The Second Win

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This note on a second win in a game[1] expands on some of the ideas in the Masterclass from Patrick McNutt[2]. It links back to the document[3] *Thief of Nature* and builds on the reasoning and thinking strategies outlined in the book *Decoding Strategy*. The examples presented here adapt and adopt the classic Schelling 2x2 payoff matrices wherein the payoffs of each player reflect the preference ordering a > b > c > d. Table 1 links back to the discussion in *Thief of Nature* that a Nash equilibrium occurs at payoff (1, 1) with c = 1 from the ordering a = 3, b = 2, c = 1 and d = 0. A Nash bargaining outcome can be expected by the players at payoff (2, 2).

Payoffs to:
Player 1, Player 2

Table 1: Payoff Matrix

	Strategy 1: Cooperative/social	**Strategy 2: Independent/selfish**
Strategy 1: Cooperative/social	b, b	d, a
Strategy 2: Independent/selfish	a, d	c, c

It is a general discussion on the second win. The idea or concept is embedded in the literature in terms of *second mover advantage* in sequential games or in market share payoffs where a player realises that a higher market share is unattainable due to zero-sum market conditions. However, the focus is on the payoffs *per se*; in the second win the focus is more on the choice of strategies *per se*.

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1 Alternate title is Thinking About Thinking or Thinking About Strategy as suggested by Manfred Holler. The term 'second win' also has a legal connotation in US criminal justice. Reasoning remains grounded to the 2x2 matrix in honour of a great teacher at Oxford, the late Michael Bacharach.

2 Check the webpage http://www.patrickmcnutt.com/news/masterclass/

3 Available: http://www.patrickmcnutt.com/elearning/workshop-slideshow-beginning-2012/

It builds on player type and knowledge about player type so that we can define rational behaviour in an early sequence of moves that are not reached by an equilibrium path.

Working definition: The second win is a move in the strategy set that is guided by knowledge of player type rather than by the path of payoffs. Playing the second win a player forfeits larger payoffs that could be achieved by more aggressive play in the early sequence[4] of moves.

A sequence of moves guided by knowledge of player type defines the second win strategy. Leo the Liar's opening move is to tell a lie. Leo may betray his type to win support or influence the belief system of Honest Henry. This is a second win strategy for Leo. The quintessence of a second win is that Leo has camouflaged his type (a mixed strategy) and there is the likelihood (i) that if Leo keeps to type, he may revert back to telling a lie and (ii) the likelihood that in repeated play Honest Henry believes that Leo is an honest type. Leo the Liar knows that Honest Henry believes that Leo the Liar will be honest – it not only creates zero trust in the sequence of moves but introduces an *incredible threat* of keeping to[5] type in the sense that Leo will play the honest move in a sequence of moves up to the second win move - a point of balance between remaining honest or reverting to type as Leo the Liar.

Playbook

The playbook is a sequence of moves. It is the strategy set for a player in a game. In the search for a rational play, neither right not wrong, we explore some interactions, wherein the trade-off between unilateral behaviour *v* coordinated behaviour is the key to unlocking the second win in the sequence of moves. When a player enters a game he has evidence about the likely patterns of behaviour, about player type, Nash equilibria and likely reactions. But evidence from the early moves in the playbook contradicts the hypothesis he had at the beginning of the game. At that juncture the player is at the second win when he realises that apart from the payoffs the logical description of the game[6] and its strategies has changed.

In trying to define the second win in a game we focus on player type and explore a camouflage[7] on player type which requires an opponent to stop and think in the sequence of moves. This is illustrated in *Thief of Nature* wherein a rational player, for example, after 3 moves scores the same total payoffs with two strategies but in one strategy set (with cheating or betrayal of type) the total payoff 6. In terms of the payoffs we define 6 as an illusionary intermittent theft from the game. If the fourth and subsequent moves in that game reveal a strategy set that contradicts the player's initial evidence of play, a rational player will stop and think.

[4] We refer to the early sequence as a Turing sequence of moves less than 5.

5 Think a chameleon or camouflage but more like the folklore character Griselda, noted for her obedience and patience (playing a long game) as hinted in the Griselda effect in Decoding Strategy.

[6] Chapter 10 in *Decoding Strategy* discussed 'Boolean Competition' in the search for a logical sequence.

[7] Imagine player type as a chameleon that can quickly change their type in response to the game and to the behaviour of opponents with commitment type observable, then a neutral type with no threat and a camouflage type at a threat level in the game. In a second win playbook a rational player can 'tune' their type in response to the sequence of moves in a game. Related concepts of Griselda type and yellow snowflakes are discussed in Chapter 10: Boolean Competition in *Decoding Strategy*.

Turing moves

We refer to the three opening moves collectively as Turing moves, a small enough sequence of moves to learn to predict an opponent's behaviour. The sequence of Turing moves are expanded in *Thief of Nature* document. So we can define irrational behaviour in terms of payoffs when a player moves to the fourth, fifth and sixth moves in a continuum. This is discussed in the literature as punishment when a betrayed player punishes the cheating player. In a repeated game a sequence of moves to obtain a second win is to start silent, then do what the other player did on the previous round.

Consider a version of the classic Prisoner's dilemma:

Payoffs to:
Player 1, Player 2.

Table 2: Machiavelli-Tucker

	Confess	**Don't' confess/Silence**
Confess	-5,-5	0,-10
Don't confess/Silence	-10,0	-1,-1

The Prisoners' dilemma presents a classic trade-off between following one's self-interest and trying to cooperate with an opponent for a greater gain. It is an example of a non-zero-sum game wherein cooperation between two or more players leads to a greater gain for the group. In the classic Prisoners' Dilemma discussed in the Masterclass, *Nash equilibrium* arises when it is implicitly assumed that the players play independently of each other. It provides a stop and think move for each player at the move where both players realise that neither player unilaterally can improve on their payoffs. Unless the players signal to each other their intention to avoid the equilibrium both players will remain at the lower payoff, for example, in a price war.

No Chat

The playbook then for each player is to maximise their payoff against the worst possible independent payoffs that is consistent with the player's information. In Table 1, (-5, -5) is a NE with *no chat and no communication* between the players. We should differentiate this from a Nash bargaining outcome at (-1, -1) with chat, communication or signalling amongst players.

In Tucker's initial representation two prisoners have been arrested for a crime and placed in separate cells. The information available separately (there is no communication) to both players is captured by Table 1: if they both confess the payoff is five years in jail, if both remain silent all charges are dropped with a minimal fine but there is a deal on the table – if one player remains silent and the other confesses, the one who confesses will get off and the other goes to jail for ten years, as illustrated by the payoffs (0, -10) and (-10, 0). What is the rational play? Rationality in this case is defined by each player wishing to receive the smallest sentence. Neither has any information about the other except that both are rational.

One play is to confess: whatever you do, I do better to confess. Both think like this and the payoff matrix in Table 2 shows confessing as *the dominant strategy* as reflected in expectation of a zero in the payoff (0, -10) notwithstanding the ultimate realisation of the (-5, -5) payoff. So it is rational to confess; it is rational for both players to confess but then they both go to prison for five years. By acting in a rational way both players secure an outcome that is a worst outcome than what they could achieve, that is a 5 (years in prison) is worse than 1. However, each player must know the other players type – for example, trustworthy to remain silent. For a second win what is rational in the playbook (of evidence) must be relative to what we know.

Strategic Lateral Thinking: 'I-think-you-think-I-think'

In other words, in Table 2 what would be optimal for me (payoff 0) is that you remain silent perhaps under the influence of persuasion or threat or promises while I, reneging on promises, confess: check the sequence in *Thief of Nature*. In a repeated game a sequence of Turing moves is to start silent, then do what the other player did on the previous round. So, could silence be a rational play? This is a version of Newcomb's paradox of applying 'I-think-you-think-I-think' or matching - knowing that we are both rational. Suppose silence is a rational play and I know that it is. Then in knowing that you are rational, I also know that it is the choice you will make. So now I know that you will remain silent. However in that case it must be rational for me to confess and I get off. But you can reason like this too and I know that so if you are rational, you will not keep silent. So it is rational for me to confess. Silence as a rational play is refuted. However, in a Turing sequence of moves, silence as a strategy under the influence of persuasion or threat or promises, creates a second win.

Maximin and Minimax Strategy

In the business world, firms as players focus on market shares. The realisation that (say) 35% could fall back to 30% given the evidence from the playbook defines the second win strategies in terms of defending 35% as a second mover advantage. First mover advantage play is to push for 40% with the risk-on of a fall in market share to less than 30%. A player's optimal move depends on the assumptions it is willing to make on how competitors are likely to behave. So in an extension of 'I-think-you-think-I-think' let's prepare for the worst in a two player zero-sum game.

Payoffs to:
Player 1

Table 3: Zero-Sum: Maximin = Minimax

	S3	**S4**
S1	20	60
S2	10	80

The market shares of Player 1 are illustrated in Table 3. Player 1 is considering the choice of S1 or S2. If Player 1 plays S1 and Player 2 plays S1, Player 1's market share = 20 (Player 2's market share = 80). Given the distribution of payoffs what is Player 1's optimal play? S1 may deliver a 20 or a 60 percent market share. Player 1 should identify the worst (minimum) payoff for each strategy, S1 and S2 and select the maximum of the minima (20, 10), a *maximin strategy* S1 with 20. Why? Player 2 as the near-rival in this zero-sum game will employ a *minimax strategy* which considers the best Player 1 could do in response to S3 and S4 and chooses the strategy that minimises the maximum payoffs to Player 1.

So, in Table 3, if Player 2 plays S3, at best, Player 1 can obtain 20 whereas if Player 2 plays S4, Player 1 could obtain 80. The minimum of these maxima = 20. If both players reason in this way, each will, in Table 2, obtain the payoff it expected and with Player 1's maximin S1 coinciding with the minimax S3 of Player 2 delivers an equilibrium payoff to A of 20 and B of 80. But is it always necessarily true that one player's maximin strategy is the most profitable response in a playbook to a rivals's minimax strategy?

In Table 4 the payoffs reflect an absence of equilibrium when in this instance Player 1 now thinks like Player 2. He asks: why should Player 2 play minimax? Player 2 is the near rival to Player 1 but Player 2 may not necessarily keep to type with minimax.

Payoffs to:
Player 1, (Player 2)

Table 4: Zero-Sum Maximin ≠ Minimax

	S3	S4
S1	20 (80)	60 (40)
S2	80 (20)	10 (90)

In Table 4, Player 1's maximin strategy is still S1 with an expected 20 market share. S1 is in Player 1's playbook and if (Player 1 thinking as) Player 2 plays minimax with S4, Player 1 could expect obtain 60. But if Player 2 (thinking as Player 1) believes that Player 1 will play maximin S1 then Player 2 as Player 2 will not play minimax but play S3. In this game it is to Player 1's disadvantage to have its playbook guessed by Player 2 so Player 1 should camouflage with less focus on payoffs and more focus on strategy choice.

Mixed Strategy

One way for Player 1 is to camouflage its strategy choice by opting for a random decision by tossing a coin. This is a mixed strategy with payoffs as noted in Table 5:

Payoffs to:
Player 1

Table 5: Baumol-Schelling Zero-Sum

	S3	S4
S1	20	60
S2	80	10
½ ½ probability	*50*	*35*

In Table 5 the actuarial value of a mixed strategy for Player 1, given that Player 2 plays S3, is 50 and for S4 it is 35. Once a mixed strategy is used by Player 1 it is more difficult for Player 2 to out-smart Player 1 and it is worth noting that 35 is the maximin of payoffs (20, 10, 35) from a mixed strategy. So Player 2 considers a camouflage play by applying a probability and both players include an optimal mixed strategy[8] in their playbooks. Both players are going for a second win strategy but they need assurance on each other commitment.

Assurance: Stag v Hare

In the search for a second win across the strategy choice in a rational playbook let's consider an extension of 'I-think-you-think-I-think' in terms of an assurance of one's belief about a player's commitment in terms of time commitment in number of moves to commitment to type without camouflage.

Payoffs to:
Player 1, Player 2.

Table 6: Rousseau's Dilemma

	R&D/Stag	**No R&D/Chase the Hare**
R&D/Stag	3,3	0,1
No R&D /Chase the Hare	1,0	2,2

Each player wants to play the strategy that the other is playing as assurance. If Player 2 plays No R&D then Player 1 wants to play No R&D as well because if Player 2 plays No R&D Player 1 receives a payoff of 2 from playing No R&D and 0 otherwise. Similarly if Player 2 plays R&D, Player 1 as well wants to play R&D because if Player 2 plays R&D, Player 1 will receive a payoff of 3 from doing the same instead of a payoff of 1 from playing No R&D. So we have two NE at (3, 3) and (2, 2). The (2, 2) is Pareto inefficient in that both players would be better off to move to (3, 3).

From Tables 1 and 2 earlier, the Nash equilibrium arises when it is implicitly assumed that the players play independently of each other. The playbook then for each player is to maximise their payoff against the worst possible independent payoffs that is consistent with the player's information on type. As discussed in *Decoding Strategy* when *Leo the Liar* betrays his type he gains credibility in the game. But the timing of that move early in the game sequence and the assurance gained by Leo that Leo – who is now trustworthy – is an integral part of the second win strategy. Consider the following payoffs:

Payoffs to:
Player 1, Player 2.

Table 7: Game of Truth

	Reaction Move	**Simultaneous move**
Reaction Move	2,2	0,0
Simultaneous Move	0,0	1,1

[8] In a 2x2 zero-sum game Player 1's maximin payoff should coincide with Player 2's minimax payoff if both players play an optimal mixed strategy. And any player could compute Cramer's V for the game.

Both players have a trade-off in terms of when to move so we ask: is it strategically convenient for one player to move first? Table 7 reflects the consensus that a first mover advantage payoff is higher in a sequential game than in a simultaneous move game. If the game is symmetric (across the diagonal) implying that neither has an advantage in the game – there is no first mover innovation. There are two NE at (2, 2) and (1, 1) and (2, 2) is Pareto efficient. In the early literature[9] on learning as *no player is distinctive* they move simultaneously. In order to move first in the game a player must have an innovation. If both players think like this and if neither player knows whether they move simultaneously to obtain payoff (1, 1) then it is rational to adopt a mixed strategy playbook.

However, by changing type unilaterally a player could alter the probability of winning. How? By camouflage and opting to move second in order to secure a second mover advantage. For example, in a game of truth, Leo tells the truth in the second move; Leo the Liar and Honest Henry on entering the game simultaneously have an expected payoff of (1, 1); subsequently, by changing type, Leo, secures a 2 provided Henry believes that Leo is now honest. Next stage, Leo keeps to type and betrays the trust that Henry has invested in him and the payoffs fall back to the *Thief of Nature*. Elsewhere there is a discussion on the Boolean logic in a noosphere[10] of 'telling the truth as perceived by others' in a game of truth and lies.

An Incredible Threat (of Type)

A near-rival[11] – an opponent who reacts first and plays minimax – in all probability is the second move in a sequence of moves initiated by the opening player. The maximin is the lower bound of the value of the game and the minimax is the upper bound of the value of a game. Minimax is used in zero-sum games to denote minimizing the opponent's maximum payoff. Maximin is more commonly used in non-zero-sum games to describe the strategy which maximises one's own minimum payoff. In a non-zero game maximising your minimum payoff does not correspond to minimising your opponent's maximum payoff as illustrated later by Table 10. In a Turing sequence the winning move is at that point of second win where the best reply to a minimax is the maximin strategy; by playing the second win a player forfeits larger payoffs that could be achieved by more aggressive play. But opponents are thinking the same.

Payoffs to:
Player 1.

Table 8: Stable Game

	Left, L	**Right, R**
Top, T	2	3
Bottom, B	-1	4

Player 1 has strategy pair (T, B) and Player 2 has pair (L, R). Player 2 is the near-rival and will play minimax. Find the minimax: column maxima are 2 and 4 and a minimax = 2. Player 2 if they keep to type will play L. As the first mover in the game, Player 1, knowing Player 2 will play minimax, plays maximin. Find maximin: row minima are 2 and -1 and maximin = 2 and Player 1 should play T. So T

[9] Check Fernando Vega-Redono (2003) *Economics and the Theory of Games*
[10] http://www.patrickmcnutt.com/news/lying-is-the-norm-in-a-noosphere-telling-it-slant-and-white-lies-prevail/
[11] Near-rival is that competitor who reacts first to your move in a game, so they are a follower, second mover.

the pair (T, L) is a stable equilibrium. If Player 1 obfuscates like Leo the Liar, then from Player 2's perspective, Player 1's moves are now camouflaged with a likely probability of playing T or B. And Player 2 (thinking as Player 1) considers a uniform probability of ½ to either T or B since only the probability of T or B is known. If Player 1 plays maximin T in the playbook Player 2 may choose the second win and not choose R.

With a camouflage, Player 2 plays R with positive probability < 1. He abandons minimax. If Player 2 plays L then only if Player 1 plays T will the stable payoff equilibrium obtain. But if Player 1 believes that Player 2 will keep to type and play minimax, notwithstanding the camouflage, then Player 1 will only play maximin T but if Player 2 thinks the same way, Player 2 should stop and think: play L for an expected payoff of 2. It is a second win strategy. We can see this if we change the payoffs to

Payoffs to:
Player 1

Table 9: Strict Determination

	Left, L	**Right, R**
Top, T	2	3
Bottom, B	1	4

The maximin across the rows is computed from 2 and 1 with 2 and minimax down the columns is computed from 2 and 4 with 2. In Table 9 we have a strict determination zero-sum game ensuring that Player 2 will keep to minimax L and play L as it is a dominant strategy so no matter what Player 1 does Player 2 will keep to minimax. In war games it results from a commitment to resources so that when one player plays a dominant strategy choose your best reply. The best reply to a minimax is the maximin strategy; by playing the second win a player forfeits larger payoffs that could be achieved by more aggressive play. The assumption that the opponent is always out to get you is tempered to *sometimes* the opponent is always out to get you – realising that point of balance in the sequence of moves describes the conditions for a second win.

Second Win Strategy

But player type raises the strategic issue that the probability of each strategy T or B separately is not known. There is prior belief on type but type is also learned or observed during play so that each move reveals incomplete information on type allowing the moves in the playbook to be camouflaged by the beliefs about them. BE is a profile of complete beliefs that given the beliefs, the strategies cannot be improved unilaterally at each node in the playbook. However with camouflage in the playbook there is a risk-on for any player in believing that an opponent, independent of the complete beliefs profile in a game, will keep to type.

Payoffs to:
Player 1, Player 2.

Table 10: Maximin & Non-Zero-Sum

	Left, L	**Right, R**
Top, T	3,1	2,-20
Middle, M	5,0	-10,1
Bottom, B	-100,2	4,4

In this example[12] in Table 10 the row player can play T with payoff of 2 as playing B is too risky with a possible payoff (-100). The column player can play L and secure at least 0 and if both play maximin strategies in this non-zero-sum game at the pair (T, L) they obtain payoff (3,1). Maximin is more commonly used in non-zero-sum games to describe the strategy which maximises one's own minimum payoff, The[13] NE, however, is (4, 4).

Finally, let's identify a weakly dominant strategy for Player 1.

Payoffs to:
Player 1, Player 2.

Table 11: No Regret

	Left, L	**Right, R**
Top, T	1,1	1,1
Middle, M	1,0	0,1
Bottom, B	0,1	1,0

In Table 11 strategy T (payoff 1) for Player 1 is preferred to M (payoff 0) when Player 2 plays R and also strategy T (payoff 1) is preferred to B (payoff 0) when Player 2 chooses strategy L. In this instance strategy T is a weakly dominant strategy for Player 1. Player 1 will not regret playing strategy T.

Second Win Playbook

In conclusion, the playbook for each player is to maximise their payoff against the worst possible independent payoffs that is consistent with the player's information. A near rival opponent is more likely to play minimax and the player with innovation moves second. When a player camouflages type in the sequence of opening moves a second win strategy is in the playbook. In the classic PD game in Table 2 a punishment strategy by one player may secure a zero payoff but it requires trust and commitment to type (not to confess). Discipline in a price fixing cartel, for example, can ensure no cheating. But the focus here is in the early moves of a game, the Turing moves, where sufficient number of repetitions as evidence from the playbook enables a player to choose a second win strategy that may or may not converge to equilibrium.

In *Thief of Nature* the sequence of three moves (cooperate, cheat, matching) obtains a payoff = 6 and equal to the payoff from three moves of cooperate with trust and commitment. The fourth move in the game is to stop and think that cooperation strategy at the initiation of the game is the rational play. Both players can secure a Nash bargaining outcome at payoffs (2, 2). By looking back after the playbook is opened the rational player identifies the second win payoff = 4 after two moves (instead of an elusive 5), and a second win strategy is to obtain 6 after three moves in a repetitive pattern and 16 after 8 moves, 8x2 payoffs. The camouflage play is an important element in a second win as it requires the player to assign a set of probabilities and to evaluate a mixed strategy.

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[12] https://en.wikipedia.org/wiki/Minimax
[13] Note that maximin is not necessarily the same payoff as the NE.

In a Turing set of minimal moves there is camouflage play and a mixed strategy – both define rationality in the second win. If a rational player stops and thinks early in the sequence having looked at the early evidence on pattern behaviour – even allowing an opponent a marginal gain – then he is choosing a second win strategy. The participation of the players in the game – for example, Henry does not abandon Leo - can be secured only if they trust the player with a second win strategy to make a fair[14] distribution of the payoffs. In this playbook it is not necessarily the case from the evidence of the game and the hypothesis that all players are rational, that a particular payoff will not be obtained.

Second Win Playbook

Define the game.

Collect robust corporate intelligence on all opponents in the game.

Identify the near-rival.

Focus on early sequence of Turing moves.

Assume that they play minimax in a zero-sum game.

Camouflage your type to influence belief systems.

Focus more on player type and the probability of repetition across games.

Simulate an assurance payoff matrix with 'I-think-You-think-I-think'.

Define a fair distribution payoff.

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[14] Hypothesis: if the players agree to participate in the game, Henry and Leo remain in the game, then the payoffs are fair. Simply because the payoffs are fair does not necessarily lead to participation.