy that produces luxuries for a few. Far more challenging is to design an economic system that satisfies the human needs for food, clothing, homes, education,

and medical care of all. What are the characteristics of such an economy? What obstacles prevent it from emerging, and how can they be overcome?

Galtung coined the notion of “structural violence” (as opposed to direct violence) for social conditions that cause avoidable human suffering and death, even if there is no specific actor committing the violence. Köhler and Alcock (1976) have estimated that structural violence causes about one hundred times as many deaths each year as all international and civil wars combined. It is as if over 200 Hiroshima bombs were dropped each year on the children of the world, but the media fail to report it because it is less dramatic than a bomb explosion. How can we estimate the loss of life resulting from poverty and unequal income distribution? How can we reduce it?

19. To what extent does the profit motive and rent-seeking activity promote unneeded military expenditure?

There is no question that selling goods and services to government officials can be far more profitable than selling them to private individuals, because government officials do not spend their personal funds but have access to the public treasury. They tend therefore to be far more generous. Likewise, there is no question that the profit-motive and rent-seeking play an important role in promoting military expenditure. But to what extent? By what mechanisms? Lack of transparency, lack of accountability, lack of open systems of information certainly play roles. Can they be systematized? If there are worst-case scenarios (say, the current arms acquisition scandal in South Africa), are there best-case scenarios and what can we learn from them?

20. To what extent does the spread of knowledge and technology contribute to weapons proliferation?

Unlike physical resources, useful knowledge, once discovered, can be copied an unlimited number of times at almost no additional costs. For this reason, it may represent the most underutilized resource for development. If the least polluting and least energy, resource, and labor intensive production method known anywhere on earth was available everywhere, everybody could be much better off. Ironically, knowledge dispersion cuts both ways, for example in nuclear technology. The International Atomic Energy Agency does not have sufficient supervisory powers at present. It can only inspect nuclear facilities that member countries voluntarily declare and place under its inspection. If a border guard could inspect the car of a suspected drug smuggler only in places where the smuggler agreed, such an “inspection” would be meaningless. The IAEA needs the power to conduct unannounced random

inspections. Today, many governments would oppose this as an infringement on their national sovereignty. But when airlines began to inspect passengers' luggage after a series of fatal hijackings, many people also protested against this "invasion of their privacy." Yet today most people welcome such inspections, because they realize they are necessary for their own protection. Sooner or later, governments may reach the same conclusion. Will they do so before or only after the first terrorist nuclear bomb explodes?

Probability theory demonstrates that as long as the use of nuclear weapons is possible, it is bound to happen with near certainty sooner or later. Nobel Laureate George Wald once asked a Professor of Government at Harvard University, "How likely is a nuclear war?" "Not very likely," he replied, "I would say about 2 or 3 percent a year." But as Boulding (1978) has pointed out, a 2 percent annual probability grows to 63 percent over 50 years, and to 99.995 percent over 500 years. No matter how unlikely an event is, as long as its probability remains finite, it is bound to happen ultimately. The only safe way to avoid the future use of nuclear weapons is to abolish them, before they abolish us.

Many argue that even though we might be better off if nuclear weapons had never been invented, it is impossible to disinvent them now, and therefore we will have to live with nuclear weapons as long as civilization exists. But nobody has disinvented cannibalism either, we simply abhor it. We must now learn to abhor equally the thought of incinerating entire cities with nuclear weapons. The same of course goes for other weapons of mass destruction.

CONCLUSION

Our twenty questions have no easy answers, and even if answers may be found in theory, the more daunting task is how to implement any solutions. But if we avoid tackling these difficult questions, nobody may be left to address easier and more pleasant questions. Some readers will have some answers to some aspects of the questions we raised but for many questions definitive theory is absent, as is documented, empirical evidence. Moreover, sometimes even we experts get so locked into our "research mode," that we forget the larger context to which a particular research question belongs, and we get bogged down with minutiae instead of taking a step back to work on a larger, and perhaps more important, question. We hope that students, especially, will take any of these "Hilbert-like" questions as a challenge and devote themselves to the production of answers. We would also emphasize that those of us who are established scholars tend too much to write for ourselves. Defense and peace economists should more actively seek joint research-work with experts in other

areas, especially those experienced in field research.

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