



The Zimmermann Telegram: How to Make Use of Secrets?

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Abstract This paper discusses the problem of how to make use of a secret without publishing the source. The point of the departure is the so-called Zimmermann Telegram which, at least to some extent, motivated the U.S.A. to join the Allies in the war against Imperial Germany. The paper analyzes how Admiral Hall, Director of British Naval Intelligence, managed to convince the US Government that he can read the Telegram, written in cryptographic code, without letting everybody, including the Germans, know that his department can decipher the German code. A game theoretic model is presented which supports the historical analysis.

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1. How to make use of a secret without publishing the source

This paper refers to submarines, Mexico, and Room 40. Its heroes are people who unravelled secrets or have the power to do so. Some created secrets; others deciphered secrets; others have a pile of secrets in their cupboard.¹ Almost all of them, directly or indirectly, face a problem: How to make use of a secret that is no longer a secret without letting others know that you know the secret? The latter condition could be paramount in case of war as the story of the Zimmermann Telegram illustrates. You do not want that the enemy knows that you can decipher his messages. The safest way to achieve this is not to use the information. But then what is good about reading the enemy's messages?

In section 2, I will tell the story of the Zimmermann Telegram and add a

¹ See Holler (2002) for the creation of secrets as a form of art.

somewhat unusual interpretation to it. I call it story, as history has not yet decided. Sections 4 and 5 contain a game theoretical analysis. Despite the fact that game theory is a child of mathematics this analysis is kept rather informal. However, for these sections, it is expected that the reader is willing to apply theoretical concepts like Nash equilibrium or subgame perfectness. However, readers who expect to find some sophisticated game theory or theoretical novelties in this paper, will be disappointed.

This paper is meant to shed some light on a so far rather neglected phenomenon of secret: How to make use of a secret without publishing the source? Mankind spends a lot of time and energy to create secrets and perhaps even more resources to unravel them – see our secret services –, but often it is the question what to do and how to use the dearly achieved knowledge if it is not answered, and in many cases the question is not even asked. Modern societies enjoy many private and public institutions that collect data and a large share of these data are in fact secrets 'from some point of view'. But the use of these data is still in its infancy and hardly understood. This paper is meant as, however modest, contribution to bridge this gap.

2. The Zimmermann Telegram story

Most secretly: 'We intend to begin on the first of February unrestricted submarine warfare. We shall endeavor in spite of this to keep the United States of America neutral. In the event of this not succeeding, we make Mexico a proposal of alliance on the following basis: make war together; make peace together; generous financial support and an understanding on our part that Mexico is to reconquer the lost territory in Texas, New Mexico, and Arizona. The settlement in detail is left to you. You will inform the President of the above most secretly as soon as the outbreak of war with the United States of America is certain and add the suggestion that he should, on his own initiative, invite Japan to immediate adherence and at the same time mediate between Japan and ourselves. Please call the president's attention to the fact that the ruthless employment of our submarines now offers the prospect of compelling England in a few months to make peace'.²

² This is considered as the ultimate English version of the so-called Zimmermann Telegram. Quoted after Friedman and Mendelsohn (1994[1938]: 1). Also see Collier's Encyclopedia (1969: 761).

2.1 The reading of the Telegram

It was January 17, 1917, when the transcript of a German wireless landed on the desk of De Grey's desk in Room 40, the locus of decoding situated in the vicinity of the British Admiralty. The decoders unearthed first the name of the sender's name: Arthur Zimmermann, The Kaiser's Minister of Foreign Affairs. Then they found 'Most Secret' and 'For Your Excellency's personal information'. Since the wireless was directed towards Washington a very plausible hypothesis was that the German Ambassador Count von Bernstorff was the Excellency in question. Further scrutiny uncovered that the German will resume 'unrestricted' submarine war by February 1 and that the German Minister in Mexico von Eckhardt should convince the Mexicans and possibly the Japanese to make war against the USA if the United States do not remain neutral. In her best-selling book 'The Zimmermann Telegram' Barbara Tuchman followed the traces of this telegram which, in the end, became a decisive factor which made President Wilson to give up neutrality policy and bring the United States into war against Germany. This chapter exploits this book with a focus on the working of secrets, secret messages, and their decoding.

Before, however, we dive into this swamp it has to be told that, at the beginning of 1916, the perspective of Mexico making trouble to the United States and Japan joining in this was not as unrealistic as it seems today. In fact, General Pershing commanded twelve thousand American soldiers operating within the Mexican borders. It is not obvious whether this activity was meant to support President Carranza against the mushrooming competitors or to teach the Mexicans an adequate interpretation of the Monroe doctrine. In any case, this action added to the hostile feelings of the Mexicans towards their mighty northern neighbor. A promise of loads of guns and ammunition and some fuel for the dream to regain the old borders which included Texas, New Mexico, and Arizona could motivate the Mexicans to consider threatening the southern border of the United States.³ The promise and the fuel for the dream were contained in Zimmermann's note.

The relationship between the United States and Japan were even more delicate. On the one hand, Japan was an ally to England, France, and the other enemies of *Axís*. It declared war on Germany on August 9, 1914, and by November of the same year it had harvested Marshall and Carline Islands and taken over Tsingtao on Chinese mainland that was formally leased by China to Imperial Germany as naval basis, but, in fact, was treated as colony and functioned to control major parts of the host country.

³ California was not mentioned. Perhaps it was reserved to bribe Japan.

On the other hand, the Americans were more than irritated when the *Asama*, a Japanese battle cruiser, together with a fleet of smaller units, was visiting the Turtle Bay on the coast of Mexican Lower California and got stuck in the mud. Many Americans felt that the 'Yellow Peril', a term made popular by the Kaiser, came closer. Barbara Tuchman (1971: 59) observed that 'Japan was not displeased by the universal suspicion of her intentions. The greater the doubts of her loyalty, the higher the price the Allies would pay to keep her loyal. She did not mind letting it be known to the Allies that she had been approached by the enemy'. In any case, the Germans were strongly convinced that the Japanese had chosen the wrong side in this war. Step by step they promoted the Japanese from 'Yellow Peril' to the 'Prussians of the East'. This conviction might look peculiar in the early twentieth century, but the future demonstrated its implementation, at the expense of millions of lives.

There was a somewhat bizarre argument which, in the view of the Germans, connects the fate of Japan with the one of Mexico, and vice versa. The German considered the Mexicans and the Japanese 'a like race' and, strangely enough, there were more and more Mexicans and Japanese, but also Americans and Germans who drew their political conclusions from this peculiar message. Obviously, the Zimmermann Telegram and its interpretation were partly a result of it. Thus, the Telegram fell on fertile ground and so did its publication.

2.2 How Admiral Hall managed the secret of the secret

Admiral Sir William Reginald Hall, Director of Naval Intelligence and head of Room 40, was 'seized by the agonizing problem that always haunts the cryptographer: how to make use of the information without revealing that he knows the code' (Tuchman, 1971: 7). Hall was sure that he held the instrument that would puncture American neutrality – if it could be used. To bring the United States into war was vital to the Allies exhausted as they were in men, morals and money. Not only the Germans expected that the unrestricted submarine war could strangle England and the unoccupied rest of France by cutting the delivery of the necessities to resist the German war machinery – and ultimate defeat loomed. However, it 'had taken years, the genius of a few men, the lives of others, the long patient month' (Tuchman, 1971: 8), to break the German code and the prospect that the Germans could switch to another code was not promising at all.

One of the first activities of the English after declaring war to Germany on August 4 was to cut the German transatlantic cables and thus to seal it off from direct cable communication. The Germans were constrained to wireless communication that allowed the English picking German secrets, commands and gossips out of the air, or the Germans sent their messages

on detours via neutral information channels.⁴ Of course, these secrets were coded and thus invited decoding. This gave birth to Room 40.

When the Zimmermann Telegram was intercepted, Room 40 was peopled by eight hundred wireless operators and up to eighty cryptographers and clerks.

Without going to the intricacies of deciphering, it has to be said that it was of great help to the Room 40 team that the Germans sent out their messages in duplicate and triplicate, and thus producing several versions of the same message in alternative cryptographic codes.⁵ This was a procedure that was also of help to Admiral Hall to solve his problem. As the 'very secret' Zimmermann Telegram was also sent over various channels, Hall could design a story which made it difficult, if not impossible for the Germans to trace back the leaking to Room 40 or to think even that their code was broken. However, what was even more substantial was the German hubris which made Admiral Hall think that '...the Germans were clever but just the fatal inch of being clever enough to suspect that their enemy might be clever too' (Tuchman, 1971: 7). He actively supported this perspective also at the occasion of the Zimmermann Telegram. When President Wilson arranged its publication in the US press, Admiral Hall 'was very anxious that there should be no suspicion in the German mind' that the British 'had anything to do with it. It was then that the Daily Mail', at Admiral Hall's own request, 'published a stinging leader passing severe reflections on the British Intelligence Service' (Friedman and Mendelsohn, 1994[1938]: 47). The Germans never thought about changing the code. Even when the Zimmermann Telegram was published, they still used the very same code and sent messages in duplicate and triplicate to find out where the Telegram was leaked. But where was it leaked?

Room 40 prepared a version of the Telegram which suggested that it was stolen from the desk of von Eckhardt, probably by a spy, after it reached Mexico via Washington with the help of US communication installations. If the make-up was believed then there was no hint that the

⁴ Supportive Swedish government officials allowed a large number of German messages to be sent via Stockholm-Buenos Aires to America. In 1915, the British protested against this practice. However, the 'British government must have realized soon after this protest...that the information they were gleaning from the study of these messages was too valuable to lose, even taking into account the fact that the messages were of considerable use to the enemies. It is more than likely that the information was at least as useful to the British as it was to the Germans themselves. In some cases there is no doubt that it was even more useful' (Friedman and Mendelsohn, 1994[1938]: 18).

⁵ 'The sending of a message in more than one code is a capital crime in cryptography. True, it was a crime that we know the Germans to have committed' (Friedman and Mendelsohn, 1994[1938]: 43).

code was broken – and that the British had a routine of reading the telegrams transmitted over it, generally sent and received by US government agents. This version of the Telegram was shown to the United States ambassador in London and then transferred into the hands of President Wilson. The latter, 'perhaps the most tragic figure of the day',⁶ did not only see his edifice of peace break down but got seemingly very angry when he learned that the Germans used the American hardware to look for partners in the pending war against the United States: '...the German Foreign Office used the American Government as an errand boy for the transmission of a document that contained a plot against its own territorial integrity' (Friedman and Mendelsohn, 1994[1938]: 20).⁷

Still at the beginning of 1917, Wilson was hoping and rallying for a 'peace without victory'. He thought that this can only be achieved if the United States acted as a mediator. This role of the mediator necessitates that the United States keep their neutrality. However, either side of the European War insisted on victory and the ultimate defeat of the other side. Wilson, however, was firm in this policy and his policy was supported by a majority of US citizens who just elected him for a second term. Most Americans thought that the Europeans should solve the troubles on their own. Although this was quite different to Wilson's motivation, it gave his presidency a majority.

2.3 Grapes of wrath and naivety

President Wilson was extra-furious about the Telegram because it was him who agreed that the German Embassy may receive messages in code. He expected that the exchange of messages was about conditions for peace, and not about finding allies that keep America busy at home. Wilson felt cheated, humiliated and betrayed.

⁶ This is how Bernard Shaw ranked the American President, see Shaw (1964[1919]: 45). Lewis (2009, p.44) reports that Wilson "pushed through Congress in 1917 an Espionage Act that criminalized not only espionage but speech critical of the government, Wilson proposed to include, but the Congress struck out, a provision for censorship of newspapers. In 1918 Congress passed an amendment, known as the Sedition Act, that made a crime to use 'disloyal' or 'profane' language that might encourage contempt for the Constitution or the flag." Lewis concludes that Wilson was a reformer on economic issues "but on civil liberties he was a disaster" (p.44).

⁷ In his biographical work on Walter H. Page, the war-time American Ambassador to Great Britain, Burton J. Hendrick commented: 'Humor of any kind the Germans seldom displayed at crises of this sort, yet the mechanism adopted to make certain that this plot against the American people would safely land on Bernstorff's desk evinces an unmistakable gift - even - though an unconscious one - for the sardonic' (quoted from Friedman and Mendelsohn, 1994[1938]: 19).

Now, after Wilson read the Telegram and the text of the Telegram was widely published in the press, whatever the motivation was, the American neutrality transformed into disgust and hate for the *Huns*. Even the American West, so far utmost disinterested in the European War, saw itself attacked by a German policy which invited the 'Yellow Peril' to come ashore. More or less within a day, public opinion swung from neutrality that even allowed some sentimental ties with Germany - not surprising with a large portion of population of German origin -, to call for joining the Allies in the fight against the German aggressor. Most likely the 'cry of wrath' would have been even stronger if it had been made public by what channel Zimmerman transmitted his instructions. But the US Government kept silence on this and about many other details. This silence was readily supported by Admiral Hall and his office.

No wonder that in the US Senate there were still members who doubted the authenticity of the Telegram and proposed that it could be a make-up of the English to bring the United States into war. These doubts were strengthened by the fact that President Carranza strictly denied that he had received any offer by the Germans and confirmed his and his country's neutrality. Confirming authenticity looked like a rather complicated problem. For a solution, Admiral Hall pointed out that there was at least one copy of the Telegram with the American telegram system, although still coded. He offered some hints that the transcript which was on Wilson's desk was a deciphered version of this copy. However, 'standing on federal law protecting the contents of telegrams', Western Union 'would not let its files be searched' (Tuchman, 1971: 165). It needed some government pressure on the president of the company to overcome this barrier. Still Room 40 keep some degree of ambiguity about how much the English could decipher of the German code. This did not help President Wilson to make an easy decision. He was very angry but still hesitant, while most of his voters now cried for some sort of revenge, especially when information arrived that several American ships were torpedoed and sunk by German submarines, and American lives were lost.

Rather unexpected, Admiral Hall received support from an absolutely reliable source that unambiguously confirmed the Zimmermann Telegram. In a conference to the press at Berlin, Arthur Zimmermann said he cannot deny the Telegram. 'It is true', he said. Why Zimmermann did not deny and thereby let the authenticity discussion pending, and give the German intelligence a chance to get further information of how the Telegram was leaked, remains one of the great secrets of history.⁸ Five weeks later the

⁸ Perhaps Zimmermann relied on a reading of the Telegram as a note on possible measures if the United States enters war. Perhaps he even hoped that potential threats from south

United States joined the Allies in the war against Germany.

There are a series of other questions related to this case that are still waiting for an answer. Admiral Hall kept on playing cat and mouse after his retirement and the tons of deciphered documents which he left for the public only demonstrate that Room 40 was extremely skilled and highly efficient. But they do not answer why the British waited till the end of February, 1917, to let President Wilson know what the German plan in the case that his government declares war while the Telegram was already read in Room 40 on January 17, 1917. Friedman and Mendelsohn (1994[1938]: 45) suggest a mix of quite convincing arguments for this 'delay'. Firstly, the British could not admit that they received the information by decoding messages sent via American channels. Secondly, Room 40 had problems with deciphering; in order to fill the gaps, British had to resort to time-consuming crosschecks with information contained in the duplicates and triplicates sent by the Germans. Thirdly, Admiral Hall could hope that the reopening of the unrestricted submarine warfare would bring the United States on the British side. In fact, '...diplomatic relations between the United States and Germany were severed. But as the weeks went by there was no declaration of war...Something had to be done to stir up the President and the people of the hinterland beyond the Mississippi'.

Perhaps Admiral Hall was not convinced that the Telegram could have a decisive effect at all and to drop information which could signal that the British can read the German code could be too high a price. In fact, from a careful reading of the Telegram the Americans could have learned about German measures, *if the USA enters war against the Axis*. They could also read that the Germans will 'endeavour...to keep the United States of America neutral'. This does not sound like looking for a fight.

In his book *Road to War, America 1914-1917*, Walter Millis pointed out that the headlines of the American press commenting the Zimmermann Telegram, or what was given to them by the US Government, '...were not always precisely accurate. Germany had not actually sought an alliance as yet...It was not a proposal for an aggression against the United States, but merely a conventional, though rather blundering diplomatic preparation against a probable American attack upon Germany...'. Obviously, Zimmermann was too naïve to make this point clear to the Americans and their president. It seems that he relied too much on careful reading. What made the telegram '... particularly shocking, of course, was the suggestion that the Japanese...should be invited to the American Continent, or that the principle upon which many Americans had demanded the restoration of

of its border and from the other side of the Pacific could make neutrality even more valuable to the Americans.

Alsace-Lorraine (because they had been acquired by force) should be applied to California and Texas, which we had forcibly detached from Mexico. Informed Americans understood perfectly well that the Allies had bribed Japan, Italy, and Rumania into war with the promise of slices from the enemy carcass...'⁹ But even informed Americans felt threatened by the perspective that was drafted in the Telegram. Zimmermann did not try to make clear that this was a draft that will become relevant only if the Americans join the Allies in the war against Germany.

Somewhat ironically Millis concludes that there '... is no doubt that President Wilson was profoundly shocked by this revelation of the fact that one could not go to war with Germany without having the Germans fight back. It did never even occur to him to question the authenticity of the document or the motive for the production of a month-old telegram at just that moment'.¹⁰ Indeed, there was no need to question the authenticity of the document after the published text was confirmed by Zimmermann. However, the political evaluation of the telegram was not based on careful reading but on strong resentments triggered by the possibilities indicated in its text and the scandalous circumstances of its transmission.

3. The Telegram game

Of course, the Allies did not ask the Germans to write down any secrets so that Admiral Hall's office had the pleasure to find out the code for itself. The need for information and communication, which is an important feature of modern wars, forced the Germans into wiring coded messages after the British had cut the German transatlantic cables at the beginning of the war. However, the creation and use of information implied thinking in terms of 'putting oneself into the shoe of the other' when making decisions. This is the essence of a game situation and, indeed, most of the involved agents acted strategically in a game theoretical sense.

The game had various players: the US represented by their President, the members of the Congress and of the political elite, the Germans, the governments and military of the Allies including Hall's own superiors, and Admiral Hall and his office. However, these players were relatively unconnected to each other and coalitions can be the result of the game but not a precondition in the outset. In game theoretical terms, Hall's game is non-cooperative, but this does not exclude that players cooperate.¹¹ If we

⁹Quoted from Friedman and Mendelsohn (1994[1938]: 46).

¹⁰Quoted from Friedman and Mendelsohn (1994[1938]: 33).

¹¹In non-cooperative games players cannot make binding agreements. Therefore, cooperation has to be self-enforcing if it should prevail (see Binmore, 1992).

accept this, then we can look at the game that Admiral Hall and his office played with the USA under the constraint that the Germans should not find out about the British capacity of decoding. As the above story tells us, the Germans did not behave strategically in a game theoretical sense and therefore can be considered part of nature in the telegram game: They never thought that somebody could ever decode their messages. They even committed the blunder of sending a message in more than one code, which is 'a capital crime in cryptography' (Friedman and Mendelsohn, 1994 [1938]: 43) as noted above. Therefore we can reduce the strategic decision making to two players: Admiral Hall and his office, in short 'Hall', and President Wilson and his staff, in short 'Wilson'. However, what are their strategy sets?

3.1 The strategies

Hall can deliver the contents of the telegram, inasmuch as it is deciphered, but keep the source fully covered. We will label this strategy as 'keep covered'. Alternatively, Hall can admit to Wilson and his staff that the British can read the German code and that they followed communication on US information tracks. In this case, the secret of the decoding is fully disclosed and the fact that the British spy on US information channels is uncovered. However, Hall can choose degrees of (incomplete) disclosure and this is what he did by making up the story of the stolen documents. In what follows, the variable p indicates this degree: $p = 1$ indicates that no reliable information about the source is given while $p = 0$ implies full disclosure.

Matrix 1 The Zimmermann Telegram game

		President Wilson and his staff	
		Not publish ($q=1$)	Publish ($q = 0$)
Admiral Hall and his office	Keep covered ($p = 1$)	(0,2)	(1, 1)
	Disclose ($p = 0$)	(1,1)	(-5, 2)

President Wilson can decide to publish the information that Hall gave, or not. In order to convince the public, Wilson will also give information on the source if he chooses the pure strategy 'publish', conditional on the

information that Hall delivers. Of course, there are also degrees of how much to publish. These degrees are expressed by q with q being a value between 0 and 1. $q=0$ indicates that Wilson publishes the information that Hall delivers on the issue of the Zimmermann Telegram without further qualification. $q=1$ means to be absolutely silent about the source of the Telegram. Alternatively, q can also be interpreted as the probability that the given information will not be published. Then p describes a mixed strategy and $p \in [0,1]$ is Wilson's set of mixed strategies with the pure strategy $p=1$ and $p=0$ as extreme cases.

Note that the matrix representation implies that Hall does not know the strategy choice of Wilson when he is to choose his strategy, and vice versa. The matrix representation implies imperfect information of the players. This also implies that Wilson will decide on publishing before he can see Hall's decision. The assumption that the President has informed the press before it has been verified whether Hall has disclosed the source of the information, or to what degree, might seem somewhat peculiar. However, this is what has happened. But to take care of possible objections, we will analyze a model in section 5 which suggests that the degree of disclosure is known to Wilson before he decides to 'publish' on the source of the information, or not.

3.2 Outcomes and values

To give a complete description of the game, we have to know the outcomes that result from the various strategy combinations and, most importantly, the values, i.e. payoffs, that the two players assign to these outcomes. Of course, the latter are the most debatable entries of Matrix 1.

But let us first talk about the outcomes that do not show up in the matrix, but are essential for the entries given in the matrix. The assumption is that in case the source of information contained in the Telegram is fully uncovered and the source will be published, then the Germans know that the British can read their coded messages. It is assumed that the Germans will stop wiring information if this information is meant to be secret, and look for a new code. Both consequences are expected to have damaging effects for the Allies. This justifies a value of -5 for Admiral Hall and his office, while President Wilson and his staff can convincingly argue that the USA have to enter war against Germany. The latter is evaluated by an entry of 2. However, the same value is assumed for President Wilson and his staff if the source is kept covered and nothing is published. Then, at least so far, the USA will not enter the war. We should not forget that Wilson was looking for peace as long as he was not forced by hostile actions to become active against the German Reich.

Compared to the two outcomes just described less favorable results are

expected for President Wilson if his agents support the publication of the Telegram but the source remains fully covered or, alternatively, the source is fully disclosed but the information is not published. Obviously, 'not publish' is not a best reply if Hall chooses to 'disclose' how successfully his office works (which he did not intend per se). However, the strategy 'disclose' is a best reply to the strategy 'not publish' – i.e. there is no risk to give information if it is not published -, but not vice versa. Therefore, the strategy pair (disclose, not publish) is not a Nash equilibrium as the strategies are not mutually best replies to each other.

In fact, there is no pair of pure strategies in this game that represents a Nash equilibrium, even if we interpret p as a degree of disclosure. Whatever strategies Admiral Hall and President Wilson choose, one of the two decision makers can do better by choosing an alternative strategy, *given the strategy of the other*. However, the game is finite – the number of pure strategies can be expressed by (a positive) natural number – and, therefore, by the seminal proof of Nash (1951), we know that the game has an equilibrium. Therefore, since there is none in pure strategies, there has to be at least one in mixed strategies.

But before we look into details of this equilibrium it should be mentioned that the payoff values of Admiral Hall and his office should be further discussed, however, we just leave it with the numbers given in Matrix 1. In the next section, we will see that the specification of the numbers determine the values of p and q that represent a Nash equilibrium. However, the discussion will demonstrate that the problem of mixed strategy equilibrium is much more general than a specific game can show. That is why we will use a more general form. That is, the specification of the payoff numbers determine the probability mix in equilibrium, but there is a large class of two-by-two matrix games that is characterized by a mixed-strategy equilibrium so that no equilibrium in pure strategies exists and the interpretation given in the next section applies.

4. The mixed strategy equilibrium

We generalize the game in Matrix 1 so that it has the form of Matrix 2. Hall is represented by player 1 who controls the pure strategies s_{11} and s_{12} while Wilson is represented by player 2 who controls the pure strategies s_{21} and s_{22} . For the payoffs we assume

$$b > d, c > a, \alpha > \beta \text{ and } \delta > \gamma . \quad (\text{A.1})$$

This assumption guarantees that for the game in Matrix 2 a Nash equi-

librium in pure strategies does not exist.¹²

Two-by-two matrix games with payoffs that satisfy either (A.1) or (A.2) are called inspection games. This allows the application of the standard analysis of these games to the generalized Zimmermann Telegram game in Matrix 2. In the inspection game, p and q are defined as probabilities for strategies s_{11} and s_{21} , correspondingly.

Matrix 2 Generalized Zimmermann Telegram game

Player 1 2	s_{21}	s_{22}
s_{11}	(a,a)	(b,β)
s_{12}	(c,γ)	(d,δ)

A Nash equilibrium is characterized by a pair (p^*, q^*) such that none of the two players can improve his payoffs, *given the strategy of the other player*. This holds for a value p such player 2 is indifferent between choosing strategies s_{21} or s_{22} , or any convex combination of the two. The condition of indifference is

$$ap + \gamma(1 - p) = \beta p + \delta(1 - p) \tag{1}$$

This solves for $p^* = (\delta - \gamma) / (\alpha - \beta - \gamma + \delta)$. Correspondingly, the equilibrium value of q^* derives from the indifference condition

$$aq + b(1 - q) = cq + d(1 - q) \tag{2}$$

This solves for $q^* = (d - b) / (a - b - c + d)$. If we plug p^* into (1) and q^* into (2) we get the corresponding payoffs:

$$u_1(p, q^*) = (ad - bc) / (a - b - c + d) = u_1^* \tag{3}$$

$$u_2(p^*, q) = (a\delta - \beta\gamma) / (\alpha - \beta - \gamma + \delta) = u_2^* \tag{4}$$

¹² In fact, there is a second set of condition that assures such a result: (A.2) $b < d, c < a, \alpha < \beta$ and $\delta < \gamma$. However, (A.1) corresponds with the values in Matrix 1 while (A.2) does not.

The equilibrium (p^*, q^*) has been widely discussed in literature. Its plausibility has been questioned¹³ mainly on the fact that the mixed strategy p^* is exclusively defined by the payoffs of player 2. As consequence, if, for instance, α increases, this will not affect the equilibrium 'behavior' of player 2, but have an impact on the mixed strategy of player 1. What looks rather paradoxical in the outset, however, gains plausibility if we take care of the strategic relationship embedded in the game. If α increases, player 1 will alter p^* to p^{**} such that player 2 has no incentive to change his behavior prescribed by q^* . In fact, $p^{**} < p^*$ such that (1) still holds despite the increase of α . Needless to say that we obtain a corresponding interpretation for q^* if the payoffs of player 1 change.

Another line of discussion is based on the fact that (a) the equilibrium (p^*, q^*) is weak and, therefore, the payoff of, e.g. player 1 does not decrease, if he deviates from choosing p^* , given that player 2 chooses q^* , and (b) that the payoffs that result from (p^*, q^*) , i.e. u_1^* and u_2^* , are identical to the payoffs of the maximin solution, if maximin also implies mixed strategies.¹⁴

If, without further discussion, we apply the results of the generalized Zimmermann Telegram game to the specific game of Matrix 1 we get the values $p^* = 1/2$ and $q^* = 6/7$ for the strategies and $u_1(q^*) = 1/7 = 0,143$ and $u_2(p^*) = 1.5$ for the payoffs. Note that we interpreted p^* as degree of disclosure and q^* as probability of publishing the source of information.

5. Sequential information game

It has been argued that Wilson and his adviser could not decide on publishing the information contained in the Zimmermann Telegram before Hall and his office did not disclose the message. However, an essential item of the message was its reliability, i.e. the need of a good story of how the British acquired its possession. History tells us that Wilson gave a preliminary text to the press before the conditions to verify the information was clear. Of course, Hall made the first move in this game by letting the US Government have a preliminary version of the Telegram's text. Does this already imply disclosure? Or, does it necessitate that the British will have to produce a story that makes the Telegram booty trustworthy? Does

¹³ But it has also been exploited to discuss 'paradoxical' phenomena, see, e.g. Andreozzi (2004), Frey and Holler (1998), Holler (1993), and Tsebelis (1990).

¹⁴ See Holler (1990). If both maximin and Nash equilibrium are mixed and result in identical payoffs then Harsanyi (1977: 104-107) called the Nash equilibrium 'unprofitable' and suggested maximin (125). This applies to our game if either (i) $a > c, a > b, d > b, d > c$ and $\beta > a, \beta > \delta, \gamma > a, \gamma > \delta$ or (ii) $b > a, b > d, c > a, c > d$ and $a > \beta, a > \gamma, \delta > \beta, \delta > \gamma$.

it matter whether Hall decided first on disclosure and Wilson followed, or is the simultaneous move story, implied in Matrix 1 and 2, a good approximation?

In order to prepare for an answer to these questions we assume a sequential game such that Hall decides first on 'keep covered' ($p=1$), 'disclose' ($p=0$) or any other degree p . Wilson can observe Hall's decision, even when p is more complex than $p=1$ or $p=0$. Wilson will choose a best reply to p and select either 'not publish' or 'publish' or a linear combination of the two, characterized by $q \in (0,1)$. As Hall expects such a reaction, the following reasoning derives from simple backward induction.¹⁵

The indifference properties of (p^*, q^*) suggest that if Hall chooses $p^\circ > p^* = 1/2$, then $q=1$, i.e. Wilson will choose the pure strategy 'not publish'. In this case, Hall's payoff will be $u_1(p) = p^\circ 0 + (1 - p^\circ)1 = 1 - p^\circ$. Assuming $p^\circ = p^* + \varepsilon$ and $\varepsilon > 0$, then $u_1(p^\circ) = 0.5 - \varepsilon$.

This result shows that the payoff to Hall will be the larger the smaller ε is. This suggests minimizing ε . Of course, ε has to be large enough so that Wilson is no longer indifferent between 'not publish' and 'publish', but will choose the pure strategy 'not publish' with probability $q=1$.

If Hall chooses $p^\circ < p^* = 1/2$, then Wilson will react with $q=0$. Accordingly, Hall's payoff will be $u_1(p^\circ) = p^\circ 1 + (1 - p^\circ)(-5) = 6p^\circ - 5$. Assuming $p^\circ = p^* + \varepsilon$ and $\varepsilon > 0$, then $u_1(p^\circ) = -2 - 6\varepsilon$.

A comparison of the payoff $u_1(p^\circ)$ for $p^\circ < p^* = 1/2$ and $p^\circ > p^* = 1/2$ indicates that Hall should choose the latter deviation from p^* if he wants to maximize his payoff. For any $\varepsilon > 0$, obviously $0.5 - \varepsilon > -2 - 6\varepsilon$.

The more sensitive Wilson is to variations of degrees of disclosure, the smaller ε will be. If ε approaches 0, that is, if Wilson is very sensitive and Hall knows about this, then Hall's payoff will be close to 0.5. This, of course, is larger than the payoff that corresponds to the mixed strategy equilibrium of the simultaneous game in Matrix 1. Plugging corresponding values into equation (3) tells us that the latter value is $u_1(p, q^*) = 1/7 \approx 0,143$.

Just in order to complete the picture, equation (4) tells us that Wilson's payoff value in the case of the simultaneous game will be $u_2(p^*, q) = 1.5$ while in the sequential game Wilson's payoffs will be $(1/2 + \varepsilon)2 + (1/2 - \varepsilon)1 = 1.5 + \varepsilon$. Since $\varepsilon > 0$, also Wilson will get a higher payoff in the sequential game. However, the (subgame perfect) equilibrium of the sequential game, $(p^\circ, q=1)$, presupposes that Hall cannot change the strategy p° after Wilson opted for 'not publish'. Note that p° is not a best

¹⁵ See Andreozzi (2004) for an alternative application. However, in Andreozzi p° is a probability (representing a share of the population), but no degree.

reply to $q = 1$ as we know from the discussion of the simultaneous game.

The result shows that it pays for Wilson not to be too sensitive, given that Hall knows about this fact. For Hall, however, it is advantageous if ε is small and Wilson reacts on minor variations of p . The sensitivity of Wilson may depend on the facts disclosed, on the reliability of the source, but also on political convenience. In any case, the American publication policy and the British information policy were such that the Germans did not conclude that their messages were decoded. This result is consistent with our game theoretical analysis.

6. Concluding remarks

The French historian Georges Duby claims that 'the most startling discoveries that remain to be made, I think, will come from the attempt to find out what was left out of the discourse, whether voluntarily or involuntarily, to determine what was hidden, consciously or unconsciously'.¹⁶ Naturally, a lot is left out when politics makes use of obfuscation and secrecy.

Duby concludes 'What we need are new scholarly tools, tools better adapted than those we now have to bringing out the negative in what we are shown, to laying bare the things that men deliberately cover up. At times these suddenly reveal themselves quite by accident, but most of the time they must be carefully deciphered between the lines of what is actually said'.¹⁷

Game theory is often applied to model and analyze counterfactual or, in more popular terms, paradoxical events and, therefore, seems an adequate instrument to lay bare the things that 'men' cover up. Of course, game theoretic models are highly stylized, but this cannot be avoided if we want to analyze complex phenomena. The stylizations and simplifications help us in uncovering general principles, defining relevant problems, and find new questions.

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¹⁶Quotation taken from Guilbaut (1983: 6).

¹⁷Quotation taken from Guilbaut (1983: 6).

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