

Class 4

Making the chess pieces move

May 18, 2017

Class 4: housekeeping

- 1 Monday: 9:15 AM; 12:45 at Gloucester Tube for trip to St. Paul's.
Travel forms to FIE!
- 2 Menu's for Monday.
- 3 Sleeping in France.
- 4 Sample exam question:

"... they generally take it for granted that the playing pieces will go where they are moved. In real battles they frequently do not. The economic problem is why they do not and what can be done about it." Explain, in a way that could be understood by someone who has not had this course, e.g., your parents, why Friedman saw this as the central problem to economists who want to understand conflict, and discuss the various approaches we have seen that attempt to "solve" this basic problem. Use all appropriate rhetorical devices you deem necessary.

What this course about: WWI as poster child

- Brief history
 - A world of colonial powers: France, Russia, UK, emergent Germany, Italy to some extent
 - World of alliances: Germany and AH empire vs France, UK, Russia.
 - Arms races, especially UK vs Germany in navies
 - Franco-Prussian war: short, swift, the loser paid
 - Economically integrated (Norman Angell, "The Great Illusion.")
 - Eve of war: both sides anticipated a short war with reparations, both sides expected to win. If it did not end quickly, cooler heads would prevail and end it.
- What had happened to military technology as illustrated by Civil War?
 - Breech-loading, rifled barrel weapons
 - Improved artillery
 - machine guns perfected
 - Early civil war: a war of movement; later civil war, butchery as defense gained upper hand
 - Upshot: pendulum swung to defence.

- "Make the right wing strong" (Schlieffen's dying utterance)
 - Opportunity cost.
 - PA problem: where's the glory in defence? (what are incentives of left-wing generals? Civil War generals "leaked info to newspapers that enhanced their careers); March on Paris? (Von Kluck exposes his flank).
 - Belgian neutrality: misperceptions ("they won't ... fight," Britain will not enter war). Historians say: Germans "had" the information, i.e., objective observer would have predicted this, but didn't see it this way. (behavioral economics: why do economists, Dr.'s, disagree?)
 - Behavioral: see what you want to see (Romeo and Juliet).
- Militarism: misaligned incentives again, PA problem ("bloody wars and dread diseases")
- France: quick strike through Ardennes, no need to be defensive, belief the Germans wouldn't invade neutral Belgium.
- Offense-defence misperceptions

WWI: the cost

Country	KIA	% Pop.	Wounded	Casual. as % force.
UK	900,000	2	2,000,000	36%
France	1,700,000	4.25	4,266,000	73%
Italy	589,000	3	1,000,000	39%
Russia	2,300,000	1.75	5,000,000	76%
US	117,000	.13	204,000	7.1%
AH	2,000,000	3.75		
Germany	2,000,000	3.75	4,000,000	64.9%

WWI cost: back of env. calc.

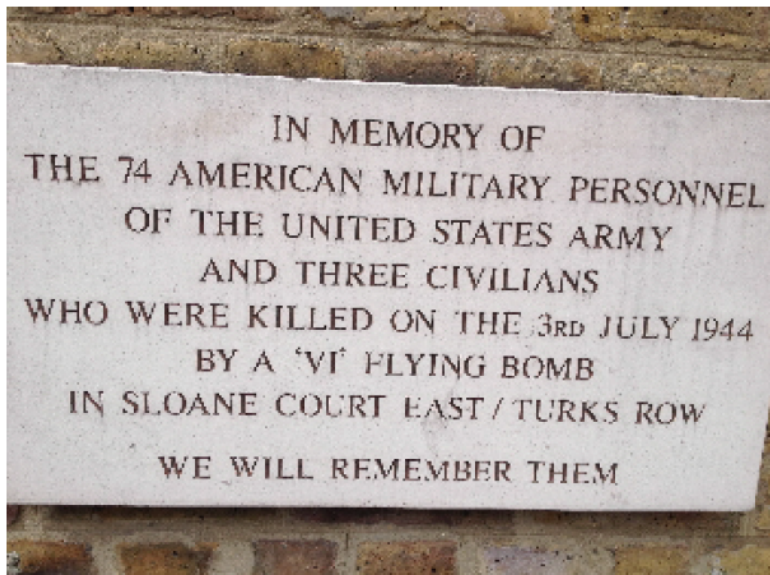
- British population: 45,000,000
- Pop. of people who are "age of service:" 15,000,000
- Men of age of service: 7,500,000
- About every eighth such man died, every fourth wounded
- Probably disproportionately high outside of metropolises
- For France, about doubled: one of every fourth such man died

WWI costs: comparisons

Country	Military deaths	Pop.	%
France	200,000	41,000,000	.04%
Germany	5,000,000	70,000,000	7%
UK	383,000	48,000,000	.07%
US	416,000	131,000,000	.03%

- Viet Nam: 47,000 battle deaths, 153,303 WIA, about 25 million eligible men.
- Population? maybe 200,000,000

Why are we here?



Why are we here?

V1 Bombs

"The weapon was a flying torpedo, twenty-five feet long with stubby wings, a crude jet engine, and a one-ton warhead. It could cross the English coast twenty minutes after launch; when the fuel ran dry, the engine quit and the bomb fell. Hitler called them "cherry stones." "

Atkinson, Rick (2013-05-14). The Guns at Last Light: The War in Western Europe, 1944-1945 (The Liberation Trilogy) (p. 107). Henry Holt and Co.. Kindle Edition.

Why are we here?

V1 Bombs

"But subsequent volleys showed greater promise. By noon on June 16, of 244 launches, 73 cherry stones had reached "Target 42," also known as London. This very morning the nameless weapon had been anointed the Vergeltungswaffe— reprisal weapon— or V-1. "Terror is broken by terror," the Führer liked to say. "Everything else is nonsense.

Rundstedt suggested that the V-1 be used against those half million enemy soldiers now massed in the beachhead. Rommel agreed. Hitler summoned a military expert who explained that the flying bomb's inaccuracy made any target smaller than London difficult to hit: the V-1s were aimed at Tower Bridge on the Thames, but the margin of error might be fifteen kilometers or more. Relentless pummeling of Target 42, Hitler told the field marshals, would "make it easier for peace." Panic would paralyze Britain, with psychological and political chaos."

Atkinson, Rick (2013-05-14). *The Guns at Last Light: The War in Western Europe, 1944-1945 (The Liberation Trilogy)* (p. 107). Henry Holt and Co.. Kindle Edition.

Why are we here?

V1's on June 18, 1944

"In the Guards Chapel at Wellington Barracks on Birdcage Walk, ... a full-throated congregation belted out the "Te Deum" and prepared to take communion from the bishop of Maidstone. "To Thee all angels cry aloud," they sang, At 11: 10 A.M. an annoying growl from those same heavens grew louder. Ernest Hemingway heard it in his Dorchester Hotel suite, ... from the window he looked for the telltale "white-hot bunghole" of a jet engine. ... Clementine Churchill, the prime minister's wife, heard it in Hyde Park, The Guards Chapel congregation heard it and kept singing. Then they heard nothing— that most terrifying of all sounds— as the engine quit, the bunghole winked out, and the black cruciform fell. Through the chapel's reinforced concrete roof It plummeted before detonating in a white blast that blew out walls, blew down support pillars, and stripped the leaves from St. James's plane trees. A funnel of smoke curled fifteen hundred feet above the wrecked nave; rubble ten feet deep buried the pews even as six candles still guttered on the altar and the bishop stood unharmed. One hundred and twenty-one others were dead

Why are we here?

V1's

In a memo on Sunday evening, the supreme commander ordered that the targets code-named CROSSBOW, comprising V-1 launch areas, supply dumps, and related sites, “are to take first priority over everything except the urgent requirements of the battle.” Yet more than thirty thousand attack sorties already had flown in the past six months, dropping the tonnage equivalent of four Eiffel Towers on CROSSBOW in an effort to eviscerate a program Allied intelligence knew was in development. ... Eisenhower’s “first priority” edict dismayed his air force chieftains, who favored the uninterrupted smashing of German cities, oil facilities, and other strategic targets.

Why are we here?

V1's

"A British study calculated that "the average Londoner" could expect to be within a half mile of a V-1 detonation once a month, odds that did "not appear unduly alarming." Few Londoners saw it that way. V-1 explosions sucked workers from office windows, incinerated mothers in grocery stores, and butchered pensioners on park benches. A lieutenant who was recuperating in a hospital hit by a flying bomb wrote his wife that the blast "pushed through the walls and surrounded us, gripped us, entered us, and tossed us aside." He confessed to being "more afraid than I have ever been of anything in my life." "

Atkinson, Rick (2013-05-14). *The Guns at Last Light: The War in Western Europe, 1944-1945 (The Liberation Trilogy)* (p. 110). Henry Holt and Co.. Kindle Edition.

Why are we here?

V1's

"By August, 1.5 million Londoners would evacuate the city, more than during the Blitz. Of 10,492 V-1s ultimately fired at Britain, about 4,000 were destroyed by fighters, balloons, and anti-aircraft guns, while others veered off course or crashed prematurely. But about 2,400 hit greater London, killing 6,000 and badly injuring 18,000. (Not one struck Tower Bridge.) It was, an official British history concluded, "an ordeal perhaps as trying to Londoners as any they had endured throughout the war." "

Atkinson, Rick (2013-05-14). *The Guns at Last Light: The War in Western Europe, 1944-1945 (The Liberation Trilogy)* (pp. 110-111). Henry Holt and Co.. Kindle Edition.

Why are we here?

Faulty Towers

https://en.wikipedia.org/wiki/The_Germans

Making the pieces go where you want them to go

Friedman

"Economics assumes that individuals have objectives. We do not know all of the objectives that any individual has, but we do know that for most of us, staying alive is high on the list. The general commanding an army and the soldier in the front line have, in one sense, the same objectives. Both want their side to win, and both want both of them to survive the battle. The soldier, however, is likely to rank his own survival a good deal higher and the general's survival a good deal lower in importance than the general does. One consequence of that disagreement is that the general may rationally tell the soldier to do something and the soldier may rationally not do it. Neither is necessarily making a mistake; each may be correctly perceiving how to achieve his ends."

Also:

Generals vs Head of State as in the desire for glory for a general at expense of overall victory;

Patrols (note monitoring issue that arises as well: tickets from police?)

Body counts?

Making the pieces ...

Friedman

- "But rationality is an assumption about individuals, not about groups. Each individual, in my simple example of the economics of war, is making the correct decision about how he should act in order to keep himself alive. It so happens that the correct decision for me (running away) decreases the chance of being killed for me but increases it for everyone else on my side, and similarly for everyone else's correct decision; individually, each of us is better off (given what everyone else is doing) than if he stood and fought, but we are all worse off than we would be if each of us had failed to reach the correct conclusion and we had all stood and fought."
- Other examples? Schelling rubbernecking; who plays what position on a team (Hunter Bledsoe)
- Solution? punishment (why would not soldiers want this, a la barge example?); changing the culture (heroism); aligning incentives through commitment (burning bridges).

Making the pieces ...

Friedman

Supporting evidence of basic proposition (individual motives/rationality might not be aligned with agent's or with collective goals).

1. Shooting your weapon: smaller units mean more likely to have good reward/cost ratio; BAR; Note: less need for punishment? Is this consistent with Army studies of why soldiers fight?
2. Melee

"a sharp conflict between the interests of a soldier and the interests of soldiers"

Each individual soldier's payoff depends on what others do. Other examples? Does it necessarily follow that everyone runs, or are there multiple equilibria? A formal analysis might be important here (stag hunt, other coordination games).

Making the pieces ...

Friedman

Making the pieces ...

Friedman

- Friedman's scenario: a PD

R/C	B	S
B	(.8, .8)	(.6, <u>.9</u>)
S	(<u>.9</u> , .6)	(<u>.7</u> , <u>.7</u>)

- Easy to motivate a prediction: dominance

Game theory

Assurance games

- Medals, training, etc.: payoffs not just prob. of living

R/C	B	S
B	(.95, .95)	(.6, .9)
S	(.9, .6)	(.7, .7)

- Is there a dominant strategy? If C is Brave, R should be brave. But if C Shirks, I should shirk.
- Two *Nash equilibria!*
 - What is it?
 - Justification? Proof in pudding.
- Solution to Friedman's problem: how to get coordination on (.95, .95).

Some games in normal form

Agression game

Scenario: Hitler is "Ray;" His most-preferred outcome is if he aggresses and Chamberlain ("Charley") plays strategy CESR aka "Cheese-Eating Surrender Monkey" aka Being French. He gets payoff of 3. If he refrains, his payoff is the status quo, 2. His worst outcome is if he plays "Aggress" and Chamberlain plays "Bow Up," in which he gets 1. Chamberlain has bad choices if Hitler agresses: he gets worse than the status quo no matter what he does. The payoff matrix is:

	CESR	Bow Up
Aggress	(3, 1.5)	(1, 1)
Refrain	(2, 2)	(2, 2)

What's not captured in payoff matrix: sequential nature.

Some games in normal form

Aggression game

By our usual method of looking for a NE, we get two: (Aggress, CCSR) and (Refrain, Bow Up)

	CCSR	Bow Up
Aggress	(<u>3</u> , <u>1.5</u>)	(1, 1)
Refrain	(2, <u>2</u>)	(<u>2</u> , <u>2</u>)

Some games in normal form

Aggression game

- Iterated dominance and backward induction: which strategy should be thrown out?
 - If Hitler plays Aggress, he could end up with less than if he played Refrain, and if he played Refrain, he could end up with less than if he played Aggress: no dominated strategy.
 - If Chamberlain played CESR, he gets either 1.5 or 2; if he plays Bow Up, he gets 1 or 2. He has no reason to play Bow Up.

	CESR	Bow Up
Aggress	(3, 1.5)	(1, 1)
Refrain	(2, 2)	(2, 2)

- Key assumption: Hitler knows this about the payoff matrix and knows that Chamberlain is rational. Thus he can deduce that "Bow Up" will never be played, and thus knows that his best play is Aggress.
- What have most people taken away from this episode? Appeasement always bad (VN, ISIS, Ukr.)

Some normal form games

Backward induction

In the movie "Dr. Strangelove," American Air Force General Jack Ripper, believing the Russkies have used water flouridation to sap American's "precious bodily fluids," wants the U.S. to hit the USSR with an all-out first-strike nuclear attack. He has successfully tricked the small nuclear-armed bomber group under his command to believe the US has been attacked and has sent them on a bombing mission to Russia. Only he knows the secret code to recall them. Ripper plays a game with the U.S. president to get him to launch the all-out first-strike attack that insures victory-clearly at a high cost, but in Ripper's mind worth it-over the Russkies.

Some normal form games

Backward induction

While his bomber group is still short of crossing Soviet airspace, he makes sure the U.S. President knows what he has done. He explains his reasoning: Once his bombers cross Soviet airspace, the Soviets will launch a retaliatory attack. This will really be a "first strike," as Ripper's bombers are few in number, and their effect on the USSR will be small. Thus, if the U.S. President does not immediately launch a first strike, the U.S. will be hit with an ensuing Russkie first strike and lose the ensuing nuclear war. The president's only rational choice is to now launch a U.S. first strike.

Some normal form games

Dr. Strangelove

- Does this payoff matrix capture the scenario?

	First Strike Now	Lose Nuclear War
Not Recall	(3, 1.5)	(1, 1)
Recall	(2, 2)	(2, 2)

- This says Ripper values status quo at 2. (Not Recall, First Strike Now) is preferred by Ripper to status quo. Pres. values status quo at 2, but values (NR, FSN) less than status quo but greater than Lose Nuclear War.

Some normal form games

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- Is Ripper's thinking sound? No matter what Ripper does, "Lose Nuclear War" is a dominated strategy. See the movie to see what happened.

Some normal form games

Games of coordination: waiting, security

Suppose a group of 25 people must all arrive at a suggested time of 13 : 00 before the group can depart. Each individual can choose an effort level s_i that gets them close to the 13 : 00 suggested departure time from the set of effort levels $\{1, 2, 3, 4, 5, 6, 7\}$ where effort increases with the number. The benefit (payoff) each individual gets from leaving on time at 13 : 00 is a "weakest link" function: The payoff depends on *lowest* effort level expended by a member of the group (because the group cannot leave until the last person gets there)

$$B_i = 50 + 20 \times \min \{s_1, s_2, \dots, s_{25}\} .$$

E.G., if the lowest effort level is 2, the payoff for each individual is 90. If the lowest level is 7, the payoff is 190.

The cost to each individual is proportional to the effort level, and is given as

$$C_i = 10s_i .$$

That is, if someone chooses $s_i = 5$, their cost is 50.

Some normal form games

Games of coordination

- Nash Equilibrium: Each person takes the strategy of every other person as given, and tries to do best for herself.
- Because benefits depend on the minimum effort of the group, but costs are proportional to effort, all people will pick the same effort level, call it s' .
- Person 1 chooses s_1 to maximize her own Benefits minus Costs, assuming $s_2 = s_3 = s_4 = \dots = s_{25} = s'$:

$$\max_{s_1} NB_1 = \{50 + 20 \times \min(s_1, s')\} - 10 \times s_1;$$

- suppose she chooses $s_1 = s'$:

$$NB(s_1 = s') = 50 + 20s' - 10s' = 50 + 10s'$$

- Suppose she chooses $s_1 > s'$:

$$NB_1(s_1 > s') = 50 + 20s' - 10s_1.$$

This cannot be a maximum, because she could choose $s' < s_1$ and save on costs without sacrificing benefits:

$$NB(s_1 = s') - NB_1(s_1 > s') = -10s' + 10s_1 = 10(s_1 - s') > 0$$

- Suppose she chooses $s_1 < s'$:

$$\begin{aligned} NB_1(s_1 < s') &= 50 + 20s_1 - 10s_1; \\ NB_{1,s'} - NB_{1,s_1} &= 20(s' - s_1) > 0. \end{aligned}$$

Some normal form games

Games of coordination

- Upshot: *any* common level of security is a NE.
- Like other coordination games: NB's are different for different equilibria:
 - $$NB_i = 50 + 10s_i$$
 - This is increasing in effort level: best is maximum effort!
- Experimental evidence; race to the bottom!
- Other applications: Fight or Flee, NDP's. airlines, early versus late planting.