

Introduction to Negotiation

Summary

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in the Spring Semester 2021 given by Michael Ambühl

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Preface

This is a summary of the topics dealt with in the lecture Introduction to Negotiation in the spring semester 2021 given by Michael Ambühl at ETH Zürich. This script is based on the lecture slides provided by Prof. Michael Ambühl. All images and illustrations in this Script were taken from the lecture slides. The list of topics is not exhaustive. Many things were left out and only the topics which the author regarded as important are mentioned. This summary should neither be considered as a replacement of the lecture nor as a sufficient preparation for the exam. This summary should only be a reminder to which you can resort in case you quickly want to look something up. No liability is accepted in the event of failure to pass the examination.

If you stumble over mistakes, be it linguistic or thematic, or if you have suggestions what to add or how to improve this script, do not hesitate to contact me at szekerb@student.ethz.ch.

Many Thanks

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1 Introduction

1.1 Definition

Definition (Negotiation). • "By negotiation we mean exchange between parties designed to reconcile their differences and produce a settlement" (Brams 2003)

- "Negotiation - a process involving multiple individuals cooperating to arrive at a joint decision. The joint decision entails joint consequences, or payoffs, for each individual." (Raiffa 2003)
- "Like it or not, but you are a negotiator. Negotiation is a fact of life. Everyone negotiates something every day" (Fisher and Ury 2012)

Common things in Negotiations

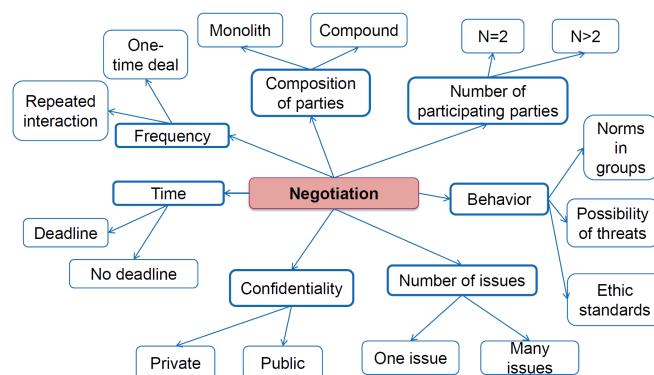
- There are 2 or more parties (special case: 1 person against "nature")
- Conflict of needs
- Choice
- Give-and-take process
- Prefer to negotiate rather than to "fight openly"
- "Tangibles" and "Intangibles" ("Materialles" und "Immaterielles")

When should people, in normal cases, not participate in negotiation?

- No willingness to make concession
 - Demands are unethical*
 - The other side acts in bad faith*
 - You are not prepared*
- * = exceptions possible

Definition (Mediation). "Any action taken by an actor that is not a direct party to the crisis, that is designed to reduce or remove one or more of the problems of the bargaining relationship, and therefore to facilitate the termination of the crisis itself." (Oran Young)

1.2 Taxonomy (Negotiation)



Definition (Distributive Negotiation). Distributive negotiation is a competitive negotiation over one issue, a win-lose situation, such as haggling over a price in a bazaar. It is adversarial. Revealing information can be a handicap for a party.

Definition (Integrative Negotiation). Integrative negotiation is a negotiation that can look for win-win solutions or problem solving in order to have mutual gain. It is cooperative. Sharing information is helpful/necessary for both parties.

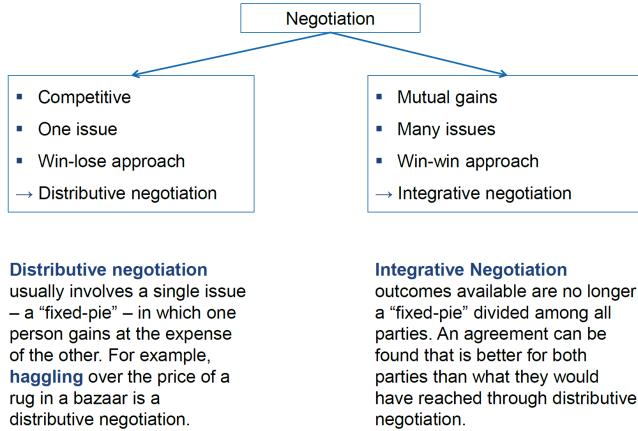
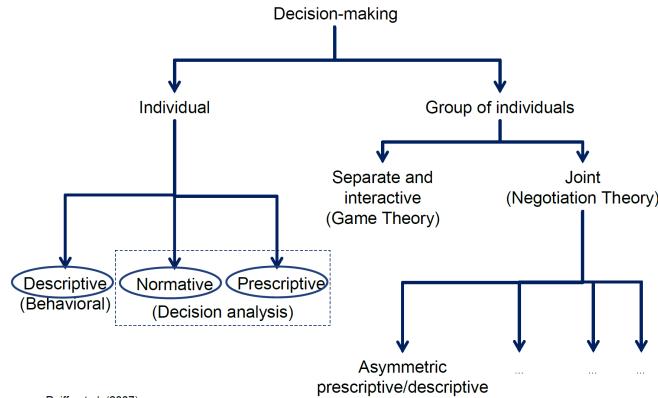


Figure 1: Distributive vs. Integrative Negotiation

1.2.1 Negotiation and decision Theory



Descriptive, normative, and prescriptive orientations

- Descriptive: How decisions are made. How and why individuals think and act the way they do.
- Normative: How decisions should be made. How idealized, rational, super-intelligent people should act. Often used in applied mathematics because concept is clear. However, normative theories → often only first-order approximations of real-world behaviour.
- Prescriptive: How decisions could be made better. What can a real person actually do to make better decisions? What is practically useful?

1.3 Rationality

1.3.1 Definition

Definition (Rationality). Let a be an action and $a \in A$ (set of alternative actions), ω the outcome and u the utility. A utility function is a function $u : \Omega \rightarrow \mathbb{R}$ such that $u(\omega_1) > u(\omega_2) \Leftrightarrow \omega_1 > \omega_2$. A payoff function $\pi : A \rightarrow \mathbb{R}$. λ is a lottery, a set of probabilities for the occurrence of every $\omega \in \Omega$. For the probability that outcome ω occurs in lottery λ we denote $p(\omega|\lambda)$. The expected utility (expected payoff) is $\pi(a) = \sum_{\omega \in \Omega} p(\omega|\lambda(a)) \cdot u(\omega)$

An individual is rational under certainty if his preferences for outcomes $\omega \in \Omega$ satisfy the following conditions:

- 1) Completeness: Either $\omega_1 \geq \omega_2$ or $\omega_2 \geq \omega_1$
- 2) Transitivity: If $\omega_1 \geq \omega_2$ and $\omega_2 \geq \omega_3$, then $\omega_1 \geq \omega_3$.

An individual is rational under uncertainty if his preferences for lotteries satisfy the following conditions:

- 1) Completeness: Either $\lambda_1 \geq \lambda_2$ or $\lambda_2 \geq \lambda_1$
- 2) Transitivity: If $\lambda_1 \geq \lambda_2$ and $\lambda_2 \geq \lambda_3$, then $\lambda_1 \geq \lambda_3$
- 3) Monotonicity: If $\lambda_1 > \lambda_2$ and $q_1 > q_2$, then $q_1\lambda_1 + (1 - q_1)\lambda_2 > q_2\lambda_1 + (1 - q_2)\lambda_2$
- 4) Continuity: If $\lambda_1 \geq \lambda_2$ and $\lambda_2 \geq \lambda_3$, then there exists a probability q such that $\lambda_2 \sim q\lambda_1 + (1 - q)\lambda_3$
- 5) Independence: If $\lambda_1 > \lambda_2$, then $q\lambda_1 + (1 - q)\lambda_2 > q\lambda_2 + (1 - q)\lambda_3$

Definition (Transitivity). A relation R is transitive, if $\forall a, b, c \in A : (a, b) \in R \wedge (b, c) \in R \Rightarrow (a, c) \in R$

Non-Transitivity creates a perpetuum mobile. Transitivity is an important condition for rational behaviour. It is a concept in the normative orientation. However, in exceptional cases it can also lead to problems/paradoxes.

Definition (Behaving rationally). The negotiation objectives are based on comprehensible motivations and the measures to achieve these objectives are consistent and do not violate generally acceptable conventions/customs.

Negotiation parties representing a big group, will be considered as behaving rationally if the negotiation is conducted/monitored

- by professional people of the negotiation party
- of which a couple of people (i.e. more than 5) are not directly participating in the negotiation but work in a sort of "back-office" function.
- where the work culture permits an internal objective/critical discussion.

1.4 Brief excursion to philosophical concepts

A big question of moral and political philosophy: Is morality a matter of counting lives and weighing costs and benefits, depending solely on the consequences it brings about or are certain moral duties and human rights so fundamental that they rise above such calculations, for reasons independent of the social consequences?

Utilitarianism "The highest principle of morality is to maximize happiness, the overall balance of pleasure over pain." "The greatest good for the greatest number" was the ethic system.

Objections: Utilitarianism fails to respect individual rights. Difficult to translate all moral goods into a single currency of value (utility function).

Criticism: Only actions done due to a motive of duty (doing something because it is right) have moral worth. The moral worth of an action is dependent on the motive from which it is done, not the results it produces.

Kant developed the Categorical Imperative (universal law): "Act only according to the maxim whereby you can, at the same time, will that it should become a universal law"

2 Basic Concepts

2.1 Definitions

Definition (Target point). Target point is the point at which a negotiator would like to conclude negotiations, i.e. his aspired goal. The target point is often referred to as the 'negotiator's aspiration'.

Definition (Resistance point). Resistance point is a negotiator's bottom line - the most he will pay as a buyer (for a seller, it is the smallest amount she/he will settle for). The resistance point is often referred to as the 'reservation price'.

Definition (Starting point). Starting point (or asking price, initial offer) is the initial price set by the seller/buyer.

Definition (ZOPA). Zone of potential agreement (ZOPA) (bargaining range, settlement range) is the spread between the resistance points of the negotiating parties.

2.2 Distributive negotiation

It is a negotiation in a competitive way over one issue, a win-lose situation, such as haggling over a price in a bazaar.

Example (Selling/Buying a flat).

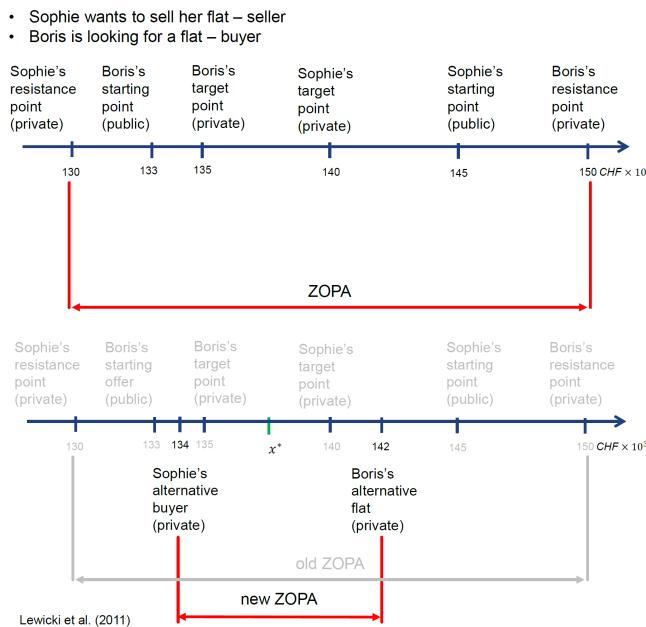
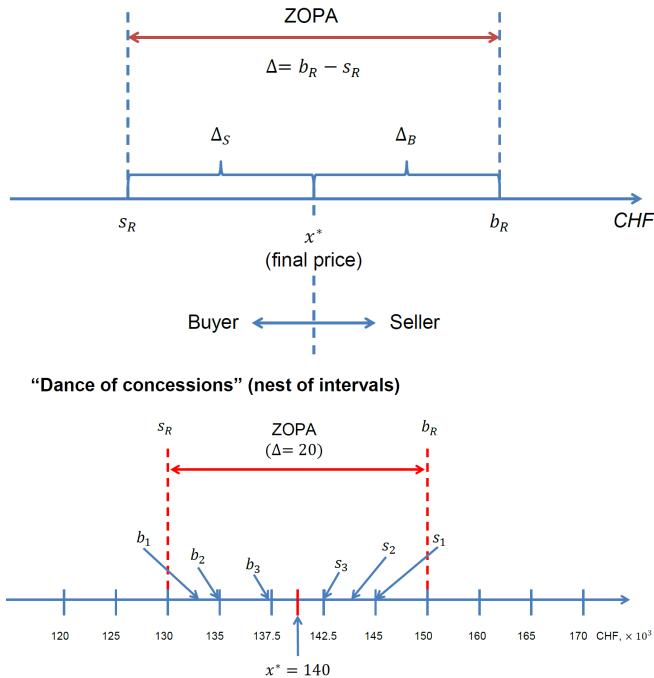


Figure 2: ZOPA without and with alternatives

Formal model Negotiation:

- b_R : buyer's resistance point (i.e. the maximum price buyer would agree to pay)
- s_R : seller's resistance point (i.e. the minimum price seller would settle for)
- x^* : final price
- Seller's surplus: $\Delta_S = x^* - s_R$
- Buyer's surplus: $\Delta_B = b_R - x^*$
- The total surplus from the deal: $\Delta = \Delta_S + \Delta_B = b_R - s_R$
- Note: If $\Delta \geq 0$ there is a ZOPA. If $\Delta < 0$ there is no ZOPA.



Comments

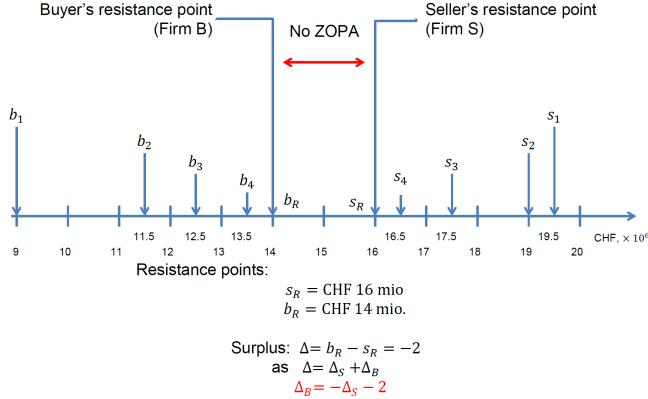
- Achieve the most preferable outcome within the bargaining range
- Subjective assessment/perception of the deal
- By making high offers and small concessions you can attempt to review the resistance points
- It is important that people feel as if they got the best possible deal.

2.3 Integrative negotiation

It is a negotiation that can look for win-win solutions or problem solving in order to achieve a mutual gain.

Example (Acquisition of a company). • A big international corporation (Firm B) wants to make a friendly acquisition of one of its suppliers, the small company (Firm S)

- Both agree that Firm S would be more valuable as a part of Firm B.
- Despite this agreement, they are unable to complete the acquisition.
- Firm B offers CHF 13.5 million for Firm S, but firm S insists on CHF 16.5 million.
- Efforts to find a compromise fail: neither side finds 15 CHF acceptable.
- Both firms do some research and realize that the two have different views of the value of a new high-tech, high-risk Division D.
- Firm B considers Division D worth only 1 million CHF (of the 14 mio resistance point) whilst firm S truly believes in the viability of the new products under development and has valued this division at 6 million CHF (of the 16 mio resistance point)
- When the parties realize this, they can trade-off on this underlying issue, in order to find an agreement: Firm B acquires Firm S for 12 million CHF, but the owners of the Firm S retain control of Division D.



Formal model Different valuations of Division D:

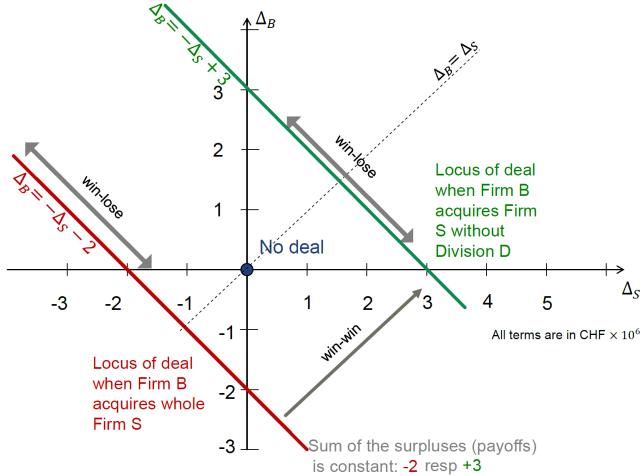
- Firm S values it at CHF 6 mio
- Firm B values it at CHF 1 mio

New resistance points:

$$s_R = \text{CHF } 10 \text{ mio } (= 16 - 6)$$

$$b_R = \text{CHF } 13 \text{ mio } (= 14 - 1)$$

Surplus: $\Delta = b_R - s_R = 13 - 10 = +3$ as $\Delta = \Delta_S + \Delta_B$. For any price x^* the buyer's and seller's surpluses are related to $\Delta_B = -\Delta_S + 3$. A fair price could be in the middle of 10 and 13 mio. $x^* = 11.5$ mio.



Steps in integrative negotiation

1. Sides need to agree on what the problem is
2. What are the interests behind the positions
3. Generate alternative solutions
 - Redefine the problem (Example 3)
 - Expand pie
 - Logroll
 - Offer compensation in other area
 - minimize costs
 - Bridge

- Generate solutions for the given problem
4. Make a list of solutions
 5. Prioritize options and reduce the list
 6. Select a solution

Example (Generaet alternative solutions).

- The Problem: What will a husband and wife do with 2 weeks of vacation?

- Interests:
 - She wants: mountains, hiking, and other outdoor activities, rustic cabin
 - He wants: beach, swimming, and night life, fancy hotel
- Generate alternative solution:
 - Expand pie: make 4 weeks - 2 weeks mountains; 2 weeks beach
 - Logrolling: (1) fancy hotel in the mountains or (2) rustic hotel on the beach
 - Compensation in other area: he pays her a ski equipment, she accepts to go the beach
 - Minimize cost: he accepts to take a beach house away from the big hotels
 - Bridge: they choose a place that offres hiking, mountains, swimming, beaches and night life

Comments Additional important elements:

- Fairnes and other intangibles
 - Outcome is equally shared ("divide it down the middle")
 - Outcome is devided based on equity
 - Outcome is divided based on needs
- Emotional escalation
- Difference in risk preferences, expectations, time preferences
- "Nothing is agreed until everything is agreed!"

2.4 Best practices

Lewicki: Ten best practices

1. Be prepared
2. Diagnose the fundamental structure of the negotiation
3. Work the BATNA (Best alternative to the negotiated agreement)
4. Be willing to walk away
5. Master the paradoxes
6. Remember the intangibles
7. Actively manage colitions
8. Savor and protect your reputation
9. Remember that rationality and fairness are relative
10. Continue to learn from experience

3 Harvard method

Fundamental question: "What is the best way for people to deal with each other's differences?"

Problem: Negotiators tend to bargain over positions and lock themselves into those positions.

Suggested solution: Focus on principled negotiation or negotiation on the metrics instead of positions (e.g. create respective values)

3.1 Concept

Negotiation based on five principles:

1. People: Separate the people from the problem
 - Negotiation is interaction between people. Be aware of your perception, emotions, and communication.
 - Hard on the facts, soft on the people
 - Separate the working relationship from the subject of negotiation
2. Interests: Focus on interest, not positions
 - Many negotiations start based on positions. Identify implicit and explicit interests of negotiations behind the positions.
 - Position: manifestation of an interest in a concrete manner.
 - Interest: underlying motivation, concern, and importance
 - Examples: Window opening, Two sisters want an orange but there is only one left (orange peel), 1978 Israeli-Egyptian peace talks after 6 Day War 1967, Camp David.
3. Options: Invent options for mutual gain
 - Invent and judge options for potential solutions with the aim to create mutual gain.
4. Criteria: Insist on using objective criteria
 - Develop, agree upon and apply objective criteria upon which an agreement can be derived.
5. Alternatives: Know your best alternative to a negotiated agreement (BATNA)
 - Be aware under which condition an agreement is not in your favor.

3.2 Criticism

- Not much beyond common sense (professional negotiators are already doing this)
- It is not scholarly or analytical and relies on anecdotal evidence
- It is too simplified for complex situations
- "The authors seem to deny the existence of a significant part of the negotiation process, and to oversimplify or explain away many of the most troublesome problems inherent in the art of practice of negotiation"

4 Game Theory

Possibilities

- Individual decision-making (Games with $N = 1$)
- Group of N individuals (Games with $N > 1$)
 - Non cooperative games
 - * Static games
 - Constant sum game (zero-sum): Pure Strategy and Mixed Strategy
 - Non constant sum game
 - * Dynamic games: Sequential move games and repeated simultaneous move games
 - Cooperative games

4.1 Introduction

Two generals opposing each other in a battle. Each has the possibility to attack or withdraw.

		General 2	
		attack	withdraw
General 1	attack	-3, -3	1, -2
	withdraw	-2, 1	0, 0

According to Adam Smith: "In competition, individual ambition serve the common good."

Contrary to this: Nash's key sentence: "The best result comes from everyone in the group doing what is best for himself and the group."

4.1.1 History

John von Neumann (1903-1957)

- Born in Budapest
- Diploma in chemical engineering from ETH (1926)
- PhD in mathematics from University of Budapest
- Founded the field of game theory as a mathematical discipline

Oskar Morgenstern (1902-1977)

- Born in Görlitz (Germany)
- Student and PhD in political sciences at University of Vienna
- Together with Neumann, he founded the mathematical field of game theory and its application to economics.

John Nash (1928-2015)

- Born in Bluefield (USA)
- Master in Mathematics from Carnegie Mellon University
- PhD in Mathematics from Princeton University
- Defined and studied what would later be called the "Nash equilibrium" and the "Nash bargaining solution"
- Nobel prize 1994; Abel prize 2015

4.1.2 What is Game Theory?

Roger Myerson: "Game theory can be defined as the study of mathematical models of conflict and cooperation between intelligent rational decision-makers. Game theory provides general mathematical techniques for analyzing situations in which two or more individuals make decision that will influence one another's welfare. [...] Game theory offers insights of fundamental importance for scholars in all branches of the social sciences, as well as for practical decision-makers."

4.2 Individual decision-making (Games with $N = 1$)

Example (Linear programming: production problem).

Example 6: Linear programming: production problem

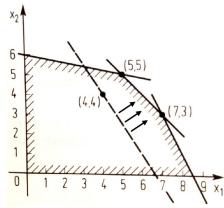
	Product 1	Product 2	Capacity
Factor A	2	10	60
Factor B	6	6	60
Factor C	10	5	85
Gain per unit	45	30	

Factor A: working hours
Factor B: square meters
Factor C: capital

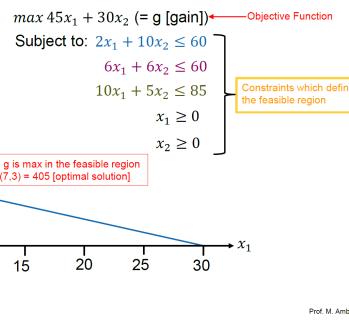
- Target – total gains: $45x_1 + 30x_2$

- Optimization problem

$$\begin{aligned} \max & 45x_1 + 30x_2 \\ \text{subject to} & \begin{aligned} 2x_1 + 10x_2 &\leq 60 \\ 6x_1 + 6x_2 &\leq 60 \\ 10x_1 + 5x_2 &\leq 85 \\ x_1 \geq 0, x_2 \geq 0 & \end{aligned} \end{aligned}$$



Linear programming: graphic solution



Prof. M. Ambühl

Example (Secretary problem). There exists different versions of the problem. Here is an easy version:

- There is one secretarial position available
- The number of n of applicants is known
- The applicants are interviewed sequentially in random order
- Each time you see an applicant you have to decide if you take him/her or not. The rejection of an applicant cannot be revoked later on. If you decide on taking one applicant you can not see any other applicant thereafter.
- You compare each candidate with the ones you have already seen
- How should you proceed in order to maximize the probability of selecting the best candidate?
- You should let $\frac{n}{e}$ applicants go by and then select the first one whose value exceeds those of all the earlier rejected ones. The probability of getting the best one with this strategy is $\frac{1}{e} \approx 37\%$
- Proof:
 - n applicants (n is known) are to be presented in a randomized Sequential order
 - When an applicant is in front of you, you must either choose him, and the game is over, or you reject him, and you can't go back.
 - The probability to choose the best is at each stage $\frac{1}{n}$.
 - Suppose you reject the first candidate, then there is a $\frac{1}{n}$ chance that this one was the best and you failed to select the best
 - The second now presents himself and you compare him to the first. If he is not as good as the first you will obviously not select him; but even if the second is better than the first, you might still want to pass up on that person because you think the best is among the remaining ones
 - The best of the rejected ones serves you as the standard for judging the ones to come. So the best of the first x (x : rejected ones) will represent a standard against which to judge the remainder.
 - How many should you let go before making your choice? What chance do you have to pick the best?

- * Strategy S: Idea: Divide the universal sequence of all candidates into two groups; the first group (called the rejected ones or the “standard-setting group”) consisting of a proportion t of candidates, is used only to identify the best in that group; we then sequentially observe the candidates in the second group (called the selection group) and choose the first who beats the best in the standard-setting group. $P(t)$: Probability of finding the best candidate when the standard-setting group comprises a proportion of t candidates. This strategy will result in the choice of the best, if
 - the second best falls in the first group (proportion t , $0 \leq t \leq 1$) and the first best in the second (proportion $(1 - t)$). This has the probability $p = t(1 - t)$.
 - the third best falls in the first group (probability $p = t$) and the first best in the second group ($p = (1 - t)$) and the second best also in the second group ($p = (1 - t)$), and the first comes before the second ($p = \frac{1}{2}$). This has probability of $p = t \frac{(1-t)^2}{2}$.
 - the fourth best falls in the first segment and the first, second, and third best in the second segment and the first comes before the second or the third: $p = \frac{t(1-t)^3}{3}$
 - and so on...
 - Hence: $P(t) = t(1-t) + \frac{t(1-t)^2}{2} + \frac{t(1-t)^3}{3} + \dots$ assuming $n \rightarrow \infty$: $P(t) = t \left[(1-t) + \frac{(1-t)^2}{2} + \frac{(1-t)^3}{3} + \dots \right] = -t \ln(t)$
 - To find the optimal proportion for the standard-setting group, we differentiate $P(t)$ and set $P'(t)$ to 0. This yields: $t = \frac{1}{e}$, so $P\left(\frac{1}{e}\right) = \frac{1}{e}$

- Concrete Case, n small ($n = 4$):

- You want to select the best candidate, only the best
- Random order, each order being equally likely
- You can rank all applicants from worst to best; the decision to accept or reject is based only on the relative rank
- Let $n = 4$
- Best candidate: rank 4; least best candidate: rank 1
- Ranks are ordinal numbers
- $n!$ permutations possible, i.e. $4 \cdot 3 \cdot 2 \cdot 1 = 24$
- Strategy: Let t ($0 \leq t < 4$) applicants pass by, then select the first one that is better than the rejected one(s)
- $\frac{4}{e} \approx 1.471$, rounded: $t = 1$.

1 2 3 (4)	2 1 3 (4)	3 1 2 (4)	4 1 2 3
1 2 (4) 3	2 1 (4) 3	3 1 (4) 2	4 1 3 2
1 3 2 (4)	2 3 1 (4)	3 2 1 (4)	4 2 1 3
1 3 (4) 2	2 3 (4) 1	3 2 (4) 1	4 2 3 1
1 (4) 2 3	2 (4) 1 3	3 (4) 1 2	4 3 1 2
1 (4) 3 2	2 (4) 3 1	3 (4) 2 1	4 3 2 1

Strategy successful: selecting the best one, i.e. applicant with rank 4.
 p is the probability of choosing the best one, using the given strategy.

1. Pass 0 by, then take the first one $p = 6/24 = 0.25$
 2. Pass 1 by, then take the first one that is better $p = 11/24 = 0.4583$
 3. Pass 2 by, then take the first one that is better $p = 10/24 = 0.416$
 4. Pass 3 by, then take the first one that is better $p = 6/24 = 0.25$

highest p → best strategy

Example 8: Casino (Game against nature)

Payoff table:

You	Nature		
	W	X	Y
A	2	2	0
B	1	1	1
C	0	4	0
D	1	3	0

- You have four actions: A, B, C, and D
- Choices of nature: W, X, Y, and Z

Method 1: If prior probabilities are known, choose action to maximize your expected payoff

Suppose:

$$p(W) = 20\%, p(X) = 40\%, p(Y) = 30\%, p(Z) = 10\%$$

Expected utilities:

$$\pi(A) = 0.2 \cdot 2 + 0.4 \cdot 2 + 0.3 \cdot 0 + 0.1 \cdot 1 = 1.3$$

$$\pi(B) = 0.2 \cdot 1 + 0.4 \cdot 1 + 0.3 \cdot 1 + 0.1 \cdot 1 = 1.0$$

$$\pi(C) = 0.2 \cdot 0 + 0.4 \cdot 4 + 0.3 \cdot 0 + 0.1 \cdot 0 = 1.6 \leftarrow \text{take action C}$$

$$\pi(D) = 0.2 \cdot 1 + 0.4 \cdot 3 + 0.3 \cdot 0 + 0.1 \cdot 0 = 1.4$$

Method 2: (Laplace 1749 – 1827) If you do not have any information on the probability distribution, then assume choices of nature are equally possible. Then choose the action (in our table) which gives you the highest average value.

Equal probability:

$$p(W) = 25\%, p(X) = 25\%, p(Y) = 25\%, p(Z) = 25\%$$

Average utilities:

$$\pi(A) = 0.25 \cdot 2 + 0.25 \cdot 2 + 0.25 \cdot 0 + 0.25 \cdot 1 = 1.25 \leftarrow \text{take action A}$$

$$\pi(B) = 0.25 \cdot 1 + 0.25 \cdot 1 + 0.25 \cdot 1 + 0.25 \cdot 1 = 1$$

$$\pi(C) = 0.25 \cdot 0 + 0.25 \cdot 4 + 0.25 \cdot 0 + 0.25 \cdot 0 = 1$$

$$\pi(D) = 0.25 \cdot 1 + 0.25 \cdot 3 + 0.25 \cdot 0 + 0.25 \cdot 0 = 1$$

Method 3: (maxmin strategy, Wald 1902 – 1950) Write down the minimum entry in each row. Choose the row with the largest minimum. → "Pessimist's strategy"

		Nature					
		W	X	Y	Z	Min payoff	
You		A	2	2	0	1	0
		B	1	1	1	1	1
You		C	0	4	0	0	0
You		D	1	3	0	0	0

← Maximum of the minimum
↓ Take action B

Method 4: (maxmax strategy) Write down the maximum entry in each row.

Choose the row with the largest maximum. → "Optimist's strategy"

		Nature					
		W	X	Y	Z	Max payoff	
You		A	2	2	0	1	2
		B	1	1	1	1	1
You		C	0	4	0	0	4
You		D	1	3	0	0	3

↑ Maximum of the maximum
Take action C

Method 5: (Leonid Hurwicz 1917 – 2008) Choose a coefficient of optimism, $\theta \in (0,1)$. For each row, compute:

$$\theta(\text{row maximum}) + (1 - \theta)(\text{row minimum})$$

Choose the action for which weighted average is the highest. (= mixture between maxmax [$\theta = 1$] and maxmin [$\theta = 0$])

Suppose $\theta = 0.75$

		Nature					
		W	X	Y	Z	Weighted sum	
You		A	2	2	0	1	$0.75 \cdot 2 + 0.25 \cdot 0 = 1.5$
		B	1	1	1	1	$0.75 \cdot 1 + 0.25 \cdot 1 = 1.0$
You		C	0	4	0	0	$0.75 \cdot 4 + 0.25 \cdot 0 = 3.0$
You		D	1	3	0	0	$0.75 \cdot 3 + 0.25 \cdot 0 = 2.25$

← Take action C

Method 6: (Leonard Jimmie Savage 1917 – 1971) Compute the regret matrix.

Write down the largest entry in each row. Choose the row for which this largest entry is smallest. (min maxregret)

The regret matrix is computed the following way: take the original matrix (table) with payoffs. Find what is the maximum in each column. The result is what would be the best for you if you knew the nature's decision. Compute the difference between this largest entry in the column and corresponding entry in the original matrix.

Example of regret table:

		Nature					
		W	X	Y	Z	Row maximum	
You		A	0	2	1	0	2
		B	1	3	0	0	3
You		C	2	0	1	1	2
You		D	1	1	1	1	1

← Minimum of the maximum regret
↓ Take action D

METHOD	ACTION
Method 1: Expected utility optimization	C
Method 2: Laplace	A
Method 3: Maxmin	B
Method 4: Maxmax	C
Method 5: Hurwicz optimism coefficient	C
Method 6: Savage minimize regret	D

4.3 Group of N individuals (Game with $N > 1$)

4.3.1 Non cooperative Games

Static Games

- The Players: Who is involved?
- The rules:
 - Who moves when?
 - What do they know when they move?
 - What can they do?
- The outcomes: For each possible set of actions by the players what is the outcome of the game?
- The payoffs: What are the players' preferences (i.e. utilities) over the possible outcomes?
- Pure strategies - there is no randomization when players take an action.

Constant sum Game Pure Strategy:

Example 9: Boris and Sophie divide the surplus

a) Situation in words

- Imagine Sophie and Boris decide to finalize a price in the following manner:
- They sit in different rooms, don't communicate with each other and announce their decision simultaneously: A or B
- If both announce A they trade without concessions (i.e. each gets zero additional surplus)
- If Boris announces B and Sophie –A : The price will shift towards Sophie by CHF 5
- If Boris announces A and Sophie –B: The price will shift towards Boris by CHF 4
- If both announce B: Sophie will make a concession towards Boris by CHF 1

b) Game

- Players: 2 (Boris, Sophie)
- Actions: 2 (A,B)
- Preferences: Boris: $(A, B) > (B, B) > (A, A) > (B, A)$, Sophie: $(A, B) < (B, B) < (A, A) < (B, A)$
- Payoffs are presented in the normal form below

		Sophie	
		A	B
Boris	A	0,0	4,-4
	B	-5,5	1,-1

- Zero sum Game.

		Sophie		Min payoff to Boris	
Boris					
		A	B		
Boris	A	0, 0	4, -4	Min payoff to Boris	
	B	-5, 5	1, -1		
		0	-4		

↑ Maxmin payoff to Sophie ← Maxmin payoff to Boris

Strategies (A,A) form equilibrium of the zero-sum game (often called saddle point). Observe:
 $(\text{maxmin payoff to Boris } [=0]) = -(\text{maxmin payoff to Sophie } [=0])$

Equilibrium

We say pure actions (a_1^*, a_2^*) (strategies) form an equilibrium if

$$\pi_1(a_1^*, a_2^*) \geq \pi_1(a_1, a_2^*), \text{ for } \forall a_1 \in A_1 \text{ and}$$

$$\pi_2(a_1^*, a_2^*) \geq \pi_2(a_1^*, a_2), \text{ for } \forall a_2 \in A_2.$$

In maxmin equilibrium (saddle point) we have:

$$\pi_1(a_1^*, a_2^*) = \max_{a_1 \in A_1} \min_{a_2 \in A_2} \pi_1(a_1, a_2) = \min_{a_2 \in A_2} \max_{a_1 \in A_1} \pi_1(a_1, a_2)$$

Theorem (Maxmin (John von Neumann)).

- Every zero-sum game with two players and finite number of strategies has a solution. That is, there is a unique number v , called the value of the game, and there are optimal mixed* strategies for Player 1 and Player 2 such that:
 - i. If Player 1 plays his optimal strategy, his expected gain will be larger or equal to v , no matter what Player 2 does, and
 - ii. If Player 2 plays his optimal strategy, his expected loss will be smaller or equal to v , no matter what Player 1 does.

Comments:

- Game Theory began with studies of zero-sum games
- In zero-sum (also called constant sum) games:
 - The sum of payoffs in each cell is zero (or constant)
 - The interests of the players are strictly opposite
- Maxmin strategy enables a player to calculate the maximum of the minimum payoff he can achieve. This strategy guarantees him a security level - the minimum payoff for a player, when he plays non-cooperative.

Example 10: 2 players, 4 strategies:

		Sophie				Min payoff to Boris	
Boris		A	B	C	D		
		12, -12	-1, 1	1, -1	0, 0	-1	
Boris	B	5, -5	1, -1	7, -7	-20, 20	-20	
	C	3, -3	2, -2	4, -4	3, -3	2	
Boris	D	-16, 16	0, 0	0, 0	16, -16	-16	
		-12	-2	-7	-16		

↑ Maxmin to Sophie ← Maxmin to Boris

Strategies (C,B) form equilibrium of the zero-sum game.
 $(\text{maxmin payoff to Boris } [=2]) = -(\text{maxmin payoff to Sophie } [=2])$

Boris and Sophie maximize their minimal gains (payoffs), they take the best minimum.

Figure 3: Solution with maxmin

		Sophie				Max payoff to Boris
		A	B	C	D	
Boris	A	12,-12	-1,1	1,-1	0,0	12
	B	5,-5	1,-1	7,-7	-20,20	7
	C	3,-3	2,-2	4,-4	3,-3	4
	D	-16,16	0,0	0,0	16,-16	16
	Max payoff to Sophie	16	1	0	20	If both play D then S will get only -16. If S would know that Boris plays D she would play A and get +16. But if he would know that she plays A then he would play A and get +12 and she would get -12 => Maxmax: unsafe game!
						Maxmax to Boris
						Maxmax to Sophie

Strategies (D,D) form no equilibrium of the game. Observe:
 $\text{maxmax payoff to Boris } [16] \neq \text{maxmax payoff to Sophie } [20]$

Figure 4: Solution with maxmax

		Sophie			
		A	B	C	D
Boris	A	12,-12	-1,1	1,-1	0,0
	B	5,-5	1,-1	7,-7	-20,20
	C	3,-3	2,-2	4,-4	3,-3
	D	-16,16	0,0	0,0	16,-16
					Nash Equilibrium

Figure 5: Solution with the best response / Nash equilibrium

Nash Equilibrium**Theoretical concept**

We call a strategy a'_i is a **best response** for Player i to some strategy combination of the other players, denoted by a_{-i} , if

$$\pi_i(a'_i, a_{-i}) \geq \pi_i(a_i, a_{-i}), \text{ for } \forall a_i \in A_i.$$

Meaning: "Given the strategies of the other players, decide what maximizes your payoff!"

The action profile $a^* = (a_1^*, \dots, a_i^*, \dots, a_N^*)$ is a **Nash Equilibrium** in pure strategies of a game with N players if and only if every player's action is a best response to the other player's actions. No one has an incentive to change his strategy **unilaterally**!

Remark 1: In static games there is no difference between terms 'strategy' and 'action'. However, in dynamic game this is not true.

Remark 2: We have already given a definition of an equilibrium before. This definition just uses the terms of the best responses. Notion of best responses is helpful when one solves a particular problem or tries to prove the existence of an equilibrium.

Comments:

- We applied two solution concepts A and B : Maxmin by von Neumann and Nash Equilibrium.
- Both concepts led to the same solution.
- The maxmin concept was developed first and is applicable to constant sum games.
- Nash's best response is more widely applicable and we will use it from now on.

Example 11: Equilibrium in pure strategies.

		Sophie
	A	B
Boris	A	3, -3 0, 0 -1, 1
	B	-4, 4

Nash Equilibrium
No one has an incentive to change his strategy **unilaterally!**

Example 12: No equilibrium in pure strategies.

		Sophie
	A	B
Boris	A	3, -3 0, 0 -1, 1
	B	-4, 4

No Nash Equilibrium

As an **illustration** we use the maxmin (von Neumann) solution method **for comparison**
 → as there is no Nash there is also no saddle point

		Sophie
	A	B
Boris	A	3, -3 0, 0 -1, 1
	B	-4, 4
		Min to Boris
	A	3, -3 0, 0 -1, 1
	B	-4, 4
		Maxmin to Boris
		←
		↓
		No maxmin equilibrium in pure strategies. Observe:
		(maxmin payoff to Boris [0]) ≠ (maxmin payoff to Sophie [-3])

Mixed Strategy:

- A mixed Strategy specifies the probability with which each of the pure strategies is used.
- Example: Suppose the set of pure strategies to player i is $S_i = \{s_a, s_b, \dots\}$ Then the mixed strategy is a vector of probabilities $\sigma_i = (p(s_a), p(s_b), p(s_c), \dots)$ such that $\sum_{s \in S_i} p(s) = 1$
- A pure strategy can be represented as a special case of a mixed strategy.

Back to example 12:

According to the definition on the previous slide, the *mixed strategy* is a randomization of a combination of pure strategies, i.e. you choose your action according to a certain probability distribution.

Suppose now Sophie chooses A with probability p and B with $1-p$

Boris' expected payoff:

$$3 \cdot p + 0 \cdot (1-p) \quad (-1) \cdot p + 4 \cdot (1-p)$$

If Boris plays A

If Boris plays B

Boris is indifferent between playing A and B if Sophie's probability p satisfies:

$$3 \cdot p + 0 \cdot (1-p) = (-1) \cdot p + 4 \cdot (1-p)$$

$$p^* = \frac{1}{2}$$

Suppose now, Boris chooses A with probability q and B with $1-q$

Sophie is indifferent between A and B if Boris' probability q satisfies:

$$-3 \cdot q + 1 \cdot (1-q) = 0 \cdot q + (-4) \cdot (1-q)$$

$$q^* = \frac{5}{8}$$

		A (p)	B (1-p)
A (q)	3, -3	0, 0	
	-1, 1	4, -4	

Mixed strategy profile
 $(q^* = \frac{5}{8}, p^* = \frac{1}{2})$
is the equilibrium of the game.

Observe:
 $\pi_S(q^*, p^*) = -1.5$
 $\pi_B(q^*, p^*) = 1.5$

Non constant sum game Example 13: Maroni game

a) Situation in words

- There are 2 roasted chestnut (Maroni) sellers, competing for 100 clients
- Both sellers decide simultaneously which of the following two prices to charge (e.g. without knowing the decision of the counterpart):
 - High price: 6 SFr per packet
 - Low price: 5 SFr per packet
- If both sellers choose the same price, each buyer will make his decision with 50% probability
- Whenever the chosen prices are different, the one who sets the smallest price will get all 100 clients
- What will be the outcome of the competition?

b) Game

- i. Players: 2 (seller 1 and seller 2)
- ii. Actions of players: $a_i \in \{\text{high, low}\}$, for $i \in \{\text{seller 1, seller 2}\}$
- iii. Payoffs: See monetary payoffs presented in the *normal form* below

		Seller 2	
		High	Low
Seller 1	High	300, 300	0, 500
	Low	500, 0	250, 250

Nash equilibrium at 250,250.

c2) Optimality considerations

We call an outcome **Pareto Optimal** (named after Vilfredo Pareto) if there is no other outcome that increases payoff to one player without decreasing payoff to another player.



(1848 – 1923)

Observe:

If both sellers choose "high" prices, both sellers would be better off; we call this strategy combination Pareto optimal and, compared to the strategy combination "low/low" (Nash Equilibrium), a Pareto improvement

		Seller 2	
		High	Low
		High	300, 300
Seller 1	High	0, 500	
	Low	500, 0	250, 250

Nash Equilibrium
is in this case
Pareto-inferior

"Low" is the dominant strategy.

Comments:

- Game illustrates conflict in "economics"
- For both sellers strategy "low"-pricing dominates strategy "high"-pricing
- Nash Equilibrium is not always Pareto optimal outcome
- This is a typical illustration of the Prisoners' Dilemma

Classical Prisoners' Dilemma**Classical Prisoners' Dilemma**

(Name proposed by: Albert Tucker in 1950)

Situation in words

Two partners in a crime are imprisoned in two separate prison cells. They are both offered the same deal:

- If one of them confesses – and the other doesn't – he will be set free (**0 years** in prison), the other will serve **3 years** in prison
- If both confess, each of them serves **2 years** in prison
- If both don't confess, both of them will only serve **1 year** in prison

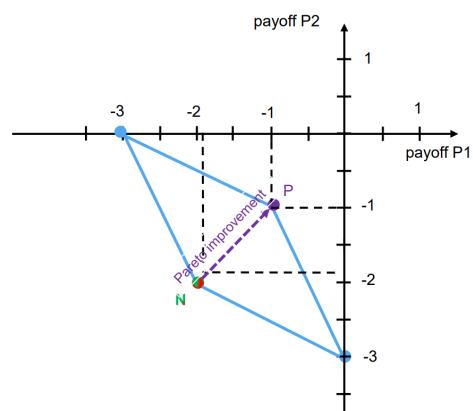
Game in the normal form

		P2	
		Don't confess	Confess
		-1, -1 Pareto** (-improvement)	-3, 0
P1	Don't confess	-1, -1 Pareto** (-improvement)	-3, 0
	Confess	0, -3	-2, -2 Nash*

Graphical representation of the prisoners' (Pareto \neq Nash):

		P2	
		don't confess	confess
		-1, -1 Pareto	-3, 0
P1	don't confess	-1, -1 Pareto	-3, 0
	confess	0, -3	-2, -2 Nash*

* None of the players has an incentive to change his strategy unilaterally
 ** None of the players can improve his situation without hurting the other



Example 14: Situation:

- Two countries disagree over the right of a patch of territory.
- The governments can decide whether to announce mobilization (and thus escalate conflict further) or to refrain from mobilization (and thus deescalate the conflict)
- When both countries decide to mobilize, the probability of war increases, while chances of peace resolution are getting smaller. This is the least preferred outcome for both countries as they fall in a devastating war (both receive utility of 0)
- Whenever one country mobilizes and the other does not, the mobilizing army can get control over the territory without a war. This is the most attractive situation for the aggressor (utility of 4) and the refraining country does not incur costs of war (utility of 2).
- When both countries choose to refrain the likelihood of peaceful sharing of territory is high (utility of 3).

Game:

- Players: 2
- Actions of players: mobilize, refrain
- Payoffs: Summarized in normal form below:

		Country 2	
		mobilize	refrain
Country 1	mobilize	0, 0	4, 2
	refrain	2, 4	3, 3

c) Solution

c1) Nash Equilibria in Example 14 (pure strategy)

		Country 2	
		mobilize	refrain
Country 1	mobilize	0, 0	4, 2
	refrain	2, 4	3, 3

Nash Equilibrium 1

Nash Equilibrium 2

T. Schelling
(1921-2016)

c2) Equilibrium coordination problem

- 2 Nash Equilibria:
 - (refrain, mobilize)
 - (mobilize, refrain)
- Equilibrium coordination problem:
 - What is the prediction of the analysis?
 - Which equilibrium will be played?
- Are there some characteristics/properties of an equilibrium that conspicuously distinguishes it from all the other equilibria?
- One may think of social norms – cultural influences, for example
- Thomas Schelling argued that in certain situations
- A small perturbation in payoffs (e.g. asymmetry in payoffs) may be enough for both players to expect mobilization by the player who expects the most payoff from it, making this equilibrium “salient” or “focal”
- Pre-play communication may help coordinate equilibrium

c3) Mixed strategy equilibrium in Example 14

- Suppose Country 2 decides to “mobilize” with probability p and to “refrain” with $1 - p$
- Country 1 expects the following payoffs:

<i>in case it mobilizes</i>	<i>in case it refrains</i>	$M(p)$ $R(1-p)$ M(q) 0,0 4,2 R(1-q) 2,4 3,3
$0 \cdot p + 4 \cdot (1 - p)$	$2 \cdot p + 3 \cdot (1 - p)$	

- Country 1 is indifferent between mobilizing and refraining if probability p satisfies:

$$0 \cdot p + 4 \cdot (1 - p) = 2 \cdot p + 3 \cdot (1 - p)$$

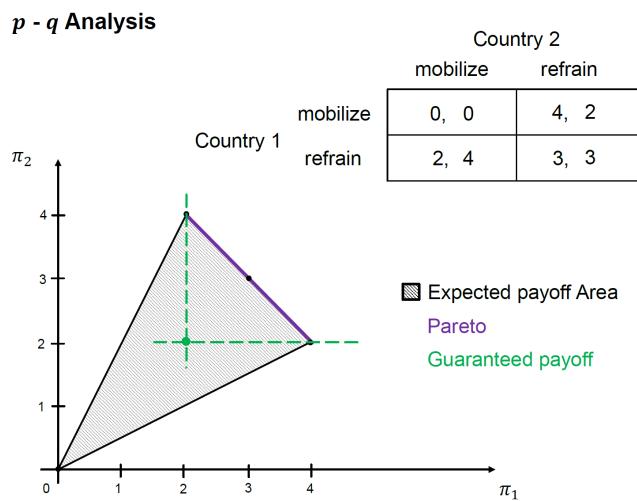
$$p^* = \frac{1}{3}$$
- Suppose now, Country 1 decides to mobilize with probability q and to refrain with $1 - q$
- Country 2 is indifferent between mobilizing and refraining if probability q satisfies:

$$0 \cdot q + 4 \cdot (1 - q) = 2 \cdot q + 3 \cdot (1 - q)$$

$$q^* = \frac{1}{3}$$
- The resulting mixed strategy profile:

$$(q^* = \frac{1}{3}, p^* = \frac{1}{3})$$

is the mixed strategy equilibrium of Example 14



Payoffs in general for any $p, q \in [0, 1]$

$$\begin{aligned}\pi_1(q, p) &= q[p \cdot 0 + 4(1-p)] + (1-q)[2p + 3(1-p)] = q(1-3p) - p + 3 \\ \pi_2(q, p) &= p[q \cdot 0 + 4(1-q)] + (1-p)[2q + 3(1-q)] = p(1-3q) - q + 3\end{aligned}$$

Question: C_1 wants to maximize its payoff (π_1) as the best response to C_2 who plays p . Which q does C_1 have to play? And which p maximizes π_2 for C_2 ?

Let's distinguish 2 cases:

Case of C_1 : C_1 can influence π_1 only via q

$$\pi_1(q, p) = q(1-3p) - p + 3$$

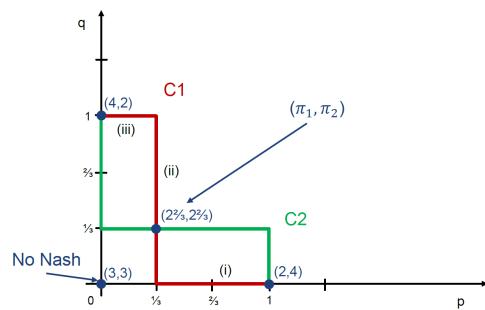
Distinguish 3 cases of p :

- i) $\frac{1}{3} < p \leq 1$ then $\pi_1 = q(1-3p) - p + 3$ is max, if $q = 0$
 $\pi_1(0, p) = -p + 3 \rightarrow 2 \leq \pi_1 < 2\frac{2}{3}$
- ii) $p = \frac{1}{3}$ then $\pi_1 = -\frac{1}{3} + 3 = 2\frac{2}{3}$ is max, if q is "anything":
 $q \in [0, 1] ; \rightarrow \pi_1(q, \frac{1}{3}) = 2\frac{2}{3}$
- iii) $0 \leq p < \frac{1}{3}$ then $\pi_1 = q(1-3p) - p + 3$ is max, if $q=1$
 $\pi_1(1, p) = 4 - 3p - p = 4 - 4p; \rightarrow 2\frac{2}{3} < \pi_1 \leq 4$

Case of C_2 : switch roles of p and q

p - q Diagram

Best responses



Comments:

- This type of game is often referred to "Chicken" or "Hawk-Dove" game. The name is derived from a "sport" in which two drivers race towards each other on a narrow road. Each driver has the option to either swerve or to continue on a collision course.
- In case of multiple equilibria - how to coordinate a particular outcome?
- There can be one, many or no Nash equilibria in pure strategy
- Existence of Nash Equilibrium: In the normal-form game with a finite number of players and each player's strategy set being finite, there exists at least one Nash Equilibrium in pure or mixed strategies.

		Driver 2		
		Jump early	Jump late	Jump too late
Driver 1		Jump early	2, 2 NP	1, 4 P
		Jump late	4, 1 P	3, 3 Nash
		Jump too late	0, 2 NP	0, 3 NP
		Movie		
		0, 0 NP		

P: Pareto
NP: Not Pareto

Example 15: Stag Hunt Situation:

- The "Stag Hunt" is a game extracted from Jean Jaques Rousseau's "A Discourse on Inequality" which introduces the conflict between cooperation and safety.
- In this game, each member of a group of hunters has two options: he may remain attentive to the pursuit of the stag, or he may catch a hare
- If all hunters cooperate to pursue the stag, they catch it and share it equally; if any hunter devotes his energy to catching a hare, the stag escapes, and the hare belongs to the defecting hunter alone
- Each hunter prefers a share of the stag to the hare

If a group of hunters set out to take a stag, they are fully aware that they would all have to remain faithfully at their posts in order to succeed; but if a hare happens to pass near one of them, there can be no doubt that he pursued it without qualm, and that once he had caught his prey, he cared very little whether or not he had made his companions miss theirs.

Interpretation: If one hunter decides to hunt down a hare (does not cooperate) then all other hunters will not be able to hunt down a stag (even if the other hunters cooperate they will not be able to succeed).

Game:

- Players: 2
- Actions of players: Stag, Hare
- Payoffs are presented in the normal form below

		Hunter 2	
		Stag	Hare
Hunter 1	Stag	3, 3	0, 2
	Hare	2, 0	2, 2

		Hunter 2	
		Stag	Hare
Hunter 1	Stag	3, 3	0, 2
	Hare	2, 0	2, 2

Nash Equilibrium 1
and Pareto Optimal

Nash Equilibrium 2
but Pareto Inferior

Figure 6: Pure Strategy

		Hunter 2	$S(p)$	$H(1-p)$
		$S(q)$	3, 3	0, 2
		$H(1-q)$	2, 0	2, 2
Hunter 1	Stag	Stag	3, 3	0, 2
	Hare	Hare	2, 0	2, 2

$3p = 2p + 2(1-p)$
 $3q = 2q + 2(1-q)$

$$p^* = \frac{2}{3}$$

$$q^* = \frac{2}{3}$$

Figure 7: Mixed Strategy

		Hunter 2	Stag	Hare	Min payoff
		Stag	3, 3	0, 2	0
		Hare	2, 0	2, 2	2
Hunter 1	Stag	3, 3	0, 2	0	
	Hare	2, 0	2, 2	2	
	Min payoff	0	2	2	Maxmin payoff: 2 => Security Level: 2 (Hare, Hare)

Figure 8: Security Risk analysis

c4) Solution: Expected utility

If one has no information about the other side's intention then set the probabilities for the other side's strategies all equal; here: $p = 0.5$

		Hunter 2	Stag	Hare
		Stag	3, 3	0, 2
		Hare	2, 0	2, 2
Hunter 1	Stag	3, 3	0, 2	
	Hare	2, 0	2, 2	

Exp utility for H1: in case "stag": $3p + 0(1-p) = 1.5$

in case "hare": $2p + 2(1-p) = 2$

Exp utility for H2: in case "stag": $3p + 0(1-p) = 1.5$

in case "hare": $2p + 2(1-p) = 2$

"hare" higher

than "stag"

Note: By playing "hare, hare" - the Nash equilibrium which is Pareto inferior (!) - both hunters have higher expected utilities than in "stag, stag"

Figure 9: Expected Utility

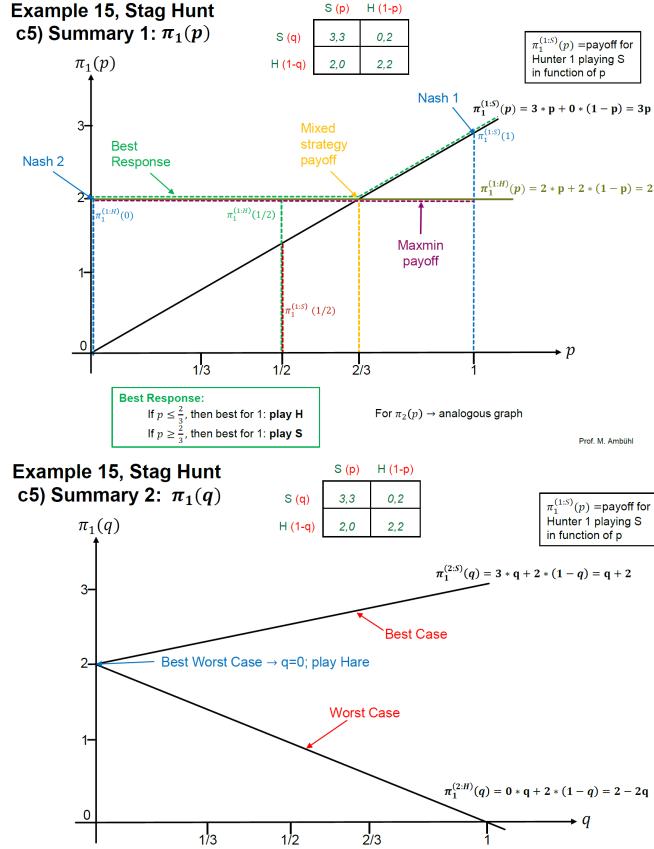


Figure 10: Stag Hunt summary

Example 16: 'Arms race' game Situation:

- Arms race is the process of excessive investment in weapons, military technology and the army. Prominent examples:
 - Great Britain and Germany competed on having the best navy before WWI
 - Nuclear arms race between the US and the SU
- Generally the arms race can be characterized by a country's desire to have a military advantage, whenever the counterparty does not arm. Staying ahead in military terms allows a country to maintain a powerful position.
- Whenever all countries are well armed, no one has an advantage, but the excessive investment may even hurt the economies.

Game:

- Players: 3
- Actions of players: Arm, Disarm
- Payoffs are presented in the normal form below.

		Country 3	
		Arm	Disarm
		Country 2	
Country 1	Arm	-1, -1, -1	1, -3, 1
	Disarm	-3, 1, 1	-1, -1, 2
		Arm	Disarm
Country 2	Arm	1, 1, -3	2, -1, -1
	Disarm	-1, 2, -1	1, 1, 1

Pareto optimal

Comments:

- Example 16 illustrates the "non-cooperative simultaneous move" game in the normal form in case of 3 players.
- Arms race is another example of the Prisoners' Dilemma: Every country is better off when no one increases their military capabilities, but this cooperative outcome is not sustainable as a Nash Equilibrium.

Example: Turkey Greece refugee question

Special Case: Turkey – Greece refugee question

Situation 1

Problem statement:

"Turkey threatens to let asylum-seekers flood into Europe but Greece and the EU are refusing to let them in" (the Economist, 5 March 2020)

Preferences:

- Turkey prefers to let refugees cross over into Greece
- Greece prefers to keep the border closed

Assumptions 1:

- No country wants to take in the refugees
- Greece **does not care about its reputation**

Actions:

- Greece: Open the border (Open)
- Greece: Keep the border closed (Close)
- Turkey: Push the refugees into Greece (Push)
- Turkey: Keep the refugees in Turkey (Keep)

Equilibrium:

This game has a Nash equilibrium at **Close / Push**: this is arguably the **worst outcome** for the refugees in this situation

		Turkey	
		Push	Keep
		Open	Close
Greece (EU)	Push	1, 4	3, 1
	Keep	2, 3	4, 2

Nash equilibrium

Special Case: Turkey – Greece refugee question

Situation 2

Assumptions 2:

- No country wants to take in the refugees
- Greece **cares about its reputation**

Actions:

- Greece: Open the border (Open)
- Greece: Keep the border closed (Close)
- Turkey: Push the refugees into Greece (Push)
- Turkey: Keep the refugees in Turkey (Keep)

Equilibrium:

This game has a Nash equilibrium at **Open / Push**: this is arguably the **best outcome** for the refugees in this situation

		Turkey	
		Push	Keep
		Open	Close
Greece (EU)	Push	2, 4	3, 1
	Keep	1, 3	4, 2

Nash equilibrium

Example

17 Camels should be distributed to 3 children according to the following distribution:

- $\frac{1}{2}$ goes to the oldest son

- $\frac{1}{3}$ goes to the middle son
- $\frac{1}{9}$ goes to the youngest son

Solution: Camel

Comparison of the options:

Will: original distribution according to the will

Δ : difference to the will

Opt. 1: wise-man distribution

Opt. 2: rounds up optimum without a "fourth person"

Opt. 3 a: distribution where a camel of the older son is given to the "fourth person"

Opt. 3 b: distribution where a camel of the middle son is given to the "fourth person"

Opt. 3 c: distribution where a camel of the younger son is given to the "fourth person"

The table below summarizes the "shares of camels" received by each of the brothers and the imaginary fourth participant for all options. Observe now that the wise-man's proposal (Opt.1 [and Opt.2]) provides the largest deviation from the actual Father's will; the distribution Opt.3 a gives the smallest error (for integer options), Opt.1 and 2 the largest error.

Person	Exact will	Opt. 1	Δ	Opt. 2	Δ	Opt. 3 a	Δ	Opt. 3 b	Δ	Opt. 3 c	Δ
Older Son	$8\frac{1}{2}$	9	$\frac{1}{2}$	9	$\frac{1}{2}$	8	$\frac{1}{2}$	9	$\frac{1}{2}$	9	$\frac{1}{2}$
Middle Son	$5\frac{2}{3}$	6	$\frac{1}{3}$	6	$\frac{1}{3}$	6	$\frac{1}{3}$	5	$\frac{2}{3}$	6	$\frac{1}{3}$
Younger Son	$1\frac{8}{9}$	2	$\frac{1}{9}$	2	$\frac{1}{9}$	2	$\frac{1}{9}$	2	$\frac{1}{9}$	1	$\frac{8}{9}$
"Fourth Person"	$1\frac{17}{18}$	0	$\frac{17}{18}$	0	$\frac{17}{18}$	1	$\frac{1}{18}$	1	$\frac{1}{18}$	1	$\frac{1}{18}$
Total "Error"	0		$1\frac{8}{9}$		$1\frac{8}{9}$		1			$1\frac{3}{9}$	$1\frac{7}{9}$

Figure 11: Solution to the Camel problem

Dynamic Games

- Contrary to a static game, in a dynamic game players take action over time.
- A static game can be seen as one 'one-shot' game, whereas in a dynamic game a player can move more than once.
- We will consider dynamic games of perfect information, i.e. games in which each player, when taking an action, is perfectly informed of all the events that have previously occurred.

Sequential move games

- In sequential move games players have some knowledge about earlier actions of the game, i.e. decisionmaking happens sequentially - one player takes his action before the other does.

Example 17: 'Nuclear deterrence' game

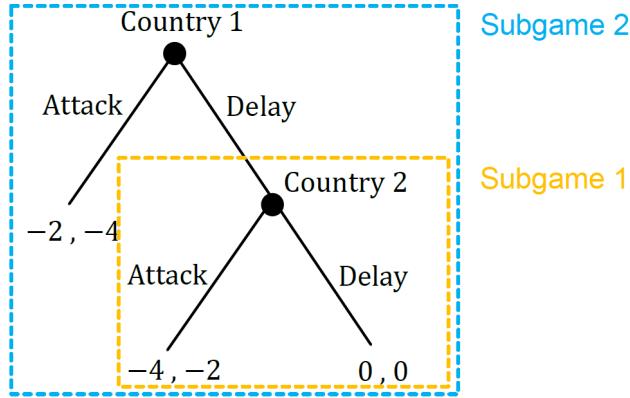
a) Situation in words:

- During the Cold War, the US and SU had big nuclear arsenals and neither side could 'disarm' the other side with just the first nuclear strike - each side secured second strike capabilities - both could have responded to any nuclear strike with a devastating retaliatory strike (e.g. from submarines)
- Knowing this, consider now the situation where one country decides first whether to launch an attack or to delay it. In case it delays an attack, the second country can make its own decision whether to attack or not.
- When both countries delay an attack, the status quo is preserved
- Whenever there is an attack, both aggressor and defender suffer from the nuclear war, however there is a slight first-mover advantage in comparison to the defender.

b) Game

(i) Players: 2

- (ii) Strategies of players: Attack, Delay
- (iii) Sequence of moves is shown in the extensive form game (e.g. in the game tree)
- (iv) Payoffs are given in the terminal nodes (i.e. places where the game tree ends).



c) Solution

c1) Some definitions:

- (1) A subgame is a part (sub-tree) of a game that satisfies the following conditions:
 - a) It begins at a decision node (for any player)
 - b) The player knows all the decisions that have been made up until that time
 - c) The sub-tree contains all the decision nodes that follow the initial node (and no other)
 Example: There are two subgames in Example 17
- (2) A strategy is a rule for choosing an action at every point that a decision might have to be taken by the player. A strategy is a complete plan of actions.

c2) Backwards Induction and Subgame Perfect Nash Equilibrium

- The most common way of solving dynamic games is through backwards induction. In this procedure, the last player to act at each node chooses the action that maximizes his utility (i.e. the Nash Equilibrium)
- The second to last player then chooses his action optimally, knowing that the last player chooses optimal actions at each node. This process continues until each player has chosen optimally under the assumption that all future players make optimal choices.
- Applying backwards induction always results in a pure strategy Nash Equilibrium (i.e. there is always at least one Nash Equilibrium in pure strategy)
- The resulting equilibrium is called a *Subgame Perfect Nash Equilibrium* as it induces a Nash Equilibrium in every subgame of the whole game.
- The concept of subgame perfection was formulated by Reinhard Selten.

c3) Solution to example 17:

In Subgame Perfect Nash Equilibrium both countries decide to delay.

d) Comments:

- This model assumes the order of moves: First is Country 1 and second is country 2. (In reality, however, both countries can pretend to be the first to move and both countries can be unsure whether delaying a move will transition to the status quo or give the other side the opportunity to launch its own strike.)
→ More elaborate games (e.g. game with imperfect information) may be better suited for analysis.
- Subgame Perfect Nash Equilibrium is a more suitable solution concept for dynamic games than just Nash Equilibrium - it rules out some 'unrealistic' Nash Equilibrium predictions (see Exercise Session)

Example 18: 'Political crisis' game

a) Situation:

- In a country there is a conflict between the government and the opposition.
- The Government has now the choice between proposing a broad package of reforms or escalating the conflict by calling in the army
- In case the reforms are proposed, the opposition can decide whether to accept them or to continue the protests.
- In case the military option is chosen, the opposition decision is reduced to either giving-in or resisting.

b) Game:

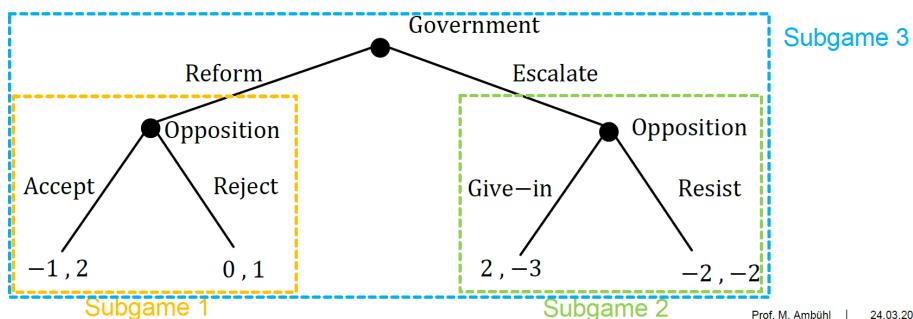
(i) Players: 2

(ii) Action of players:

- Government: Reform, Escalate
- Opposition:
 - In the case of Reform is chosen: Accept, Reject
 - In the case of Escalate is chosen: Give-in, Resist

(iii) Sequence of moves is shown in the extensive form game (e.g. in the game tree)

(iv) Payoffs are given in the terminal nodes.



c) Solution:

Subgame Perfect Nash Equilibrium:

- Government: Plays Reform strategy (Because, if they play Escalate, the opposition will play Resist)
- Opposition: Plays Accept, if Reform is observed and plays Resist, if Escalation is observed from the government side

d) Comment

- Example 18 illustrates the concept of a strategy in a dynamic game. A strategy is a complete list of actions. Thus it prescribes an optimal action even in the decision nodes, which are not reached by the equilibrium play of the game.

Repeated simultaneous move games A repeated game consists of some number of iterations of a simultaneous move game (i.e. the stage game). A repeated game can be either finite (i.e. with a finite number of repetitions) or infinite (e.g. without a time horizon).

Example 19: 'Infinite interactions' game

a) Situation:

- Recall: In Example 13 the Nash Equilibrium was when both sellers chose low prices. However, if both choose high prices, both will win. (See Example 13)
- In reality, competing sellers meet each other every day, i.e. they play the game from Example 13 many times in a row, possibly an infinite amount of times.
- Can the Pareto efficient outcome be achieved, if the game is repeated infinitely many times?

b) Game:

- (i) Players: 2
- (ii) Actions of players in each stage of the game: high, low
- (iii) Discounted Payoffs:
 - Each seller discounts his future payoff - discount factor $0 < \delta < 1$
 - Total payoff to player i is $\sum_{t=0}^{\infty} \delta^t \cdot r_i(t)$ where $r_i(t)$ is a payoff received in stage t .

c) Solution

c1) Concept:

- In every stage of the game players can choose an action: High or Low price
- There are several tactics that players should play depending on the history of the game. One of them is the so called "Grim Trigger" strategy. This strategy is specified as follows:
 - start by setting High price (i.e. cooperate with the other player)
 - continue with High price until either player sets Low price (i.e. until you or him defect)
 - then set Low price forever.

c2) Solution to Example 19:

- Suppose Seller 2 sticks to the Grim Trigger strategy, then if Seller 1 sets the High Price, it will establish a cooperation in the long run. This generates flow of utility $\sum_{t=0}^{\infty} \delta^t \cdot 300 = \frac{300}{1-\delta}$
- Suppose now Seller 1 decides to deviate in the first stage and sets the low price (which brings him an immediate return of 500). According to the Grim Trigger strategy, Seller 2 will set the low price in the next round. This generates flow of utility: $500 + \sum_{t=1}^{\infty} \delta^t \cdot 250 = 500 + \frac{250\delta}{1-\delta}$
- Neither of the sellers will find it profitable to deviate if: $\frac{300}{1-\delta} > 500 + \frac{250\delta}{1-\delta}$, or $\delta > \frac{200}{250} = 0.8$

Example 20: Repeated Prisoners' Dilemma

There are other strategies which achieve cooperation; one of the most successful strategies in experiments was "Tit-for-Tat".

- In negotiation you often have multiple phases/rounds.
- "Tit for Tat" strategy ("As you do unto me, so I do unto you") is a famous strategy (in game theory) for repeated games, developed by Anatol Rapoport for an experiment by Robert Axelrod:
 - begin by playing cooperatively
 - then do whatever the other player did in the last stage
- "Tit for Tat" is a remarkably good and robust strategy for playing iterated Prisoner's Dilemma.
- Such a strategy should follow these principles:
 - Nice: Start by cooperating, and never be the first to defect
 - Retaliation: Reliably punish defection by the opponent
 - Forgiving: If you punish defection, be willing to try to cooperate again.
 - Clear: The pattern should be consistent and easy to predict (by the opponent)
- It is a cooperation strategy of "friendly reciprocity"

4.3.2 Cooperative Games

Introduction Concept: Players talk to each other to decide on a reasonable or fair outcome and agree to implement the decision.

Example 21: 'Rose and Colin' game

a) Game

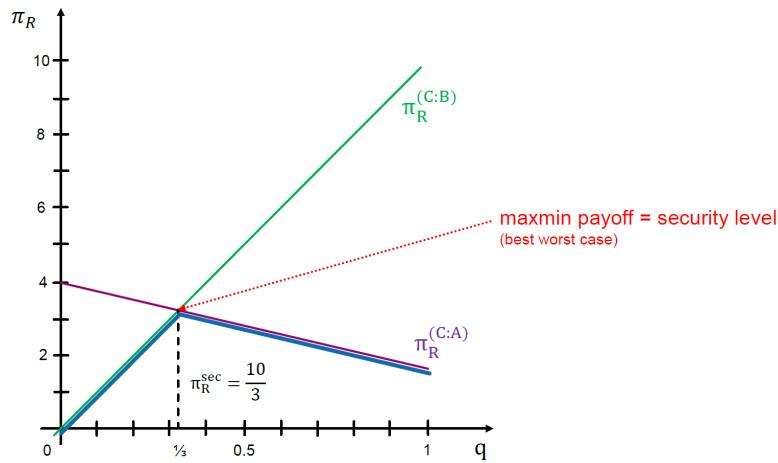
- (i) Players: 2
- (ii) Action of players: A, B
- (iii) Payoffs: Preferences are summarized in the normal form below:

		Colin	
		A	B
Rose	A	2, 6	10, 5
	B	4, 8	0, 0

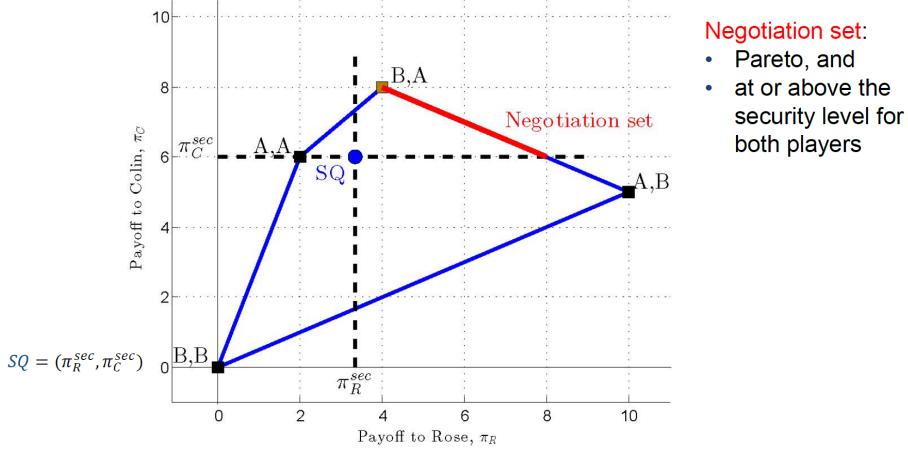
b) Solution

- b1) Non-cooperative approach: Nash Equilibrium in the bottom left corner. Observe: Colin has a dominant strategy A . This strategy guarantees him a payoff of 6.
 - b2) Security levels: Security strategy is the strategy which guarantees the minimum payoff for a player, when he plays non-cooperatively.
 - Colin's security level: Recall, Colin has a dominant strategy - strategy A ; it guarantees him a security level payoff $\pi_C^{sec} = 6$
 - Rose's security level: Suppose Rose plays A with probability q and B with $(1 - q)$. Her expected payoffs are:
 - If Colin plays A : $q \cdot 2 + (1 - q) \cdot 4$
 - If Colin plays B : $q \cdot 10 + (1 - q) \cdot 0$
- We obtain her maximum strategy $q^{sec} = \frac{1}{3}$. This gives her a security level payoff $\pi_R^{sec} = q^{sec} \cdot 2 + (1 - q^{sec}) \cdot 4 = \frac{10}{3}$

$$\begin{aligned}\pi_R^{(C:A)} &= q \cdot 2 + (1 - q) \cdot 4 && \text{if Colin plays A} \\ \pi_R^{(C:B)} &= q \cdot 10 + (1 - q) \cdot 0 && \text{if Colin plays B} \\ && \text{line of Rose's payoff in the worst case}\end{aligned}$$



b3) Payoff Polygon:



Question: What would be a fair outcome for Rose and Colin? Could we choose, within the range of the negotiation set, a single outcome as the fairest?

Nash axioms for a fair outcome

AXIOM 1: Rationality - the solution point should be in the negotiation set

AXIOM 2: Linear invariance - if either Rose's or Colin's payoffs are transformed by a positive linear function, the solution point should be transformed by the same function.

AXIOM 3: Symmetry - if the polygon happens to be symmetric about the line of slope +1 through SQ , then the solution point should be on this line.

AXIOM 4: Independence of irrelevant alternatives - suppose NBS is the solution point for a polygon P with status quo point SQ . Suppose Q is another polygon which contains both SQ and NBS , and is totally contained in P . Then NBS should also be the solution point for Q with status quo SQ .

Nash Bargaining Solutions (NBS) There is a one and only arbitrary scheme which satisfies Axioms 1-4.

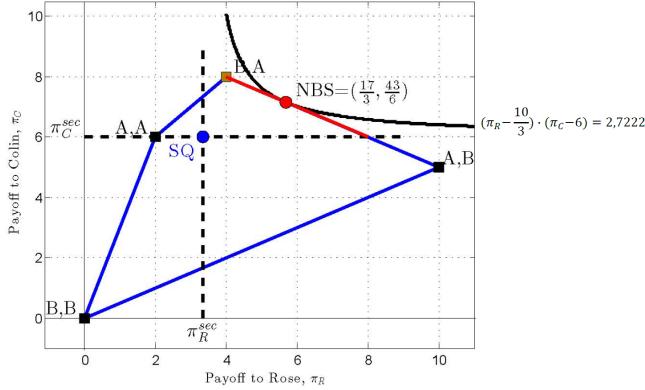
- if $SQ = (\pi_R^{\text{sec}}, \pi_C^{\text{sec}})$, then arbitrated solution point NBS is the point (π_R, π_C) in the polygon with $\pi_R \geq \pi_R^{\text{sec}}$, $\pi_C \geq \pi_C^{\text{sec}}$
- which maximizes the product: $(\pi_R - \pi_R^{\text{sec}}) \cdot (\pi_C - \pi_C^{\text{sec}})$

Meaning, for our problem, we need to solve

$$\max_{\pi_R, \pi_C} \left\{ \left(\pi_R - \frac{10}{3} \right) \cdot (\pi_C - 6) \right\}$$

subject to

$$\begin{aligned} \pi_C &= -\frac{1}{2}\pi_R + 10 \quad (\text{equation for negotiation set line}) \\ \pi_R &\geq \frac{10}{3} \\ \pi_C &\geq 6 \end{aligned}$$



Threats and alternations of SQ2

- Players may try to influence the outcome of the NBS by using threat strategies, e.g.: "If negotiations breaks down, I will pay the following strategy, which will be bad for you!" In our example: "I will play A if the negotiations break down."
- By doing this, Colin would only get 6 (playing A) instead of 8.
- However, Rose would have lowered her SQ from $\pi_R^{sec} = 3\frac{1}{3}$ to $\pi_R^{sec} = 2$
- What would happen?



Dealing with threats in negotiation

Strategies that are likely to fail:

- Striking a direct counterattack: your threats may not be sufficiently credible or could launch an uncontrollable conflict escalation
 - However, in situations where your aggressor only responds to aggression, a counterattack can establish your credibility. In such situations, issue a reasonable counter threat and then immediately proceed to identify each other's interests to prevent conflict escalation
- Concede immediately: that would reinforce his/her domineering tactics.

DEAL approach offered by the Harvard Program on Negotiations

1. Diagnose the threat:
 - Remove yourself from the situation: physically and psychologically
 - Consider the motivation behind the threat > to determine your response:
 - The victim: your counterpart is feeling frustrated or offended, the threat might have emerged from his/her need to be acknowledged
 - The pragmatists: your counterpart is straight forward, the threat is informing you of his/her real constraints or strong outside alternatives.
 - The bluffer: your counterpart is feeling insecure, the threat is rather a trick
2. Express understanding
 - Listen to your counterparts grievances and acknowledge them, but be careful not to offer concessions to > to help reduce tension and further threats.

3. Ask questions

- Ask questions about the needs and alternatives of the counterparty to find new solutions to his/her concerns, rather than giving in to surface demands > to determine if ZOPA exists and find solutions that are better than BATNA for both.

4. Label the Negotiation Threat

- If you think the threat is a bluff, then let your counterparty know that > to boost your sense of control in the situation.

4.4 Summary

	Ex.9	Ex. 10	Ex. 11	Ex. 12	Ex. 13 Prisoners' dilemma; Maroni Game; Arms Race	Ex. 14 'Mobilization'; 'Chicken'; 'Hawk-Dove'	Ex. 15 Stag Hunt Game	Ex. 16 Prisoners' dilemma; Maroni Game; Arms' Race	Ex. 17 Deterrence Game	Ex. 18	Ex. 19 Repeated Maroni Game	Ex. 20 Repeated Prisoners' dilemma Game	Ex. 21 Cooperation Game
Number of players	2	2	2	2	2	2	2	3	2	2	2	2	2
Number of strategies	2x2	4x4	2x2	2x2	2x2	2x2	2x2	2x2x2	2x2	2x4	2x2	2x2	2x2
Payoff structure	Zero-sum	Zero-sum	Zero-sum	Zero-sum	Non-constant sum	Non-constant sum	Non-constant sum	Non-constant sum	Non-constant sum	Non-constant sum	Non-constant sum	Non-constant sum	Non-constant sum
Solution concept	Maxmin (or Nash)	Maxmin (or Nash)	Nash Eq.	Nash Eq.	Nash Eq.	Nash Eq.	Nash Eq. (for non-coop.); Nash Bargaining Solution (for coop.)	Nash Eq.	Nash Eq.	Nash Eq.	Nash Eq.	Nash Eq.	Nash Eq. (for non-coop.); Nash Bargaining Solution (for coop.)
Remark	Saddle Point	Saddle Point	Nash Eq.	No Nash Eq. in pure strategies	Nash Eq. ≠ Pareto Optimal outcome	2 Nash Eq. in pure strat. + 1 Nash Eq. in mixed strat.	To find security levels one may use maxmin approach	Nash Eq. ≠ Pareto Optimal outcome	Subgame Perfect Nash Eq.	Subgame Perfect Nash Eq.	Discounting payoffs	Tit for Tat	To find security levels one may use maxmin approach
Order of moves	Simultaneous	Simultaneous	Simultaneous	Simultaneous	Simultaneous	Simultaneous	Simultaneous	Sequential	Sequential	Sequential	Repeated simultaneous	Repeated simultaneous	Simultaneous



Non-cooperative game: Players decide their decisions individually, without cooperation with the other players.
Cooperative game: Players decide jointly knowing that the implementation of the decision is enforceable.

Static game: A decision is made by each player once and for all, and each player has no knowledge of the decision made by the other players before making his own decision, i.e. decisions are taken simultaneously.

Dynamic game: Players have some knowledge about earlier actions in the game, i.e. decision-making happens sequentially.

Zero-sum (constant-sum) game: the sum of payoffs for each outcome is zero (or another constant), i.e. what you get is what I lose. Examples: dividing surplus.
Non-zero-sum game: a game which is not a zero-sum game. Examples: "Prisoners' dilemma", "Joint project", etc.

Mixed strategy is a randomization over a combination of pure strategies, i.e. you choose your action according to certain probability distribution.

Pure strategy is one in which there is no randomization.

Dominant strategy is one if regardless of what any other players do, the strategy earns a player a larger (or not smaller) payoff than any other.

Security level strategy is the strategy which guarantees the minimum payoff for a player, when he plays non-cooperatively.

Saddle point is an outcome in a zero-sum game with two players if the entry at that outcome is both less than or equal to any entry in its row (i.e. in payoffs to player 1), and less than or equal to any entry in its column (i.e. in payoffs for player 2).

In **Nash Equilibrium**, given the strategy adopted by the other player, neither player could do strictly better (i.e. increase his payoff), by adopting another strategy. In a Nash Equilibrium no one has an incentive to deviate unilaterally from the equilibrium strategy. The strategies adopted by players are best responses.

Outcome is **Pareto optimal** if there is no other outcome that increases the payoff to one player without decreasing payoff to another player.

A **Pareto improvement** is a measure (change of strategy-combinations) that harms no one and increases the payoff of at least one player. If an outcome is **Pareto optimal** then no more Pareto improvements are possible. An outcome is **Pareto-inferior** if a Pareto improvement is possible.

Nash Bargaining Solution: an arbitration scheme which gives Pareto efficient division of utilities.

Figure 12: Important Definitions in Gametheory

Important Definitions

Recommendations

- Define the key elements of the game:
 - Who are the players?
 - Which actions and strategies does each player have?
 - How do the combinations of the strategies played determine the final payoff?
- When you don't know what to do - think of maximizing your minimal gain!

- Never play a dominated strategy, play the dominate strategy (if such a one exists)
- Calculate your and your opponents' best responses!
- Think carefully of your threat strategies to push opponents towards cooperation!

Benefits and limits of models If

- i there are at least two players: a player may be an individual, but it may also be a more general entity like a company, a nation, or even a biological species.
- ii each player has a number of possibilities, i.e. courses of action, which he may choose to follow.
- iii The strategy chosen by each player determine the outcome of the game.
- iv Payoffs are associated to each possible outcome of the game in a collection of numerical payoffs, one to each player; these payoffs represent the value of the outcome to the different players.

then a game theoretical approach to the problem at hand is possible.

Comments

- Game theory is a powerful tool for the generation of insights into problems.
- Game theory needs a considerably high level of abstraction - in order to allow for sensible propositions; in difficult problems the complexity may often not be reduced to a level which would allow the use of a game theoretical approach.
- Often it is specifically useful for ex post analysis

5 Negotiation Engineering

5.1 Concept

Definitions

- Negotiation: "A formal discussion with someone in order to reach an agreement"
- Engineering: "The study of using scientific principles to design and build machines, structures, and other things"
- Engineering method: "The strategy for causing the best change in a poorly understood or uncertain situation within the available resources." Characteristics:
 - Solution oriented
 - Looking for an answer (not the answer)
 - In relation to existing constraints
 - Valuating different options
 - Mathematical language
 - Heuristic techniques
 - * Rule of thumb
 - * Strategy
 - * Trick
 - * Simplification
 - * Or any other mean reducing time needed to solve a problem
- Negotiation Engineering: "We define Negotiation Engineering as a solution-oriented approach to negotiation problems that uses quantitative methods in a heuristic way to find an adequate solution." It is an approach to bring scientific methods into practice and a sort of convex combination between "Game theory" and "Harvard method".

The Method Application of engineering method/reasoning to negotiation. It is based on four principles:

- a. Decomposition
 - Division in sub and sub-sub problems
 - Reduction of complexity
 - Allow identification of underlying key problems
- b. Formalization
 - Translation of critical sub-problem into mathematical language
 - Thereby: reduction of problem to its most formal structure
- c. Mathematical Method
 - If the problem is stated in mathematical language one can access a variety of existing mathematical tools:
 - game theory
 - mathematical optimization
 - statistics
 - etc.
- d. Heuristics
 - Experience-based techniques
 - Not guaranteed to be optimal
 - But good enough for the given situation

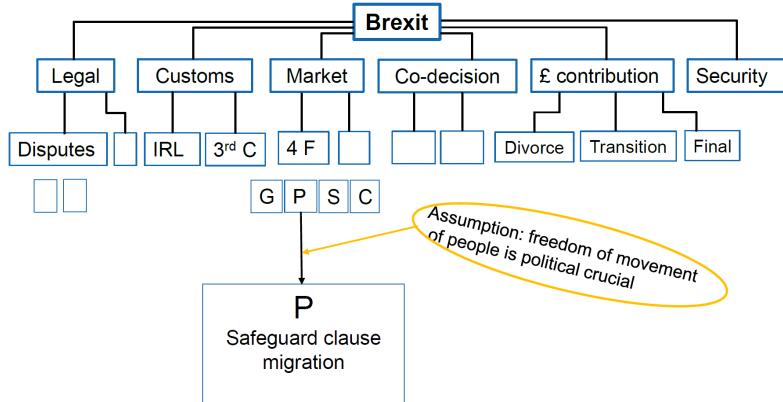


Illustration Brexit negotiation with negotiation engineering

Safeguard Clause Migration

- Possible model that combines the EU free movement of persons principle with the ability to regulate the flow of migration in specific cases.
- Inspired by the abstract existing safeguard clause [Art. 14(2)] in the bilateral agreement Switzerland-EU.

Article 14 - Joint Committee

In the event of serious economic or social difficulties, the Joint Committee shall meet, at the request of either Contracting Party, to examine appropriate measures to remedy the situation. The Joint Committee may decide what measures to take within 60 days of the date of the request. This period may be extended by the Joint Committee. The scope and duration of such measures shall not exceed that which is strictly necessary to remedy the situation. Preferences shall be given to measures that least disrupt the working of this Agreement.

- A more concrete safeguard clause could be formulated.
- In the form of a clear trigger and well described measures.

On the Trigger

- If the net migration is significantly higher than the average, the safeguard clause will be triggered.
- This trigger point could be defined by the following formula:

$$d_i = m + \alpha_i \beta_i \gamma_i 2\sigma$$

with m = average migration, α_i = current relative number of EU citizens in state i , β_i = current relative number of third country citizens, γ_i = unemployment factor and $2\sigma = 2 \cdot$ standard deviation

- If the net migration of the country is larger than d_i , the safeguard clause is triggered.

As an Example Net migration "EU-25" per 1000 inhabitants:

- Threshold UK: 148'824
- Actual UK: 160'421
- UK would have been allowed to activate safeguard clause because actual migration is larger than threshold.

Generalizability of Negotiation Models

- A key issue in the study of negotiations is the analysis of commonalities across different negotiation contexts and the question to what extend an approach can be generalized and applied to different negotiation cases.
- To contribute to this objective, abstract models are used to draw general conclusions about generic negotiation situations.
- Mathematics provides a powerful instrument for modeling complex problems. However, if such models remain on a high level of abstractness, their usefulness in complicated real-world negotiations is often reduced.
- Illustration with a generalized formulation of a "give-and-take" negotiation in the form of a mathematical program.
- In the negotiation, the actors want to find a common solution that ideally maximizes a combination of the utility function, a sort of joint welfare function.
- Nash proposed a convincing concept in the form of a mathematical program: maximize the product of the utilities, which are subject to the negotiation set (Pareto optimal and above levels).
- Maximize a function, subject to a set of constraints. Nash proved: this solution satisfies four axioms that define a reasonable negotiation solution.
- We generalize Nash's Bargaining solution with his concept of a combined utility function F_p , and model the negotiation as follows:
 - A number of \bar{a} actors ($\bar{a} \geq 2$) negotiate over a set of issues $I = \{i \mid i = 1, \dots, \bar{i}\}$
 - We assume that the actors agree to split the complex negotiation into \bar{p} phases ($p = 1, \dots, \bar{p}$), in each of which a part of the issue $I_p \subseteq I$ is negotiated and brought to a conclusion.
 - For all the different issues i , each actor has a utility function $u_{a,i}$
 - Each actor has a set of constraints C_a limiting his scope of actions and defining the area of a possible solution for actor a .
 - The intersection of all constraints C_a forms a zone of possible agreement (ZOPA), where the solution of the negotiation problem must be an element of the feasible region $C_1 \cap \dots \cap C_a$
 - In a world of rational, far-sighted actors, each actor a tries to maximize his or her utility u_{pa} in every phase p . The utility of actor a in phase p is $u_{pa} = \sum_{i=1}^{\bar{i}} \beta_{a,i} u_{a,i}$, $i \in I_p$, where $\beta_{a,i}$ is a weighting factor, weighting the importance of issue i for actor a .
 - Model of Nash's concept of combined utility function F_p

$$\begin{aligned} & \max F_p(u_{p1}, \dots, u_{pa}, \dots, u_{p\bar{a}}) \\ & \text{s.t. } u_{pa} \geq u_{pa}^{sec} \quad \forall a \\ & \quad u_{p1}, \dots, u_{pa}, \dots, u_{p\bar{a}} : \text{Pareto} \end{aligned}$$

where

$$F_p(u_{p1}, \dots, u_{pa}, \dots, u_{p\bar{a}}) = \prod_{a=1}^{\bar{a}} (u_{pa} - \alpha_a u_{pa}^{sec})$$

α_a is a weighting factor, weighting the importance of actor a

u_{pa}^{sec} is security level of actor a in phase p

- As soon as all phases are completed, each actor checks the overall result and, if not satisfied, asks to re-negotiate the crucial phase until eventually everything is agreeable → iterative process
- Even though this process could go through many iterations in theory, in practice, the time consuming and burdensome re-opening of a closed phase does not often happen (e.g., in EU membership negotiations, where closed chapters [phases] are rarely re-opened).
- This is a processing combining advantages of a sequential and simultaneous resolution of issues when (i) the number of issues is too large to be negotiated at once, but (ii) the combination of different issues (which are different valued by the actors) allows to trade them off against each other → logrolling/cross-concessions.

- This principle 'nothing is agreed until everything is agreed' allows a re-negotiation of already-concluded phases if the overall result should not satisfy one of the actors. In practice, the acceptance of a 'not so perfect' result in a previous phase can act as a bargaining chip in later phases.

Difficulties in complex negotiations

- Difficult to precisely define the different utility functions
- The mathematical programming problem remains almost unsolvable (the feasible regions are not necessarily convex, and the utility functions are often not even continuous).
- ⇒ Negotiation Engineering tries to overcome these difficulties in real-world application

5.2 Strengths and weaknesses of Negotiation Engineering

Strengths

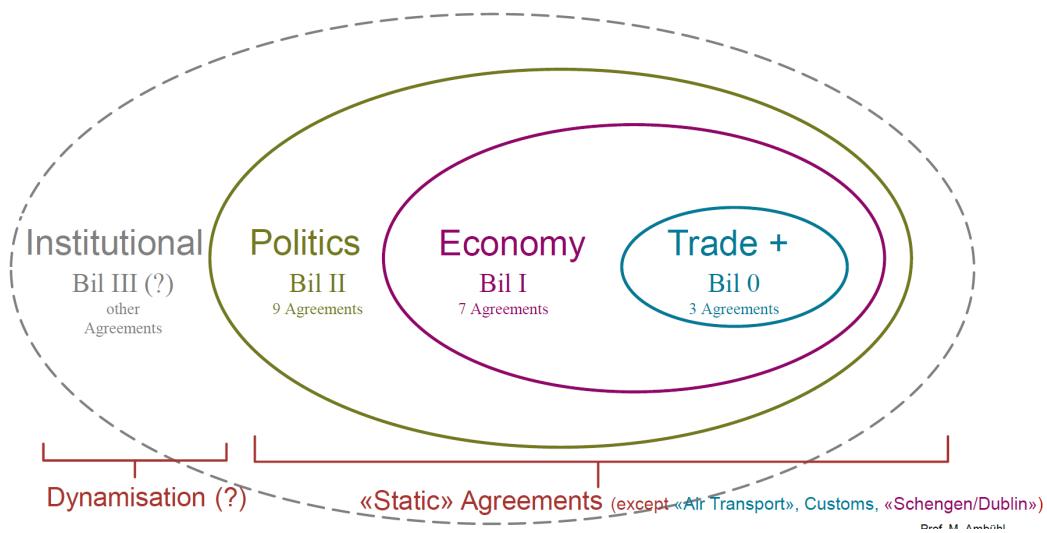
- Revealing the underlying mechanism with mathematical tools.
- Define abstract mechanism without pre-imposing the outcome
- De-emotionalization of the problem

Weaknesses

- It does not concentrate on higher-level factors: it is not strategic, but ("only") technical; no higher-level discussions
- It is not about the search of the answer to a general question
- Formalization is a reduction (leaving out some aspects)
- Not all problems can be quantified

6 Case Studies CH-EU

6.1 Introduction

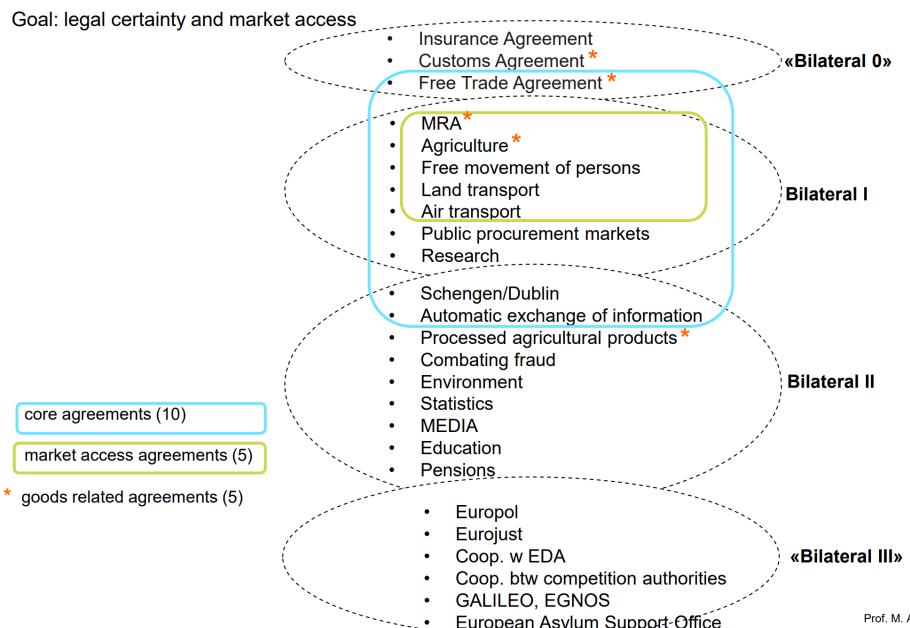


The Swiss Bilateral Approach

Bilateral 0: Free Trade Agreement, Insurance Agreement, custom's Agreement

Bilateral I: 7 sectoral agreements (linked together): Free movement of persons, Technical barriers to trade (MRA), Public procurement markets, Agriculture, Land transport, Air transport, Research.

Bilateral II: 9 sectoral agreements (not linked together): Schengen/Dublin, Taxation of savings, Combating fraud, Processed agriculture products, Environment, Statistics, MEDIA, Education, Pensions.



All in all

- Strong de facto integration
- Good relations through bilateral agreements

New challenges

- Institutional arrangements
- New market access agreements

6.2 Cases

6.2.1 Land Transport Agreement CH-EU (1999)

Background Bilateral I

- Land transport
- Air transport
- Technical barriers to trade
- Public procurement
- Research
- Free movement of persons
- Agriculture

For the first two points declarations to negotiate existed, for the next three where was a common interest and the last two were an EU-demand.

Main challenges in the land-transport negotiations

- Internal: Implementation of the Alpine Initiative Art. 84, Paragraph 2 of the Swiss Constitution: "Transalpine goods traffic shall be transported from border to border by rail."
- External: EU request:
 - Abolishment of 28t-limit
 - No discrimination
- ⇒ Demanded: EU-compatible implementation of the Alpine Initiative.

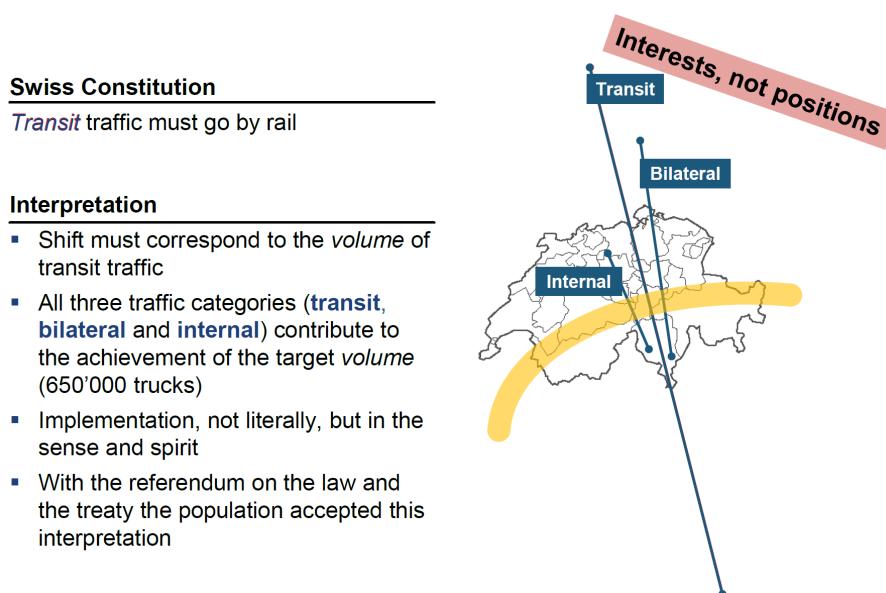


Figure 13: Land Transport

Negotiation challenges

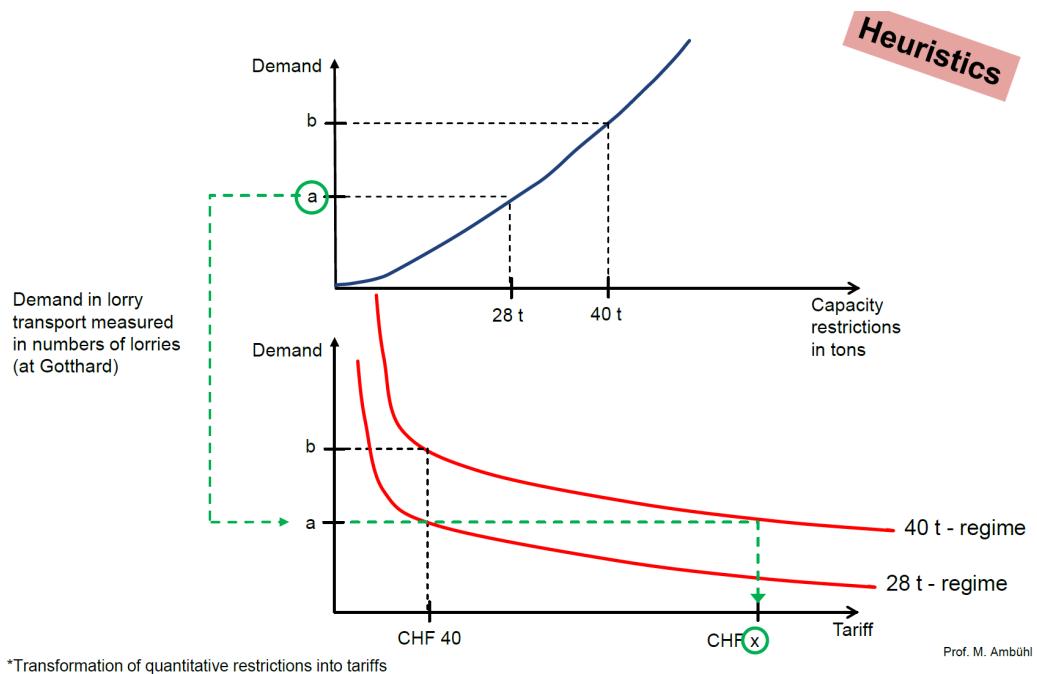
- Complex political and technical question
- Discussion about ways and means to regulate truck traffic
- Consensus: regulation through pricing → tariffs
- Key-question: how to determine the amount?

Negotiation

Swiss proposal Environmental protection via market-based instruments (regulations by means of pricing), rather than by command and control mechanisms (steering by quotas):

- Abolishment of the 28t-Limit (zero quota for 40t trucks)
- Introduction of fees for trucks

Approach 1: Tarification of the weight limit



Approach 2: Internalization of external costs

- CH: CHF 560 for 300 km of a 40 t lorry - internal and external costs
- Good concept, however EU did not like it for economic and political reasons.

Approach 3: Pragmatic approach ("Negotiation Engineering")

- Tariff split
- Weighted average

Main problem: different views on the amount: EU 200 CHF ↔ Switzerland 560 CHF. Solution: Not 1 tariff, but 3 tariffs. Fixed according to ecological criteria. New difficulty: Technological development: Engines (cleaner trucks), Problem of Ökopunkte in Austria. Solution: Weighted averages.

Engine categories	Share of vehicle fleet	Fee	Share of vehicle fleet	Fee	Adjusted fee
Dirty	33,3%	400.-	0%	400.-	
Medium	33,3%	350.-	50%	350.-	375.-
Clean	33,3%	300.-	50%	300.-	325.-
Weighted average		350.-		325.-	350.-

Calculation of fees for a given Weighted Average

- G - weighted average (325.-)
- P - max tariff (380.-)
- x, y, z - fees for lorries (dirty, medium, clean)
- α, β, γ - share of vehicle fleet of lorries (dirty, medium, clean)
- Optimization Problem:

$$\begin{aligned}
 & \max_{x,y,z} (x - z) \\
 & \alpha \cdot x + \beta \cdot y + \gamma \cdot z = G \\
 & x \leq P \\
 & 0 \leq x - y \leq 0.15 \cdot G \\
 & 0 \leq y - z \leq 0.15 \cdot G \\
 & x, y, z \geq 0
 \end{aligned}$$

- Linear optimization problem → simple algorithm.

Comments

- Typical example of "negotiation engineering"
- Phases:
 1. Negotiation of concept: Meccano / "Algebraic solution": a, b, c, \dots, x, y, z etc.
 2. Try to solve as many " a, b, c, \dots " as possible
 3. Leave 2 (max 3) terms open, which can be decided in a final political / high level round
- Search for objective criteria is very useful
- Complicated calculation is sometimes helpful for political reasons: more difficult to criticize.

6.2.2 Negotiation Menu (Bilateral II)

Background

- Four declarations in the Bilateral I:
 - Three joint declarations ("Leftovers")
 - * The Contracting Parties undertake a commence as soon as possible negotiations on the general liberalisation of service provision on the basis of the *acquis communautaire*.

- * The Commission of the European Communities and Switzerland undertake to seek an appropriate solution to the problem of the double taxation of the retirement pension of former employees of institutions of the European Communities resident in Switzerland.
 - * The European Community and the Swiss Confederation declare their intention to undertaking negotiations to conclude agreements in areas of common interest such as the updating of Protocol 2 to the 1972 Free Trade Agreement and Swiss participation in certain Community training, youth, media, statistical and environmental programmes. Preparatory work for these negotiations should proceed rapidly once the current bilateral negotiations have been concluded.
 - One unilateral declaration
 - * Switzerland reaffirms its wish to reinforce cooperation with the EU and its Member States in the area of migration and asylum policy. To this end, Switzerland is willing to participate in the EU system for coordinating asylum applications, and it proposes that negotiations be entered into for the conclusion of a convention parallel to the Dublin Convention (Convention determining the State Responsible for examining applications for Asylum lodged in one of the Member States of the European Communities, signed in Dublin on 15 June 1990).
 - Demand of the EU regarding:
 - Savings taxation
 - Fight against Fraud
- 10 subjects of Bilateral II negotiations. Later reduced to 9, Liberalization of services was dropped.
- CH and EU in the beginning of the "Bilateral II"-negotiation did not agree on the "menu" (i.e. the issue to be negotiated)
 - CH wanted all 10 issues mentioned earlier in one or another form
 - EU wanted only 6 issues in a first phase and, depending on the outcome in the fraude-dossier, eventually a second phase for the 4 issues:
 - * Schengen/Dublin
 - * Services
 - * Education/Youth
 - * Media
 - CH insisted on the parallelism in the negotiations (we learnt our lessons of Bilateral I)
 - EU did not want a parallelism

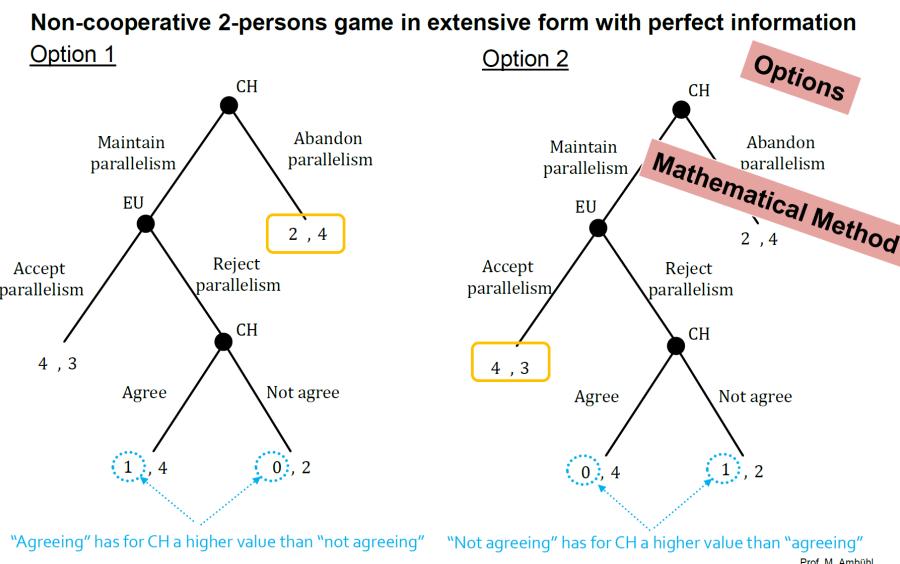


Figure 14: Negotiation

Negotiation

Results

- Switzerland decided on option 2 (insisting on parallelism)
- EU finally agreed, on 17.06.2002, to start the negotiation on all 10 issues
- Berne/Brussels started with the negotiation on 18.6.2002
- Initialed: 25.06.2004
- Signed: 26.10.2004
- Vote: 5.6.2005
- In force: 2005 (different dates for agreements)

Comments

- Rare case, known to me (~20 cases), where a government took a decision (March 2002) based on a game theoretical analysis
- It was to Switzerland's advantage and allowed to include Schengen negotiation
- Game theoretical sensitivity analysis helped to convince the own decision makers and to make the right decision

6.2.3 Schengen Association Agreement

Background

- Schengen and Dublin are integral parts of the EU-Acquis (The EU Acquis are the accumulated legislation, legal acts, and court decisions which constitute the body of EU law.)
- Third country has to take over the whole Acquis; in case of development of the Acquis, the third party has to take over the new Acquis.
- The third party has no decision-making rights, only decision-shaping rights
- In the case where the third country does not take over the new Acquis and the parties do not find a pragmatic solution, then "Guillotine" applies.

Negotiation

- CH accepted the fact that Schengen/Dublin is an integration/dynamic agreement
- However, CH wanted a special exemption regarding the judicial assistance concerning Art. 51 of the "Convention Implementing the Schengen Agreement" (CISA/SDÜ) 1990

Summary Article 51 a) Act is punished with more than 6 months of imprisonment in both contracting parties, A and B. Or: Act is punished with more than 6 months of imprisonment in A, and is prosecuted by administrative authorities in B (with the possibility to appeal to a court which has jurisdiction in criminal matters)

Art.7 Para.5: Unlimited exception to the “Guillotine” clause of Art.7 Para.4

AGREEMENT
between the European Union, the European Community and the Swiss Confederation on the Swiss Confederation's association with the implementation, application and development of the Schengen acquis*

Art. 7, Para.4

4. Where:

(a) Switzerland notifies its decision not to accept the contents of an act [...]

...

[...]

this Agreement shall be considered terminated unless the Mixed Committee, after carrying out a careful examination of ways of continuing the Agreement, decides otherwise within 90 days. Termination of this Agreement shall take effect three months after the expiry of the 90-day period.

AGREEMENT
between the European Union, the European Community and the Swiss Confederation on the Swiss Confederation's association with the implementation, application and development of the Schengen acquis

Art.7 Para.5

5. (a) [...]

...

[...]

Switzerland may notify the Council and the Commission within the period of 30 days referred to in paragraph 2, point (a) that it will not accept or implement those provisions in its internal legal order where they apply to search and seizure requests or orders made for the purposes of investigating or prosecuting offences in the field of direct taxation which, if committed in Switzerland, would not be punishable under Swiss law with a custodial penalty. In that case this Agreement shall not be considered terminated, contrary to the provisions of paragraph 4.

(b) [...]

Figure 15: Results

Results

Comments

- It is important to have reasonable (counter-) demands
 - Co-decision would not have been one
 - Exception of Art. 51 was a border line case
- Thanks to the strong demand of the EU in savings taxation and to the tight line between the subjects made by CH → CH succeeded

6.2.4 Institutional Agreement (Current Case)

Background

- Most bilateral agreements between EU and Switzerland are of static nature; i.e. if the EU-Acquis changes, the bilateral agreements do not change dynamically.
 - Advantages: Switzerland knows what "the rules" are and may reject changes.
 - Disadvantages: EU can withhold changes Switzerland would like to accept and use this as a bargaining chip in order to achieve its goals in other issues.
- EU wants to embed existing bilateral market access-agreements with Switzerland within an institutional framework in order to change the static nature to a dynamic nature and in order to implement a dispute settlement process.
- For the time being, negotiations for corresponding draft agreement (InstA) were "concluded" (EU view) / "suspended" (CH view) in November 2018.
- The Federal Council decided to launch a broad domestic consultation.
- In June 2019, the Federal Council decided to ask for 3 clarifications of the text.
- After these clarifications, the Federal Council is faced with the decision whether to sign the InstA or not.

Negotiations

- EU signaled its interest in changing the bilateral agreement from a static nature to a dynamic nature already over 12 years ago.
- For Switzerland the static nature has certain advantages, nevertheless dynamization remains a major concession.
- EU: most important international partner and with more bargaining power.
- Switzerland could accept dynamization, if safeguards are established: exceptions for areas of vital interest and a truly independent dispute settlement process.
- Hence the Federal Council decided to pursue such negotiations by defining a mandate in 2013.
- In November 2018, the negotiations came to a tentative end in the form of a draft agreement/InstA. Switzerland did neither reject nor accept → domestic consultation.
- CH did not reject it. Reason: EU imposed time limit for the recognition of equivalence of the stock market.

Result We focus on 5 issues:

1. Achievement to negotiate an institutional framework
2. Horizontal joint committee might contribute to foster the political exchange between Switzerland and the EU
3. The dispute settlement process envisages that in case of disputes for which the joint committee cannot find a solution, either party may request to refer the dispute to an arbitration panel. If resolving the dispute requires clarification of a question concerning the interpretation or application of EU law, the arbitration panel refers the matter to the CJEU. The arbitration panel then resolves the matter based on the CJEU's interpretation. As the bilateral agreements are by definition mostly related to EU law, the CJEU's ruling might be decisive in most cases.
4. The so-called "guillotine clause" is further extended within the InstA. (Reminder: the existing guillotine clause connects the 7 agreements of the Bilateral I package.) Should the InstA be terminated, not only will the InstA cease to be in force but also all future market access agreements. Should the parties not be able to agree otherwise within 3 months, the 5 agreements of the Bil I package, which are affected by the InstA will no longer be in force. Due to the existing guillotine clause, the same applies for the remaining 2 agreements of the Bil I package. Furthermore, the same most likely also applies for Schengen-Dublin as this agreement is only possible within a "free movement of person's area". Summarizing: The "default value" is to terminate the mentioned agreements (as opposed to another "default value", which envisages not to terminate the agreements, except if one party actively decides to do so.)
5. In certain areas, which are vital for Switzerland, the negotiations were able to achieve an explicit exception from the dynamization (e.g. land transport) However, other vital areas (e.g. accompanying measures, the state subsidies, Citizen's Rights Directive) were not fully excluded.

Comment Assessment:

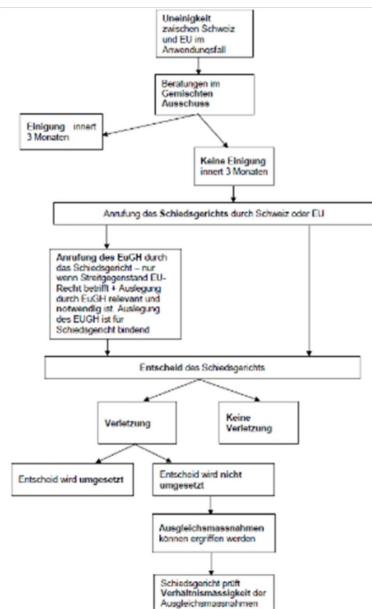
- Generally, it is good for Switzerland to have an institutional agreement in order to consolidate the bilateral path.
- Horizontal joint committee potentially facilitates political dialog.
- The dispute settlement process as designed in the InstA might not be unproblematic: CJEU is the court of one party. In international law it is rather unusual that a party subjects itself to the jurisdiction of the other party (even if this court might be a well-reputed one).
- The extension fo the guillotine clause is no longer politically legitimate in a dynamic framework, which foresees the introduction of "rebalancing measures".
- Based on domestic consultation process, the protection of salaries is not sufficient; the Union Citizens' Rights Directive is considered, by certain circles, to be problematic.

Our propositions:

- Exceptions of dynamization in vital areas
- Simplified dispute settlement process (inspired by existing CH-EU custom's agreement of 2009)
- No extension of guillotine clause but elimination or relativization.

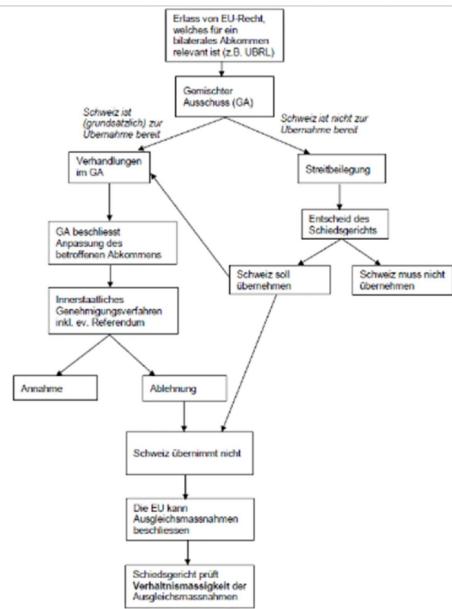
Ad dispute settlement process:

Wrong interpretation of old EU-law:

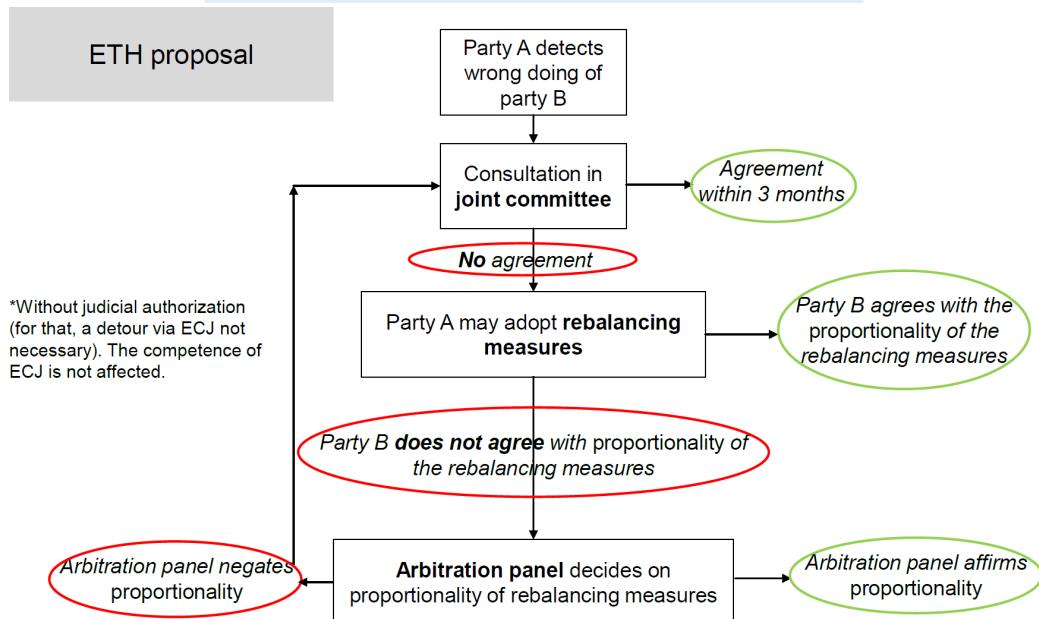


Dispute settlement process according to InstA

Non-adoption of new EU-law:



Simplified dispute settlement process for both cases:



Summary of our assessment

- A framework agreement is desirable.
- The present draft agreement has deficiencies, which narrow the domestic political acceptance.

- According to us, if the Swiss Government would conclude that the probability of a rejection in a Swiss referendum is higher than the acceptance, then it should not sign the draft agreement. A no vote by the Swiss population does more damage to our bilateral relations than a suspension of the negotiation on the level of the negotiators.
- In such a case, both sides should concentrate on an Interim Agreement with concrete positive measures.

InstA follow up (2021)

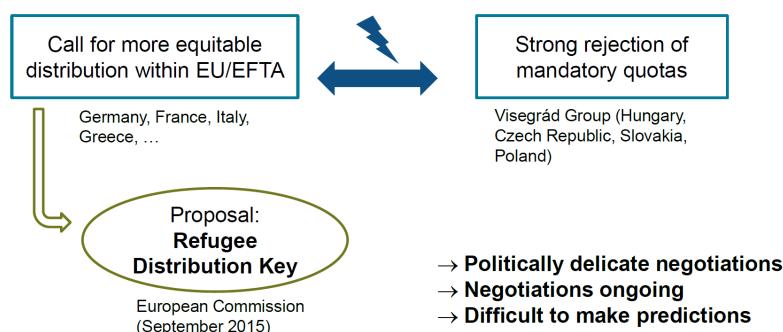
- The meeting between Swiss President Guy Parmelin and Com President von der Leyen on 23.4.21 in Brussels has brought clarity.
- There exists some substantial differences regarding salary protection, right of citizens of the Union, (and to a lesser extend, subsidies)
- What to do? 3 Options
 - Continue the negotiations and potentially sign the agreement
 - Stop the negotiations without Plan B
 - Stop the negotiations with a Plan B
- Concerning the Plan B:
 - (i) Unilateral offer after stopping the negotiations
 - (ii) bilateral agreement, may be an "InstA light"
 - * dynamization, with 2 "opt outs" (salary protection, UBRL)
 - * simplified dispute settlement acc to our ETH model
 - * cohesion payment's increase
 - * new agreements: electricity, research, health
 - * review clause

6.2.5 Refugee Distribution

Background

- EU is currently dealing with the largest refugee crisis since WW2; Germany alone has received 1.1 Mio refugees in 2015.
- EU and EFTA have a common asylum policy governed by the Dublin III Regulation (except for Denmark); this regulation essentially obliges refugees to apply for asylum in the EU/EFTA state in which they first enter.
- ⇒ Strong asylum pressure for several Southern European states (=entry points for most refugee routes)

Negotiation Strong opposing position within the EU/EFTA:



Result Regulations made with mathematical methods. The distribution key formula determines, for each state, the fraction of all asylum applications that it has to deal with. It is based on the following four influencing factors:

1. GDP
2. Population Size
3. Corrective factor: Average number of asylum applications per one million inhabitants over the preceding five years
4. Corrective factor: Unemployment

Press Release European Commission (September 2015): "Corrective factors for the average numbers of asylum applications and unemployment rate are applied inversely, meaning that high existing asylum application numbers and a high unemployment rate would result in fewer individuals being relocated to a member state".

The conclusion is incorrect. The formula was wrong.

Fact (undesired property)

- Some states with comparably high unemployment and high number of past asylum applications per capita receive a higher quota than if the two corrective factors were not taken into account.
- Conversely, states with comparably low unemployment and few past asylum applications per capita may actually benefit from a diminished asylum burden due to the corrective factors.
- Key reason for the undesired properties: Population size and GDP are treated in the same way as unemployment and past asylum applications.

Comment

- The European Commission's approach is a classical example for negotiation engineering
- Their formula however suffers from an international inconsistency. This can be seen by a heuristic argument and data analysis.
- Keep formulas simple and transparent and apply sanity checks to ensure their consistency (engineering mindset)

A detailed account of the described inconsistency as well as proposal for an alternative distribution key can be found in (to appear in "European Union Politics").

6.3 Conclusions

1. Negotiations with EU are bilateral and multilateral and most often complex:
 - Several players
 - Smallest common denominator
 - Concept of bilateral negotiations is basically against EU logic. Four categories of countries:
 - EU-Member States (w-w/o Schengen; w-w/o Euro)
 - EEA (EU + Norway + Iceland + Lichtenstein)
 - Candidate countries
 - Third countries
 - [Brexit (new category?)]
2. Co-decision rights
 - "EU-ins":
 - Have more to say
 - But have to follow rules and can be outvoted

6.3.1 Box: EU-Institutions

- Complicated basic structure: mixture between Confederation and Federation.
 - Decision making in small groups, dominance of big powers.
 - Evolution of the percentage of votes for DE, FR, IT:
 - 23.5% (EEC6)
 - 15.9% (EC10)
 - 11.5% (EU15)
 - 8.4% (EU27)
 - 8.2% (EU28)
 - Is there a Voting Paradox? Losing voting weight but gaining influence(?)
 - Pro memoria: Percentage of votes system has been abandoned: Art. 16(4) of the Lisbon Treaty (TEU). See Brainteaser 4!
-

2. Co-decision rights

- "EU-outs" hold "good cards" only if they:
 - have a nuisance value (Störpotential) / leverage
 - make a positive contribution to the good functioning
 - do not intend to go against EU essentials

3. Best strategy for a smaller player

- Coherent concept / proposal and no contradictions
- No changes in argumentation
- Make reasonable counter-demand
- Don't say "No", say "Yes, but..."

4. Way forward in negotiations

- Identify interests of both sides
- Develop concepts based on:
 - Objectives, principles, measures, special modalities, safeguard clauses
 - Design Meccano / logic / "algebraic solution"
 - Fill in the numbers

5. If demander: combine different subjects

- Put different subjects in one process, in all phases: Preparation, negotiation, initialing and entry into force.

7 Other Case Studies

7.1 Nile Water Conflict

Background

Geographical Background Nile: one of the longest rivers in the world

- Passes through 11 countries, over 250 million people live in the Nile basin
- 95% of Egypt population rely on Nile's water
- Two main tributaries:
 - White Nile - long stream, originating from Lake Victoria
 - Blue Nile - provides 2/3 of the Nile's water, originates in Ethiopia.

Historic Background

- Allocation of Nile's estimated 84 km^3 water per year, measured at Aswan High Dam, Egypt.
- Egypt claims veto rights to upstream projects impacting the Nile's flow
- Treaty not recognized by Ethiopia.

Matter of Dispute: Grand Ethiopian Renaissance Dam

- Since 2011, Ethiopia is constructing Africa's largest hydropower plant and the world's 7th largest artificial lake. Main dam 1800 m long, 145 m high, side dam 5000 m long, 50 m high.
- Potential to increase Ethiopia's generation capacity by 6450 MW (currently 4200 GW)
 - Currently over 60% of Ethiopians not connected to the grid
 - Potential to become Africa's largest power exporter
- 79 km^3 water in reservoir: Almost the size of lake Geneva and more than annual flow of Blue Nile.
- Blue Nile main source of the Nile's water → depending on filling regime, Nile flow can be impacted severely.

Negotiation

Ethiopia

- No international financing: Symbol of national pride
- Meet electricity demand and export power
- Dam at core of industrial plans and economic growth
- Filling over 7 years: Reduce Nile flow by up to 25%

Egypt

- Claiming historic right to Nile waters and veto right to any upstream project
- Fears drop of own hydropower generation and damage to agriculture
- The dam gives Ethiopia leverage
- Filling over 12-21 years

Sudan

- Dam will help control Blue Nile flow → manage annual floods
- Reduce electricity deficit by importing power

7.1.1 Excursion: General Safeguard Clause

What happens in special situations, when one party can not stick to treaty due to serious difficulties? Tried and tested tool: Safeguard clause. Example: European Economic Area (EEA): Safeguard measures, Art. 112

Benefits: Generally applicable, Unilaterally invokable

Disadvantages: Not concrete, abstract, Dispute: When are difficulties "serious"?

In the Nile case, it is possible to define "serious difficulties" more concretely.

Specific Safeguard Clause Agreements describe general principles and mechanisms. Consider a normal distribution. When normal situation is clearly defined, mechanisms can be agreed on that apply in extreme situations. One example is the Land transport Agreement EU-CH: Article 46.

Benefits: No room for interpretation, clear, Even if never invoked, provide security against potential negative events

Disadvantages: Not general, requires precise definitions, Consists of trigger conditions and measures.

Possible Solutions

- What should be the Blue Nile's minimum annual flow?
- Definition of safeguard clauses:
- What is drought, extended drought, severe drought?
- Guaranteed minimum filling level of Egypt's own Aswan high Dam?
- Parameter causing issue: Too little water
- Of the two cases distinguished, here it is possible to be more specific.

Possible Safeguard Clause If...

- GERD lake lavel at least ... m → Conditions

And...

- GERD water releases below certain norm
- Precipitation in current season below norm
- Mean temperature consistently above norm
- → Triggers (No room for interpretation!)

Then...

- GERD release must be at least ... m³/day
- Additional release proportional ot difference between current filling level and defined minimum filling level.
- → Appropriate measures

Conclusion: Take-aways

- Classic negotiation scenario
- Conflicts over water will become increasingly relevant
- Engineering approach does not solve the problem, but makes it more objective
- "Reduce problem to its most formal structure"

7.2 Brexit

a) Background

Milestones

- 19 Feb 2016: PM Cameron and Com Pres Juncker redraw the terms of the UK's membership
 - Restricted access to in-work benefits for EU migrants
 - Child benefit payments indexed to the cost of living for children living outside the UK for all new arrivals
 - References to "ever-closer union" do not apply to the UK
- 23 June 2016: UK decides to leave the EU, 51.9%
- 29 March 2017: UK notifies its intention to withdraw, negotiations start Deadline: 29 March 2019
- 22 Nov 2018: The EU-UK negotiators agree on a draft of the withdrawal agreement.
- Jan - March 2019: British parliament rejects the agreement three times cf. "Irish Backstop"
- 10 April 2019: EU summit; Brexit delay until 31 October 2019, i.e. UK has to participate in the EU-elections
- 7 June 2019: Theresa May resigned as PM
- 25 June 2019: Boris Johnson is elected as new PM
- 17 October 2019: UK and EU agree on revised withdrawal agreement including a new Northern Ireland Protocol
- 22 October 2019: British Parliament partially accepts withdrawal agreement: renewed request for extension to EU → new deadline: 31 January 2020
- 31 January 2020: UK officially withdraws from EU
- 24 December 2020: UK and EU reach an agreement
- 1 January 2021: The EU-UK Trade and Cooperation Agreement enters into force.

7.2.1 Box: Article 50 of the Treaty on European Union (TEU)

1. Any Member State may decide to withdraw from the Union in accordance with its own constitutional requirements.
2. A Member State which decides to withdraw shall notify the European Council of its intention. In the light of the guidelines provided by the European Council, the Union shall negotiate and conclude an agreement with that State, setting out the arrangements for its withdrawal, taking account of the framework for its future relationship with the Union. That agreement shall be negotiated in accordance with Article 218(3) of the Treaty on the Functioning of the European Union. It shall be concluded on behalf of the Union by the Council [of the European Union], acting by a qualified majority, after obtaining the consent of the European Parliament.
3. The Treaties **shall cease to apply** to the State in question from the date of entry into force of the withdrawal agreement or, failing that, **two years after the notification** referred to in paragraph 2, unless the European Council, in agreement with the Member State concerned, **unanimously** decides to extend this period.
4. For the purposes of paragraphs 2 and 3, the member of the European Council or of the Council representing the withdrawing Member State shall not participate in the discussions of the European Council or Council or in decisions concerning it.
A qualified majority shall be defined in accordance with Article 238(3)(b) of the Treaty on the Functioning of the European Union.
5. If a State which has withdrawn from the Union asks to rejoin, its request shall be subject to the procedure referred to in Article 49.

b) Negotiations

b1) Withdrawal Agreement What happened in the negotiations for the Withdrawal Agreement?

- EU behaved professionally: EU defined and dominated Art 50.
 - No negotiation without notification (according to art. 50)
 - No future relationship without divorce agreement
 - No divorce agreement without questions settled regarding:
 - * Payments
 - * Citizens' rights
 - * Irish border
- UK had a bad start
 - "We will negotiate the terms of the new deal before we start any legal process to leave" (according to Brexit campaign 2016)
 - UK proposals violated the "no-cherry-picking"-prescription ("indivisibility of the 4 freedoms")
- PM had a difficult job to come up with a clear UK position:
 - Remainers wanted a second referendum
 - Hardliner wanted a no-deal
 - Soft-Brexit did not have a clear vision what was feasible and desirable
- PM made two major mistakes:
 - Substantive mistake: "Cherry-picking" and not well pre-cooked with EU Council
 - Tactical Mistake: Accepted of the 22.11.2018 draft agreement, containing the "backstop"
- EU had a tough position:
 - EU offended by the UK
 - "Alcatraz-strategy"
 - Veto-right for the EU regarding exit from EU Customs Union
 - Professional way of negotiating:
 - "An extension [of the deadline] will be something that extends uncertainty - and thus uncertainty has a cost"

b2) All in all there are 11 negotiation blocks (eg Transportation, Energy Goods, Legal, etc). How did the negotiations for the Cooperation Agreement start?

- Starting positions in a nutshell:
 - UK:
 - * Free trade agreement based on Canada-EU agreement
 - * No involvement of EU institutions and no obligation to take over new pieces of EU acquis
 - * Goal to finish negotiations by end of the year
 - EU:
 - * "Given the UK's geographic proximity and economic interdependence with the EU27, the future relationship will only deliver in a mutually satisfactory way if it includes robust guarantees which ensure a level playing field."
 - * Same regulatory conditions and their continuity over time: UK should sign up to set of commitments "...including all future EU rules on state aid and a 'status quo' deal for access to UK fishing grounds, as the price for agreeing a 'zero tariff, zero' quota trade deal."
 - * Same monitoring rules: EU proposal very similar to the one forwarded to Switzerland.

c) Results

c1) Withdrawal Agreement

- Key points:

- 'Divorce bill': The agreement ensures that UK and EU honour all financial obligations undertaken while UK was an EU member → the financial settlement estimated at ~ GBP 30bn
- Protocol on Northern Ireland (NI): NI continues to align with EU rules on goods in order to avoid a hard border on the island, protecting the island economy and honoring the Good Friday Agreement → essentially NI remains at the same time a part of the EU's customs union (for regulatory purposes) and UK's customs territory (for UK's free trade agreements with third parties)
- Citizens' rights: the life choices of over 3 million EU citizens in the UK and over 1 million UK nationals in EU countries have to be protected while safeguarding their right to stay → Independent Monitoring Authority (IMA).
- Transition period: During the transition until 31 Dec 2020, the status quo will be maintained; the UK and EU may agree to a single extension of up to one or two years before 1 July 2020. → Implications of Covid-19 crisis?

c2) Cooperation Agreement

- Key points:

- Trade: Goods traded between EU and UK won't face new tariffs and quotas. However, new procedures introduced on borders such as safety checks and customs declarations (e.g. for rules of origin) → Doing business across UK and EU becomes more costly and burdensome.
- Services: UK businesses offering services (banking, architecture, accounting) lose automatic access to EU markets and vice versa, no automatic recognition of professional qualifications (e.g. for doctors). → Rather than following one set of rules for the whole EU, UK businesses need to comply with regulations in each individual country. EU and UK have pledged future dialogue on access in services sector, especially concerning financial services.
- Mobility: UK nationals no longer have the freedom to work, study, start a business or live in the EU and vice versa. Visas required for stays longer than 90 days.
- Dispute settlement: No role in the UK for the European Court of Justice (ECJ). Disputes that cannot be resolved between UK and EU are referred to an international tribunal instead. → Ending the role of ECJ was a key UK demand, for Brexit supporters it meant to "take back control" of its laws. ECJ retains some role in Northern Ireland, because it continues to follow some EU trade rules.
- Other points: covering level playing field in environmental, social, and labour standards, education, fishing, security and data, education and other areas.

d) Comments Eight Lessons from Brexit, from a Swiss point of view.

1) Influence of UK-EU negotiations on bilateral efforts between Switzerland and EU obvious.

2) Deadlines usually put pressure on smaller negotiating partners:

- The deadline of 29 March probably led May to accept an immature or unbalanced treaty text in November 2018.
- Evidence: lack of support in parliament.

3) "Best alternative to negotiated agreement" proofs to be tactically wise:

- little advantage for May by taking no deal solution off the table, because this gave the EU strong leverage
- Johnson brought (i) BATNA back into play and (ii) made new proposals; EU was suddenly ready to resume negotiations

4) Elaborating concrete options brings weaker negotiating partners further instead of just saying no:

- Last Brexit negotiation rounds show as soon as Johnson presented a new idea (simultaneous integration of Northern Ireland into the EU international market and the UK customs union) did the possibility of concluding the agreement arise
- 5) Proposals only have a chance if they do not harm the vital interests of the negotiating partners:
- EU right of veto on Irish border issue; Only the correction of the backstop solution and the protection of Irish interests made a majority in the British Parliament possible in the first place
- 6) The Cooperation Agreement clears the path for future agreements.
- In this sense the EU-UK partnership could be similar to the EU-Swiss bilateral way.
- 7) The Cooperation Agreement brings a new balance between sovereignty and cooperation.
- Compared to the status quo antea a bit more sovereignty and less market access. Whether this new balance is better than the old one can be only judged in a later phase and of course is primarily up to the UK to evaluate this question.
- 8) Brexit could have far reaching consequences on the unity of the UK.
- Scotland independence referendum; Status of Northern Ireland

7.3 Nuclear Waste - Framework for Remuneration Negotiations

In the beginning of 2017, we had been mandated by the Swiss Federal Office for Energy to develop a framework for the negotiation of remuneration payments to the siting region of a deep geopolitical repository for the disposal of nuclear waste.

a) Background

- Radioactive waste is produced in
 - Nuclear power plants (32.8% of Swiss electricity production)
 - Industry
 - Medicine
 - Science
- 26% comes from Industry, Medicine, Science and 74% come from Nuclear Power Plants
- Estimated to amount finally to approximately 87'000 m³
- 8% High-level waste (HLW), 2% Alpha-toxic waste (ATW), 90% Low- and intermediate-level waste (L/ILW)
- The law defines that:
 - Radioactive waste, produced in Switzerland, has to be disposed of in Switzerland.
 - The waste producers have to pay for the disposal.
 - Radioactive waste has to be disposed of in such a way that the long-term protection of people and the environment is ensured
 - Radioactive waste has to be disposed of in a deep geological repository.

The search for a siting region is a long process.

- 1972, the National Cooperative for the Disposal of Radioactive Waste (Nagra) was founded
- 1994 Wellenberg was chosen for a L/ILW repository
- 1995 Nidwalden voters rejected the concession with 51.9%
- 2002 Nidwalden voters rejected the exploratory tunnel with 57.7%
- 2003 New Nuclear Energy Act (Kernenergiegesetz)
- 2008 Sectoral Plan Deep Geological Repositories

b) Negotiation

- Developing a negotiation framework
- Negotiations are voluntarily, therefore the framework has only a value if all parties accept it. These are:
 - Waste Producers
 - Siting Regions
 - Cantons
- The development of the negotiating framework itself is a negotiation
- Our task: not so much to just make the best proposals, but rather to draw up the rules of the game to which all parties would agree in the end.

Difficulties:

- Concerning the form:
 - Framework had to be established in consensus with all involved parties.
- Concerning the substance:
 - i. in the beginning, negotiation objective was not clear
 - It was not clear if one would negotiate about compensation payments and about remuneration payments (definition in the documents leaves some ambiguity)
 - Art. 1 Negotiation Objective: Objective of the negotiation is the regulation regarding remuneration payments and if appropriate about possible compensations.
 - ii. in the beginning, negotiation parties were not clear
 - Waste producer (role of federal state)
 - * The power plant operators insisted on the participation of the federal state (responsible for industry, medicine, and science).
 - Everything happens under the assumption that all waste producers (including the federal state) will participate in the payment.
 - In what form the federal state will participate in the payment is still unknown. Als unknown is, if the federal state will participate in the negotiations. (no contract at the expense of a third party)
 - Competences of siting regions
 - * A region is not a legal entity in Switzerland → The municipalities will have to sign the contract and will have to negotiate.
 - Participation of Germany
 - * Germany wanted to be a part of the negotiations → There is one additional seat in the delegation of the municipalities reserved for Germany.
 - iii. Beginning of the negotiations was not clear
 - The waste producers wanted to start the negotiations late and the regions wanted to start early.
 - The intention was that the negotiation parties are known (region is selected), while at the same time giving the regions enough time for their internal processes.
 - → Definition of an interval: The negotiations start the earliest after [...] but not later than [...]. The two reference points are not fixed dates but defined through the process.
 - iv. Entry into force of contract
 - One single municipality could block an agreement for the whole region. → Therefore the contract comes into force if
 - * all waste producers,
 - * all cantons,
 - * 60% of all municipalities of a region and
 - * 60% of all infrastructure municipalities agree within a period of two years.

v. Commitment of the negotiation framework

- The framework could not be legally binding but should still have a clear commitment.
- Declaration: The signatories [...] confirm their firm intention to recommend to the responsible authorities of their institutions to use this negotiation framework as a basis for the negotiations of remunerations / compensations.

c) Results

- Declaration (2 sentences)
- 20 signatuers
- Negotiation framework (6 pages including front page and preable)
- 12 articles:
 - Negotiation objective
 - Negotiation subject
 - Usage
 - Negotiation parties
 - Begin of negotiation
 - Frequency of meetings
 - Chair, negotiation secretariat, and editing of contract
 - Arrangement of meetings
 - Communication
 - Conclusion of negotiation
 - Entry into force of contract
 - Other closing provisions

d) Comment You work with people:

- Building a good and respectful working relationship makes the process easier.
- In our situation it was furthermore very important to treat every party equal (same rights, communication, and information)
- Always listen very carefully and try to understand the sensitivities of the parties.
- A negotiator is always under pressure from his constituency at home.
- You should negotiate with the people who can make the decisions.
- It was always essential for us to have a close contact with all involved parties (sometimes this means talking back and forth five times a day, sometimes it means to have a emergency meeting at 7 a.m. in another city).

Be always well prepared

- Know the subject well.
- Be prepared for different developments in a negotiation and have varying proposals ready.
- If the process is stuck, generate new alternatives which try to circumvent the obstacle.
- Be skeptical and also plan for the worst case.

Keep calm

- There is often an escalation in the end of negotiations. Keep calm and try to solve emerging problems.
- Know when to be firm in tone.

Have a good working procedure

- After an initial round, try to work with a negotiation text.
- Conflicting views or parts which are still to debate can be noted in square brackets. They are then later resolved.
- Don't vote on specific points or formulation. Work on a consensus basis.
- Nothing is agreed until everything is agreed.

7.4 US-Swiss UBS Deal

a) Background

- 18. Feb. 2009: UBS ↔ Dep. of Justice (DoJ), Deferred Prosecution Agreement
 - Penalty of \$ 780'000'000
 - Obligation to hand out 52'000 names of US-clients
- Problem: Conflict of jurisdictions. Choice of UBS would be:
 - Either to violate US Law (by not handing out the names)
 - Or to violate Swiss Law (by handing out the names)

b) Negotiation

- 22. June 2009: First meeting in Washington DC
- Several rounds of negotiations
- 31. July 2009: Agreement in principle on ministerial level
- 19. August 2009: Signing and entry into force

Three key problems in the negotiation:

1) To convince the US-side to negotiate in the first place

- We had to convince the IRS that in case they would force UBS to hand out 52'000 names, Swiss police authority would confiscate UBS data ("Blocking Order" by the Swiss government)
- We explained in detail that the government ordinance (Blocking Order) could be put into force within one or two hours
- This would have led to a classical lose - lose situation (even though the "lose part" of Switzerland would have been bigger than the one of the US)
- As a consequence, the US preferred the win - win: → start negotiation

2) How to give clients' names on based existing law?

- We can only give the names according to Swiss law.

[...]

Fraudulent conduct is assumed in situations when a taxpayer uses, or has the intention to use, a forged or falsified document such as a double set of books, a false invoice, an incorrect balance sheet or profit and loss statement, or a fictitious order or, in general, a false piece of documentary evidence, and in situations where the taxpayer uses, or has the intention to use a scheme of lies ("Lügengebäude") to deceive the tax authority. It is understood that the acts described in the preceding sentence are by way of illustration, not by way of limitation. The term "tax fraud" may in addition include acts that, at the time of the request, constitute fraudulent conduct with respect to which the requested Contracting State may obtain information under its laws or practices.

[...]

Reference to Art. 190, Swiss Direct Federal Tax Law (DBG)**

Art. 190 Prerequisites

¹ Should there be founded suspicion that serious tax violations were committed or that such violations have been aided and abetted or instigated, the Director of the Federal Ministry of Finance may authorize the Federal Tax Administration to carry out an investigation in conjunction with the Cantonal Tax Administration.

² Serious tax violations include, in particular, the systematic evasion of large amounts of tax (Art. 175 & 176) and tax offenses (Art. 186 & 187).

Underlined phrase: National treatment. We offer to the other government to deal with their request as if they would be a national authority. We treat them in the same way as we treat our own citizens.

- 3) Independence of the Swiss courts: What shall be done if due to appeals the expected number of names (bank accounts) cannot be reached? (The expected number was estimated 4450)

- Rebalancing measures - inspired by the EEA-concept
- Article 114 EEA (European Economic Area)
 1. If a safeguard measure taken by a Contracting Party creates an imbalance between the rights and obligations under this Agreement, any other Contracting Party may towards that Contracting Party take such proportionate rebalancing measures as are strictly necessary to remedy to imbalance. Priority shall be given to such measures as will least disturb the functioning of the EEA.
 2. The Procedure under Article 113 shall apply.
- If the expected number could not be reached, the DoJ would be allowed to take rebalancing measures. In the sense, to go back to the terms of the DPA.

c) Result

- Agreement between Switzerland and USA on the request for information from the Internal Revenue Services of the USA regarding UBS, a corporation established under the laws of the Swiss Confederation
 - Initiated: 12. August 2009
 - Signed: 19. August 2009
- Swiss Laws respected
- US got names on the basis of the treaty requests
- Integration of a European concept of Rebalancing into an American treaty. Special for the US.

d) Comment

- Creative interpretation of texts
- Negotiate, not just "yes" or "no"

7.5 Overview

	Title	Actors	Topic	Measures/Approach	Conditions
Case 1	Land Transport Agreement CH-EU	EU-CH Multi-/Bilateral	Traffic / environment	Quantitative (linear programming)	Constitutionally relevant, essential for Bilateral I
Case 2	Negotiation Menu (Bilateral II)	EU-CH Multi-/bilateral	Negotiation menu	Quantitative (dynamic game theory)	Important for foreign policy, little time pressure
Case 3	Schengen Association Agreement	EU-CH Multi-/bilateral	Inner security / asylum	Qualitative (special arrangement for a particular problem)	Important for foreign policy, little time pressure
Case 4	CH-EU Negotiations for the Free Movement of Persons	EU-CH Multi-/bilateral	Free movement of persons	Quantitative (descriptive statistics)	Essential for the maintenance of Bilateral II
Case 5	Institutional Agreement	EU-CH Multi-/bilateral	Institutional Agreement	Qualitative (innovative interpretation of laws)	Fundamental for the CH-EU bilateral approach
Case 6	Refugee Distribution	EU / (EFTA)	Refugees	Quantitative (statistics)	Politically sensitive question, strong time pressure
Case 7	CH – UK/At-Tax Agreement	UK / AUT – CH Bilateral	Taxes	Quantitative (mathematical formulation of a complex subject)	Politically sensitive question, little time pressure
Case 8	Brexit	UK – EU	Brexit	Quantitative (statistics)	Could have been important for full market access
Case 9	US-Swiss UBS deal	USA – CH (UBS) Bilateral	Banking secrecy	Qualitative (innovative interpretation of laws)	Strong political pressure, strong time pressure
Case 10	US-Swiss tax deal (extending UBS Agreement)	USA – CH Bilateral	Banking secrecy	Qualitative (categorization of the problem)	Strong political pressure, strong time pressure
Case 11	FATCA	USA (EU 5) – CH Bi-/multilateral	Information exchange	Qualitative (systematic problem analysis and solution)	Pressure to take action by EU, taking a leading role
Case 12	Nuclear Waste -Framework for Remuneration Negotiations	Waste producers, Cantons, Siting regions	Radioactive waste / environment	Soft skills, human factors	Important for acceptance, emotional topic

In all Cases (1-12) there is:

- a difficult intergovernmental negotiation problem (exept case 12)
- a reduction of the problem to its formal structure
- application of heuristic methods
- application of systematic/methodological thinking
- the use of mathematical methods (Where appropriate/possible (cases: Land Transport,Bilateral II, Free Movement of Persons, Refugee Distribution, CH-UK Tax agreement, Brexit))

8 Conflict Management

8.1 Concepts

Definition of conflicts

- Conflict refers either to a violent dispute or to an incompatibility of positions
- Conflict refers to an universal feature of human society
- In general, conflicts cannot be eliminated. What can be eliminated is the violent expression of conflict
- On the other hand: "A strong statement is that conflicts are solvable. This is not necessarily an idealistic or optimistic position"

Elements of conflict analysis

1) Parties in conflict: a) Individuals, b) Groups, c) Organizations, d) Nations, e) Others.

2) Issues in conflict:

a) The parties' evaluation

- Issues expressing disagreement over means
- Issues expressing disagreement over ends

b) Rewards

c) Content:

- Resources (territory, income)
- Preferences
- Nature of relationship
- Values
- beliefs

3) Environment of conflicts:

- Structured (institutionalized conflict management)
- Unstructured (e.g. revolution)

4) Attitudes in conflict:

- Cognitiv (beliefs and ideas)
- Affective (feelings and emotions)
- Behavioral (readiness to respond)

5) Behavior in conflicts:

- Persuasion
- Coercion
- Reward

Dealing with a conflict Different approaches

- Conflict prevention can be defined in terms of short- and long-term effects. It is concerned with the international use of various policy tools and instruments to prevent a violent conflict from emerging or escalating, and to create the conditions for long-term peace and stability.
- Conflict management refers to any effort by a third party at preventing a conflict from getting worse, limiting escalation, minimizing suffering and creating an environment for interaction without resorting to violence. Conflict management does not necessarily solve the conflict.
- Conflict containment involves peacekeeping and war limitations (violence termination at the earliest opportunity).

- Conflict transformation implies a deep transformation of the institutions and discourses that reproduce violence, as well as in the conflict parties themselves and their relationships.
- Conflict settlement means the reaching of an agreement between the parties to settle a political conflict, so forestalling or ending an armed conflict.
- Conflict resolution is a situation where the conflicting parties enter into an agreement that solve their central incompatibilities, accept each other's continued existence as parties and cease all violent action against each other.

Special case of mediation:

- Ethymologically, mediation comes from the Latin root to halve
- Mediation definitions have different focus. Outcome-oriented definitions:
 - "Any action taken by an actor that is not a direct party to the crisis, that is designed to reduce or remove one or more of the problems of the bargaining relationship, and therefore to facilitate the termination of the crisis itself."
 - "Intermediary activity ... undertaken by a third party with the primary intention of achieving some compromise settlement of the issues at stake between the parties, or at least ending disruptive conflict behaviour."
 - "The intervention of a third party who first investigates and defines the problem and then usually approaches each group separately with recommendations designed to provide a mutually acceptable solution."

Characteristics: Main features of mediation:

- Mediation is an extension and continuation of peaceful conflict management.
- Mediation involves the intervention of an outsider (an individual, a group, or an organization with values, resources, and interests of their own)
- Mediation is a non-coercive non-violent and ultimately, non-binding form of intervention
- Mediators enter a conflict, whether internal or international, in order to:
 - Affect it
 - Change it
 - Resolve it
 - Influence it
- Mediators bring with them:
 - Ideas
 - Knowledge
 - Resources
 - Interests
- Mediation is a voluntary form of conflict management
- Mediation usually operates on an ad hoc basis only
- All in all: mediation is based on
 - Neutrality
 - Confidentiality
 - Voluntariness

8.2 Case Studies

8.2.1 Iran - P5+1 talks

P5+1 means the 5 permanent members of the UN Security Council plus Germany

(a) Background

- Nuclear program ~ 200 centrifuges in Iran (2005)
- Difficult situation at the start
 - History
 - Heavy burden from the past (US-IR): 1953 Iranian coup d'état (supported by the US), 1979 Iranian revolution, Iran hostage crisis at the US Embassy from 1979-1981.
 - Rhetoric:
 - * One side: Regime change
 - * Other side: Unacceptable views on historic events
- Preconditions:
 - One side: Stop all nuclear program related activities
 - Other side: Guarantees for enrichment
 - ⇒ Anticipation of a possible outcome.

(b) Negotiation / Facilitation

- Deadlock between Iran and P5+1
 - Good condition for Switzerland to act as facilitator
 - Good networks in Washington and Tehran due to US interest mandate
 - Non-EU
 - Non-NATO
 - Experience
 - No hidden agenda
- ⇒ Switzerland offered its Good Offices to promote dialogue between the two parties.

Negotiation Process:

- No formal mandate to mediate
- However, P5+1 and EU-Council were interested to see what the Swiss were capable to achieving
- We produced Non Papers in cooperation with
 - SG Mohammed El-Baradei (IAEA), and in consultation with
 - SG Javier Solana (EU-Council)
- Paper on the basis of the following principles:
 - No preconditions (i.e. no revenge)
 - Freeze-for-freeze-concept in the beginning
 - Phased approach - not a solution in one go:
 - i) informal pre-talks
 - ii) pre-talks → joint declaration/interim agreement, 6 months
 - iii) negotiations → comprehensive agreement

(c) Results

- Diplomatic-procedural proposal:
 - No preconditions
 - Confidence-building measures (freeze-for-freeze)
 - Guiding principles for the negotiation
 - Phased approach for the talks
- Thematic proposal:
 - Set of formulas concerning the construction of centrifuges.
 - Mechanism to negotiate the exact number of centrifuges.
 - Number of centrifuges: number of centrifuges at preceding time-period + a rate of increase.
 - Rate of increase: average rate of increasing in the time period before the mechanism comes into place, multiplied by $\beta \in [0, 1]$.
 - Set of formulas concerning the production of low-enriched uranium (R&D, industrial)
 - Mechanism to negotiate the exact amount and its development
 - Produced amount has to be smaller or equal to the amount produced before, multiplied by a factor γ .

Iranian nuclear program
Construction of centrifuges

April 2007
Swiss Non Paper

Let

- t : time [measured in months]
 t_0 : time of reference
 t_i : deadline i , $i \geq 1$
 $n(t_0)$: number of centrifuges at t_0
 $n(t)$: number of centrifuges at t
 a_0 : average number of centrifuges constructed per month in the time period before t_0
 a_i : rate of increase of centrifuges constructed per month during the time period $[t_{i-1}, t_i]$
 β_i : coefficient ; $0 \leq \beta_i \leq 1$

Then

$$n(t) = n(t_{i-1}) + (t - t_{i-1}) \cdot a_i \quad ; \quad t \in [t_{i-1}, t_i]$$

Whereas

$$\dots \rightarrow a_i = a_0 \beta_i ; \quad i \geq 1$$

(If a differentiation does not prove to be necessary: $a_1 = a_2 = a_3 = \dots$)

For example:

- t_0 : 1 September 2007
 t_1 : $t_0 + 2$ months
 t_2 : $t_1 + 4$ months

RELAUNCHING THE NEGOTIATIONS

April 2007

Swiss Non Paper

Step 1: Informal Pre-Talks

In order to relaunch a negotiating process leading to a comprehensive settlement ("package"), the P5+1 and Iran (hereinafter referred to as "the Parties") agree to the following initial confidence-building measure (CBM):

- a. the P5+1 will not table any new resolutions and sanctions on the UNSC level as well as on an unilateral way.
- b. Iran will not develop any new nuclear enrichment-related activities on an industrial scale at the Fuel Enrichment Plant in Natanz (FEP).

This initial CBM will last for the duration of the pre-talks under Step 2 and will be extended for the duration of the negotiations once they take place under Step 3.

Step 2: Pre-Talks

As soon as Step 1 is implemented, the Parties will start pre-talks lasting no longer than 60 days unless otherwise agreed in order to prepare the negotiations. During these pre-talks, the Parties will agree on the following guiding principles and modalities as a basis for the negotiations:

1. recognition and reaffirmation by the P5+1 of Iran's full rights under the NPT.
2. recognition and reaffirmation by Iran of its obligations under the NPT and under its safeguards agreement with a view to resolving all outstanding issues with the IAEA. To this end Iran will present a timetable to the IAEA and act according to the Additional Protocol when requested by the IAEA. As soon as the IAEA has resolved all outstanding issues the dossier will return from the UNSC to the IAEA and Iran will act according to the Additional Protocol pending its ratification.
3. the modalities of all Iran's nuclear activities and programmes are based on the NPT, the Safeguards Agreement and the Additional Protocol in order to provide assurances with regard to non-diversion of nuclear material for non-peaceful purposes. These modalities will be negotiated in good faith with the aim of achieving a comprehensive settlement ("package") including nuclear issues and non-nuclear issues such as economic cooperation, international security and political dialogue.
4. additional CBMs to be extended for the duration of the negotiations including a time-out by Iran on all enrichment-related activities and by the P5+1 on the implementation of all UNSC resolutions and sanctions. The commitment to CBMs does not prejudge the outcome of the negotiations.
5. procedural questions for the negotiations (schedule, agenda, level and composition of delegations, venues, etc).

The agreement reached on the above following guiding principles and modalities will be incorporated in a joint declaration signed by the Parties at a high level.

Step 3: Negotiations

As soon as Step 2 is implemented, the Parties will enter into the negotiations on the comprehensive settlement ("package") mentioned under Step 2 (point 3). These negotiations will last no longer than 6 months unless otherwise agreed.

April 2007
Swiss Non Paper

Uranium Enrichment

Let

- $e(t)$: enrichment of fuel ($\leq 5\%$) per time unit at time t [e.g. g/day]
 P : Pilot enrichment plant (PEP) ; R+D
 F : Fuel enrichment plant (FEP) ; industrial
 $e_p(t)$: enrichment of fuel at P
 $e_f(t)$: enrichment of fuel at F
 $\gamma_{Pi} ; \gamma_{Fi}$: coefficients, for the time period $[t_{i-1}, t_i]$

Then

$$e_p(t) \leq e_p(t_0) \cdot \gamma_{Pi} ; \quad t \in [t_{i-1}, t_i]$$

$$e_f(t) \leq e_f(t_0) \cdot \gamma_{Fi} ; \quad t \in [t_{i-1}, t_i]$$

Whereas

$$0 \leq \gamma_{Pi}$$

$$0 \leq \gamma_{Fi}$$

(If a differentiation does not prove to be necessary:

$$\gamma_{P1} = \gamma_{P2} = \gamma_{P3} = \dots \text{ and } \gamma_{F1} = \gamma_{F2} = \gamma_{F3} = \dots$$

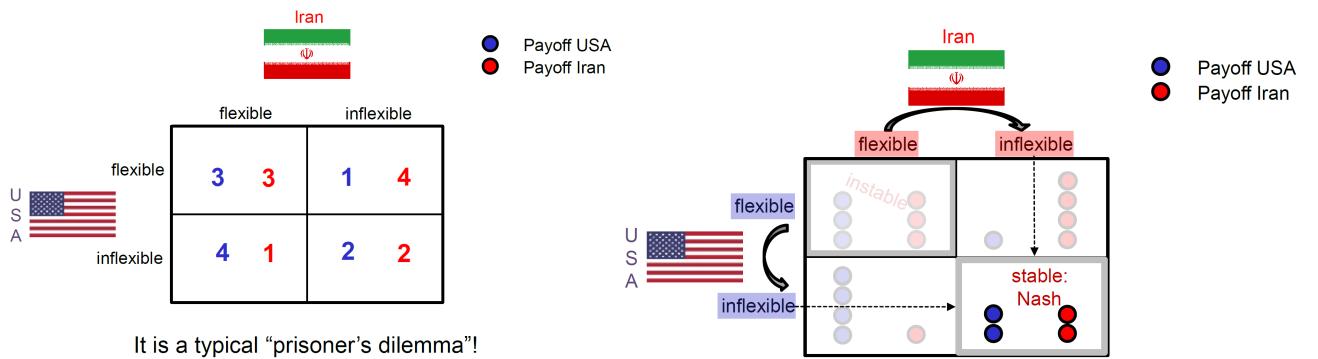
(d) Conclusions

- The parties could not agree to take up formal negotiations (until November 2013)
- Perhaps our math was too complicated (?), although Solana and Larijani (both mathematicians) understood it well
- However, this paper laid the basis for the first Geneva talks in July 2008. First high level meeting between US and IR since 1980.

(e) Follow-up The two sides continued to:

- increase the pressure via sanctions from 4 to ~ 80
- increase the number of centrifuges from ~ 200 to ~ 20'000.

Game theoretical analysis:



If both parties are flexible no negotiations occur and there is a lose-lose situation. If one party increases its inflexibility, the other has to increase as well to preserve the equilibrium (case of arms race).

Only when new elements appeared the situation changed: At the outset: political changes in the governments: Bush to Obama and from Mahmud Ahmadinedschad to Hassan Rohani.

Additionally, 4 new elements came to the forefront:

- Sanctions started to hurt
- Enlargement of nuclear program problematic
- Iran's ambitions for regional power role
- Iran's Involvement in Syria crisis

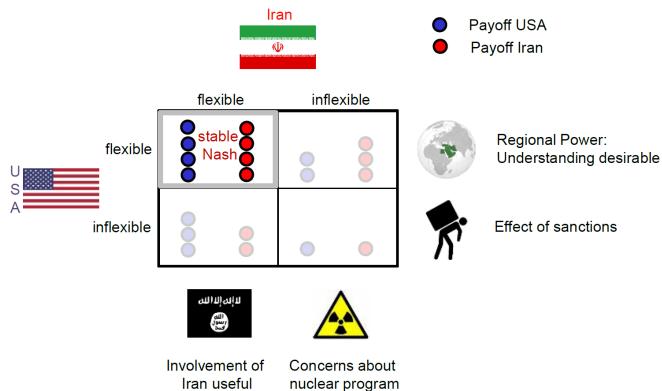


Figure 16: New allocation of payoffs after the new changes

As a result, it was no longer a "prisoner's dilemma" but a "concord" game. The negotiations between P5+1 and Iran could start.

- After the first Geneva-Talks (19.7.2008) a series of follow-up-meetings were held. With the above mentioned changes of the situation real negotiations started in fall 2013 and came to a (first) interim conclusion (Geneva interim agreement/"Joint Plan of Action"), signed on 24.11.2013.
- In these plan several of the Swiss proposal were taken up:
 - no preconditions
 - freeze-for-freeze
 - phased approach
 - negotiations [mainly] in Switzerland
- This Plan of Action gave the framework for the following talks.
- The negotiations for a comprehensive/final agreement started on 20.01.2014. Initially thought to last 6 months, they were prolonged until June 2015.
- On the 2.4.2015 they achieved an important (second) step towards the final agreement (to be finalized by end June 2015): "Parameters for a Joint Comprehensive Plan of Action" (Lausanne Agreement).
- On the 14.7.2015 the parties finally achieved the nuclear agreement in the "Joint Comprehensive Plan of Action" (JCPOA):
 - Iran scaled back its nuclear program according to mutually agreed parameters
 - The West conceded Iran's right of nuclear activities to a clearly defined degree, ~ 6000 centrifuges
 - P5+1 lifted international sanctions in response
 - Iran accepted long-lasting, robust verification by the IAEA
- This agreement contributes to stability and peace in the Middle East and can be considered as a diplomatic success (of Obama [Kerry] and Rohani [Zarif]) and success of diplomacy.
- This Joint Plan of Action gave the framework for the following talks which resulted in the Vienna Agreement.

Development under Trump

- On 8.5.18 Trump withdraws from the Iran deal
 - According to him, it was the "worst deal of all times"
 - Trump is convinced that Iran didn't fulfil their part of the agreement
- The US-sanctions against Iran were increased to a level above of what they were before the nuclear deal, seriously hurting the Iranian economy and putting the regime in a weak position.
- Due to pressure from the US, many international firms stopped dealing with Iran
 - They had the choice between stop dealing with Iran or stop dealing with the US
- Subsequently, tensions rose considerably, peaking at a US drone strike killing Iranian general Qasem Soleimani, for whose death Iran conducted retaliating missile strikes against US military bases in Iraq.

Back to cooperation under Biden?

- The situation is similar to the time before Obama
 - The US want to contain the Iranian threat in the region globally
 - Iran wants the US to ease off the sanctions
 - Both want the other to move first (Chicken Game)
- Political situation
 - US Republicans (and some democrats) are not convinced the original deal was good
 - Moderate Iranian president Rouhani, who will leave office in 2021, and current foreign minister Mohammed Javad Zarif, who was a key player during the negotiation of the 2015 deal, are under pressure from hardliners. Hardline-majority in the Iranian parliament wants to end negotiations completely.
 - Potential backlash: Allied Israel and its newfound partners at the gulf don't want the US to deal with Iran

Talks in Vienna

- A Joint Commission of the remaining participants to the Joint Comprehensive Plan of Action (JCPOA) met at the beginning of April 2021 in Vienna to salvage the agreement.
- The US and Iran are joining for the second round of talks under the condition of Iran, that they will not directly engage with the US. The other participants - the UK, France, Germany, Russia, China and the EU - have thus to play the role of intermediaries, under the chairmanship of the EU.
- The delegations from Iranian and the US are residing in two separate hotels that are located 100m across the street from each other with the EU leading the shuttle diplomacy.
- While the talks are expected to go for months - and with recent attack on the Iranian nuclear facility looming - there is pressure to produce results before the presidential elections in Iran on 18 June 2021, where a hardliner could succeed the current centrist President Rouhani.
- There are also questions whether the 2015 deal is still as robust an agreement as it was then it was signed: in the past two years, Iran has developed new centrifuges that have altered the calculation on which the limits set by the 2015 deal was based.

Where do both sides stand?

- US positions
 - Biden wants to re-join a deal, but it is not the number 1 priority (Covid-Pandemic)
 - US would prefer to negotiate a "longer and stronger" deal
 - The US is willing to only lift those sanctions that are inconsistent with the JCPOA as part of a mutual return to compliance. This, however, does not necessarily include the sanctions imposed by the Trump administration on major Iranian entities under non-nuclear sanctions authorities (i.e. terrorism), which includes Iran's Central Bank and the National Iranian Oil Company. If these are not lifted it would be hard to imagine a benefit for Iran from a revival of the deal.
- Iran Position
 - Iran demands a lifting of all sanctions (even those that would be permissible under the deal, such as those on Iran's missile programme or relate to human rights issues)
 - Sanctions have to be lifted simultaneously and not in a step-by-step process. Iran would then verify their removal before bringing its nuclear programme back into compliance. Thus the question here: how much flexibility is there in Iran's position?
 - Position will become tougher if a hardliner is elected President in June.

8.2.2 Deutsche Bahn (DB) train drivers' strike

Conflict between Management and Labor Union

(a) Background

- DB has two trade unions:
 - GDL (Gewerkschaft Deutscher Lokomotivführer) representing 70% of all DB employees
 - EVG (Eisenbahn- und Verkehrsgesellschaft) representing majority of DB employees
- Until July 2014, the tasks of the two trade unions were clearly distributed
 - GDL negotiates working conditions for train drivers
 - EVG negotiates working conditions for all other DB workers
- Wage negotiations in July 2014: GDL wanted negotiations in the name of train crew (train conductors etc.) as well, while EVG wanted to negotiate in the name of all DB employees.
- Train drivers followed the call of GDL and stopped working several times between September 2014 and May 2015.

(b) Negotiations Conflict between GDL and DB

- GDL demands:
 - 5% pay increase
 - Workweek reduces from 39 to 37 hours
 - To negotiate for all? (negotiate on behalf of 17'000 train stewards) DB employees
- DB offered:
 - Raise pay of train drivers by 5% for 30 months
 - Hire 200 more train drivers to allow for more flexible working times
- Strike of November 2014:
 - On 5 November DB offered to go to mediation/arbitration, GDL refused
 - On 6 November DB filed an injunction with the labor court in Frankfurt
 - Court decided the strike is legal
 - GDL finished the strike one day earlier as a "gesture of good will"

Conflict between unions GDL and EVG

- Struggle for influence between GDL and EVG
- DB could negotiate different collective agreements with each of the groups
- EVG offered that the majority union negotiates deals → GDL negotiates train drivers conditions and EVG negotiates continuations for all other DB workers. GDL refused this offer.
- Act of collective agreement plans that only the collective agreement of the union with the most members does apply.

There was a huge criticism of the strike. The costs were also really large, be it for the DB or the passengers.

Assesment

- Germany's internal legal difficulties about the question who represent the workers (only the main union or also the competing unions)
- Probably, also a person's driven strike
- Mr. Claus Weselsky (GDL) is perceived as tough trade union leader
- Difficult to give good advice for avoiding strikes, however it is always important for the management to cultivate good relations with the trade union.

(c) (Possible) Results Conflict between Management and Labor Union:

Concept

- Often conflicts between the management and labor union involve many issues
- To facilitate win-win process, a good preparation is useful:
 - Prepare a list of all issues
 - For each issue: What resolutions are possible for this issue?
 - Distribute points which represent your preferences over issues and resolutions levels
 - Anticipate points distribution over the issues and resolutions levels from your counterpart's point of view
 - → These preparation steps are the basis for so called 'additive scoring system'

Example: Score based analysis of a conflict

- Possible application of Raiffa's Additive Scoring System by our chair
- Issues, resolution levels and preferences of DB and GDL are given below

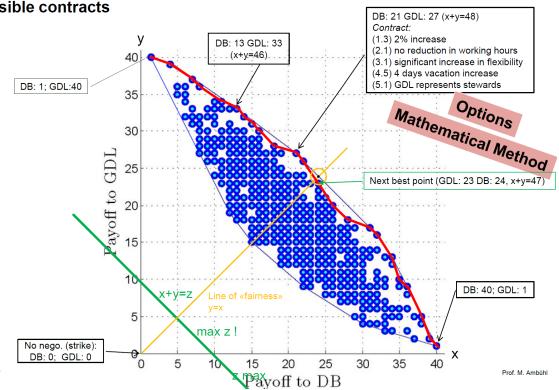
Issue:	Resolution level:	Points to DB:	Points to GDL:
1) Wage increase (in %)	(1.1) 0% (1.2) 1% (1.3) 2% (1.4) 3% (1.5) 4%	10 9 8 2 2	0 1 4 5 6
2) Reduction in workweek (in hours)	(2.1) 0 (2.2) -1 (2.3) -2 (2.4) -3	10 7 4 0	0 1 4 7
3) Work flexibility	(3.1) significant increase (3.2) moderate increase (3.3) keep current flex	1 3 5	5 4 1
4) Vacation increase (in days)	(4.1) 0 (4.2) +1 (4.3) +2 (4.4) +3 (4.5) +4	10 4 3 3 0	0 2 2 4 10
5) Representation	(5.1) GDL represents stewards (5.2) EVG represents stewards	0 5	8 0

Examples (2 out of 720 possible combinations):

- Contract: (1.1) (2.1) (3.3) (4.1) (5.2) gives to
- Contract: (1.6) (2.4) (3.1) (4.5) (5.1) gives to

H_zurich

DB: 40 GDL: 1
DB: 1 GDL: 40

All possible contracts

What are the potential weaknesses of the score-based conflict analysis approach?

- Structuring the issues
- Assigning payoffs
- Avoiding tactical scoring
- Concerning the scoring:
 - Standardizing the metrics
 - Ensuring same end-points
 - Ensuring distribution

(d) Comments

- 'Quantification' of the problem may help
 - to structure the problem
 - to understand possible tradeoffs
- For mediator: Look for contracts in the 'north-east' direction
- Trust is crucial: Mediator can propose an optimal contract on Pareto frontier only if he has the true preferences of the parties (i.e. if they do not manipulate the values of certain outcome)
- Weselsky refuses to appeal a mediator: "Wir lassen nicht über Grundrechte schlichten"

9 Social and procedural aspects

9.1 Social dimensions

9.1.1 Overview

Most often, negotiation takes place among people. Therefore, this process is a social interaction and can be influenced by many social factors. Social dimensions of negotiations are: Power, Influence, Status, Gender, Ethics, Culture, etc.

9.1.2 Power

- In the social sciences power is the ability to influence others
- It emerges from asymmetric control over valued resources in social relations (information, money, rhetorics, etc.)
- It is a potential force in a social relation, often not constant but dependent on the situation.

Types of power:

- Positional Power:
 - Reward power: Based on the perception to have the ability to reward
 - Coercive power: Based on the perception to have the ability to punish
 - Legitimate power: Based on the perception to have a legitimate right to prescribe a behaviour (formal status, authority)
- Personal Power
 - Referent power: Based on identification and liking
 - Expert power: Based on the perception to have special knowledge or expertise
- Relational power: Based on relationships

Sources of Power:

- Positional power derives from the positions and roles you hold in your social system
- Personal power is derived from your unique set of personal attributes and skills
- Relational power is derived from your relationship with others. (This can provide emotional support, advice, information and other tangible resources)

Relevance for Negotiators

- Be aware of how much and what type of power you and the other party have
- The BATNA is one of the most important sources of power
 - Know your BATNA and keep your options open
 - Signal your BATNA /resistance point but do not reveal it
 - Improve constantly your BATNA
 - Assess the other sides BATNA
- The contribution to a negotiation is another source of power (bringing resources to the negotiation that are highly valued by the other side)
- Possible effects of power to those with more power:
 - less accurate in assessing situations
 - stronger illusion of control

- increased risk taking
- Possible effects of power to those with less power:
 - better in perceiving the behaviour of those with higher power
 - fear of being constantly tested
 - susceptible to the emotions of the other party

9.1.3 Influence and persuasions

Definition and Concept

- Social influence is the action of affecting the emotions, opinions, or behaviour of others
- One form of social influence, important for negotiation is persuasion
- Not only those with more power can be persuasive
- The two main streams of persuasion, build on:
- Rational and deliberate strategies based on information and arguments
- Credibility and likability. More of an automatic response to subtle cues.

Implications for Negotiators Information based persuasion

- Knowledge of the negotiation subject is important
 - You have to know the facts to be convincing
 - Only a good understanding of the subject allows you to generate alternatives
- Generate alternatives and options:
 - Consider alternatives
 - Generate options (which sometimes are equally good for you)
- → the one who formulates the alternatives may have an advantage
- Be aware of the power contrasts. The perception of an offer can depend on:
 - Previous offers
 - Alternatives
- → know what is good in absolute vs. relative terms
- Be aware of framing effects. The perception of an offer can depend on how it is framed.
- → perception of gains and losses are different. It depends how a result is presented.
- Be aware of the anchoring effects. In an experiment participants witnessed the spin of a manipulated roulette wheel (0 to 100). They were then asked whether they thought the percentage of the UN member countries coming from Africa is greater or smaller than the number on the wheel. Next, they were asked to make an estimation of the true percentage.
 - Participants who saw the wheel stop on the number 10: guessed on average 25%.
 - Participants who saw the wheel stop on the number 65: guessed on average 45%
- → Tendency to give too much weight to the first offer. Try to re-anchor rapidly, as the agreement is often the midpoint between the first two offers.
- Be aware of the commitment and consistency principle.
- → people often align with active commitments. Only commit to things you can stick to.
- Be aware of fairness heuristics

- Offers labeled "fair" are more often accepted
- People tend to accept an offer made by themselves more often than an identical offer made by the other side
- There are different fairness principles:
 - * Outcome is equally shared ("divide it down the middle")
 - * Outcome is divided based on equity
 - * Outcome is divided based on needs
- Perception of fairness is subjective and depends on the circumstances (e.g. what others get)

Emotion-based persuasion

- Be aware of the principle of liking
 - We are more likely to comply with requests made by people that we like
 - People like those who like them
 - Liking is increased through similarity and praise
 - * Similarity: People were more willing to buy an insurance policy from a salesperson who was more akin to them in age, religion, politics, or even cigarette-smoking habits.
 - * Praise: Experimental data show that positive comments about another person's traits, attitude or performance reliably generates liking in return and a willingness to comply with the wishes of the person who is offering the praise.
- Be aware of the principle of social proof
 - → People follow the lead of similar others.
- Be aware of appearance and judgment
 - Studies show that attractive people tend to be perceived as more talented, kind, honest, intelligent, etc
- Be aware of priming
 - Studies show that unconscious priming of cues in the environment can influence the behaviour.
- Be aware of time pressure
 - → often people abandon self-prescribed principles when hurried

Persuasion Frameworks Basic framework for individual level persuasion: Establish Credibility, Frame for common understanding, Provide evidence, Connect emotionally. Advice: Argue clearly and logically!

9.1.4 Status

- Status is the relative position or rank given to people or groups by others
- Status influences social interactions, also through intervening, e.g. power or gender
- There are two types of status characteristics:
 - Primary: rank, title (e.g. CEO), degree (e.g. PhD), etc
 - Secondary: age, status in other groups, cultural background, etc

Status exists in the eyes of others > status perception can be changed.

How can you affect status perception in a negotiation?

- Choose the right reference group
- Determine the reference group of your counterpart
- Use concerns about status strategically
- Seek out objective standards

9.1.5 Gender

Definition and Concept

- Between 1992 and 2019, women constituted, on average, 13% of negotiators, 6% of mediators, and 6% of signatories of major peace processes worldwide.
- Worldwide, women's representation in national parliament stands at 25% in 2020.
- Among the G20 countries, the share of women in middle and senior management positions stands at 30% in 2020.
- Gender: refers to the social attribute and opportunities associated with being male and female (UN Woman definition)
- Gender can have a strong influence on social interaction, status perception, and influencing processes
- What does research tell us on the role of gender in negotiations?

Research findings How well do different genders do at the bargaining table relative to one another?

- Women tend to set lower opening offers than men of similar experience, education and bargaining position
- Men tend to outperform in negotiation situations characterized by structural ambiguity
- Women are less likely to initiate negotiations than men e.g. for salary negotiations

How are men and women treated by their counterparts in negotiations?

- Women encounter social and economic backlash when they behave assertive in negotiations
- Women who "ask" are viewed more negatively than men who ask (and more penalized by evaluatory)
- Self-advocating female negotiators suffer negative social judgment

Gender stereotypes are pervasive in our society but they do not represent reality:

- Women: gentle, not aggressive, submissive, talkative sensitive, emotional, verbal
- Men: tough, aggressive dominant, not talkative, less sensitive, logical, analytical

They do not tell anything useful about the real world.

- Effective negotiators are characterized as: assertive, rational, decisive, constructive
- Ineffective negotiators are regarded as: weak, emotional, irrational, too conciliatory
- Many of the traits that characterize effective negotiators are perceived to be masculine in nature, and many of the traits of ineffective negotiators are perceived to be feminine
- Stereotype threat: a negative threat, whether or not endorsed by the holder, influences judgements and behaviour
- When stereotypes are explicitly activated, people exhibit stereotype reactance

Implications for Negotiators Strategies to counteract the situation:

- Regenerate stereotypes
 - Members of traditionally stereotyped groups can redefine their own beliefs about their group.
 - Stereotypes can be dismantled by openly addressing them
 - Studies show that such practices can close the gap in negotiations
- Redefine agency
 - Members of traditionally stereotyped groups can assume a representation role in negotiations (for an organization, another person, a cause)

- Studies show that female negotiator's performance enhances when negotiating for someone else as opposed to only themselves
- Prepare well
 - Increase the degree of certainty in parties' understanding of the economic structures in the negotiation (e.g. benchmark values)
 - Studies show that gender differences in outcomes tend to be smaller when negotiators receive information about the bargaining range in negotiation simulations

In professional negotiations, there should be no gender relevance.

9.1.6 Ethics

Definition and Concept

- Ethics are manifestations of cultural, contextual, and interpersonal norms that make certain strategies and behaviours unacceptable
- Negotiations can create incentives for people to violate ethical standards and negotiators must sometimes deal with an ambiguity of what is ethical

Lying

- Lying is regarded to be unethical (and in some cases illegal)
 - Knowingly misrepresentation of a material fact is unethical and can be illegal
 - Negotiations must happen in good faith but it is generally assumed that people are self-interested
 - Misrepresentation of own interests is not lying about material facts and it is not illegal to exaggerate the own position
- Omission vs. Commission
 - Omission (Auslassung) = withholding relevant (or irrelevant) information → can be OK or is even a must, "Good negotiators need not disclose everything"
 - Commision (Falschaussage) = active lying → not acceptable, "Good negotiators need not lie."

Under what conditions do people engage in Deception?

- Influencing factors that may lead people to engage in deception:
 - Prospect of economic gain
 - Uncertainty
 - Anonymity of victims
- Groups have a higher tendency to lie compared to individuals in the same bargaining situation.

Other questionable negotiation strategies

- Traditional competitive bargaining
 - e.g. making very high or low opening offers (generally not regarded as unethical)
- Manipulation of an opponent's network
 - Trying to weaken an opponent by influencing his or her associate or constituency
- Cancel a negotiated agreement
 - Is it unethical to retract from an agreement after an informal closing has occurred but while it is still legal (e.g. just before signing)
- Retracting an offer
 - Is it unethical to retract an offer made during a negotiation? Legal, but bargaining in bad faith
- Small additions
 - Strategy of continually asking for "just one more thing" after the deal has been closed.

9.1.7 Culture

Definition and Concept

- Culture is shared patterns of values and norms learned through a process of socialization
- Culture is a unique characteristic of a social group (which does not have to be the nation state)
- Culture influences our mental models of how things work
- But differences within cultures can be significant

Cultural Dimension		
Motivation: Individual versus collective orientation	<i>Individualist:</i> Key goal is to maximize own gain (and perhaps the difference between oneself and others); source of identity is the self; people regard themselves as free agents and independent actors.	<i>Collectivist:</i> Key goal is to maximize the welfare of the group or collective; source of identity is the group; individuals regard themselves as group members; focus is on social relations.
Influence: Egalitarianism versus hierarchy	<i>Egalitarians:</i> Do not perceive many social obligations; often regard BATNA to be major source of bargaining power.	<i>Hierarchists:</i> Regard social order to be important in determining conflict management strategies; subordinates are expected to defer to superiors; superiors are expected to look out for subordinates.
Communication: Direct versus indirect	<i>Direct Communicators:</i> Engage in explicit, direct information exchange; ask direct questions; not affected by situational constraints; face-saving issues likely to arise.	<i>Indirect Communicators:</i> Engage in tacit information exchange such as storytelling, inference-making; situational norms.

Implications for Negotiators

- Know where you are in the negotiation process:
 - Building a relationship
 - Exchanging information
 - Trying to persuade each other
 - Making concession and reaching an agreement
- Concentrate on the commonality rather than on the differences:
 - politeness
 - respect
 - and a sense of humor
 - The above three points are appropriate in all cultures!
- Some questions to ask yourself:
 - How does the other side perceive my culture?
 - How does the other side perceive power?
 - How does the other side perceive time?
 - Does the other side communicate directly or implicitly?
 - How do you show respect?
- Some remarks for overcoming cultural differences:
 - Learn the other side's culture (part of the preparation)
 - Don't stereotype (there is still variance)
 - Be aware of your own culture and how others may perceive it
 - Find ways to bridge the cultural gap

9.2 Procedural aspects

Procedure can shape and influence the negotiations

- Preparation
- Location
- Communication
- etc.

Steps of the negotiation process

1. Recognize/identify the problem
2. Explore negotiation possibilities
3. Get a mandate
4. Negotiate within your mandate. If you have to change the mandate, you should be sure, that it is final.
5. Initial the negotiation text, if practice (Up to here as a negotiator)
6. Signing of the negotiation text
7. Approval, if necessary
8. Entry into force
9. *Open the champagne*

Preparation of Negotiations

- Explore the situation well: Get the maximum of information on:
 - Problem
 - The other side's position
 - Your possibilities
- Mandate-drafting is decisive:
 - Draft it yourself, if possible
 - Mandate should be ambitious, but reasonable/realistic so that later adaptations do not become necessary.
- For each round of negotiation prepare:
 - 3 main questions:
 - * What do you want to achieve?
 - * How do you want to proceed?
 - * Which follow-up?
 - Additional preparations:
 - * Organization of your team (who speaks?)
 - * Where?
 - * Style of the negotiation?
 - * Protocol
 - * Communications and press information

Aspects regarding negotiation strategy: Question for avoiding common mistakes in negotiation

- Are you pursuing a negotiated course of action only to justify an earlier decision?
- Are you assuming that what's good for you is necessarily bad for your opponent, and vice-versa?
- Are you being irrationally affected by an initial anchor price?
- Is there another frame that would put a different perspective on the negotiation?
- Are you being affected by readily available information, and ignoring other valid, but less accessible data?
- Have you fully thought about the decisions of your opponent?
- Are you placing too much confidence in your own fallible judgement?

Communication Verbal communication:

- Use decent language
- Try to say it positively ("glass is half full")

Instead of this...	say this...
Cririque	Comment
Debate	Discuss
Focus on differences	Search for common ground
Fight	Discussion
The opposition party	The other party
No	Yes, but (e.g. "while I understand your position, I would like to emphasize...")

Nonverbal communication

- Appearance (cultivated, appropriate)
- Body language (gestures, body postures, facial expression)
- It is important to be aware of this communication especially in the other team. This can give you additional information ("face-to-face" in the same room is crucial for important negotiations (no tele-negotiations))
- Try to avoid judging according to simplified stereotypic ideas.

Location and physical environment

- Seating order always according to objective criteria:
 - Alphabet
 - Hierarchy
 - Seniority

Time

- Time can be source of power and leverage
- But also an obstacle
- Try to use deadlines in order to force the parties to be more constructive and to give up their resistance (Exp. Lausanne Iran - P5+1 Agreement 02.04.2015)
- But do not say the deadline will never be prolonged (In the sense of a "last chance")

Conclusion

- The procedure of a negotiation can be an important influencing factor
- It is important to manage it carefully
- Try to be:
 - prepared
 - goal oriented and objective
 - intellectually skeptical and distrustful
 - polite

10 Summary, Conclusion, Discussion

10.1 NECON recommendations

NECON = Negotiation and Conflict Management

1. Before asking for, accepting, or refusing a negotiation, undertake a thorough analysis. Refusing one can be an unfriendly act and/or signal that there is no room for concessions.
There are players who perceive the start of negotiation already as a concession (although this is not true in rational/friendly environments).
2. Negotiate in good faith, create confidence, while remaining critical. Be polite, but be insistent. Do not play games, do not use dirty tricks. If the other does it show that you do not agree. Use the "Tit for Tat" - Strategy in a reasonable way.
3. Stick to a coherent line of argumentation and stick to your engagement in the negotiation. Do not change argumentation unless new, objective elements appear.
4. Proceed carefully in the negotiation:
 - (i) Do not disclose your red lines ("restrictance points", "reservation prices"). In case you think the indication of a red line (true or pretended) is useful for tactical reasons, take into account that in the event of not respecting it at a later stage you could lose credibility.
 - (ii) Do not burn bridges - maybe you will have to change your position.
5. Demands / Counter Demands:
 - (i) have to be well founded, and
 - (ii) should be based on your own realistic assessment of the possibilities of the other side (evidently, this assessment does not need to coincide with the offers made by the other side).
6. Negotiation Engineering: The method based on a decomposition and formalization of the negotiation problem, where the heuristic application of mathematical methods facilitates the process of reaching an agreement. Identify the difficult elements of the negotiation.
7. When there are several issues on the table, link them together, if the added value for the negotiation of the more controversial issues is larger than the potential negative / delaying effect for the negotiation of the less controversial issue.
8. If you have a bigger interest in a negotiated solution than the other side, make proposals that solve the problem of the other side (while evidently fulfilling your own requirements). If your proposals are rejected for comprehensible reasons, make new proposals.
9. Proceed in phases. Fix (orally or written) the intermediaite result. Make clear that you do not intend to backpedal (and that you expect the other side not to do it either), but do not give up your pledge before you are sure to get the counterpart. Accordingly, make it also clear that "nothing is agreed until everything is agreed".

10.2 Benefits and limits of models

10.2.1 Game Theory

- Game theory is a powerful tool for the generation of insights into problems
- Game theory needs a considerably high level of abstraction - in order to allow sensible propositions. In difficult problems the complexity may often not be reduced to the level which would allow the use of the game theoretical approach.
- Game theory is based on utilitarian reasoning, which is not always applicable in real life.

10.2.2 Harvard model

- Good remarks regarding mutually beneficial agreements
- Recommendations are on a relatively high level of abstraction and therefore globally applicable
- Per se correct, but in a specific situation often not enough

10.2.3 Negotiation Engineering

- Uses different engineering approaches and puzzling to find a solution for complex problems; sort of a mixture of "Harvard" and Game theory.
- Approaching political problems with technical means is not always accepted
- Not every problem can be divided in subproblems to solve them with technical means.

10.2.4 In General

- There is no cookbook or a recipe for good negotiation: It lies in the nature of negotiation that there is no "one size fits all" model
- Thinking in models is very helpful. It allows to structure a problem and to reduce it to its most formal nature: This is already an important part of the solution
- For every problem, one has to choose the best approach in relation to the concrete situation: This lies in the nature of a heuristic method.