

Should I Stay or Should I Go?*

Smoking and Social Interaction

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Abstract

We study the social interaction of non-smokers and smokers as a sequential game. We explain the often observed paradox that non-smokers do not ask smokers to stop smoking although they would like the smoker to stop smoking: due to social norms this strategy is dominated. Moreover, if we observe smokers who stop smoking on request this is not because they were considerate, but because they would not behave optimally, otherwise. Overall, smoking is unduly often accepted, since smoking is the social norm. The introduction of no smoking areas do not overcome this inefficiency. Only strict smoking bans are effective.

Keywords: smoking; social norms; social interaction; smoking policy.

JEL-codes: I18; D01; D11.

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1 Introduction

Active smoking causes health problems and often advanced death.¹ Second-hand smoking is obviously comparably dangerous.² Hence, active smokers exert a dangerous, negative externality on non-smokers whenever they smoke and socially interact with non-smokers. Correspondingly, tobacco and smoking policies have become stricter in recent years in several countries like England, Ireland, Italy, Scotland, Sweden, the U.S.A., and Wales;³ Finland is following the suite. In other countries, like Germany, strong tobacco lobbies still seem to hamper strict policies; however, e.g. the German state Hesse introduced a strict ban at all schools in 2006.

Involuntary smoking typically occurs in situations in which smokers and non-smokers socially interact, for instance when visiting a pub. We analyze the social interaction between smokers and non-smokers who want to visit a location together. The strategic interaction of smokers and non-smokers is considered as a sequential game. We demonstrate that social norms play a central role. We often observe the paradox behavior that non-smokers hesitate to complain and agonize smoking, although they would prefer that smokers did not smoke. Our model explains this paradox by a weak level of strategical bargaining power, determined by social norms. Hence, smoking is unduly often accepted. We show that in such a non-anonymous group game, the introduction of no-smoking areas is not sufficient to cope with the dangerous externality of smoking, but strict smoking bans appear to be required in areas where smokers and non-smokers meet.

To our knowledge, there does not exist any related economics literature concerned with the relation of smoking and social interaction. The theoretical research is restricted to understanding and explaining addictive behavior like smoking (Spinnewyn, 1981; Becker and Murphy, 1988; Chaloupka, 1991; Orphanides and Zervos, 1995, 1998; Becker and

¹Smoking is a documented risk factor for cancer. The risk is increased when alcohol is consumed additionally (Chowdhury and Rayford, 2000; DKFZ, 2005; Li, 2001; Partanen *et al.*, 1997; Schuller *et al.*, 2002; Silverman *et al.*, 1995).

²DKFZ (2002,1999), IARC (2004), or Gruber (2001a), pp. 203-204.

³The World Health Organization (WHO) even follows a policy on non-recruitment of smokers (<http://www.who.int/employment/recruitment/en/index.html>).

Mulligan, 1997; O'Donoghue and Rabin, 1999; Suranovic *et al.*, 1999; Laux, 2000; Gruber and Kszegi, 2001). The authors agree in the point that the costs smokers impose on others gives rise to a mandate for government intervention. Gruber (2001a) provides an excellent review of the main part of the theory and evidence on tobacco regulation.⁴ Overall, there is evidence that the behavior of smokers is influenced by social and psychologic aspects. We believe that these social and psychologic aspects are also crucial for the behavior of smokers and non-smokers in social interaction. So far, no author has explained the behavior of non-smokers in the social interaction with smokers. We hope to open the door to another interesting field of research in the area of smoking and human behavior in general.

2 Model

For simplicity, we consider the social interaction of one smoker, player 1, and one non-smoker, player 2; the players are indexed by $i = \{1, 2\}$. Both players enjoy being together and receive utility of size $T_i > 0$ thanks to social interaction. The smoker obtains utility of $S > 0$ by smoking; potential utility losses in the case she/he would not smoke represent saved opportunity costs and increase S . That is, variable S covers both the pleasure of smoking and the pleasure of not suffering some additional potential disutility of not smoking, e.g. when addicted. Therefore, the smoker's utility in the case where she/he does not smoke is zero. The non-smoker, in turn, suffers a utility loss of size $E > 0$ by second-hand smoking; utility loss E also involves the subjective perception of the danger of second-hand smoking.

We suppose that within society there exists a *social norm* or standard behavior that determines whether or not smoking is generally accepted. We postulate that if smoking is the social norm, then social interaction happens at a location where smoking is accepted, and the non-smoker has to ask the smoker for not smoking. Since not smoking is not the

⁴Empirical works on smoking are Chaloupka (1991), Licari and Meier (1997), Evans *et al.* (1999), Lahiri and Song (2000), Gruber (2001b), Gruber and Mullainathan (2002), López Nicolás (2002), Sheu *et al.* (2004), Buddelmeyer and Wilkins (2005), and Hammar and Carlsson (2005).

norm, the non-smoker will suffer a utility loss of size $A_2 > 0$ from asking for not smoking. Similarly, if it is standard not to smoke, the smoker will have to ask for allowance to smoke, which costs her/him utility of size $A_1 > 0$. In most countries, the status quo is still such that smoking is standard.

2.1 When smoking is generally accepted

If smoking is the norm the smoker will not ask for permission for smoking and smokes whenever she/he wants to. Therefore, the two players sit, for instance, in a pub and play the following sequential game:

Game 1:

Stage 1 The smoker decides whether or not to smoke, or even to go directly away. If player 1 does not smoke both stay in the pub together, if player 1 goes she/he smokes alone. In both cases the game ends.

Stage 2 If the smoker is choosing to smoke, the non-smoker decides whether she/he goes away, asks the smoker to stop smoking, or accepts smoking. If she/he accepts smoking, the game ends and both stay together; if player 2 directly goes away, the game ends as well.

Stage 3 If the non-smoker asks for stopping smoking, the smoker decides whether or not to stop smoking, or to go away. If player 1 stops smoking, both stay together. If the smoker goes away she/he smokes alone. In both cases the game ends.

Stage 4 If the smoker continues with smoking, the non-smoker decides whether to accept smoking or to go. If player 2 accepts they will stay together, otherwise they go separate ways. The game ends.

The game is illustrated by the game tree in figure 1; one can also find the payoff vectors P_i , $i = \{1, 2, \dots, 8\}$, there. Whenever the smoker chooses not to smoke, the non-smoker chooses to accept smoking, or one of the players goes, the game ends. We assume that both players exactly observe the actions of the other player (perfect information). We

consider the social interaction of people who know each other. Hence, we assume that both players know each other's type and payoff function (complete information). We suppose that the social interaction between the players during the game does not cost so much time that we would have to discount the payoffs correspondingly. Moreover, for simplicity, we introduce the following tie-breaking rule: if a player is indifferent between two actions, the player chooses the action for being together, that is, for instance, the smoker is then willing not to smoke. Notice that the possibility of going away at every stage represents an exit option. We assume that going away is considered as a rude step which involves for the one leaving a loss of utility of L_i higher than A_i : $L_i > A_i$ for $i = \{1, 2\}$. We solve the game by backwards-induction and obtain:⁵

Proposition 1. *Depending on parameter constellation, game 1 possesses the following subgame-perfect Nash equilibria:*

(a) *If $T_2 \geq E - L_2$, the unique subgame-perfect Nash equilibrium is described by the sequence of actions⁶ (smoke, accept) and payoff⁷ $P_4 = (S + T_1, T_2 - E)$.*

(b) *If $T_2 < E - L_2$ and*

(i) *$S > T_1$, the unique subgame-perfect Nash equilibrium is described by the sequence of actions (smoke, go) and payoff $P_3 = (S, -L_2)$.*

(ii) *$S \leq T_1$ and*

1. *$T_2 - A_2 \geq -L_2$, there exist two subgame-perfect Nash equilibria. One equilibrium is described by the sequence of actions (smoke, ask, stop smoking) and payoff $P_6 = (T_1, T_2 - A_2)$, another by (do not smoke) and $P_2 = (T_1, T_2)$.*
2. *$T_2 - A_2 < -L_2$, the unique subgame-perfect Nash equilibrium is described by the sequence of actions (do not smoke) and payoff $P_2 = (T_1, T_2)$.*

⁵Note that there may exist further Nash equilibria, but the only subgame-perfect Nash equilibria are the equilibria associated with the backwards-induction outcome. Cf., for instance, Gibbons (1992: 59).

⁶The first entry is the equilibrium choice of player 1 at stage 1, the second the of player 2 at stage 2, the third would be the optimal choice of player 1 at stage 3, and so on: (stage 1, stage 2, stage 3, ...).

⁷The first term in parentheses represents the payoff of player 1 and the second the payoff of player 2.

Proof: See appendix.

If the non-smoker's utility loss E is such that player 2 values the smoker's company plus the costs of being impolite by leaving higher than the danger of second-hand smoking (case (a)), this will always end in the fact that the smoker smokes and the non-smoker will accept this. The smoker knows that a non-smoker's threat of leaving would not be credible, and hence player 1 will not stop smoking if asked for, which the non-smoker knows, in turn: there is no point in asking the smoker to stop smoking. Thus $T_2 + L_2 \geq E$ is a necessary and sufficient condition for smoking being accepted.

However, in the contrary case, the non-smoker's threat of leaving is credible. Now the smoker must consider whether she/he prefers being together with the non-smoker renouncing smoking (case (b)(ii)) or smoking alone (case (b)(i)). If player 1 prefers the latter alternative ($S > T_1$) she/he will smoke at stage 1 knowing that the non-smoker will go; the smoker will not go at stage 1, because then she/he would behave impolitely. If the smoker prefers being together with the non-smoker, it is clear that knowing that the non-smoker will not ask her/him to stop smoking, but will directly leave, the smoker will decide not to smoke. However, if the smoker knows that the non-smoker prefers asking her/him to stop smoking—compared to going away—(case (b)(i) 1.), the smoker might prefer that the non-smoker asks for stopping smoking before she/he stops smoking.⁸

Smokers might say that our results do not ask for policy intervention. However, the smoker will never go away, since the norm “allows” to smoke, while non-smokers might have to leave the pub (case (b)(i)) or suffer smoking. Part (a) of the proposition tells us that a non-smoker will accept smoking even though her/his subjective perception of the danger of second-hand smoking, expressed by E , is higher than her/his utility from being together, i.e. $T_2 < E$. This *paradox* occurs because due to the social norm smoking is not considered as impolite, which lowers the non-smoker's “*bargaining power*” in our game.⁹ Normally we would argue that the non-smoker should just leave if $T_2 < E$; but going away is a step that is considered as impolite, whereby the non-smoker hesitates to

⁸Notice that the non-smoker will only ask if she/he knows that the smoker will stop smoking.

⁹We use the definition of bargaining power via the *Best Alternative To a Negotiated Agreement* (BATNA, cf. e.g. Korobkin, 2004): the smoker can stay and smoke, the non-smoker can only go away.

leave. The smoker, in turn, has no reason to regard her/his behavior as impolite, because she/he acts in line with the social standard. Without the social norm that smoking is standard, asking for stopping smoking would not involve any costs ($A_2 = 0$): condition $T_2 - A_2 \geq -L_2$ was more often fulfilled, so that the smoker would more often decide not to smoke. Moreover, without the social norm that going away is impolite—that is, when $L_2 = 0$ —smoking would be less often accepted, since condition $T_2 \geq E - L_2$ was more often fulfilled; especially the paradox that non-smokers accept smoking though their perception is $T_2 < E$ would not occur.

To overcome the inefficiency generated by social norms it may be necessary to ban smoking at places where individuals socially interact. Nonetheless, if smoking is accepted even if $A_2 = 0$ and $L_2 = 0$, then, in a liberal society, it is not clear whether one should really introduce a ban, as a ban then contradicts the will of both groups.

2.2 When no smoking is the norm

Suppose smoking is not the norm, which could also result from a policy intervention in the past. Then, the smoker and non-smoker play the following three-stage game:

Game 2:

Stage 1 The smoker decides whether to ask whether she/he may smoke, the smoker does not smoke, or the smoker goes away. If player 1 goes or does not smoke the game will end. In the first case, the smoker smokes without player 2, in the latter they stay together.

Stage 2 If the smoker asks for permission to smoke, the non-smoker decides whether or not to allow smoking. If player 2 allows the smoker to smoke, the game ends and both stay together with the smoker smoking. Moreover, the non-smoker has the option to go away, in which case the game ends.

Stage 3 If the non-smoker does not want the smoker to smoke, the smoker decides whether she/he stays or goes. The game is over.

The game is illustrated by the game tree in figure 2; one can also find the payoff vectors P_i , $i = \{1, 2, \dots, 6\}$, there. We obtain:

Proposition 2. *Depending on parameter constellation, game 2 possesses the following subgame-perfect Nash equilibria:*

- (a) *If $S - L_1 \leq T_1$, there exists a unique subgame-perfect Nash equilibrium with the sequence of actions (do not smoke) and payoff vector P_2 .*
- (b) *If $S - L_1 > T_1$ and*
 - (i) *$T_2 < E$, the unique subgame-perfect Nash equilibrium is described by the sequence of actions (go) and payoff vector P_1 ;*
 - (ii) *$T_2 \geq E$, there exist two unique subgame-perfect Nash equilibria:*
 - 1. *if $T_1 + L_1 \geq A_1$, the unique subgame-perfect Nash equilibrium is described by the sequence of actions (ask, allow) and payoff vector P_4 ;*
 - 2. *if $T_1 + L_1 < A_1$, the unique subgame-perfect Nash equilibrium is described by the sequence of actions (go) and payoff vector P_1 .*

Proof: See appendix.

Three outcomes are possible: the smoker directly decides not to smoke, directly decides to leave, or asks whether she/he may smoke and the non-smoker allows it. If $T_1 \geq S - L_1$ the smoker prefers being together without smoking, compared to the situation where she/he goes away to smoke. Since the non-smoker knows this, the non-smoker will not allow the smoker to smoke, because the threat that the smoker will leave is not credible. Knowing this, in turn, there is no point for asking for being allowed to smoke. Hence, this condition is a necessary and sufficient condition for the outcome “do not smoke”. If, to the contrary, $S - L_1 > T_1$ holds, the smoker’s threat of leaving is credible. Therefore, the non-smoker must reflect whether she/he rather wants to be together with the smoker suffering the smoke than being alone. Knowing the non-smoker’s consideration in this regard, the smoker will directly go away when, first, it is optimal not to ask but to go away for smoking though $T_2 \geq E$ (case (b)(ii) 2.), and, second, when the non-smoker

prefers being alone instead of suffering the smoke (case (b)(i)). In the latter case, there is no reason for asking for permission, since the request will be refused anyway. In the former, the utility loss generated by asking is too high. However, player 1 knows that the non-smoker will allow her/him to smoke if she/he asks. Therefore, if asking for allowance does not involve a too high loss of utility, player 1 will ask whether she/he may smoke and receive permission to do so (case (b)(ii) 1.).

We obtain the reversed image of the case where smoking is the norm: the non-smoker will never go away, since the social norm of no smoking strengthens the non-smoker's "bargaining power". Without the social norm of no smoking the smoker would not have to ask for smoking ($A_1 = 0$) and $S - L_1 \leq T_1$ was fulfilled less often, so that the smoker would smoke more often. Again, since people want to avoid behaving impolitely, now it can happen that the smoker does not smoke even if $S > T_1$, that is, when she/he rather would prefer to smoke instead of not smoking in companion with the non-smoker. Smokers might say that this represents a comparable utility loss to that suffered by non-smokers in case smoking would be the norm. However, smokers produce a dangerous externality, non-smokers do not. Therefore, the two cases differ qualitatively.

3 Are smoking and no smoking areas sufficient?

Viewing the outcome of both social norm specifications one might argue that the establishment of smoking and no smoking areas would be sufficient to overcome the problem of social conventions. However, this is not the case. To see this, we simply reinterpret the games analyzed in section 2.

Imagine there are smoking and no smoking areas. The smoker and non-smoker are together and have to decide where to go. If smoking is the norm, at stage 1 of the game, the smoker can go away, go to the no smoking area, or directly go to the smoking area. If the smoker goes away or to the no smoking area the game ends. However, if player 1 goes to the smoking area, the non-smoker can go away, accept going to the smoking area, or ask for going to the no smoking area. If player 2 accepts or goes away the game ends, but if

player 2 asks for going to the no smoking area, the smoker at stage 3 can go away, go to the no smoking area, or could stay in the smoking area. If the smoker really stays in the smoking area, the non-smoker could accept being in the smoking area, or can go away. Therefore, both players play the same game as analyzed in section 2. It directly follows that the establishment of smoking and no smoking areas is *not* sufficient to overcome the identified problem of social norms in the social interaction of the smoker and non-smoker. Analogically, one can reinterpret game 2. That is, the establishment of two areas is not a tool that would solve our problem.

4 Conclusions and discussion

We have highlighted the crucial role of social norms in determining the extent of smoking in the context of social interaction. If smoking is the norm non-smokers will hesitate to ask the smoker to stop smoking, since asking involves utility losses and going away is considered as rude. It follows that smoking is accepted unduly often by non-smokers. This explains the paradox that non-smokers in social interaction with smokers accept smoking even though they would actually prefer the smoker would not smoke. Contrarily, if no smoking is the norm, the smoker hesitates to ask whether she/he may smoke. Thereby, smoking occurs less often. Thus, social norms and the will to behave politely determine the distribution of “bargaining power” among smokers and non-smokers when they socially interact.

Our model also explains why we rarely see the outcome that smokers would refuse any time when non-smokers ask them to stop smoking: this is not necessarily the case because smokers would be nice and considerate (as their defenders might claim), it may simply be because it is not optimal for non-smokers to play a dominated strategy where they would ask if expecting to be refused; in other words, continuing with smoking is a dominated strategy for the smoker and therefore she/he does not refuse the non-smoker’s request. Similarly, non-smokers do not complain about smoking more often because asking the smoker to stop smoking is a dominated strategy when I expect the smoker to continue

with smoking.

We have shown that the introduction of smoking and no smoking areas does not suffice to overcome this particular problem of social norms and convention. Without a well-founded welfare analysis we cannot conclude policy implications from within our model. Beyond our model, we believe to be able to provide the following policy implications, nonetheless. Because smokers generate a harmful and even perilous externality¹⁰ towards their fellow citizens and non-smokers do not, the resulting situation in the case where no smoking is the norm—that is, smoking occurs less often—should be preferred. In most countries, non-smokers represent the majority of citizens and hence should be rather protected than the minority of smokers. The status quo in most countries thus represents a kind of “tyranny” of minority, which produces negative externalities. In liberal societies, basically, personal freedom should end where an action unacceptably restricts the freedom of another individual. Therefore, the state is called upon to protect the members of society whose health is endangered. Strictly speaking, smoking in the presence of non-smokers represents a bodily injury, given the massive evidence that smoking causes diseases like cancer and early death. Therefore, to protect the health of both groups¹¹, it is necessary to introduce smoking bans. Our model suggests to establish smoking bans in all areas where smokers and non-smokers socially interact, for instance in restaurants, pubs, bars and cafés. This would also help a lot of smokers who intend to quit smoking but are not in a position to do so, due to their addiction. The models of limited self-control and weak will (O’Donoghue and Rabin, 1999; Suranovic *et al.*, 1999) also suggest that smoking bans may support the many smokers who want to give up smoking anyway. This conclusion is especially in line with the results of Gruber and Mullainathan (2002) who find that taxation of cigarettes—i.e. restricted access to tobacco—make smokers happier, as the tax provide a valuable self-control device.

¹⁰Already 1986 the National Academy of Science/National Research Council’s task force and the Surgeon General’s report in the U.S.A. clearly linked passive smoking to higher rates of cancer and heart disease in non-smokers (Evans *et al.*, 1999: 728).

¹¹Following Cutler *et al.* (2000) “Smoking-related illness remains the leading preventable cause of death in the United States ...” (recited from Gruber 2001: 194).

Our paper opens many avenues to future research. For instance, which effect has the extension of the model to more than one smoker and one non-smoker? The bargaining power of a group may increase in its number of members, but starting a conflict by asking smokers not to smoke, becomes more costly when a non-smoker has to ask more than one smoker. Additionally, the non-smoker asking smokers to stop smoking might disturb other non-smokers by starting a conflict when both groups consist of heterogeneous members. Another extension is to analyze repeated games, where players could play dynamic strategies like trigger strategies. Smokers, e.g., could initially follow the strategy to continue with smoking more often, to strengthen their bargaining power.

Appendix

Proof of Proposition 1. Consider the game tree in figure 1 and the payoff vectors P_i , $i = \{1, 2, \dots, 8\}$, that can also be found there. Beginning at **stage four**, player 2's (the non-smoker's) optimum choice is "go", if $-A_2 - L_2 > T_2 - A_2 - E$, that is, when $E - L_2 > T_2$. If $T_2 \geq E - L_2$, then player 2 accepts player 1's smoking. At **stage three**, player 1 (the smoker) compares payoff vector P_8 with P_5 and P_6 , if $T_2 \geq E - L_2$; otherwise, $T_2 < E - L_2$, player 1 has to select from the alternatives P_7 , P_5 and P_6 . In the case where $T_2 \geq E - L_2$, the smoker strictly prefers payoff vector P_8 to P_5 or to P_6 , and therefore definitely chooses to continue with smoking. However, if $T_2 < E - L_2$ and the smoker has to select from payoff vectors P_7 , P_5 and P_6 , the smoker will choose "stop smoking", if $S \leq T_1$. In contrast, if $S > T_1$ the smoker will choose "continue". Turning to **stage two**, the non-smoker has to consider several constellations. If $T_2 \geq E - L_2$ player 2's effective set of possible outcomes to consider is P_8 , P_3 and P_4 . Since $T_2 \geq E - L_2$ is equivalent to $T_2 - E \geq -L_2$, we directly see that "accept" is the dominant strategy in this subgame, so that the outcome is described by P_4 . However, if $T_2 < E - L_2$ things become more complex. If it additionally holds that $S > T_1$, then player 2 has effectively to consider P_3 , P_4 and P_7 . It is clear that the non-smoker prefers P_3 compared to P_7 . Because of $E - L_2 > T_2$, that is, $T_2 - E > -L_2$, the non-smoker also prefers P_3 compared to P_4 , and therefore plays "go". In contrast, if additionally to $T_2 < E - L_2$ it also holds that $S \leq T_1$, then player 2 has to compare outcomes P_3 , P_4 and P_6 . Due to $T_2 - E < -L_2$ outcome P_3 dominates outcome P_4 . Comparing P_3 and P_6 , the non-smoker plays "ask", if $T_2 - A_2 \geq -L_2$ (outcome P_6), but chooses "go", if $T_2 - A_2 < -L_2$ (outcome P_3).

Eventually we have to find the subgame-perfect strategies at **stage one**. If $T_2 \geq E - L_2$ the smoker must compare P_1 , P_2 and P_4 . One can easily prove that in this scenario the subgame-perfect equilibrium is described by (smoke, accept) and payoff vector P_4 . If $T_2 < E - L_2$, however, things again become more complicated. If it additionally holds that $S > T_1$, the smoker compares player 1's payoffs in P_1 , P_2 and P_3 . Since $S > T_1$, "do not smoke" is no option; "go" is clearly also no option. Thus the smoker smokes and we end in the terminal node with payoff P_3 . In contrast, if we suppose scenario $T_2 < E - L_2$

combined with the constellation $S \leq T_1$, we must distinguish two cases. If it additionally holds that $T_2 - A_2 \geq -L_2$, the smoker effectively must compare player 1's payoffs of P_1 , P_2 and P_6 . Outcome P_1 is strictly dominated by P_2 and P_6 . Between payoff vector P_2 and P_6 , in turn, the smoker is indifferent, and we obtain two subgame-perfect equilibria, (do not smoke) and (smoke, ask, stop smoking). In contrast, in the constellation $T_2 < E - L_2$, $S \leq T_1$ and $T_2 - A_2 < -L_2$, the smoker compares P_1 , P_2 and P_3 . Because of, first, $T_1 \geq S$ and, second, our tie-breaking rule, the unique subgame-perfect equilibrium is (do not smoke) with payoff vector P_2 .

□

Proof of Proposition 2. Consider figure 2 and the corresponding payoff vectors P_i , $i = \{1, 2, \dots, 5\}$, of the end nodes. Beginning at the **last stage** the smoker chooses “go” whenever $S - L_1 > T_1$ holds, and “stay”, else. At **stage two**, in turn, the non-smoker will play “allow” if $S - L_1 > T_1$ and additionally $T_2 \geq E$ holds. If $S - L_1 > T_1$ holds together with $T_2 < E$, in contrast, the non-smoker chooses “do not allow”. If $S - L_1 \leq T_1$ holds, player 2 definitely decides to select “do not allow”. Eventually at **stage one**, the smoker compares P_1 , P_2 , and P_4 , if the parameter constellation is such that $S - L_1 > T_1$ and $T_2 \geq E$. Because of $L_1 > A_1$, we know that $T_1 + S - A_1 > S - L_1$, so that we can drop option P_1 . If it now holds that $S - A_1 \geq 0$, the smoker plays “ask”, and we arrive at the end node with payoff P_4 .¹² If $S - L_1 > T_1$, $T_2 \geq E$ but $S - A_1 < 0$ player 1 will choose “do not smoke” and payoffs are given by P_2 . If we now turn to the constellation $S - L_1 > T_1$ and $T_2 < E$, the smoker considers P_1 , P_2 , and P_5 . We can directly exclude P_5 and P_2 , so that the smoker will play “go” right at the beginning of the game. Finally, if $S - L_1 \leq T_1$, the smoker must compare P_1 , P_2 , and P_6 . We immediately see that player 1 will decide to play “do not smoke”, and the outcome is described by P_2 .

□

¹²We assume that the smoker prefers being together and smoking to being together without smoking. Therefore, player 1 chooses “ask” also when $S - A_1 = 0$.

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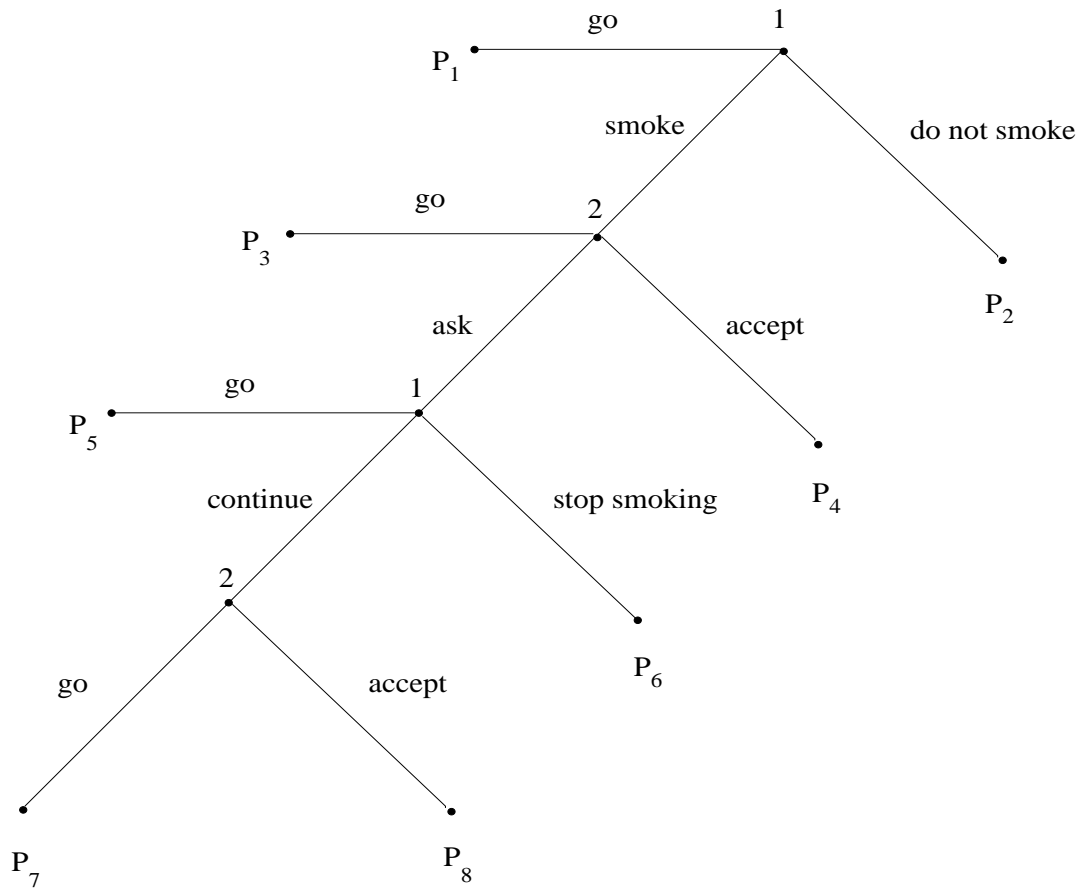


Figure 1: Game tree of Game 1 where smoking is the social norm and payoffs are given by $P_1 = (S - L_1, 0)$, $P_2 = (T_1, T_2)$, $P_3 = (S, -L_2)$, $P_4 = (S + T_1, T_2 - E)$, $P_5 = (S - L_1, -A_2)$, $P_6 = (T_1, T_2 - A_2)$, $P_7 = (S, -A_2 - L_2)$, and $P_8 = (S + T_1, T_2 - A_2 - E)$.

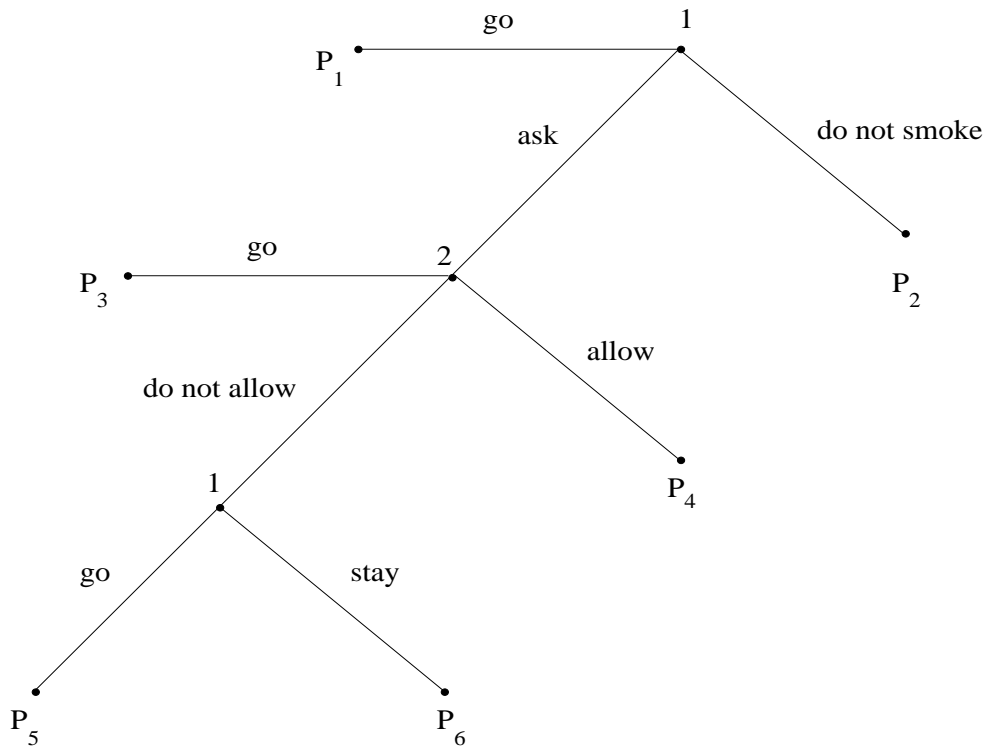


Figure 2: Game tree of Game 2 where smoking is not the social norm and payoffs are given by $P_1 = (S - L_1, 0)$, $P_2 = (T_1, T_2)$, $P_3 = (S - A_1, -L_2)$, $P_4 = (S + T_1 - A_1, T_2 - E)$, $P_5 = (S - A_1 - L_1, 0)$, and $P_6 = (T_1 - A_1, T_2)$.