POLSCI PAPERS

Evolutionary Reality of the Revolution in Military Affairs: Results of a Comparative Study

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ABSTRACT

Revolution in Military Affairs has been one of the driving concepts for creating modern armed forces capable of coping with the challenges of a contemporary security environment. Revolutionary change in Military Affairs has been interpreted as discontinuous, radical, non-incremental, and even disruptive change. Evolutionists, however, oppose this view and stress that past military transformations were actually more evolutionary, continuous, incremental, piecemeal, and slow. The third view tried to integrate both views by stressing the patterns of interchange of the periods of evolution and the turbulent periods of revolution. This article explores the revolution-evolution dilemma quantitatively by setting three logical revolution criteria/thresholds and discovers the number of changes in military affairs on a sample of 33 countries that were actually revolutionary in the period 1992-2010. The article confirms the argument that Revolution

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in Military Affairs has been in practice predominantly an incremental evolution in several military dimensions, with rare major (revolutionary) shifts. The statistical results show that only from 2 to 4% of possible revolutionary situations (periods in our measurement) were Revolution in Military Affairs. Only nine countries occasionally reached the revolution threshold of 30% change in one year, 10 countries reached the threshold of 50% change in three years, and only six countries reached the threshold of 70% change in five years. These findings suggest that Revolution in Military Affairs was used more as a promotional slogan, and perhaps even a motivational tool in military affairs.

KEY WORDS: *military policy, transformation, revolution, evolution, change*

Introduction

Contemporary armed forces have been confronted with the constant pressure to change in order to improve operational effectiveness, and retain legitimacy in their home societies. The key drivers of this pressure have arisen from the need to adapt to changing threats in the changing security environment and conscious or subconscious copying of military models of the strongest powers that have been successfully tested in the latest wars. Practical experience, however, shows varying levels of actual military change in different time periods. Normally, change has been introduced slowly in the armed forces, as a reflection of slow changes in the security environment. However, several dramatic events in the international community (e.g. end of the Cold War, 9/11, several political-military crises, etc.) or technical innovations created an increased need for greater policy changes in military affairs in shorter periods of time. How to interpret such policy changes from political, strategic, and historical perspective has become a contentious issue in military (Chapman, 2003, p. 2; Cohen, 2004, p. 395; Sheehan, 2008, p. 14) and policy academic debates. Some authors (‘revolutionists’) have labelled such changes revolutionary, while some others resisted such an interpretation and claimed that we have faced nothing else but a continued evolution in military affairs (‘evolutionists’). This study was motivated by a general interest in political science on policy development and revolutionary or evolutionary change in time. The existing approaches offer findings on the multidimensional nature of policy dynamics, different methodological approaches or

models, warnings on research pitfalls of analytical choices in this field, etc. (Giliberto, 2009; Philippe, 2009). Discovering the degree of change in qualitative or quantitative terms has become an important analytical goal. The purpose of this article is to offer quantitative evidence on the dilemma between the revolutionary discontinuity and evolutionary progress in the policy field of military transformation, and to find out how many changes in military affairs were truly revolutionary or simply evolutionary.

The Russian policy concept of Military-Technical Revolution (MTR) from the 1980s predominantly focused on the technical aspect of change, and was replaced in the 1990s by the US concept of the Revolution in Military Affairs (RMA), which broadened the debate from a relatively narrow, technical aspect towards organizational and doctrinal aspects. Both approaches have shared the non-incremental or revolutionary understanding of the change in armed forces. The problem with these approaches has been their loose use of the term 'revolution.' This has blurred the real meaning of the process despite the fact that revolutionary change in warfare has been well grounded in history (Knox and Murray, 2001). The difficult dilemma between interpretative revolutionary discontinuity and evolutionary progress has even led some authors to publicly refrain from this debate in order to make their assessments more operational and usable (Adamsky, 2008, p. 259). To avoid this dilemma, the debate in the beginning of this century further focused on another 'new' and broader concept of defence and military transformation.[6] But again, the new concept only reinforced the dilemma between the revolutionary discontinuity and evolutionary progress as it provided a confusing spectrum of definitions, ranging from comprehensive, discontinuous, and possibly disruptive changes in military technologies, concepts of operations and organization (Osinga, 2010, p. 14) to more modest processual definitions of a continuous and pro-active process of developing and integrating innovative concepts, doctrines, and capabilities (NATO Headquarters, 2010a, pp. 3–4,

[6] Transformation represents a fourth wave in the debate about the revolution in military affairs (see Raska, 2011, p. 2). The concept of military transformation was introduced in the USA after 9/11, and then widely adapted by other developed nations and NATO. This concept has been useful because it holistically encompasses combinations of operational, organizational, and personnel changes that exploit technological innovation (Osinga 2010, p. 14, Scott 2009a, p. 4). Military transformation was defined as a process of pursuing major changes to military forces in order to greatly elevate their future combat capabilities for information-age operations. The key terms of transformation and its principal determinants are "process, change, and capability" (Kugler, 2006, p. 288). The term military transformation has been frequently perceived as a more modern way of depicting changes in military affairs and as a way of avoiding the dilemma on revolution in military affairs.

2010b, p. 6). Simultaneously, the terms defence/military reform and Security Sector Reform (SSR) have also been used to reflect on more or less fundamental changes in armed forces (Edmunds, 2004, pp. 50–60; Haltiner and Klein, 2005, pp. 9–13; Kuhlmann and Callaghan, 2000; Law, 2004, p. 10; Robertson, 2002, p. vii), but these debates have also not reduced the dilemma between the revolutionary discontinuity and evolutionary progress. A third group of authors, however, tried to integrate both the revolutionary and evolutionary views into their understanding of transformation (Kugler, 2006; Moran, 2009; Scott, 2009; Stulberg, 2005). Accordingly, armed forces predominantly faced the evolutionary progress with exceptional revolutionary discontinuities.

There has been no comparative, cross-national, quantitative reflection on the revolution-evolution dilemma since the end of the Cold War. This article fills this gap by offering quantitative evidence on this dilemma. The dilemma has been a consequence of different interpretations of the concept of RMA and knowing the actual share of revolutionary changes in the RMA policies would shed a new light on the actual value of the RMA concept. We argue that Revolution in Military Affairs has been in practice predominantly an incremental evolution in several military dimensions with rare major (revolutionary) shifts. In order to verify this argument, the criteria or thresholds for revolutionary change in a particular time period need to be defined first, and then the changes above and below these criteria need to be displayed.

The first two sections of this article reflect debates on the military change as revolutionary and evolutionary policy processes, while in the third part we present integrative arguments on the coexistence of evolutionary and revolutionary changes. The empirical part of this article presents the results of a quantitative test of actual military changes on the sample of 33 countries in the period 1992-2010. In conclusion, we sum up the results and put them in the context of the revolution versus evolution debate.

The Revolution in Military Affairs as a Discontinuous Change

The concept of the Military-Technical Revolution (MTR) was introduced in the 1980s by Soviet General Staff writers who argued that the new range of technological innovations (microprocessors, computers, lasers, electronics, kinetic energy, enhanced accuracy, range and lethality of weapons, etc.) and related Western doctrinal innovations

constituted a fundamental discontinuity in the nature of war, which they dubbed the MTR. About a decade later, this fundamental Soviet approach was analysed and adapted by the US writers in the new concept, Revolution in Military Affairs. This concept criticized the narrow MTR concept, and emphasized that changes in military affairs included not only technological aspects, but also organizational, structural, doctrinal, and operational changes as well (see Cooper, 1994, p. 1; Davis, 1996; Horowitz and Rosen, 2005, p. 447; Hundley, 1999, pp. 11–17; Knox and Murray, 2001, p. 12; Krause, 1997, p. 18; Raska, 2011). A second emphasis in this concept was on the revolutionary change in military affairs that was interpreted as a profound, radical, discontinuous, non-incremental, and possibly disruptive change (see Horowitz and Rosen, 2005, p. 441; Osinga, 2010, p. 14; Roxborough, 2002, p. 71; Sheehan, 2008, p. 14). The revolutionary image of the changes was stimulated by the fascinating images from the Gulf War in 1991, wars in former Yugoslavia, Iraq, and Afghanistan. The term RMA has become fashionable, and according to Horowitz and Rosen (2005, p. 440), a promotional slogan, associated primarily with selling new pieces of technology. Anything associated with it looked good and promising.

This trendy use of the revolutionary vocabulary was, however, not without cracks. The proponents overlooked some elements of the recognized understanding of revolution as a very rare, complete (wide-ranging), drastic, and sudden change (see Abercombie et al., 1994, p. 358; Oxford Advanced learner's Dictionary, 1992, p. 1085; Robertson, 1993, p. 419). Some denied that revolution means fast changes, and only stressed the depth of changes. The 'existing' revolution was also projected into an unspecified future point when new operational concepts will be created and the fundamental discontinuity finally observed. The related paradigm shift was defined as a coexistence of emerging and old core competencies (see Hundley, 1999, p. 9; Roxborough, 2002, p. 71). Finally, the whole story of the Revolution in Military Affairs can be observed through a constructivist/perceptional prism as well. For example, Adamsky (2008, p. 280) stressed that what was initially labelled as a revolution and discontinuity for the Soviet Union (Air Land Battle concept and NATO's Follow-on Forces Attack concept) was initially simply a continuity for the West, and only later did they coin the term RMA as an American concept of discontinuity by criticizing something already included into the Soviet concept (the

organizational and doctrinal aspects of the change). These conceptual cracks became fertile ground for opponents of the revolutionary changes.

Arguments for Evolution and against Revolution in Military Affairs

Evolutionists generally claim that past military transformations were more evolutionary or continuous than revolutionary or discontinuous changes. They have offered a range of theoretical and empirical arguments in this direction. Historical studies of military changes, for example, portray them more in terms of evolution than revolution (see Black, 1998). Debates on the change towards the postmodern military in the field of military sociology also show that organizational transitions as a process of change over time did not take the form of a clear shift, but rather emerged in a gradual, cumulative, and even evolutionary fashion (Booth et al., 2001, p. 328). In addition to that, policy theory suggests that defence and military policy moves forward with numerous small steps and modifications, because this field is more the result of manoeuvring, bargaining, and compromise among the centres of political power than only logical needs and requirements (see Dixon, 1984, p. 52; Hilsman et al., 1993, pp. 67–72; Rosa et al., 1993, p. 2145). All this is completely in line with the well-known Lindblom (1959, pp. 85–89) finding that only incremental policy change or a method of 'muddling through is realistic in the public sphere,[7] while non-incremental policy proposals are typically unpredictable and politically irrelevant. If nothing else, they are risky to the decision-makers. Some other theoretical frameworks addressing policy-making dynamics emphasized powerful obstacles to policy change. One basic assumption shared by historical institutionalists, for instance, is that over time policy-making is characterized by continuity rather than change. Accordingly, policy-makers are often constrained by the effects of earlier decisions ('policy legacies'), inheritances, and persistent policy monopolies. These factors reduce the prospects for policy change (Peters et al., 2005). Such thinking led Hundley (1999, p. 83) to stress that the best chance of success in practice is: (a) when doctrinal changes are small and do not challenge anyone's traditional ways of waging

[7] Implementing changes in broader public administration is a very difficult task, as it requires changing processes, institutions, and people (see Ioniță, 2004).

war, (b) the new systems to be acquired represent evolutionary improvements on existing systems, and (c) the force structure modifications are minor, not major.

Empirical arguments in this direction entail finding that in most past RMAs the force was not really transformed – i.e. the old structural elements were not really replaced by the new elements until the RMA had been proven in battle (Hundley, 1999, p. 84). Moreover, even after the experience of war, the proposed radical military reform turned out to be only piecemeal and evolutionary first-order change (for example in Germany, France, and the UK after the war in Kosovo) (Dyson, 2008, p. 762). It was also found out that much of the transformation rhetoric in some countries, such as Norway, the UK, and the USA, was actually based on describing the small incremental and not transformational changes. This means that the results of transformation in these countries were more incremental and evolutionary (first order) changes than true transformational (second and third order) changes (Neal, 2006, p. 77, 88). Additional findings from the USA, the country with presumably the highest level of the military transformation, showed that the government's push for military transformation affected the defence sector, but not necessarily in the ways experts predicted, or in ways that should be judged transformative (Dombrowski and Ross, 2008, p. 29). They revealed that it was premature in the beginning of this century to conclude that the revolution had arrived (Krepinevich, 2003, p. 65) and that a series of defence strategies/reviews in 1990s did lay a foundation for a significant shift, but actually created a new strategic consensus that preserved many of the principal pillars of the Cold War defence policy and enabled the further existence of core elements of the status quo (Holomar, 2011, p. 190). Dombrowski and Ross (2008, p. 23) additionally stressed that military plans and programs did not match up to transformation visions. While the latter promised discontinuity and disruption, plans and programs supported only incremental, sustaining advances.

Technological generation-skipping was nowhere to be found and doctrine development was more linear than nonlinear. They also claimed that the transformation concept was so loose that it was also employed to justify defence purchasing instead of clearly guiding defence planning. The ensuing incremental nature of the military change in the USA led Patrick (2002, p. 123) to claim that RMA is only on the distant horizon for this country. Failures to implement revolutionary changes were also reported for the

countries from Central and Eastern Europe (for assessment of Russia, see Mocanu, 2008, p. 148 for Slovakia, see Peterson Ulrich, 2002, p. 26). These states have failed to create modern armed forces because many of the applied changes were only of a cosmetic nature. The money was frequently used not for the reforms, but for maintaining the old system (Donnelly, 2002).

One of frequently reported implementation problems in defence transformation has been the resistance to change within the military force itself (See Bryden, 2004, p. 1; Edmunds, 2004, p. 52; Gyarmati and Winkler, 2002, p. ix; Mocanu, 2008). Change can perceivably jeopardize the status of units, services,[8] individuals, it can lead to decrease in the numbers of staff personnel, etc. The degree of readiness to accept radical change depends on the military culture and knowledge of how to manage this change. This is why transformation involves change and overcoming resistance to change resulting from bureaucratic, operational, structural, or cultural factors (Reynolds, 2007, p. 461). The politics of transformation in military institutions, which was designed to foster continuity, therefore involves a slow dialogue between proponents of advancing transformation and a large percentage of the opponents and ambivalent officers with interests in the status quo (see Knox and Murray, 2001; Stulberg, 2005, p. 526). Mahnken and Fitzsimonds' (2003, pp. 113–140) research on a sample of US officers as key implementing actors of the transformation process concludes that major changes in dominant platforms, concepts, or organizations have not been evident (with some possible exceptions). Sampled officers equated transformation with marginal changes to existing weapons rather than a wholesale shift in the way the USA organizes, trains, and equips its forces. Most saw radical change as inevitable, but characterized the current pace as slow evolution (one termed it 'glacial') rather than rapid evolution. The case of Russia shows that many internal and external factors block military transformation (Golts and Putnam, 2004), while lessons from France show that RMA was not viewed as a fundamental change in the nature of warfare and as an opportunity to control the process of 'escalation,' but as a development in operational art (Dyson, 2010). The case of Germany showed that innovations in transformation continued to compete with the traditional

[8] The degree of readiness to accept substantial, disruptive change also varies across the military services because of their particular organizational cultures (see Terriff and Osinga, 2010, p. 200).

organization, structure, and force composition of the old Cold War Bundeswehr. In addition to that, budget restrictions and limitations have impaired the Bundeswehr's capability to restructure and modernize adequately (Engelhardt, 2004, p. 99). In this respect, it was also found out that small countries, due to their limited budgets and small defence bureaucracies, have a limited capacity to restructure and change slower (see Wijk, 2004, pp. 115, 130).

The Integral Understanding of Military Change

The third view integrates both evolutionary and revolutionary aspects in its understanding of transformation. It is based on the idea that transformation produces both evolutionary and revolutionary changes. It connects a revolutionary approach with big military changes that should be observed as the accumulation of small changes in a time perspective. Examples of an integrated perception include a view that adaptable armed forces capable of facing a broad variety of future conflict scenarios need to be more evolutionary than revolutionary. In fact, transforming the armed forces exclusively towards the network-centric warfare scenarios most appropriate for the information age runs the risk of neglecting some other scenarios that can still emerge in the future (see Reynolds, 2007, pp. 442, 453). The proponents of this view perceive military change as a gradual process, with radical change only possible in the context of external perturbations or critical junctures (i.e. seismic and formative historical events that illustrate the failure of existing defence policy and empower new actors and policy). This is how the experience of war in Kosovo drove rather deep reforms in Germany, France, and the UK (Berger in Dyson, 2008, p. 745; Dyson, 2008, p. 750). The proponents stress that evolutionary approach achieves transformational change through the *cumulative effects* of innovative modernization (Scott, 2009, p. 215). They perceive the military change in terms of a *continuum of adaptation and innovation*, where the former is understood in terms of incrementalism and the grafting of minor modifications onto prevailing goals, strategies, or missions, and the latter as the adoption of radically new technologies, goals, strategies, and organizations that change the way a service fights (Stulberg, 2005, p. 497). Moran (2009, p. 29) also states that in reality we are more likely to see a series of incremental

challenges to conventional practice, whose cumulative revolutionary implications may become only gradually apparent. He saw the military revolution of the seventeenth century as a retrospective academic construction, and an interpretation of events according to criteria that were not always apparent to the contemporaries. In this sense, he understands the rhetoric of revolution more in the context of mobilization – inspiring consensus and stifling doubts – and less in the context of a true reversal. Even a NATO transformation document suggests that transformation is both a gradual reform which encompasses accelerated changes, such as technological modernization, doctrinal reform, re-orientation of force structures, opening the culture to change, and an increasing willingness to accept risk (NATO, North Atlantic Treaty Organization, 2005, p. 4). Perhaps the most integrative perception was created by Kugler (Kugler, 2006, p. 296) who stressed that transformation must strike a sensible balance between continuity and change. He proposed a coherent transformation strategy to determine the mix of existing assets that should be retained, obsolete assets that should be discarded, and new assets that should be acquired.

Organizational theory offers an additional explanation of the pattern of interchange of evolution and revolution. Greiner (Greiner, 1998) states that organizational growth is composed of quiet stages, or periods of evolution with modest adjustments necessary for maintaining growth, and turbulent stages or periods of revolution with serious upheavals of the management practices. This process of interchange has been described by the punctuated-equilibrium model. The essence of this model is that systems (organizations) evolve through alternation of periods of equilibrium, in which persistent ‘deep structures’ only permit limited incremental change, and periods of revolution, in which these deep structures are fundamentally altered (Gersick, 1991). Romanelli and Tushman (1994) more specifically state that episodes of discontinuous change occur when inertia, that is, the inability of organizations to change as rapidly as their environment, triggers some form of revolutionary transformation. This process of revolutionary change and organizational transformation provides the basis for a new state of equilibrium. However, because of forces of resistance that inhibit continuous adaptation, this new equilibrium gives rise to another period of relative stability that is followed by a further period of revolutionary change (patterns of cyclical interchanges).

A Framework for Assessing the Revolutionary and Evolutionary Changes of Armed Forces

One question is to what extent evolutionary (incremental) changes can be distinguished from revolutionary (non-incremental) changes, and what role is played by the time perspective in such an assessment. It should be stressed that there is no universally accepted standard for what counts as a revolutionary change, and in what time perspective this should be assessed. The existing literature offers a perception that revolutionary changes are major, deeper, and non-linear changes in military affairs in comparison to evolutionary changes. Based on this – and also based on the uncertainties of their own research – Mahnken and Fitzsimonds (2003) concluded that exactly what 'radical' change means is open to interpretation. Neal's work (2006) distinguished the following expected levels of change in military transformation: small changes, upward and downward flux, strategic or transformational changes, and demise (decrease of the amount of change). However, Neal did not specify this difference in quantitative terms. It is also not clear in what time one should observe the level of change.

In organizational literature, Greenwood and Hinings (1996) defined the difference between the revolutionary and evolutionary change by the scale and pace of upheaval and adjustment: 'whereas evolutionary change occurs slowly and gradually, revolutionary change happens swiftly and *affects virtually all parts of the organization simultaneously.* Radical organizational change involves the busting loose from an existing 'orientation' and the transformation of the organization.

Perhaps the best qualitative delineation between revolution and evolution was made in terms of first, second, and third order changes. First order change (reformation) includes: small, step-by-step changes; evolutionary change; rational change (does not change the internal structure); developmental change (change within an ongoing social system adding to it or improving it); homeostasis (internal and external forces are nearly in equilibrium); normal change; or minor change. While second order change (transformation) includes: root change (starting from fundamentals); seeks to introduce discontinuity; creates a whole new system of values; revolutionary change (serious upheavals and abandonment of past management practices); radical change (a paradigm shift and system change); and the exchange of existing goals with entirely new goals

steering the system in a very different direction (Levy and Merry, 1986, p. 80). Other definitions of n-order changes introduced transformative changes only at the level of third-order change where all three components of policy (settings, instruments, and the hierarchy of goals) are transformed (Hall, 1993, pp. 287–289).

All these explanations are of a qualitative character. For a quantitative assessment of the revolution-evolution dilemma, we however need a more specific orientation. This lack of quantitative criteria for the amount of change in the amount of time led us to define our own quantitative criteria for distinguishing between evolutionary and revolutionary changes in specific time periods. Our 'experimental sliding criteria' contains three levels of change in three time periods as thresholds for distinguishing revolutionary from evolutionary changes: 30% change in one year, 50% change in three years, and 70% change in five years.[9] Additionally, the required changes need to be reflected by at least one half of the transformation indicators used in this article (in order to show that a large part of military organization has experienced revolutionary change, and not only a small part).

This article focuses on the variability of quantitative transformation indicators on a sample of 33[10] countries for the period from 1992 to 2010,[11] reflecting the annual military changes in the organizational structure, personnel structure, modernization of weapon

[9] Two different possibilities of developing criteria or thresholds were considered in such a methodological situation without a clear guidance from the literature or practice, Firstly, the possibility of developing a criterion based on a case of an individual country was explored (bottom-up criterion), but RMA turned out to be a very experimental and complex process that is under strong influence from various local factors. Inductive criteria based on an individual case would likely be of a questionable validity for the entire population of developed countries. Secondly, a pure mathematical sliding criterion was considered with the aim to scan and reflect different potential thresholds in different time periods. Such an approach is typical for explorative research and appropriate for statistical analysis of a large set of countries. It is to some extent arbitrary, but it is logical as it allowed us to test the argument with three different (yet related) criteria.

[10] Austria, Belgium, Brazil, Bulgaria, Canada, China, Czech Republic, Croatia, Denmark, Estonia, France, Germany, Greece, Hungary, India, Ireland, Italy, Latvia, Lithuania, Nederland, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States of America. This sample includes 25 NATO countries (without Iceland, due to lack of own armed forces; Luxembourg, due to the extremely small size of armed forces; and Albania, due to a very high number of missing values), four neutral countries (Austria, Sweden, Switzerland and Ireland) and BRIC countries (Brazil, Russia, India and China). This sample is an useful indicator of changes of contemporary armed forces of the majority of most developed countries.

[11] Selection of this time period is a consequence of the end of the Cold war, the beginning of our research project (2010), and the availability of comparable quantitative data in editions of the Military Balance. It is true that a longer time period (e.g. a century) would bring improved knowledge on the changes in time (evolution versus revolution), but this was not possible due to the lack of good quantitative data from a broad sample of countries.

systems, mobility of the armed forces, and level of defence spending (see the Table 1). These indicators were calculated based on the data from annual editions of *The Military Balance* (The International Institute for Strategic Studies (IISS), 1993-2011), the SIPRI military expenditures database ("SIPRI Military Expenditure Database, 2011), the World Bank database (2011), and several official websites. The results presented in this article are based on a database with 6,270 entries (33 countries by 19 years by 10 indicators).

Table 1 The quantitative transformation indicators (the table shows variables derived from literature by the authors)

1. Average size of military units
2. Share of reservists among all members of the armed forces
3. Share of support units
4. Share of Special Operations Forces
5. Share of active members of armed forces in population
6. Share of professionals in the armed forces
7. Share of modern weapon systems
8. Tactical transport capability
9. Strategic air transport capability
10. Military expenditure per active soldier

Source: author's own calculations

The first indicator used in this study refers to the average size of military units. Restructuring armed forces since the Cold War has been mostly directed towards smaller military units (Chapman, 2003; Jones, 2004; Moore, 2012). The reserve is no longer seen as auxiliary, but as a complementary force that can be used together with active units. We measured changes in the relationship between active and reserve forces by the share of members of the reserve forces among all members of the armed forces (indicator 2). To a large extent, military transformation also influences the structure of forces within a particular service, particularly the relationship between combat and support units (Kugler, 2006; McDermott, 2013).

Changes in the relationship between support and combat units were measured in this article by the share of the standardized number of soldiers of the Army support units among the standardized number of soldiers of all Army units (indicator 3). The importance of special operations forces has grown in response to the unconventional nature of threats faced by the contemporary armed forces (Sloan, 2007). We measured their growing

importance by the share of active members of the special operations forces (members of special operations units, commandos, and rangers, etc.) among all active members of the armed forces (indicator 4).

Implementation of military tasks with fewer soldiers or the reduction of armed forces in general has also been one of the fundamental elements of military transformation (Bryden, 2004; Chase et al, 2015; Donnelly, 2002; Haltiner and Klein, 2005; Hosek, 2003; Law, 2004). We measured this by the share of all active members of the armed forces among the population (indicator 5). Military transformation has also been closely linked to professionalization, which considerably improved the implementation of new military tasks (Chase et al, 2015; Edmunds, 2004; Hadžić, 2004; Jones, 2004). The professionalization of the armed forces was measured in this article by the share of professional members among all active members of the armed forces (indicator 6). The modernization of weapon systems is also important for military transformation (Chase et al, 2015; Galbreath, 2014; Kugler, 2006). We measured it by the share of modern weapon systems among four types of weapons systems (indicator 7). This was calculated by adding the pieces belonging to four types of modern weapon systems (main battle tanks, tracked and wheeled infantry vehicles, and tactical combat aircrafts[12]), multiplied by the average price for a piece,[13] and divided by the sum of all weapons systems of the same selected types multiplied by the average price for a piece. Military transformation has also contained an increase in the mobility of armed forces (Galbreath, 2014; Giegerich and Nicoll, 2008; McDermott, 2013). In this article the mobility of armed force is first measured by the indicator of tactical transport capability (indicator 8). This is calculated as the sum of four types of weapon systems (tracked and wheeled infantry vehicles, medium, and heavy transport helicopters) multiplied by the average number of soldiers carried by each type of weapon system[14]and divided by

[12] Among the modern weapons systems, we counted those types of concrete weapons and their upgrades, which were produced after the year of 1980. This was the most modern generation of weapon systems in the 1990s when our analysis began.

[13] Our assessment was that the average price for modern main battle tanks is 4.5 million USD, for modern tracked infantry vehicles 2.5 million USD, for modern wheeled infantry vehicles 1.5 million, and for a modern tactical combat aircraft 40 million USD.

[14] The general technical characteristics of selected weapon systems suggest that tracked and wheeled infantry vehicles transport on average 10 soldiers, while medium and heavy transport helicopters can carry on average 25 soldiers.

the number of active members of armed forces expressed in 1,000 soldiers. Strategic mobility was measured with the indicator of strategic air transport capability (indicator 9). It was calculated as the sum of medium and heavy transport aircrafts multiplied by the average number of soldiers carried by a selected type of transport aircraft,[15] and divided by the number of active members of armed forces expressed in 1,000 soldiers. Finally, military transformation requires more money and investment to acquire qualitatively better capabilities (Chase et al, 2015; Fetterly, 2007; Law, 2004; Wijk, 2004). The transformation-related level of military expenditures was measured in this article by the military expenditures per active soldier (indicator 10).

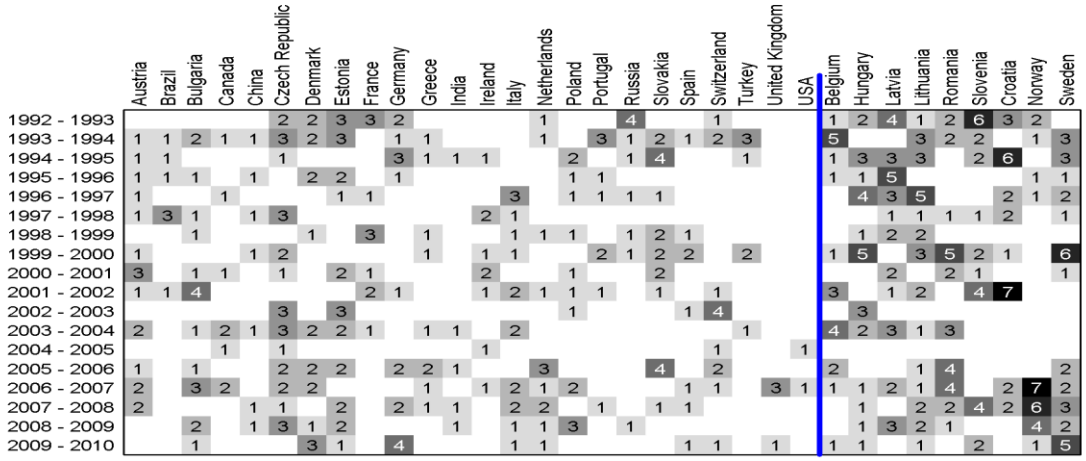
Empirical Findings on the Revolution-Evolution Dilemma

This section shows the results on the level of changes in 10 transformation indicators on the sample of 33 countries for the period from 1992 to 2010. The results of three criteria were selected for presentation: 30% change in one year, 50% change in three years, and 70% change in five years. Additionally, these changes need to be reflected by at least 5 (one half) out of 10 transformation indicators in order to consider the changes wide enough to be deemed as the Revolution in Military Affairs (i.e. to confirm that a large part of military organization has experienced revolutionary change, and not only a small part). The figures below show how many indicators (of total 10 indicators) have fulfilled the revolution criteria (i.e. changed for at least the required percent) in a selected number of years for each country. The years in the rows indicate the period in which the change was measured. The entries with missing values in the database (18 missing values out of 6,270 entries) were considered as periods without change.

Figure 1 shows how many variables exceeded the revolutionary threshold of 30% change in one year (cells with number 5 or higher). Only 12 cells (2.02% out of 594 cells) reflect the revolutionary changes higher than 30% in at least five variables. This, however, means that 97.98% of theoretical opportunities for revolution were simply incremental evolution or stagnation in some cases (see empty cells or cells with values less than 5).

[15] According to the general technical characteristics, a medium transport aircraft can carry, on average, up to 50 soldiers, and heavy aircraft can carry, on average, up to 120 soldiers.

Figure 1: Revolution in Military Affairs based on the criterion of 30% change in one year



Source: Authors' own calculations

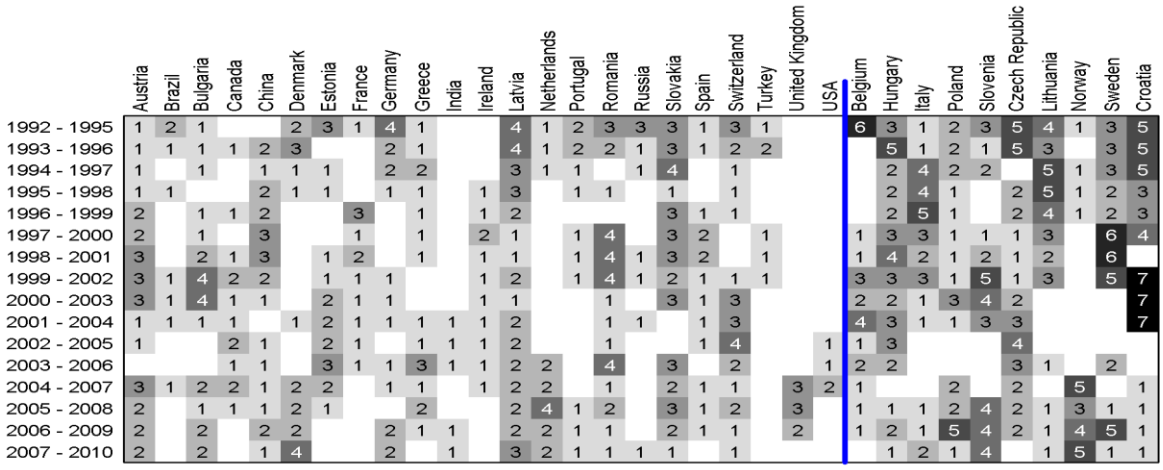
Altogether, only changes in nine countries exceeded the revolution threshold (the number in the cell is five or more) in the period from 1992 to 2010: only in one year for six countries (Belgium 1993-1994, Hungary 1999-2000, Latvia 1995-1996, Lithuania 1996-1997, Romania 1999-2000, and Slovenia 1992-1993), and in two years for three countries (Norway 2006-2008, Croatia 1994-1995, 2001-2002, and Sweden 1999-2000, 2009-2010). There were only 12 revolutionary situations in the assessed period of time. This means that revolutionary change was only rarely achieved. These situations included interconnected revolutionary shifts/changes of the following variables: tactical transport (in 11 revolutionary situations), air strategic transport (10), military expenditures per active soldier (9), share of support units (9), share of active members of armed forces in population (8), average size of independent units (8), share of Special Operations units (6), share of professional soldier in the armed forces (5), and share of modern weapon systems (1). The share of reservists was never included in the combinations of revolutionary variables in this period of time.

We can also see from Figure 1 that more revolutionary breakthroughs appeared in the nineties than later (8 versus 4), and that three countries (Hungary, Romania, and Sweden) managed to achieve revolutionary changes simultaneously in the period from

1999 to 2000. Norway managed to have revolutionary shifts in two consecutive years (2006-2008), which is extremely rare. The example of Croatia suggests that this country carried out revolutionary military changes in war time (1994-1995) and in the time of major political changes (2001-2002). Figure 1 also shows that 24 countries from our sample (72.7%) were never above the revolutionary threshold. It should be noted that bigger countries, such as China, Russia, the USA, India, and also Germany, the UK, etc., did not manage to carry out radical changes. The countries which managed to achieve revolutionary shifts belong to the group of smaller NATO countries (mainly new Central and East European members), plus Sweden as a neutral country and an active member of the Partnership for Peace (PfP).

Figure 2 shows how many variables exceeded the revolutionary threshold of 50% change in three years (cells with number 5 or higher). Only 21 cells (3.98% out of 528 cells) reflect revolutionary changes higher than 50% in at least five variables. Conversely, this means that 96% of theoretical opportunities for revolution were simply incremental evolution or stagnation in some cases (see empty cells or cells with values less than 5).

Figure 2: Revolution in Military Affairs based on the criterion of 50% change in 3 years



Source: Authors' own calculations

Altogether, only changes in 10 countries in the period from 1992 to 2010 exceeded the revolutionary threshold: for five countries only in one three-year period (Belgium 1992-1995, Italy 1996-1999, Hungary 1993-1996, Poland 2006-2009 and Slovenia 1999-2002), for three countries in two three-year periods (Norway 2004-2007, 2007-2010, the Czech Republic 1992-1996[16] and Lithuania 1994-1998), for one country in four three-year periods (Sweden 1997-2002, 2006-2009), and for one country in six three-year periods (Croatia 1992-1997, 1999-2004).

There were only 21 revolutionary situations in the assessed period of time. This also means revolutionary change was rarely achieved. These revolutionary situations included interconnected revolutionary shifts/changes of the following variables: strategic air transport (in 20 revolutionary situations), share of Special Operations forces (16) and support units (16), tactical transport (15), military expenditures per active soldier (14), average size of military independent units (11), share of modern weapon systems (7), share of active members of armed forces in population (6), share of professionals in the armed forces (6), and the share of reserve soldiers (1). Figure 2 also suggests that, in

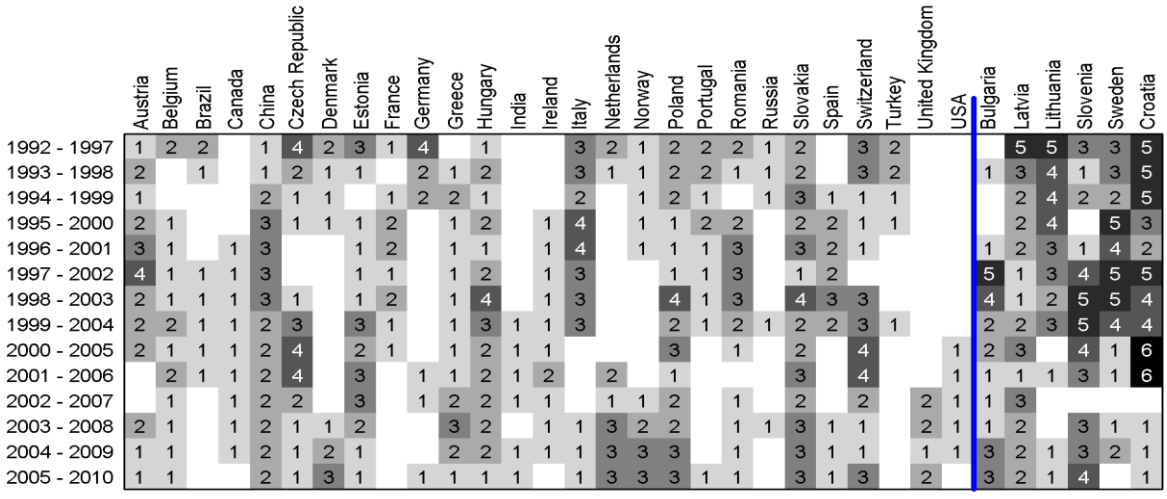
[16] This includes two three-year periods: 1992-1995 and 1993-1996.

five periods, more than one country achieved simultaneously revolutionary shifts (e.g. in the period 1993-1996 by Hungary, the Czech Republic, and Croatia).

Figure 2 also shows that 23 countries from our sample (69.7%) were never above the revolutionary threshold. The aforementioned larger states were again not able to reach this revolutionary threshold, while it was reached by the same group of countries as previously mentioned (smaller NATO countries except Latvia, joined by Italy and Poland, and again by Sweden).

Figure 3 shows how many variables exceeded the revolutionary threshold of 70% change in five years (cells with number 5 or higher). Only 14 cells (3.03% out of 462 cells) reflect the revolutionary changes higher than 70% in at least five variables. Conversely, this means that 96.97% of the theoretical opportunities for revolution were simply incremental evolution or stagnation in some cases (see empty cells or cells with values less than 5).

Figure 3: Revolution in Military Affairs based on the criterion of 70% change in five years



Source: Author's own calculations

Altogether, changes in only six countries in the period from 1992 to 2010 exceeded the revolutionary threshold: for three countries only in one five-year period (Bulgaria 1997-2002, Latvia 1992-1997 and Lithuania 1992-1997), for one country in two five-year periods (Slovenia 1998-2004), for one country in three five-year periods (Sweden 1995-2000, 1997-2003), and for one country in six five-year periods (Croatia 1992-1999, 1997-2002, 2000-2006). There were only 14 revolutionary situations in the assessed period of time. This also means revolutionary change was rarely achieved in the investigated time period. These revolutionary situations included interconnected revolutionary shifts/changes of the following variables: tactical transport (13), strategic air transport (11), share of Special Operations forces (11), share of support units (10), military expenditures per active soldier (9), average size of military independent units (6), share of professionals in the armed forces (5), share of modern weapon systems (3), and share of active members of armed forces in population (2).

Figure 3 suggests that in three time periods more countries achieved revolutionary shifts simultaneously. This happened in the period 1992-1997 by Latvia, Lithuania, and Croatia, in 1997-2002 by Bulgaria, Sweden, and Croatia and in 1998-2003 by Slovenia and Sweden. According to criteria 70% change in five years, Croatian armed forces underwent the most revolutionary changes from all states in the sample. This country implemented major changes in the period from 1992 to 2006.

Figure 3 displays that 27 countries from our sample (81.8%) were never above the revolutionary threshold. This revolutionary criteria again shows that most bigger countries were not able to reach the revolutionary threshold, and that this was done only by a group of smaller NATO countries plus Sweden as a neutral country and an active member of the Partnership for Peace.

Looking at all the results together, one could ask a contextual question why only some countries managed to achieve revolutionary thresholds and other not. These results show that in general it was technically and politically easier to create revolutionary changes in smaller countries (e.g. Belgium, Bulgaria, Croatia, Hungary, Latvia, Lithuania, Norway, Slovenia, Sweden) than in bigger countries (e.g. France, Germany, Italy, the United Kingdom, the USA, Russia, etc.). Smaller countries were obviously pressured more to change, and a change for the same absolute size (e.g. acquisition of 15 pieces

of a weapon system) means a much bigger change for a smaller armed force than for a big one. The same can be argued for numerous post-socialist countries, which had to intensify their reforms to a revolutionary level in order to increase their chances of joining NATO. Some of these countries intensified reforms before the first round of enlargement of NATO in 1997 (Czech Republic 1992-1996, Hungary 1993-1996), while others only after the political shock of not being invited to join NATO (Bulgaria 1997-2002, Romania 1999-2000, Slovenia 1998-2004), or after a major change in their security situation, which required a deep transformation from exclusively war-oriented forces into crisis management-oriented force (Croatia 1997-2006). In addition to that, NATO has been a major spur for revolutionary changes in some countries which expressed a strong commitment to NATO capabilities (e.g. Defence Capabilities Initiative, NATO Capabilities Commitments) (Poland 2006-2009, Norway 2004-2010). At the end of the Cold War, most European countries decided to downsize their armed forces due to the changed security environment. But only some of those countries independently decided to finish this process with necessary major reorganization which would merge the remaining units into a coherent force (Italy 1996-1999), or even with the deepest reorganization of the armed forces in their history (Belgium 1993-1994). An interesting case is Sweden, because it reached revolutionary thresholds several times (1995-2000, 1997-2003, 1999-2000, 2006-2009, 2009-2010) due to its unique understanding of its role in international environment (active neutrality): first with a strong contribution in NATO's Partnership for Peace, and secondly with the serious commitment to implement the EU's Battle Group concept. It should also be noted that some countries achieved revolutionary changes of armed forces because they had to create a military from a scratch after restless dissolution of former Yugoslavia (Croatia 1992-1997) or the Soviet Union (Latvia 1992-1997, Lithuania 1992-1997).

Conclusion

Revolution in Military Affairs emerged as one of the driving concepts for creating a modern armed force capable of coping with the challenges of a contemporary security environment. Revolutionary change in military affairs was simultaneously interpreted as radical and also incremental policy process. This article explored the revolution-evolution

dilemma quantitatively by finding out the number of changes in military affairs were revolutionary and how many only evolutionary in the period 1992-2010 and on the sample of 33 countries. Our argument that Revolution in Military Affairs has been predominantly an incremental evolution in several military dimensions with rare major (revolutionary) shifts has been confirmed.

The results on the sample of 33 countries show that only from 2 to 4% of possible revolutionary situations (periods in our measurement) were truly revolutionary changes in military affairs. Specifically, only in this amount the countries managed to implement changes higher than 30% in one year, 50% in three years and 70% in five years on at least five (one half of) transformation indicators. This means that revolutionary shifts have been very rare in military affairs. Only nine countries occasionally reached the revolution threshold of 30% change in one year, 10 countries reached the threshold of 50% change in three years, and only six countries reached the threshold of 70% change in five years. These countries mainly belong to the group of smaller and newer NATO countries, plus Sweden (the exception is Italy, which managed to reach a 50% change threshold in years 1996-1999). Only five countries reached revolutionary changes by all three revolution criteria: Belgium, Croatia, Lithuania, Slovenia, and Sweden. Results from the three criteria also suggest that Croatia carried out a considerably high transformation or revolution in times of large geopolitical changes and war in the nineties, and in the time of major political changes after the death of President Tudjman combined with the process of joining NATO.

The results from all three revolution criteria on the other hand suggest that 96 to 98% of theoretical possibilities for revolutionary change (periods in our measurement) were only incremental evolution or stagnation (see empty cells or cells with values less than 5). This means that incremental evolution or even stagnation in military affairs have been the predominant military development characteristic in the period 1992-2010. According to the sliding criteria, the majority of countries (24 countries or 72.7%, 23 countries or 69.7% and 27 countries or 81.8%) were never above revolutionary thresholds. Surprisingly, the larger countries, that have led the regional and global military modernization in the past, were not able to reach the revolutionary threshold.

These findings mean that the concept and policy of Revolution in Military Affairs have promised higher change than could be achieved in practice. It suggests that Revolution in Military Affairs was used as a promotional slogan and perhaps a motivational tool in military affairs. It seems that without the use of revolutionary vocabulary we would witness even less change in military affairs.

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