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3대1 법칙의 유효성 및 적용가능성에 관한 연구

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≪국문초록≫

주요한 전장 요소들의 투입 및 배치 비율을 규정하는 소위 '3대1 법칙'은 유구한 역사를 지닌다. 이 법칙은 학문 및 실무 영역을 망라하여 광범위하게 적용되어 온 동시에 상당한 비판에도 노출되어 왔다. 이 법칙과 관련된 논란에 부합하여, 본고의 목적은 3대1 법칙의 유효성 여부를 전쟁 사적 사료와 대조함으로써 반증하는 데 있다. 이런 목적에 상응하여, 본고의 고찰 방식은 보병, 포병, 기갑이라는 개별병과들의 비율적 관계, 혹은 전투력과 관련하여 사료를 활용하거나 확장하는 방향으로 구체화된다. 결과적으로 3대1 법칙의 적용가능성은 크지 않다는 결론이 도출된다. 이는 주류 연구 사적 통념을 일신할 수 있다는 점에서 중요한 의미를 갖는다.

주제어 : 3대1 법칙, 군사력 비율, 역사적 데이터, 돌파전, 전투력

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Ⅰ. Introduction

The 3:1 rule was popularized by the famous 1980's European conventional balance controversy which unfolded in the pages of *International Security* (Epstein, 1988, 1989; Mearsheimer, 1982, 1989). It is a rule of thumb used by the military and scholars as a guideline for successfully defending a position and thwarting an offensive. It is based on the expectation that the attacker usually suffers more casualties than the defender, since the defender has the benefit of prepared positions, known terrain, and that the attacker has to advance over open terrain, where it is exposed to enemy fire. "As a rule of thumb, [the defenders] should seek not to be outweighed more than 3:1 in terms of combat power. With very heavy air and field artillery support on favorable terrain, it may be possible to defend at a numerical disadvantage of something like 5:1 for short periods of time" (Headquarters, 1976, pp. 5-3).

The 3:1 rule can be traced back to before the First World War (Kupchan, 1989). The British, during the war, concluded that "in a conflict between foes of the same standard of skill, determination and [human] valour, numbers approaching three to one are required to turn the scale decisively" (Hart, 1960, p. 203). According to the Wehrmacht General Gotthard Heinrici, based on his experience on the Eastern Front during World War II, a 3:1 advantage is a bare minimum to break through a firm and dense defense (Hart, 1979, p. 216). In arithmetic terms, "the attacker and defender suffer equal fractional loss rates at a 3:1 force ratio" (Allen, 1992, p. 20).

This rule should be understood for a corps sector or smaller, where the breakthrough battle is fought. It does not apply throughout the whole theater of war. It means that a 1.5:1 advantage at the theater level may be enough to muster at least a 3:1 force ratio at the sector level (Davis, 1995). The 3:1 rule may not apply during a mixed conventional-nuclear conflict. Any force concentration would be easily destroyed by tactical nuclear strikes. Accordingly, it makes little sense to ever concentrate forces anywhere. Indeed, the risk of nuclear attacks push troops to disperse. Breakthroughs in such a case would mostly be attained by nuclear strikes on the enemy's strongpoints before penetration and exploitation operations by largely dispersed forces.

Numerous studies and official publications support the rule. Dupuy's (1986) historical calculations tend to accredit the 3:1 rule. Kress and Talmor's (1999) mathematical approach supports the 3:1 rule under some specific conditions. Armstrong and Sodergren's (2015) modeling of Pickett's Charge also seems to confirm the 3:1 rule. This rule has been criticized (Lawrence, 2017; Epstein, 1988, 1989). McQuie (1989) argues that a 2:1 rule is closer to the 50% success rate in modern battles, and this is true whether calculated in terms of troops, tanks, or artillery.

Since the 3:1 rule discussion seems to not have progressed much since the 1980s, one may wonder if it is still relevant for the contemporary era.[1] The rule is indeed still present on the minds of U.S. military planners. As summarized by the 2010 Field Manual 5-0: "historically defenders have over a 50 percent probability of defeating an attacking force approximately three times their equivalent strength. Therefore, as a starting point, commanders may defend on each avenue of approach with roughly a 1:3 force ratio" (p. B-16).[2] Accordingly, this study's attempt to test the 3:1 rule has important empirical implications.

Ⅱ. Method and Data

The 3:1 rule is said to apply only to breakthrough battles. It is necessary to distinguish between breakthrough as a tactic and breakthrough as an outcome. This study is only concerned with successful breakthroughs. Dupuy et al. (1976, p. 1) defined 'breakthrough' as "an operation in which attacking forces penetrate the defender's main line of resistance, overrunning or bypassing local reserves, completely disrupting lateral ground communications of front-line defensive units on either side of the penetration, retaining the capability of continued and sustained forward movement, while the defending forces are incapable of immediately deploying effective resistance in front of the attacker's penetrating elements."

This paper uses historical data from 20th century breakthrough battles to test the 3:1 rule. The study of Dupuy et al. (1976) describes 14 cases of successful breakthroughs realized by forces ranging from brigade to army. Although three cases (Ukraine, Manchuria, and North Korea) include penetrations on several axes, all of them are penetrations made by massed attacks leading to a breakthrough. I built on these 14 cases by adding data from two other cases; Operation Bluecoat in 1944 (based on Posen et al., 2009) and the VII Corps' breakthrough during Operation Desert Storm in 1991 (based on Bradford, 1998; Ryan, 1998).[3] The 3:1 rule would be seriously weakened if this study was to discover that the attacker has significant

1) The discussion on force ratios has of course not been limited to the United States; for the Soviet version of the rule, see Headquarters (1984, chap. 2).

2) This introductory description is partly taken from Motin (2018, 2019).

3) Accordingly, the 16 cases are: Battle of Megiddo, 1918; Battle of Flanders, 1940; Ukraine Invasion, 1941; Battle of Jitra, 1941; Operation Iskra, 1943; Operation Citadel, 1943; Belgorod-Kharkov Offensive, 1943; Operation Cobra, 1944; Operation Bluecoat, 1944; Manchuria Invasion, 1945; North Korean Offensive, 1950; Battle of Rafah, 1967; Battle of Abu-Ageila, 1967; Battle of Qala, 1967; Battle of Tel Faher, 1967; Operation Desert Storm, 1991.

chances to win even without a 3:1 superiority (see Table 1).

<Table 1> Basic Data

Operations	Manpower Ratio	Tank Ratio	Artillery Ratio	Qualitative Advantage*	Air Superiority**
Meggido (1918)	2.81	.	2.54	1	.
Flanders (1940)	1.07	6.67	0.88	0	1
Ukraine (1941)	0.88	0.90	0.82	1	1
Jitra (1941)	0.58	no defender	0.86	0	1
Leningrad (1943)	4.00	12.15	7.53	2	1
Citadel (1943)	0.69	0.56	0.48	1	0
Belgorod-Kharkov (1943)	4.67	5.82	11.96	2	0
Cobra (1944)	4.20	12.50	2.36	0	1
Bluecoat (1944)	6.39	22.53	5.25	0	1
Manchuria (1945)	1.96	7.26	6.19	0	1
South Korea Invasion (1950)	1.58	no defender	1.36	1	1
Rafah (1967)	1.00	1.21	1.25	1	1
Abu-Ageila (1967)	1.04	1.00	0.57	1	.
Qala (1967)	0.91	1.80	0.34	1	0
Tel Faher (1967)	0.90	0.20	0.41	1	0
VII Corps (1991)	0.39	0.65	0.51	1	1

* 0 = nobody, 1 = for the attacker, 2 = for the defender
** 0 = nobody, 1 = for the attacker, 2 = for the defender

Since what is to be taken into account for the 3:1 rule is unclear, I will test historical force ratios expressed by four indicators: manpower, tank, artillery, and combat power. This study uses the 'combat potential scores' (CPS) method developed by Raymond (1992) for rendering combat power ratios. This method is similar to the widely known WEI/WUV system used in the 1970s and 1980s. Since Raymond developed a simple system, it is very easy to replicate and expand. However, reconstituting data of all weaponry used in those 16 cases and scoring them is out of reach. I have consequently employed a simplified version of the CPS, using only the basic category weights for light infantry platoons of 35 men (5.68), for tanks (10), and for artillery (4.13).

Dupuy's method of accounting for qualitative difference is quite hard to replicate; it requires expert judgement about numerous variables. Instead, when one side had a significant qualitative superiority, a bonus to the CPS score was added. Since the qualitative difference between two forces is almost impossible to assess numerically, this study tests the relevant cases by accounting for both a limited and a large advantage for one side. I re-examined the dataset after

adding both a 25% and a 100% bonus (see Table 2). Although this is a very rough method, it allows for analysis of the data while taking into account potential numerical differences in quality. Whether one side had air dominance or not was also taken into account.

<Table 2> CPS Data

Operations	CPS Ratio	CPS Ratio+25%	CPS Ratio+100%
Meggido	2.76	3.45	5.52
Flanders	1.61	.	.
Ukraine	0.88	1.10	1.77
Jitra	0.80	0.99	1.59
Leningrad	4.67	5.83	9.32
Citadel	0.62	0.78	1.24
Belgorod-Kharkov	5.36	6.71	10.73
Cobra	4.49	.	.
Bluecoat	8.32	.	.
Manchuria	2.62	.	.
South Korea Invasion	1.70	2.13	3.40
Rafah	1.09	1.36	2.18
Abu-Ageila	0.98	1.23	1.96
Qala	1.07	1.33	2.13
Tel Faher	0.63	0.78	1.26
VII Corps	0.47	0.59	0.94

Ⅲ. Data Analysis and Results

At first glance, the dataset makes an unsupportive case for the 3:1 rule. Out of 16 successful cases of breakthrough:

- 4 show an at least 3:1 advantage in manpower for the attacker;
- 4 show a 3:1 advantage in artillery;
- 4 show a 3:1 advantage in CPS;
- 8 show a 3:1 advantage in tanks.

Correcting the CPS scores to take into account qualitative disparity between attackers and defenders does not alter the results significantly. Adding a 25% bonus to the qualitatively superior side gives us only one more supplementary case. A 100% bonus similarly adds only one case. It means that even when qualitative disparity is accounted for, the attacker had a 3:1

advantage in combat power in only 6 cases out of 16. When all the cases where the attacker had a 3:1 superiority in at least one of the above-mentioned categories (manpower, artillery, tanks, CPS, CPS+25%, and CPS+100%) are taken into account, this study comes up with a total of no more than 9 cases. That is only marginally better than chance.

It has been stated that the rule "applies only to equally competent opponents when one of them is fighting from prepared positions in good defensive terrain and the other is conducting a frontal attack" (Davis, 1995, p. 32). If I consider only cases where both the attacker and the defender were of equal quality, or where the defender had the advantage (7 cases), the attacker had at least a 3:1 superiority;

- In men, 4 times out 7;
- In artillery, 4 times out of 7;
- In CPS, 4 times out of 7;
- In tanks, 7 times out of 7.

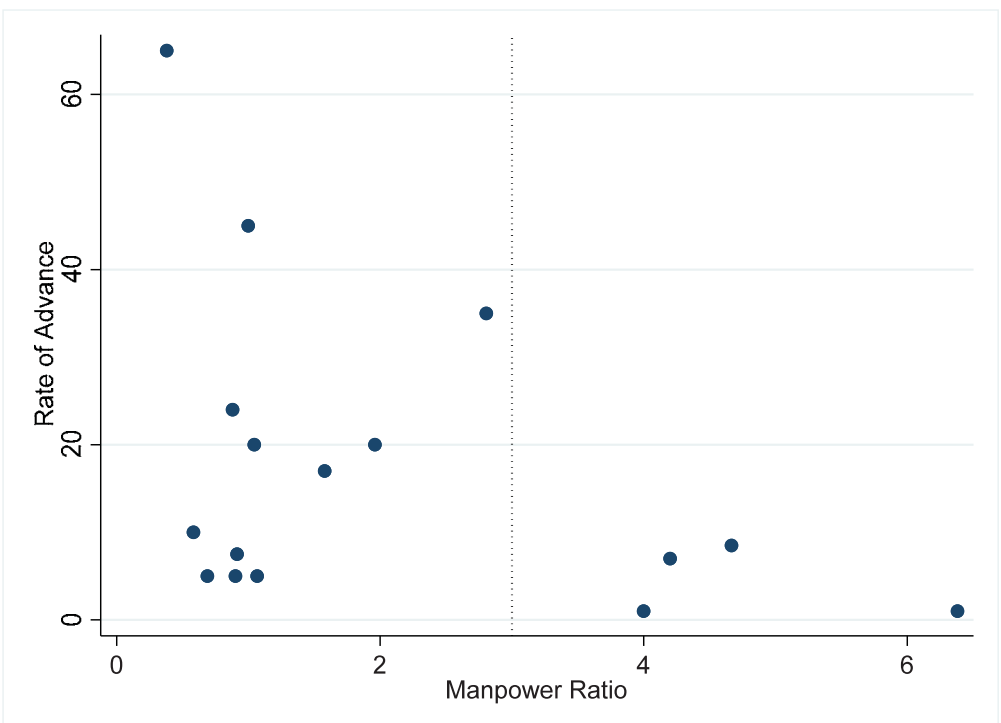
In the two cases where the attacker was qualitatively inferior to the defender (the Soviets during Operation Iskra and the Belgorod-Kharkov Offensive of 1943), it had a 3:1 superiority in all four indicators. As abovementioned, in the 7 cases where the attacker had no qualitative advantage over the defender, it had an advantage in tanks of at least 3:1. Over 16 cases of breakthrough battles, 8 cases saw the attacker having an at least 3:1 advantage in tanks. The 3:1 rule appears the strongest when expressed in terms of tanks.

To sum up, the 3:1 rule seems wrong overall and applies only for armored attackers without qualitative advantage but simultaneously who had superiority in the air in such a way that hostile air power could not hinder their advance. As apparent in the dataset, *none* of the above cases saw the defender possessing superiority in the air. Lawrence (2010; see also Lawrence, 2019) noticed indeed that this rule has had high importance on Soviet thought. It works better in the context of Soviet historical experience, where a qualitatively inferior attacker had to take on a superior defender. The attacker probably needs a superior advantage when he has no air superiority, maybe closer to 5:1, as implied by Headquarters (1976, pp. 5-3).

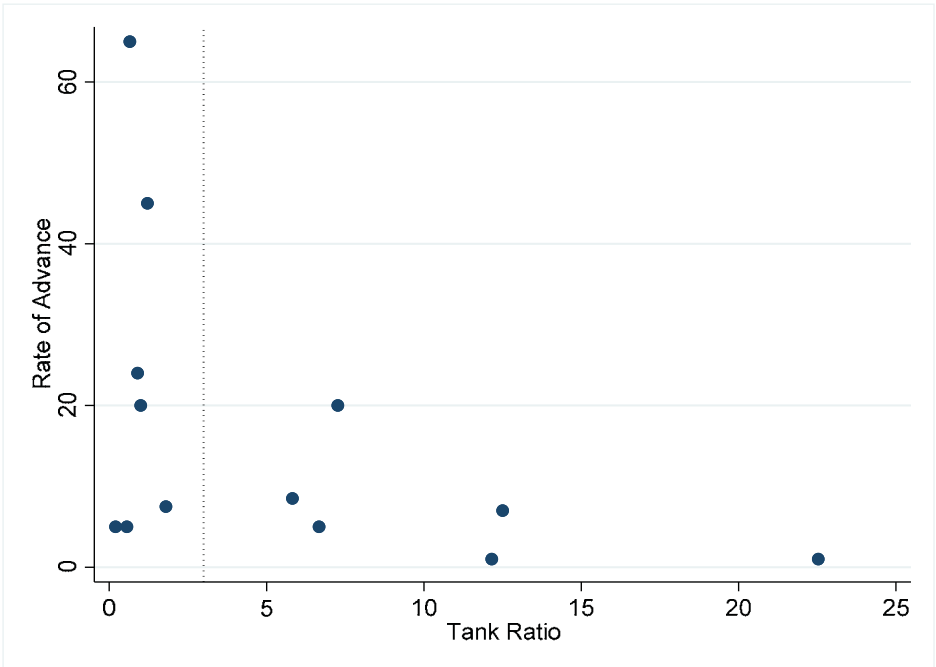
Lastly, it is possible to test whether the 3:1 rule—and force ratio in general—is related to the rate of advance during battle. As shown by the following figures, there is no attested relationship between the force ratio and rate of advance. Table 3 summarizes the attacker's depth of penetration and rate of advance for each case. Figures 1 to 4 show that 3:1 force ratios in manpower, artillery, tanks, and CPS are all unrelated to rates of advance. Accordingly, the 3:1 rule does not apply concerning rate of advance either.

<Table 3> Advance and Advance Rate Data

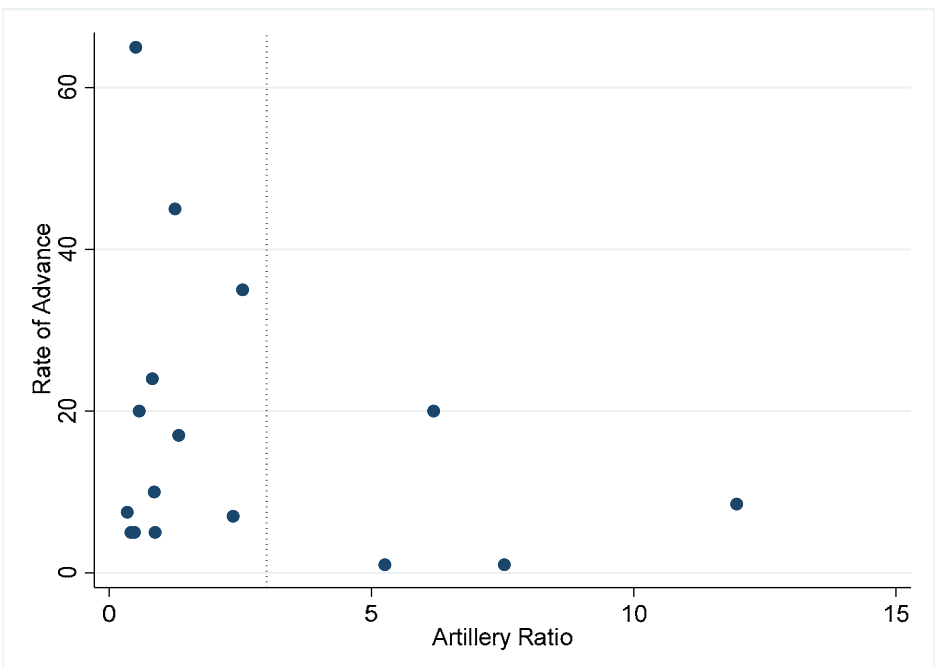
Operations	Duration (day)	Depth of Penetration (km)	Rate of Advance (km/day)
Meggido	2	70	35
Flanders	2	10	5
Ukraine	5	120	24
Jitra	1	10	10
Leningrad	7	7	1
Citadel	7	35	5
Belgorod-Kharkov	3	26	8.5
Cobra	3	21	7
Bluecoat	8	8	1
Manchuria	8	160	20
South Korea Invasion	3	50	17
Rafah	1	45	45
Abu-Ageila	1	20	20
Qala	1	7.5	7.5
Tel Faher	1	5	5
VII Corps	4	260	65



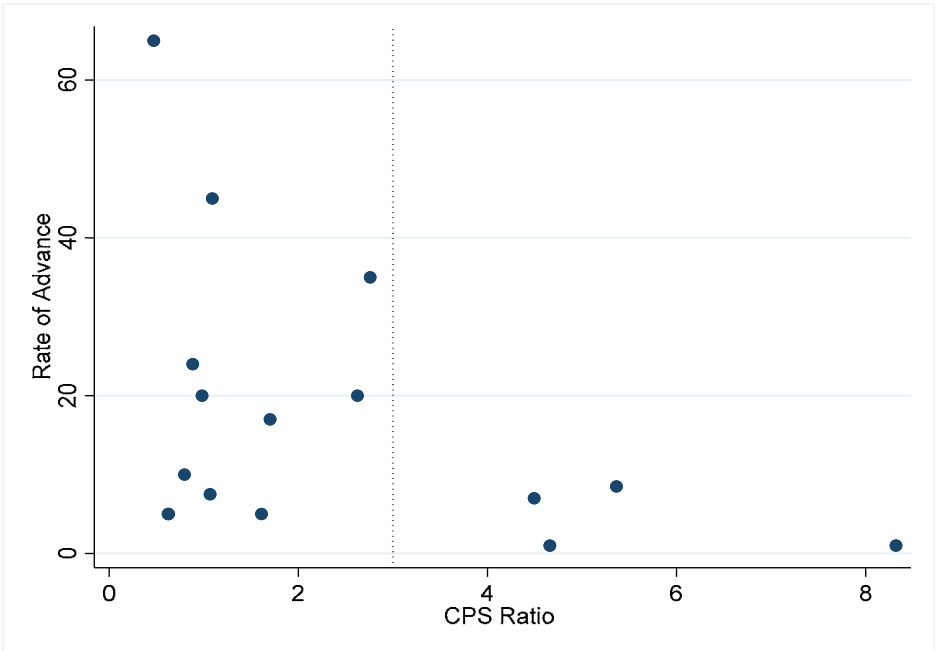
<Figure 1> Manpower Ratio and Rate of Advance



<Figure 2> Tank Ratio and Rate of Advance



<Figure 3> Artillery Ratio and Rate of Advance



<Figure 4> CPS Ratio and Rate of Advance

Ⅳ. Conclusion

As noted earlier, this study is overall unsupportive of the 3:1 rule. Most of the successful breakthroughs occurred even though the attacker did not possess a vast advantage in men or firepower. The rule seems supported only when expressed in terms of tanks and under very specific circumstances: when the attacker and the defender have no major qualitative difference and when the attacker enjoys air superiority. However, such conditions are so restrictive that the rule is almost inapplicable. This study's results have important implications for defense policy-making and military doctrine. As mentioned in the introduction, the 3:1 rule has muddled through the Cold War up to modern-day U.S. official publications (Headquarters, 2010). However, due to the serious reservations expressed in the study, it is doubtful that this rule can provide significant help to planners and field commanders.

More historical work with the specific aim of producing data on breakthrough battle would be extremely helpful to settle the 3:1 debate once for all. More broadly, as great power competition and conventional warfare are again becoming a major concern, an effort to rethink current military planning in the light of historical data extracted from 20th century conflicts and from more recent wars such as the one in eastern Ukraine would be welcome.

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Abstract

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The 3:1 Rule: A Viable Tool?

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The 3:1 rule has a long history of use and criticism by scholars and the military. It is a rule of thumb which assumes that an attacker possesses a three-to-one advantage in men or combat power has overwhelming chances of conducting a successful breakthrough operation. The present article attempts to test the 3:1 rule against historical data taken from 16 breakthrough battles of the last century. It investigates the validity of the rule, whether expressed in terms of men, tanks, artillery, or combat power, by using and expanding data of these past battles. Contrary to what has been stated by numerous researchers and in official publications, this study concludes that the 3:1 rule is not supported by history and has little applicability today. This research has major implications concerning military planning and conventional warfighting.

Keywords : 3:1 Rule, Force Ratio, Historical Data, Breakthrough Battle, Combat Power

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