Incomplete Agreements and Context-Dependent Preferences*

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Abstract

We show that players having context-dependent preferences may negotiate in stages, by first signing an incomplete agreement and then finalizing the outcome of the negotiation. An incomplete agreement eliminates possible bargaining outcomes and therefore imposes a constraint on future negotiating rounds. At the same time, by restricting the future bargaining set, the players can manipulate their future-selves context and preferences, so to align them to their present-selves preferences. We also show that when preferences are context dependent because of the focusing effect (Kőszegi and Szeidl, 2013), incomplete agreements take the shape of *threshold agreements* (Raiffa, 1982), which impose bounds on some dimensions of the bargaining solutions in order to reduce their salience.

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1 Introduction

The literature on decision theory and behavioral economics has long argued that when preferences are *context-dependent*—i.e., the preference ranking over two consumption bundles depends on the set of available consumption bundles—a person may value eliminating certain options from her choice set before making her final choice.[1] In this paper, we introduce context-dependent preferences in a bargaining game. We argue that the negotiating parties may prefer to negotiate in stages, by first restricting the set of possible bargaining options via an *incomplete agreement*, and then finalizing the outcome of the negotiation.

Similarly to a decision problem over menus, we consider two negotiating parties who can sign an incomplete agreement before finalizing the outcome of the negotiation. We restrict our attention to an environment with no uncertainty, perfect contractibility and no time discounting, which implies that rational players cannot do better than leaving the bargaining set unconstrained and negotiating over the entire bargaining set in the last stage of the negotiation. Players with context-dependent preferences, however, may anticipate that upon entering the last stage of the negotiation their preferences will be distorted by the set of possible bargaining outcomes. For example, a player may anticipate that one of the issues to be discussed will be very salient, and because of this she is likely to overvalue achieving a good result on that specific issue.

Hence, if the players' ex-ante preferences (that is, when bargaining over an incomplete agreement) are different from the players' ex-post preferences (that is, during the final negotiation round), then the two bargaining parties may jointly impose a restriction on the future bargaining set via an incomplete agreement.[2] For example, eliminating outcomes that are particularly bad for a player and will not be achieved

[1]See, for example, Strotz (1955), Gul and Pesendorfer (2001), Dekel, Lipman and Rustichini (2001), Sarver (2008), Noor (2011), Kőszegi and Szeidl (2013), Bordalo, Gennaioli and Shleifer (2013), Bushong, Rabin and Schwartzstein (2015).

[2]We consider both the possibility that players' preferences are rational when bargaining over an incomplete agreement but context-dependent in the following period, and the possibility that preferences are context dependent in both periods. In the latter case, we show that the context ex ante is generally different from the context ex post.

in equilibrium may affect the willingness to compromise of that player, the number of issues included in the final agreement, and the ex-ante value of reaching an agreement for both players. Therefore, the novelty of our paper relative to the existing literature is that restricting the set of future options is a joint decision made by players who have, otherwise, opposed interests.

We show that the choice of what incomplete agreement to implement depends on a tradeoff. From the ex-ante viewpoint, the best incomplete agreement the players can implement is one that changes the future context so to align the future-selves with the present-selves preferences and, at the same time, does not eliminate from the set of available bargaining outcomes the ex-ante optimal bargaining solution. It is possible however that achieving a full alignment of preferences requires eliminating the ex-ante optimal solution. In this case, there is a tradeoff between the degree of preferences alignment that can be achieved, and the ex-ante value of the future agreement. The incomplete agreement that will be implemented is the one that best balances the benefit of preference alignment and the cost of imposing restrictions to the bargaining set.[3]

Our theory therefore provides an explanation to why negotiating parties may sign agreements that specify only some aspects of the final outcome, and rely on future bargaining rounds to define the missing provisions. A case in point is the use of framework agreements in international negotiations and in procurement. In procurement, a framework agreement may define, for example, a set of prices and quality levels of a possible future transaction, with the understanding that the details of this transaction will be established in a future agreement. Similarly, international negotiations are often structured as a sequence of negotiating rounds. Each round is concluded by an agreement, which is neither final nor binding but provides the framework for a later round of negotiations.[4] Also, *memorandum of understanding*

[3]Technically, from the ex-ante viewpoint, the players can implement only bargaining solutions that are achievable via an incomplete agreement, making the ex-ante bargaining problem a Non-Transferable Utility (NTU) problem.

[4]This principle is sometimes explicitly stated as "*Nothing is agreed until everything is agreed.*" See, for example, the rules governing the Doha round of trade negotiations. http://www.wto.org/english/tratop_e/dda_e/work_organi_e.htm (accessed on the 28th of December 2017).

are agreements describing the intention of two parties to collaborate and the broad scope of their collaboration, leaving the details to be specified in a later negotiation stage.[5]

For most of the paper, we consider a specific source of context dependence, namely the *focusing effect*. The focusing effect (or focusing illusion) occurs whenever a person places too much importance on certain aspects of her choice set (i.e., when certain elements are more *salient* than others). Intuitively, an agent's attention is unconsciously and automatically drawn toward certain attributes, which are therefore overvalued when making a choice. Kőszegi and Szeidl (2013) formalize this concept by assuming that agents maximize a *focus-weighted utility*

$$\tilde{U}(x_1, x_2, .., x_n) = \sum_{s=1}^{n} h_s u_s(x_s)$$

where $x = \{x_1, x_2, ...x_n\}$ is a given good with n attributes. The *focus weights* h_s are defined as:

$$h_s = h\left(\max_{x\in C} u_s(x_s) - \min_{x\in C} u_s(x_s)\right),$$

where C is the choice set and $h()$ is the *focusing function,* assumed strictly increasing. In this formalization, an agent overweights the utility generated by the attributes in which her options differ more, where these differences are measured in utility terms.

We introduce the focusing effect into a bargaining game in which two players negotiate over n discrete issues and one continuous issue which we interpret as a transfer. We show that, when players negotiate in one step, the outcome of the negotiation may be inefficient, because too few or too many issues may be included in the final agreement relative to a rational benchmark in which all focus weights are equal to 1. An inefficient outcome is more likely to occur whenever the importance of the issues on the table (i.e., the additional surplus generated if an issue is included in the agreement) is uneven in the sense that one issue is much more important than the others. As the importance of an issue increases, so does the set of transfers that

[5]Importantly, memorandum of understanding are explicitly non binding. See Section 5.2 for a discussion on non-binding incomplete agreements.

satisfy the players' rationality constraints and are therefore in the bargaining set. This, in turn, increases the salience of the transfer dimension relative to all other issues. As a consequence, depending on which players' preferences are more strongly distorted by the focusing effect, too few (too many) issues may be included in the final agreement, which will happen when a player dislikes *making* a transfer more (less) than the other player appreciates *receiving* a transfer. Furthermore, relative to rational players, focused players always overvalue transfers and undervalue benefits and costs associated with each issue, therefore depressing the equilibrium transfers.

We then show that, when given the option to restricting the bargaining set via a cap on the possible transfers that can be included in the final agreement, the players may decide to do so. The reason is that imposing a cap on transfers reduces the salience of the transfer dimension in the final negotiation stage. This mechanism is well understood by practitioners, who believe that in negotiations, "the importance of an issue might be lessened by the parties first narrowing the range of possible outcomes on that issue" (Raiffa, 1982, "The art and science of negotiation" p.216).[6] A textbook example for this negotiating procedure is the use of so-called "threshold agreements" during the Panama Canal negotiations between the Panamanian government and the US government. The threshold agreements were incomplete agreements guaranteeing to the Panamanian government the achievement of minimum outcomes on three different issues, and were initiated by the American delegation to avoid the break-off of the negotiation.[7]

By reducing the salience on the transfer dimension, the cap can be used to align present selves' and future selves' preferences. However, the tradeoff discussed earlier applies here as well: achieving alignment of preferences may eliminate the period-1 optimal agreement from the set of possible outcomes. This tradeoff is particularly severe if the ex-ante preferences are rational, because achieving full alignment of

[6] See also Fisher, Ury and Patton (1991) "Getting to yes", p. 172.

[7] The three threshold agreements were on the jurisdiction of the Panamanian canal, the Panamanian participation in its defense, and on the operation of the canal. The American delegations initiated the discussion of three threshold agreements to "avoid the break-off of the negotiations and to demonstrate the good will that would be necessary for later Panamanian concessions." See Raiffa (1982) p.178.

preferences between the two periods requires shrinking the future bargaining set to a singleton (the disagreement outcome). Furthermore, even if the ex-ante preferences are rational, there is no presumption that players will choose the incomplete agreement that maximizes efficiency. This result contrasts strongly with the literature on incomplete contracts, which we discuss below.

We structure the paper in the following way. In the remainder of this section, we discuss the relevant literature. In Section 2 we introduce a generic bargaining game with context-dependent preferences. In Section 3 we fully solve a specific bargaining problem with preferences distorted by the focusing effect. Section 4 shows that our main results generalize to any bargaining problem and any form of context dependence. Section 5 discusses the robustness of our results to changes in our basic assumptions, including the case of non-binding incomplete agreements and forms of context dependence different from the focusing effect. Unless otherwise noted, all proofs missing from the text are relegated to the Appendix.

Relevant Literature

The literature on incomplete contracts has argued that behavioral biases and cognitive limitations may explain why agreements are often incomplete and the degree of their incompleteness.[8] However, to the best of our knowledge, all these explanations rely on the resolution of some uncertainty: after signing an incomplete contract, the arrival of new information makes the environment less complex, reduces the number of possible contingencies, and allows the contract to be completed in a final negotiating round. Instead, we consider a deterministic environment. This is justified by the observation that in many negotiations the start of a new bargaining round follows the end of the previous round and is not determined by the arrival of new information. With respect to this literature, our contribution is therefore to provide a foundation

[8]See, for example, Segal (1999), Battigalli and Maggi (2002), Bolton and Faure-Grimaud (2010), Tirole (2009), Hart and Moore (2008), Herweg, Karle and Müller (2017) and Herweg and Schmidt (2015).

for the existence of incomplete agreements in contexts with no uncertainty.[9]

Despite this, our basic tradeoff between the benefit of preference alignment and the cost of imposing restrictions to the bargaining set is reminiscent of Hart and Moore (2008). In that paper, if a dimension of the future bargaining problem is left unspecified, each player will feel entitled to the best outcome within the set of possible outcomes in compliance with the initial contract. This feeling of entitlement will affect the final outcome because players may shade on performance. Importantly, Hart and Moore (2008) assume that this feeling of entitlement is not present when negotiating the initial contract. Hence, the players may use the initial contract to reduce the set of options available to their future selves, reduce the future sense of entitlement and align ex-post preferences with the ex-ante ones. These restrictions have a cost whenever the ex-post efficient trade depends on the realization of a state of the world.

Finally, the literature on incomplete contracts typically assumes that players can make transfers both ex-ante (when signing the contract or allocating ownership) and ex-post (after the realization of the state of the world.) We instead focus on the case in which no side payments are possible ex-ante (that is, when discussing the incomplete agreement.) That is, we assume that only one agreement is possible, the final one, so that all transfers and exchanges will realize conditional on reaching an agreement during the last round of negotiation. We discuss in an extension (Section 5.1) what happens in our framework when ex-ante side payments are possible.

Some authors argue that, if information is perfect but players are prevented from writing a complete contract, then the players may decide to leave some potentially contractible aspects of an agreements unspecified (see Bernheim and Whinston, 1998). Closest to our model, Battaglini and Harstad (2014) study international environmental agreements, and assume that countries cannot perform side payments. They argue that environmental agreements may be left incomplete, as a way of in-

[9]The fact that the information set does not change between bargaining rounds does not imply that there is no uncertainty. However, an environment with uncertainty, perfect contracting, and no change in the information set across bargaining rounds is equivalent to an environment with perfect information. The reason is that the parties can bargain conditionally on the realization of a given state of the world.

ducing more countries to sign the agreement (see also Harstad, 2007). In our model, instead, every aspect of an agreement is potentially contractible.

Some papers demonstrate that if the players' outside options are determined endogenously, agreements may be reached gradually rather than in a single period. Closest to our work, Compte and Jehiel (2003) introduce reference-dependent utility in a game of alternating offers, and show that the history of offers affects the players' preferences and the final outcome of the game. Here we solve each bargaining stage via Nash bargaining, and show that multiple bargaining stages are possible. Hence, our model is a model of sequential agreements, and not of sequential offers.

With this respect, our paper is related to Esteban and Sákovics (2008), who allow the negotiating parties to sign separate agreements on different parts of the surplus. We are also close to the literature on agenda setting in negotiations, which has long argued that when players bargain over multiple issues, the order in which agreements are reached matters for the outcome of the bargaining process.[10] The difference with this literature is that we study negotiations that entail a unique final agreement reached via several incomplete agreements, rather than several agreements that are issue-specific, or only concern fractions of the surplus.

We employ here the model of focusing in economic choice proposed by Kőszegi and Szeidl (2013), in which the decision maker overweights attributes in which her options vary the most. Bushong, Rabin and Schwartzstein (2015) make the opposite assumption: that a decision maker *underweights* attributes in which her options vary the most. Bordalo, Gennaioli and Shleifer (2013) also develop a model of salience. They assume that agents overvalue the attributes that differ the most with respect to a reference point. We show in Section 4 that the central prediction of our model—that the bargaining parties may negotiate in stages—is robust to using any model of context-dependent preferences, including Bushong, Rabin and Schwartzstein (2015) and Bordalo, Gennaioli and Shleifer (2013). In Section 5.4 we discuss how our other results change when instead of using Kőszegi and Szeidl (2013), we use either Bushong, Rabin and Schwartzstein (2015) or Bordalo, Gennaioli and Shleifer (2013).

[10] See Lang and Rosenthal (2001), Bac and Raff (1996), Inderst (2000), Busch and Horstmann (1999b), Busch and Horstmann (1999a), Flamini (2007).

2 The Model

Consider two players a and b, engaged in a negotiation over an *unconstrained bargaining set* X, with $x \in X$ being a possible bargaining outcome. We call the players' outside option $0 \in X$. The players bargain in two periods. In the first period they negotiate over an incomplete agreement and in the second period they negotiate over the final outcome of the negotiation. There is no time discounting.

Definition 1 (Incomplete agreements)**.** An *incomplete agreement* is a set $S \subset X$. A *negotiation structure* $\mathbb{S}$ is the collection of S that can be chosen in period 1.

Because there is no time discounting, we interpret the case $S = X$ as a one-step negotiation: no restrictions are imposed on the bargaining set in period 1, and the players bargain over the entire X in period 2. In what follows we always assume that $X \in \mathbb{S}$, so that the players can always choose to bargain in one-period.

Assumption 1 (Binding incomplete agreements)**.** *Suppose the bargaining parties agreed on $S^* \in \mathbb{S}$ in period 1. A bargaining outcome x is a* feasible solution *to the bargaining problem in period 2 if and only if $x \in S^* \cup \{0\}$.*

Under this assumption, incomplete agreements are binding: during the last negotiating stage, the players can either comply with a prior incomplete agreement or disagree.[11]

In period 2, both players have context-dependent preferences of the form $U^a(x, \hat{S})$, $U^b(x, \hat{S})$: that is, the utility generated by a given bargaining outcome x depends on the players' *consideration set* $\hat{S}$. We normalize the utility of the outside option to zero, so that $U^a(0, \hat{S}) = U^b(0, \hat{S}) = 0$ for all possible $\hat{S}$.

Assumption 2 (Consideration set)**.** *A bargaining outcome x is in the consideration set if and only if it is feasible and both players satisfy their rationality constraints at x, that is:*

$$\hat{S} = \left\{ x \in S |\ U^a(x, \hat{S}) \geq 0,\ U^b(x, \hat{S}) \geq 0 \right\}. \tag{2.1}$$

[11] In Section 5.2 we discuss non-binding incomplete agreements, that is, agreements that can be ignored by the bargaining parties.

In other words, the consideration set coincides with the bargaining set, and is composed of all the feasible bargaining outcomes which are preferred by both players to no agreement.[12] Hence, contrarily to a decision problem, here each player takes into consideration the opponent's preferences in determining what bargaining solution is possible. Note also that finding the consideration set is a fixed point problem, because the consideration set determines the players' preferences, their rationality constraints and therefore the shape of the consideration set.

Regarding period 1, we will consider two cases. In the first case players' period-1 preferences are rational, that is, they do not depend on the set of possible options in period 1. This is a reasonable assumption because no matter what is agreed in period 1, in period 2, players can always trigger the disagreement option. Therefore, when bargaining in period 1, players may not feel under pressure and behave rationally. However, period 2 is the very last moment in which players can walk out of the negotiation, which may cause their preferences to be distorted. When period-1 preferences are rational, we say that the players are in a *cold state* in period 1.

We also consider the possibility that players are in a *warm state* in period 1, that is, their preferences are context-dependent also when negotiating over incomplete agreements. If this negotiation is heated, conducted under pressure, or conducted by groups of people who first have to agree among themselves and then with the other party, then the players' preferences may be far from rational already in period 1. In this case the period-1 context is given by the set of bargaining outcomes achievable via an incomplete agreement (we postpone the formal definition to the next section).

Assumption 3 (Outside option)**.** *If in period 1 the parties disagree, the outcome of the negotiation is no agreement.*

Assumption 3 implies a form of commitment with respect to the structure of the negotiation, because players cannot meet again and negotiate after having failed to agree in period 1 on whether (and how) to restrict the future bargaining set.[13]

[12]We provide additional justifications for this assumption in Section 5.5, where we consider the generalized Nash Bargaining solution and show, by continuity, that the consideration set as defined here becomes the choice set of a player who can make a take-it-or-leave-it offer.

[13]In Section 5.3, we argue that our results are qualitatively unchanged when the disagreement

Assumption 4 (Bargaining solution)**.** *Each bargaining round is solved by Nash bargaining.*

Under this assumption, within each bargaining round and for given preferences, irrelevant alternatives do not affect the bargaining outcome and the standard Nash-bargaining axioms apply. Note, however, that preferences in our model are a function of the entire bargaining set, and therefore the solution to the entire bargaining problem is affected by irrelevant alternatives. Hence, our approach isolates a single channel through which irrelevant alternatives in the bargaining set affect the outcome of the negotiation: the players' preferences.

3 A Barganining Problem with Focusing Effect

We now consider the implications of Assumptions 1-4 for a specific form of context dependence—the focusing effect—and a specific bargaining problem in which n discrete issues are on the table together with a continuous one. This bargaining problem corresponds, for example, to a supplier and a buyer having to agree on the number of items to be supplied and on a monetary payment. It may also represent two countries engaged in a negotiation in which some dimensions of the problem are discrete (e.g., whether the ownership of the Panama canal is transferred to the Panamanian government, whether the US maintains the right of use of the canal) and one is continuous (e.g., the number of US troops that will be stationed in Panama). The goal of this section is to show that the bargaining parties may impose a bound on the set of possible bargaining outcomes before agreeing on a specific bargaining outcome. These bounds are similar to the "threshold agreements" discussed in the introduction, and may affect the number of issues that are included in the final agreement.

The players bargain over $i \in \{1, 2, ...n\}$ discrete issues and a continuous issue t. Without loss of generality, we interpret t as a transfer, assumed from player b to player a. If there is an agreement on issue i, player a earns $-c$ and player b earns v_i, with $v_1 \geq v_2 \geq ... \geq v_n$. If there is no agreement on issue i, the status quo on

point of the period-1 negotiation is a one-step negotiation over the unconstrained bargaining set X.

that issue is maintained, and each player earns zero. We assume that $v_1 > c$, but impose no restriction on v_i for $i \geq 2$. Hence, the unconstrained bargaining set is $X = \{0, v_1\} \times \{0, v_2\} \times ... \times \{0, v_n\} \times \mathbb{R}$.

Both players have context-dependent preferences à la Kőszegi and Szeidl (2013). Call $h_a()$ player a's focus function and $h_b()$ player b's focus function, both assumed strictly positive and strictly increasing. The utility functions are

$$U^a(q_1, q_2..., q_n, t) = h_a(\bar{t} - \underline{t})t - \sum_{i=1}^{n} h_a\left(\frac{\bar{q}_i c}{v_i} - \frac{\underline{q}_i c}{v_i}\right) \frac{q_i c}{v_i},$$

$$U^b(q_1, q_2..., q_n, t) = \sum_{i=1}^{n} h_b(\bar{q}_i - \underline{q}_i) q_i - h_b(\bar{t} - \underline{t})t,$$

for $q_i = v_i$ if there is an agreement on issue i, and $q_i = 0$ if there is no agreement on issue i. We call $h_a(\bar{t} - \underline{t})$, $h_a\left(\frac{\bar{q}_i c}{v_i} - \frac{\underline{q}_i c}{v_i}\right)$, $h_b(\bar{q}_i - \underline{q}_i)$, and $h_b(\bar{t} - \underline{t})$ the players' *focus weights*. The values of $\bar{q}_i$, $\underline{q}_i$, $\bar{t}$, $\underline{t}$ depend the *consideration set*: for every issue i, $\bar{q}_i$ and $\underline{q}_i$ are the largest and smallest q_i in the consideration set; similarly $\bar{t}$ and $\underline{t}$ are the largest and smallest t in the consideration set. Therefore, the focusing effect causes both players to focus more on, and hence to overweight, the dimension of the bargaining problem with the largest difference in terms of possible bargaining outcomes. Note that, in every period, each player can unilaterally trigger the "no agreement" option.[14] Hence, this option must be in the consideration set. It follows that, in both periods, $\underline{q}_i = \underline{t} = 0$ for all i, and the players' preferences depend exclusively on the upper bounds of the consideration set. Finally, the focus-weighted utility is a *decision utility*, because it describes the decision maker's choice. We will contrast players' decision utility with their *material utility* corresponding to a rational benchmark in which all the focus weights are equal to one.

For ease of notation, we define the *focus wedge* as

$$\Delta(x) \equiv \frac{h_a(x)}{h_b(x)},$$

[14]This is always the case in period 2, and holds in period 1 by Assumption 3.

which measures the distortion in player a's preferences relative to that of player b. In what follows, we will mostly be concerned with three cases:

- $\Delta(x) = 1$ for all x, which implies that $h_a() = h_b()$. That is: the players' preferences are equally distorted by the focusing effect. We also say that the players are "equally focused."

- $\Delta(x) \geq 1$ and strictly increasing for all x. That is: player a is always "more focused" than player b, the more so the larger is x.

- $\Delta(x) \leq 1$ and strictly decreasing for all x. That is: player b is always "more focused" than player a, the more so the larger is x.

We start by solving this bargaining problem assuming that no incomplete agreement was imposed by the players in period 1, that is, the players bargain in one step (see Subsection 3.1). We discuss how the focusing effect distorts both the number of issues included in the agreement and the equilibrium transfers. We then explore how the presence of a previous incomplete agreement affects the outcome of the negotiation (see Subsection 3.2). Finally, we discuss the tradeoff faced by the players in the choice of an incomplete agreement (see Subsection 3.3).

3.1 No incomplete agreements (one-step negotiation)

Suppose $S = X$: in period 2 the players bargain over the entire bargaining set. By Assumption 2, a bargaining outcome $\{q_1, q_2, ..., q_n, t\}$ is in the consideration set if and only if the two players satisfy their rationality constraints:

$$h_a(\bar{t})t \geq \sum_{i=1}^{n} h_a\left(\frac{\bar{q}_i c}{v_i}\right)\frac{q_i c}{v_i} \tag{IRa}$$

$$\sum_{i=1}^{n} h_b(\bar{q}_i)q_i \geq h_b(\bar{t})t, \tag{IRb}$$

We say that issue i is in the consideration set whenever there exists at least one bargaining outcome with $q_i = v_i$ that satisfies both players rationality constraints at

$\overline{q}_i = v_i$.

Note that if we fix the issues in the consideration set, then $\bar{t}$ is simply given by the largest t satisfying player b's rationality constraint. Similarly, fixing $\bar{t}$ we can easily find the issues in the consideration set by using player a's rationality constraint. Finding the two things together is, however, a fixed-point problem which could have multiple solutions. Furthermore, not all n issues may be in the consideration set, which implies that some issues are not feasible: any agreement including them will be rejected by at least one of the two players. The presence of non-feasible issues implies that the players are, practically speaking, negotiating over $\tilde{n} < n$ issues.

Using player b's rationality constraint, we define $\bar{t}_o$ as the largest transfer that player b is willing to make in order to agree on all issues:

$$\bar{t}_o \equiv \bar{t} : h_b(\bar{t})\bar{t} = \sum_{i=1}^{n} h_b(v_i)v_i. \tag{3.2}$$

All n issues are in the consideration set whenever agreeing on n issues at transfer $\bar{t}_o$ satisfies player a rationality constraint. Since neither the existence of multiple consideration sets nor the fact that some issues may be not feasible are central to our analysis, we impose a parametric restriction guaranteeing that, as we will show, there is always a unique consideration set containing n issues:

Assumption 5.

$$v_1 \geq n \cdot c \tag{3.3}$$

Combined with Assumption 3.2, this implies $\bar{t}_o \geq v_1$, which in turn implies $h_a(\bar{t}_o) \geq h_a(c)$ and therefore

$$h_a(\bar{t}_o)\bar{t}_o \geq n \cdot h_a(c)c,$$

that is, player a is willing to agree on n issues when the transfer is $\bar{t}_o$ and is therefore in the consideration set. The following lemma summarizes these observations, and also shows that under (3.3) the consideration set is unique.[15]

[15] An alternative strategy would be to allow for more than n issues, and then define n as the number of issues that are in the consideration set for any $h_a()$, $h_b()$, $v_2, ..., v_n$. The condition would

Lemma 1. *Under* (3.3)*, agreeing on* n *issues is in the consideration set. Furthermore, the consideration set is unique.*

Note that the above lemma is equivalent to saying that, under (3.3), the *total* focus-weighted surplus—i.e., the sum of the two decision utilities—generated by agreeing on all issues is positive. However, as we show next, despite this, the inclusion of an issue in the agreement depends on the *incremental* focus-weighted surplus generated by that issue, and therefore even under (3.3) some issues may be left out of the agreement.

Given $\bar{t}_o$ the players' utilities can be written as:

$$U^a(k,t) = h_a(\bar{t}_o)t - \sum_{i=1}^{k} h_a(c)c,$$

$$U^b(k,t) = \sum_{i=1}^{k} h_b(v_i)v_i - h_b(\bar{t}_o)t,$$

where $k \leq n$ is the number of issues included in the agreement. The Nash bargaining problem is

$$\max_{t\leq\bar{t}_o, k\leq n} \left(\sum_{i=1}^{k} h_b(v_i)v_i - h_b(\bar{t}_o)t\right)\left(h_a(\bar{t}_o)t - h_a(c)c\cdot k\right). \tag{3.4}$$

The solution is characterized by the number of issues included in the agreement:

$$k^\star = \sharp\left\{v_i | \frac{h_b(v_i)}{h_b(\bar{t}_o)}v_i - \frac{h_a(c)}{h_a(\bar{t}_o)}c > 0\right\}, \tag{3.5}$$

again be (3.3), which is easy to see by considering the special case $h_a() = h_b() = 1$ and $v_i = 0$ for $i \geq 2$.

and a transfer as a function of the number of issues included in the agreement:[16]

$$t(k^\star) = \frac{1}{2}\left(\sum_{i=1}^{k^\star} \frac{h_b(v_i)}{h_b(\bar{t}_o)} v_i + \frac{h_a(c)}{h_a(\bar{t}_o)} ck^\star\right). \tag{3.6}$$

The key observation is that the number of issues that will be included in the agreement depends on the *incremental* focus-weighted surplus generated by each issue, that is $v_i \cdot h_b(v_i)/h_b(\bar{t}_o) - c \cdot h_a(c)/h_a(\bar{t}_o)$. By Lemma 1, we know that the average focus-weighted surplus generated by all issues is positive and therefore issue 1 is always included in the agreement. However, by (3.5), issue $i \geq 2$ will be included in the agreement if and only if

$$\frac{\frac{h_a(\bar{t}_o)}{h_b(\bar{t}_o)}}{\frac{h_a(c)}{h_b(c)}} \equiv \frac{\Delta(\bar{t}_o)}{\Delta(c)} \geq \frac{h_b(c) \cdot c}{h_b(v_i) \cdot v_i} \quad i \geq 2. \tag{3.7}$$

Simple inspection leads to the following result:

Proposition 1. *Suppose $n \geq 2$:*

- *Whenever player b is "more focused" than player a (that is, $\Delta(x) \leq 1$ and strictly decreasing), then it is possible that an issue $i \geq 2$ with $v_i > c$ is excluded from the agreement. This will happen whenever v_1 is sufficiently large.*

- *Whenever player b is "less focused" than player a (that is, $\Delta(x) \geq 1$ and strictly increasing), then it is possible that an issue $i \geq 2$ with $0 < v_i < c$ is included in the agreement even if it is not materially efficient to do so. This will happen whenever v_1 is sufficiently large.*

Proof. Simply by (3.7), and observing that $\bar{t}_o > c$ is increasing in v_1. □

[16] In deriving the optimal transfer we can ignore the constraint $t \leq \bar{t}_o$. By definition $\bar{t}_o$ is the largest transfer player b is willing to make in order to agree on all issues. $\bar{t}_o$ therefore must be greater than the largest transfer player b is willing to make in order to agree on $k^\star \leq n$ issues, which must be greater than the equilibrium transfer (otherwise, in equilibrium, all surplus would accrue to player a which never maximizes 3.4).

It is therefore possible that the outcome of the one-step negotiation is materially inefficient. In some cases, issues with $v_i > c$ may be left out from the agreement, while in other cases some issues with $v_i < c$ may be included in the agreement. The inefficient outcome is more likely to occur whenever v_1 is large relative to c and all other v_i. The reason is that, as the salience of the first issue increases, so does the salience of the transfer dimension relative to all other issues $i \geq 2$. If one of the two players is more focused than the other, the fact that transfers are much more salient than an issue $i \geq 2$ may imply that this issue will be left out of the agreement (when player b finds it "too expensive" to include it), or that this issue will be inefficiently included in the agreement (when player a overvalues receiving the transfer).

The above logic breaks down, however, when $n = 1$ because, in this case, $\bar{t}_o = v_1$. As a consequence, the salience of the transfer dimensions cannot be greater than the salience of the only issue.

Corollary 1. *When $n = 1$, the outcome of the negotiation is materially efficient: the players will always find an agreement.*

Proof. Simply by (3.5) and by the fact that, when $n = 1$, $\bar{t}_o = v_1$. □

Interestingly, the inefficiencies disappear also when the two players are equally focused.

Proposition 2. *When the players are equally focused (that is, $h_a() = h_b()$ or equivalently $\Delta(x) \equiv 1$) the outcome of the negotiation is materially efficient: all issues such that $v_i > c$ are included in the agreement while all issues such that $v_i < c$ are excluded from the agreements.*

Proof. Simply by (3.7). □

If the players are equally focused, then they evaluate transfers, costs of each issue and benefits of each issue equally. It follows that if the value of including an issue in the agreement exceeds its cost, then the players will be able to find an appropriate transfer and agree on that issue being included.

Finally, by (3.6) the focusing effect will have an impact not only on the number of issues included in the agreement, but also on the equilibrium transfer.

Lemma 2. *For given $k^\star$, the equilibrium transfer is below the transfer that would be agreed upon by rational players. Furthermore, the equilibrium transfer is decreasing in v_i for $i > k^\star$ (that is, it is decreasing in the value of issues not included in the agreement).*

Proof. By (3.6), and because $\bar{t}_o > c$ and $\bar{t}_o > v_i$ for all i. Furthermore, $\bar{t}_o$ is increasing in all v_i, including for $i > k^\star$. □

By definition $\bar{t}_o$ is weakly greater than any v_i and strictly greater than c. Therefore, each player overvalues the transfer relative to the other dimensions of the negotiation (weakly so for player b in case $n = 1$). By (3.6), this implies that the equilibrium transfer is lower when the players' preferences are distorted by the focusing effect than when they are rational. This distortion is stronger the higher is the value of the issues not included in the agreement because these issues affect the largest possible transfer in the consideration set $\bar{t}_o$ and therefore the salience of the transfer dimension.

3.2 Cap on transfer in period 2 (two-step negotiation)

In the previous section we showed that, absent any incomplete agreement, the outcome of the negotiation depends on the salience of the transfer dimension, which by (3.2) is a function of the various v_i. It is therefore natural to explore what happens when the players can directly determine the salience of the transfer dimension by imposing, in period 1, a cap on the transfers that can be agreed upon in period 2. In this case, the set $\mathbb{S}$ contains all the sets that can be written as $S = \{0, v_1\} \times \{0, v_2\} \times ... \times \{0, v_n\} \times [0, \hat{t}]$ for some $\hat{t} \geq 0$.[17] We start by considering what happens in period 2 if a cap on the transfer dimension was imposed in period 1.

If a cap $\hat{t}$ was imposed in period 1, in period 2 the maximum possible transfer t is $\min\{\hat{t}, \bar{t}_o\}$, where $\bar{t}_o$ is the largest possible t in case no cap is imposed in period 1,

[17] In Section 4 we are more general regarding the type of incomplete agreements that the players can sign in period 1.

and is defined in (3.2). Therefore, $\hat{t} \geq \bar{t}_o$ is equivalent to having no cap and solving the one-step negotiation problem in period 2. The cap $\hat{t}$ determines the number of issues in the players' consideration set $k(\hat{t})$, given by the largest number of issues that satisfy player a's rationality constraint at transfer $\hat{t}$:

$$k(\hat{t}) = \begin{cases} n & \text{if } n \cdot h_a(c)c \leq h_a(\hat{t})\hat{t} \\ i & \text{if } i \cdot h_a(c)c \leq h_a(\hat{t})\hat{t} \leq (i+1) \cdot h_a(c)c \text{ and } 0 < i < n \\ 0 & \text{otherwise.} \end{cases}$$

Hence, the players' utilities in the final bargaining round are now

$$U^a(k,t) = h_a(\min\{\hat{t}, \bar{t}_o\})t - \sum_{i=1}^{k} h_a(c)c,$$

$$U^b(k,t) = \sum_{i=1}^{k} h_b(v_i)v_i - h_b(\min\{\hat{t}, \bar{t}_o\})t,$$

where $k \leq k(\hat{t})$ is the number of issues included in the final agreement. It follows that the presence of a cap $\hat{t} < \bar{t}_o$ reduces both players' focus on the transfer t relative to no cap. As a consequence, when a cap on transfer is introduced, player b becomes relatively more focused on the value of including an issue, while player a becomes relatively more focused on the cost of including this issue.

The solution to the period-2 negotiation is

$$\max_{t \leq \hat{t},\ k \leq k(\hat{t})} \left(\sum_{i=1}^{k} h_b(v_i)v_i - h_b(\min\{\hat{t}, \bar{t}_o\})t \right) \left(h_a(\min\{\hat{t}, \bar{t}_o\})t - \sum_{i=1}^{k} h_a(c)c \right). \tag{3.8}$$

Call the number of issues in the solution to the above problem $k^\star(\hat{t})$. For given $k^\star(\hat{t})$, the transfer that maximizes the Nash bargaining problem is

$$t(\hat{t}, k^\star(\hat{t})) = \min \left\{ \frac{1}{2} \left(\sum_{i=1}^{k^\star(\hat{t})} \frac{h_b(v_i)}{h_b(\min\{\hat{t}, \bar{t}_o\})} v_i + \frac{h_a(c)}{h_a(\min\{\hat{t}, \bar{t}_o\})} c k^\star(\hat{t}) \right), \hat{t} \right\}. \tag{3.9}$$

As long as $\hat{t}$ is not binding, increasing $\hat{t}$ decreases the equilibrium transfer. The reason is that as the cap on transfer increases, so does the salience of the transfer dimension. This reduces the focus-weighted surplus generated by agreeing on a given number of issues, which is

$$\sum_{i=1}^{k^\star(\hat{t})} \frac{h_b(v_i)}{h_b(\min\{\hat{t},\bar{t}_o\})} v_i - \frac{h_a(c)}{h_a(\min\{\hat{t},\bar{t}_o\})} c k^\star(\hat{t})$$

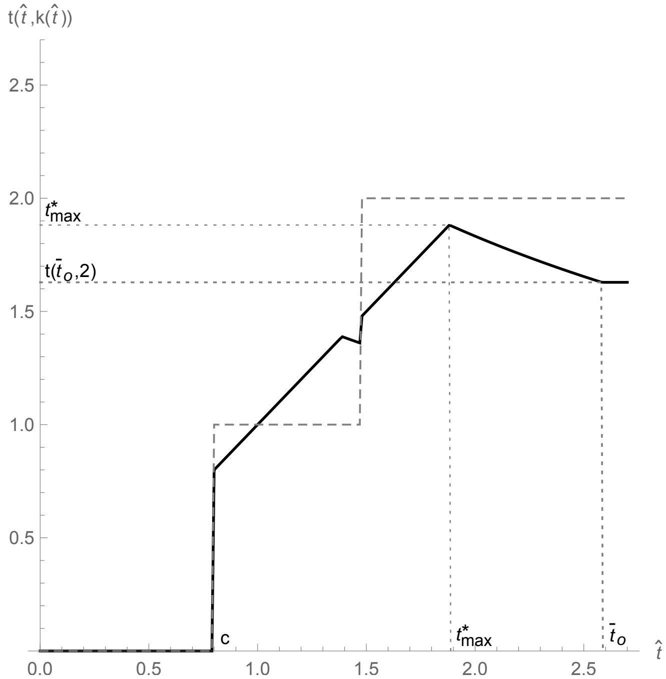
It is, however, also possible that $\hat{t}$ is binding, that is

$$\frac{1}{2}\left(\sum_{i=1}^{k^\star(\hat{t})} \frac{h_b(v_i)}{h_b(\min\{\hat{t},\bar{t}_o\})} v_i + \frac{h_a(c)}{h_a(\min\{\hat{t},\bar{t}_o\})} c k^\star(\hat{t})\right) \geq \hat{t}$$

in which case the equilibrium transfer is increasing in $\hat{t}$. Hence, for given $k^\star(\hat{t})$, the equilibrium transfer is first increasing and then decreasing in $\hat{t}$.

Determining $k^\star(t)$ is instead more convoluted. For an issue to be included in the agreement, it must be in the consideration set, and therefore $k^\star(\hat{t}) \leq k(\hat{t})$. Second, for an issue to be included in the agreement it must generate positive focus-weighted surplus, that is, issue i will be included in the agreement only if $\frac{\Delta(\min\{\hat{t},\bar{t}_o\})}{\Delta(c)} \geq \frac{h_b(c)\cdot c}{h_b(v_i) v_i}$. However, these two conditions are not sufficient to determine the number of issues included in the agreement. This is because the cap may constrain the ability of player b to compensate player a for the inclusion of an additional issue in the agreement, even when this issue is in the consideration set and generates positive focus-weighted surplus. That is, we are dealing with a Non Transferable Utility (NTU) bargaining problem, in which the players are constrained in the way they can share surplus. Because the Nash bargaining program maximizes the product of the two utilities, in an NTU bargaining problem an inefficient solution that shares the available surplus equally may be chosen over an efficient solution in which all surplus is captured by one of the two players.

Finding the number of issues included in the agreement therefore requires comparing the value of the Nash product for all issues that are in the consideration set



The period-2 transfer $t(\hat{t}, k^{\star}(\hat{t}))$ (solid black line) and the period-2 number of issues $k^{\star}(\hat{t})$ (dashed gray line) as a function of the cap on transfer $\hat{t}$ set in period 1. Parameter values are $v_1 = 2$, $v_2 = 1$, $c = 0.8$, $h_b(x) = x/4 + 1$ and $h_a(x) = 2x + 1$.

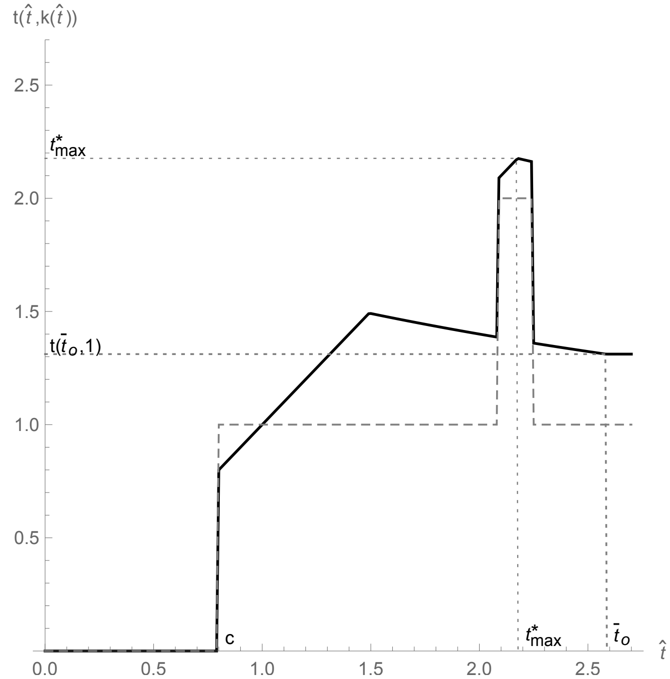
Figure 3.1: Period–2 agreement as a function of the cap on transfer: player a more focused.

and generate positive focus weighted surplus:

$$k^{\star}(\hat{t}) = \underset{k}{\text{argmax}} \left(\sum_{i=1}^{k} h_b(v_i)v_i - h_b(\min\{\hat{t}, \bar{t}_o\})t(\hat{t}, k^{\star}(\hat{t})) \right) \times \left(h_a(\min\{\hat{t}, \bar{t}_o\})t(\hat{t}, k^{\star}(\hat{t})) - kh_a(c)c \right)$$

$$s.t.\ k \leq \min\left\{ \sharp \left\{ v_i | \frac{\Delta(\min\{\hat{t}, \bar{t}_o\})}{\Delta(c)} \geq \frac{h_b(c) \cdot c}{h_b(v_i)v_i} \right\}, k(\hat{t}) \right\}$$

Figure 3.1 and 3.2 plot $t(\hat{t}, k^{\star}(\hat{t}))$ and $k^{\star}(\hat{t})$ as a function of $\hat{t}$. Note that, if we fix the focus weights, as the cap on transfer increases, the players will include (weakly) more issues in the agreement. This is because as $\hat{t}$ increases more issues are in the consideration set and the constraint on transfers is relaxed. However, changes in $\hat{t}$ also affect the players' focus weights. When player a is more focused than player b (so



The period-2 transfer $t(\hat{t}, k^\star(\hat{t}))$ (solid black line) and the period-2 number of issues $k^\star(\hat{t})$ (dashed gray line) as a function of the cap on transfer $\hat{t}$ set in period 1. Parameter values are $v_1 = 2$, $v_2 = 1$, $c = 0.8$, $h_b(x) = x/4 + 1$ and $h_a(x) = 1$.

Figure 3.2: Period–2 agreement as a function of the cap on transfer: player b more focused.

that $\Delta(x) \geq 1$ and strictly increasing in x), as $\hat{t}$ increases, any given issue becomes more likely to generate positive focus-weighted surplus. As a consequence, $k^\star(\hat{t})$ is always increasing in $\hat{t}$ (cf. Figure 3.1). When player b is more focused than player a (so that $\Delta(x) \leq 1$ and strictly decreasing in x) then as $\hat{t}$ increases, any given issue becomes less likely to generate positive focus-weighted surplus. Hence, the different effects at play push in opposite directions, and $k^\star(\hat{t})$ may be either increasing or decreasing (cf. Figure 3.2).

An important observation is that when either player is more focused than the other, $\Delta(\min\{\hat{t}, \bar{t}_o\})/\Delta(c)$ tends to one as $\hat{t}$ decreases. This implies that as long as the other constraints are not binding, the lower the cap on transfers the more likely that an issue is included in the agreement when it is efficient to do so, and is excluded otherwise. The reason is that reducing the range of possible transfers aligns the players' focus weights, which, as we already discussed in Proposition 2, tends to increase the efficiency of the negotiation. Of course, as $\hat{t}$ decreases one of the other constraints will eventually be binding. Achieving alignment of preferences may therefore come at the cost of excluding some (potentially efficient) issues from the agreement. This tradeoff is at the core of the period-1 problem.

3.3 Period 1

We now analyze the decision to restrict the future bargaining set via a cap on transfers. For the moment, we take the period-1 focus weights $\hat{h}_a^t$, $\hat{h}_a^c$, $\hat{h}_b^t$, $\hat{h}_b^{v_i}$ as given (we will endogenize them later). The period-1 problem is:

$$\max_{t,k} \left(\sum_{i=1}^{k} \hat{h}_b^{v_i} \cdot v_i - \hat{h}_b^t \cdot t \right) \left(\hat{h}_a^t \cdot t - \hat{h}_a^c \cdot c \cdot k \right)$$

$$\text{s.t.}$$

$$\{t, k\} = \underset{t \leq \hat{t},\ k \leq k(\hat{t})}{\operatorname{argmax}} \left(\sum_{i=1}^{k} h_b(v_i) v_i - h_b(\min\{\hat{t}, \bar{t}_o\}) t \right) \left(h_a(\min\{\hat{t}, \bar{t}_o\}) t - \sum_{i=1}^{k} h_a(c) c \right).$$

That is, the players will chose the bargaining outcome that solves the period-1 bargaining problem, under the constraint that this outcome solves the period-2 bargaining problem for some $\hat{t}$.

From the above expression, it is clear that the choice of $\hat{t}$ affects the period-2 problem in two ways, via the period-2 preferences and via the period-2 constraint. If the only effect of the cap was on preferences, the period-1 players would use it to align as much as possible period-1 with period-2 preferences, so that when the period-2 selves negotiate, they will reach the most preferred agreement from period-1 point of view. However, the cap has an additional effect on the constraint, because aligning preference may come at the cost of eliminating bargaining solutions that are potentially valuable from period-1 point of view.

Call $\tilde{k}$ the *best* possible k achievable from period-1 point of view, that is, the k

maximizing period-1 focus-weighted surplus:

$$\tilde{k} = \underset{k}{\operatorname{argmax}} \left\{ \sum_{i=1}^{k} \frac{\hat{h}_b^{v_i}}{\hat{h}_b^t} \cdot v_i - \frac{\hat{h}_a^c}{\hat{h}_a^t} \cdot c \cdot k \right\} \ s.t. \ k = k^*(\hat{t}) \text{ for some } \hat{t}.$$

Call $\tilde{t}_{Max}$ the largest cap on transfers $\hat{t}$ for which $\tilde{k}$ issues will be included in the consideration set, that is $\tilde{t}_{Max} \equiv \sup\{\hat{t} : t(\hat{t}, \tilde{k}) \text{ exists}\}$. By definition, at $\hat{t} > \tilde{t}_{Max}$ the number of issues included in the final agreement will be different from $\tilde{k}$.

But then it must be the case that preferences in period 2 are moving away from those of period 1 as $\hat{t}$ increases beyond $\tilde{t}_{Max}$. From period-1 point of view, therefore, the players are better off by imposing a cap equal to $\tilde{t}_{Max}$ relative to a cap greater than $\tilde{t}_{Max}$. For $\hat{t} \leq \tilde{t}_{Max}$, instead, a tradeoff may emerge: shrinking the future bargaining set may better align period-1 with period-2 preferences, but may also eliminate the period-1 preferred option. The following lemma summarizes this observation.

Lemma 3. *Call the solution to period-1 problem $\hat{t}^*$. It must be that $\hat{t}^* \leq \tilde{t}_{Max}$.*

Proof. In the text. □

We devote the rest of the section to analyzing this tradeoff in detail for some specific period-1 focus weights. But before moving forward, it is important to note that this tradeoff emerges because the players cannot perform *unconditional* transfers in period 1, that is transfers that do not depend on whether there will be an agreement in period 2. If instead the players could perform such period-1 transfers, they could use $\hat{t}$ to affect future preferences and the number of issues included in the agreement, and, independently from $\hat{t}$, share total surplus via period-1 transfers. In this case, we say that the players negotiate an *incomplete contract* (instead of an incomplete agreement). We postpone the analysis of incomplete contracts to Section 5.1.

Cold state

Suppose that the period-1 players are in a *cold state*, that is, they have rational preferences and $\hat{h}_a^t = \hat{h}_a^c = \hat{h}_b^t = \hat{h}_b^{v_i} \equiv 1$. In this case, the tradeoff discussed above is the most stringent, because period-1 and period-2 preferences are aligned at $\hat{t} = 0$, and the only bargaining outcome in the corresponding period-2 bargaining set is the disagreement point. This outcome is clearly suboptimal from period-1 point of view.

More generally, when either player is more focused than the other, as $\hat{t}$ decreases below $\bar{t}_o$, the period-2 preferences become more and more aligned with period-1 preferences. This implies, for example, that for given $k^\star$ the equilibrium transfer will be higher than that at $\hat{t} = \bar{t}_o$ and closer to the transfer that would be agreed upon by rational players. However, as $\hat{t}$ decreases, the number of issues included in the agreement is also affected. In particular, it is possible that the number of issues decreases with $\hat{t}$, and with it the material efficiency of the agreement. The optimal cap on transfer $\hat{t}^*$ therefore solves

$$\underset{\hat{t}}{\operatorname{argmax}} \left(\sum_{i=1}^{k^*(\hat{t})} v_i - t(\hat{t}, k^*(\hat{t})) \right) \left(t(\hat{t}, k^*(\hat{t})) - ck^*(\hat{t}) \right). \tag{3.10}$$

and balances the tradeoff between agreeing on the most efficient number of issues but having a very low transfer (relative to what would be agreed upon by rational players) and some inefficiencies in the number of issues in the agreement but transfers that are closer to those preferred in period 1.

Lemma 3 implies that the optimal period-1 cap on transfer is never greater than that maximizing material efficiency. However, it is possible that the cap on transfers chosen in period 1 is smaller than that achieving efficiency. To illustrate this possibility, consider the following example with three issues with values $v_1 = 2.5$, $v_2 = 1$, $v_3 = 0.75$ and cost $c = 0.8$, so that the materially efficient outcome is agreeing only on the first two issues. We specify the focus functions as $h_b(x) = \alpha x + 1$ with $\alpha > 0$ and $h_a(x) = 3\alpha x + 1$. That is, player a is more focused than player b, which means that, in the one-step negotiation the third issue may be inefficiently included in the agreement.

The parameter α measures the intensity of the focusing effect. It is a convenient way to measure the disagreement between period-1 and period-2 players. As α increases, period-2 preferences move further away from rational. As a consequence generating a given degree of alignment between period-1 and period-2 preferences

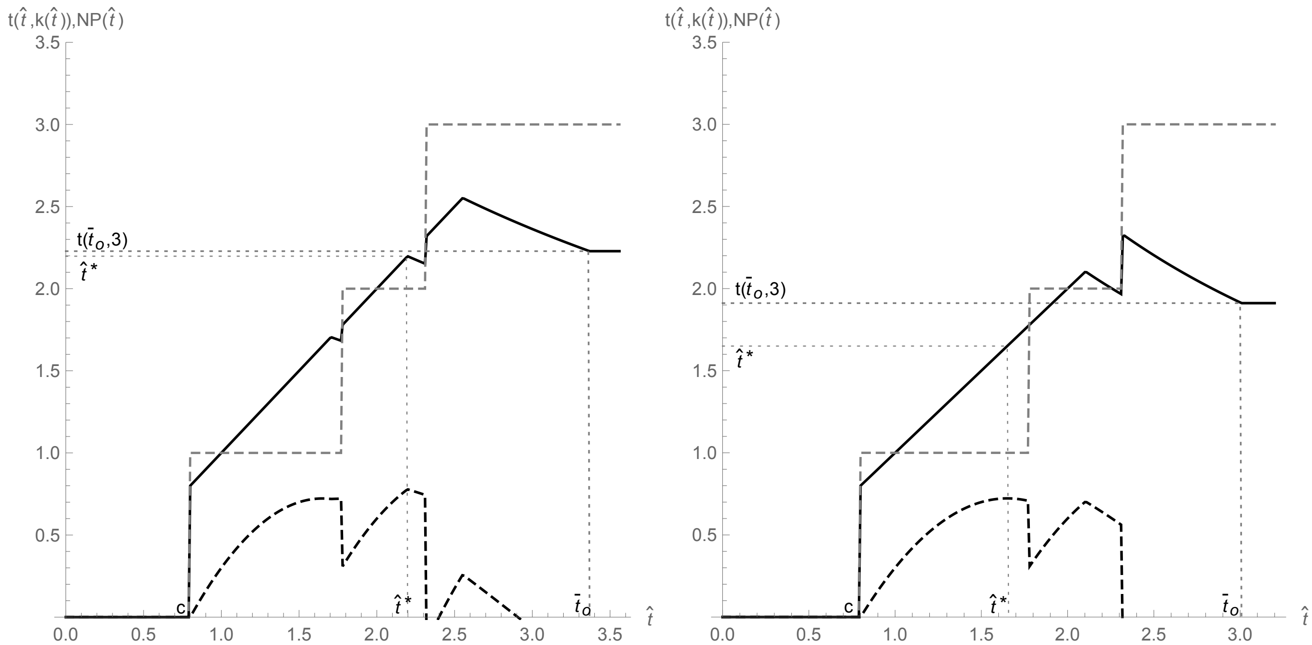


Figure 3.3: Period-2 transfer $t(\hat{t}, k^{\star}(\hat{t}))$ (solid black line), period-2 number of issues included in the agreement $k^{\star}(\hat{t})$ (dashed gray line), and period-1 Nash product (dashed black line) as a function of the cap on transfer $\hat{t}$ set in period 1. Parameter values are $v_1 = 2.5$, $v_2 = 1$, $v_3 = 0.75$, $c = 0.8$, $h_b(x) = \alpha x + 1$ and $h_a(x) = 3\alpha x + 1$. Left panel $\alpha = 0.25$; right panel $\alpha = 1$. In period 1, a cold-state cap equal to $\hat{t}^*$ will be chosen implying $k^* = 2$ and $k^* = 1$, respectively.

requires a tighter cap. Hence, α proxies how stringent is the tradeoff between the benefit of preferences alignment and the cost of imposing restrictions on the future bargaining set.

Figure 3.3 solves numerically this example for two values of α (0.25 and 1). The first thing to note is that, for any $\hat{t}$, the period-2 equilibrium transfer decreases with α. This is a consequence of the fact that, for given $\hat{t}$, period-2 preferences are farther from rational when α is large. It follows that, when α is low, the players can impose a cap such that 2 issues are included in the final agreement, and at the same time the final transfer is sufficiently large to compensate player a. Such cap will be chosen in period 1, leading to an increase in the material efficiency of the negotiation (relative to the one-step negotiation). If instead α is large, it is not possible to include 2 issues and at the same time generate a sufficiently large transfer. It follows that the players will set a transfer such that only one issue is included in the agreement. In this case, material efficiency is higher when the players negotiate in one step then when they are given the possibility to impose a cap on future transfers.

This example therefore illustrates the fact that giving the players the possibility to impose a cap on future transfers may increase or decrease material efficiency relative to the one-step negotiation. Whether material efficiency will increase or decrease depends on the strength of the focusing effect, which determines the degree of preference misalignment between period-1 and period-2 players.[18] This is a consequence of the fact that $\hat{t}$ determines both the number of issues included in the agreement and the equilibrium transfer. The period-1 bargaining problem is, again, a Non Transferable Utility bargaining problem because the players are constrained in the way they can share surplus. As a consequence, in general there is no presumption that the period-1 bargaining solution is efficient, or increases material efficiency relative to the one-period negotiation.

Warm state

Suppose now that the period-1 players are in a warm state, that is, their preferences are context dependent in period 1 as well. The period-1 context is given by the set of k and t that are achievable as a function of $\hat{t}$. Hence the period-1 focus weight on transfers is $t^\star_{\max} \equiv \max_{\hat{t}} \left\{ t(\hat{t}, k^\star(\hat{t})) \right\}$, and the players' period-1 utilities are

$$U^a(\hat{t}) = h_a(t^\star_{\max}) t(\hat{t}, k^\star(\hat{t})) - \sum_{i=1}^{k^\star(\hat{t})} h_a(c) c,$$

[18] We also solved the same example for the case of player b more focused. In this case, in the one-step negotiation, the second (and the third) issue may be left out of the final agreement. If α is low, then the period-1 players will use the cap to restore efficiency and include the first 2 issues in the final agreement. If instead α is high, then the period-1 players may impose a tighter cap and therefore only agree on 1 issue in period 2. In this case, depending on α, the possibility of imposing a cap either increases or does not affect the material efficiency of the negotiation (relative to the one-step negotiation).

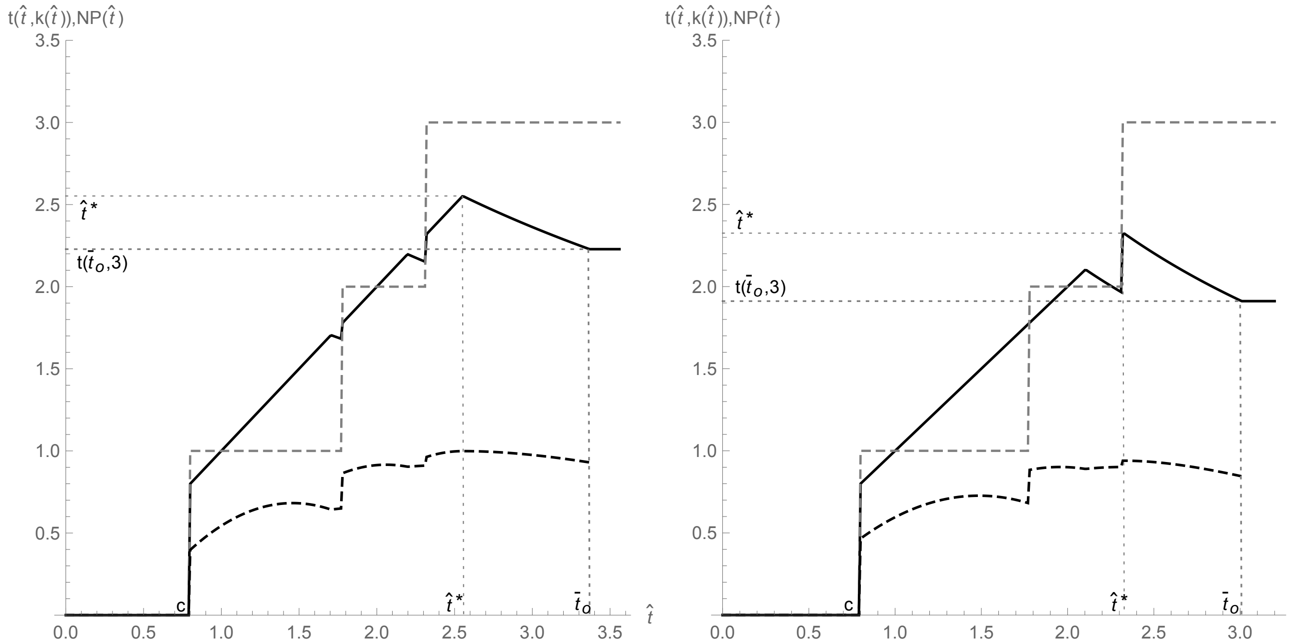


Figure 3.4: Period-2 transfer $t(\hat{t}, k^\star(\hat{t}))$ (solid black line), period-2 number of issues included in the agreement $k^\star(\hat{t})$ (dashed gray line), and period-1 Nash product (dashed black line) as a function of the cap on transfer $\hat{t}$ set in period 1. Parameter values are $v_1 = 2.5$, $v_2 = 1$, $v_3 = 0.75$, $c = 0.8$, $h_b(x) = \alpha x + 1$ and $h_a(x) = 3\alpha x + 1$. Left panel $\alpha = 0.25$; right panel $\alpha = 1$. In period 1, a warm-state cap equal to $\hat{t}^*$ will be chosen implying $k^* = 3$ in both panels.

$$U^b(\hat{t}) = \sum_{i=1}^{k^\star(\hat{t})} h_b(v_i)v_i - h_b(t^\star_{\max})t(\hat{t}, k^\star(\hat{t})).$$

There are therefore two differences with the cold-state case discussed above. First, the degree of preference misalignment between period-1 and period-2 selves is smaller in the warm state than in the cold state. This is due to the fact that, in the warm state, preferences between period 1 and period 2 can be perfectly aligned by setting $\hat{t} = t^\star_{\max}$ while, as we discussed above, in the cold-state case perfect preferences alignment is achieved only by setting $\hat{t} = 0$. Hence, the tradeoff between preference alignment and restriction of the future bargaining set is here less stringent. We illustrate this point by considering the same numerical example we presented in the cold-state case. As Figure 3.4 shows, here the players always agree on the cap that implements $\tilde{k}$, that is, they always include in the agreement the number of issues that is preferred from period-1 point of view.

Finally, in the warm-state case, period-1 preferences are endogenous and depend on the set of incomplete agreements that can be signed in period 1. That is, if, instead of agreeing on a cap on transfer, the players were given the chance to impose different restrictions on the future bargaining set, the period-1 preferences would change. We return to this point in the next section.

4 General Bargaining Problem with Context-Dependent Preferences

We now go back to the general problem introduced in Section 2. Our goal is to show that the main results derived in the previous section generalize to any bargaining problem and any form of context dependence. We will also show that, in the warm-state case, period-1 preferences depend on the set of incomplete agreements that can be signed $\mathbb{S}$. It follows that $\mathbb{S}$ is an important determinant of whether the players will sign an incomplete agreement.

Rational players. We start by considering a benchmark in which players are always rational. In this case, for a given incomplete agreement S, in period 2 the bargaining problem is:

$$\max_{x \in S} U^a(x) \cdot U^b(x).$$

Because the players' preferences do not change across periods, in period 1 the bargaining problem is:

$$\max_{S \in \mathbb{S}} \left[\max_{x \in S} U^a(x) \cdot U^b(x) \right],$$

which is maximized for the largest possible S, which is X itself.

Remark 1. *Suppose both players are rational. Suppose, furthermore, that the players have the option to restrict their bargaining set by signing an incomplete agreement.*

The players can never do better than bargaining in one step.

Cold state in period 1. Suppose now that, in period 2, both players have context-dependent preferences of the form $U^a(x, \hat{S})$, $U^b(x, \hat{S})$, where $\hat{S}$ is the players' consideration set, defined in (2.1). Because we leave the form of context dependence completely unspecified, we cannot address here issues of existence and uniqueness of the consideration set $\hat{S}$. We therefore simply assume that $\hat{S}$ exists and is unique for any S. The solution to the bargaining problem over S is:

$$x(S) = \text{argmax}_{x \in S} U^a(x, \hat{S}) U^b(x, \hat{S}),$$

which we also assume to exist and to be unique.

Define the set of anticipated bargaining outcomes $\mathbb{C}$ as:

$$\mathbb{C} \equiv \{x(S) | S \in \mathbb{S}\}.$$

Using the fact that, in period 1, preferences are rational, we can write the period-1 bargaining problem as:

$$\max_{x \in \mathbb{C}} U^a(x) \cdot U^b(x),$$

that is, among the outcomes achievable via an incomplete agreement when preferences are context dependent in period 2, choose the one that maximizes the Nash product with rational preferences. It follows quite immediately that an incomplete agreement will be imposed if it leads to a period-2 outcome that achieves a larger Nash product than the outcome achieved in the one-step negotiation with context-dependent preferences. In this sense, incomplete agreements are used to move the period-2 outcome of the negotiation "closer" to the outcome that would be achieved by players who are fully rational in both periods. The next proposition formalizes this intuition.

Proposition 3. *In period 1, the players will agree on the $S \in \mathbb{S}$ that maximizes the*

Nash product with rational preferences, that is:

$$S : x(S) = argmax_{x \in \mathbb{C}} U^a(x) \cdot U^b(x)$$

It follows that, if there exist an $\mathbb{S}$ *such that* $\max_{x \in \mathbb{C}} U^a(x) \cdot U^b(x) > U^a(x(X)) \cdot U^b(x(X))$*, the players will strictly prefer to restrict their bargaining set by imposing an incomplete agreement in period 1.*

Proof. In the text. □

Note, however, that the period-1 bargaining is a Non Transferable Utility (NTU) problem, because only bargaining outcomes in $\mathbb{C}$ are achievable. As with all NTU bargaining problems, there is no presumption that the parties will agree on the most efficient outcome achievable in period 1 (that is, there is no presumption that the solution to the period-1 negotiation maximizes the sum of the two utilities).

Warm state in period 1. When preferences are context dependent on period 1 as well, the set $\mathbb{C}$ determines the period-1 consideration set $\hat{\mathbb{C}}$. It follows that the period-1 bargaining problem has a solution given by:

$$x(\mathbb{C}) = \text{argmax}_{x \in \mathbb{C}} U^a(x, \hat{\mathbb{C}}) U^b(x, \hat{\mathbb{C}}).$$

We want to establish under what conditions the two players choose in period 1 to restrict their future bargaining set, i.e., under what conditions $x(\mathbb{C}) \neq x(X)$.

To start, note that for $x(\mathbb{C}) \neq x(X)$ to hold, it must be the case that $\hat{\mathbb{C}} \neq \hat{X}$, i.e., the period-1 consideration set differs from the unconstrained consideration set, which is true whenever there are some bargaining outcomes in $\hat{X}$ that cannot be achieved as a solution to the bargaining problem under any $S \in \mathbb{S}$. If instead the set $\mathbb{S}$ contains all singletons of X, then the period-1 negotiation becomes identical to the period 2 negotiation, and the players can finalize the outcome of the negotiation already in period 1. That is, when $x(\mathbb{C}) = x(X)$ the players negotiate in one step in period 1.

Second, the fact that $\hat{\mathbb{C}} \neq \hat{X}$ may or may not imply that the players' preferences will be different under the two consideration sets. This will depend on the specific form of context-dependent preferences. Finally, even if preferences are different under the two consideration sets, the players will agree on an incomplete agreement only if there exists an $S \in \mathbb{S}$ delivering an outcome that is jointly preferred to the outcome in case of no incomplete agreement. This will be the case if, for example, $\mathbb{C}$ itself is available in period 1 (i.e., $\mathbb{C} \in \mathbb{S}$). When $\mathbb{C}$ is chosen, period-2 players' context (and preferences) are identical to period-1 players' context (and preferences). Hence, by choosing $\mathbb{C}$ in period 1, the period-2 problem becomes identical to the period-1 problem, and whatever bargaining outcome is chosen in period 2 also solves the period-1 bargaining problem. It follows that, in period 1, if $\mathbb{C}$ is available, it will be chosen over all other available options (including the unconstrained bargaining set X). In such cases, an incomplete agreement will be used in equilibrium to shrink the bargaining set from X to $\mathbb{C}$.

To conclude this section, note that the set of incomplete agreements $\mathbb{S}$ affects the players' preferences in period 1, the choice of incomplete agreements and the final bargaining outcome. Hence, even if for some $\mathbb{S}$ the players will not want to progressively restrict their bargaining set, for some other $\mathbb{S}'$ they may decide to do so. The next proposition formalizes this intuition.

Proposition 4. *Suppose that preferences are context dependent, in the sense that there exist a set $D \subset X$ with $x(X) \in D$ such that $x(X) \neq x(D)$ (that is, when the bargaining set changes from X to D, preferences and bargaining solution change as well). There exist an $\mathbb{S}$ such that the players will strictly prefer to restrict their bargaining set by imposing an incomplete agreement in period 1.*

Proof. Define $\mathbb{S}$ as $\{D, X\}$ plus all singletons in D. In this case $\mathbb{C} = D \subset X$, which implies that $x(X) \neq x(\mathbb{C}) = x(D)$ and the players strictly prefer D to X in period 1, so to make the period-2 problem identical to the period-1 problem. Hence, the players will restrict their bargaining set. $\square$

The proposition exploits the fact that when the players are in a warm state, their preferences depend on $\mathbb{S}$. It is therefore possible to find an $\mathbb{S}$ such that the tradeoff between aligning preferences and restricting the future choice set is not binding, in the sense that full alignment of preference is possible without eliminating the period-1 preferred option.

5 Discussion

We now discuss the robustness of our results to a number of variations in our basic assumptions. In Section 5.1 we allow players to make transfers in period 1 as well as in period 2. In Section 5.2 we discuss what happens when players can ignore a previously signed incomplete agreement. In Section 5.3 we consider the possibility that in case of disagreement in period 1 the players go to a one-step negotiation (instead of ending the negotiation). In Section 5.4 we discuss how our results will change if we consider forms of context dependence different from the focusing effect. We conclude the section by providing an argument in support of our main assumption, that the consideration set should be equal to the bargaining set (see Section 5.5).

5.1 Incomplete contracts: transfers in period 1

We consider now the possibility that the players can make unconditional transfers in period 1, that is, transfers that do not depend on whether there will be an agreement in period 2.[19] In this case, we call a period-1 agreement a contract. As we already discussed in Section 3.3, when period-1 transfers are possible, the tradeoff between the benefit of preferences alignment and the cost of imposing restrictions on the future bargaining set disappears: the players will always set $\hat{t}$ such that the number of issues included in the agreement is $\tilde{k}$ (i.e., the period-1 preferred), and then use period-1 transfers to compensate player a in case $t(\hat{t}, k^\star(\hat{t}))$ is too low (relative to the period-1 preferred transfer).

[19] A period-1 transfer that is conditional on achieving an agreement in period-2 amounts to a lower bound on the period-2 transfer. Such a lower bound does not affect the players' preferences because the disagreement outcome is always in period-2 consideration set. Hence, the lowest possible transfer in the consideration set is always 0.

In the cold-state case, this immediately implies that, in period 1, the players will sign an incomplete contract that increases the material efficiency of the negotiation (relative to the one-step negotiation). Note however that both periods' agreements are now directly utility relevant (rather than indirectly utility relevant, i.e., via $\hat{t}$). It is therefore more difficult to justify the fact that players are in cold state, that is, rational in period 1 but context dependent in period 2.

In the warm-state case, instead, the solution will depend on the salience of the period-1 transfer. For example, assume that the salience of the period-1 transfer is the same as the salience of the period-2 transfer. This could be the case whenever the two transfers are "consumed" at the same time after the negotiation is concluded. The period-1 utilities are

$$U^a(\hat{t}, t_{tot}) = h_a(\bar{t}_{tot})t_{tot} - \sum_{i=1}^{k^\star(\hat{t})} h_a(c)c,$$

$$U^b(\hat{t}, t_{tot}) = \sum_{i=1}^{k^\star(\hat{t})} h_b(v_i)v_i - h_b(\bar{t}_{tot})t_{tot}.$$

where t_{tot} is now the sum of the period-2 transfer $t(\hat{t}, k^\star(\hat{t}))$ and the period-1 transfer, and $\bar{t}_{tot}$ is the largest possible total transfer in the period-1 consideration set. Call $\hat{k}^\star \equiv \max_{\hat{t}} \left\{k^\star(\hat{t})\right\}$ the largest possible k achievable via a cap $\hat{t}$. Again, $\bar{t}_{tot}$ is the largest t_{tot} that satisfies player b rationality constraint, and is implicitly defined by:

$$h_b(\bar{t})\bar{t} = \sum_{i=1}^{k^\star(\hat{t})} h_b(v_i)v_i.$$

Because $\hat{k}^\star \leq n$, we immediately establish that $\bar{t}$ is below the largest transfer that is in the consideration set of the one-step negotiation (cf. equation 3.2). That is, relative to the one-step negotiation, period-1 players are here (weakly) less focused on the transfer dimension.

Beside this, the analysis of the period-1 problem with transfer is identical to the analysis of the one-step negotiation: all results derived there (Proposition 1 and

2, Corollary 1, and Lemma 2) hold here as well. That is because, also here, both agents are relatively more focused on the transfer dimension. It follows that, as v_1 increases, the salience of the transfer dimension will increase, and therefore the distortion generated by the focusing effect.

To summarize, in the warm-state case, the two-step negotiation with transfers in both periods is almost identical to the one-step negotiation. The only difference is that, in period 1, the players anticipate that some issues with small v_i may not be included in the agreement for any $\hat{t}$, which makes them less focused on the transfer dimension (relative to the one-step negotiation).

5.2 Non-binding incomplete agreements

If a previous incomplete agreement imposes a cap on the transfer t, it is possible that, in period 2, both players are jointly willing to ignore this cap and include an additional issue in the agreement. In other words, contrary to what we assumed in the body of the paper, it is possible that an incomplete agreement may be ignored. In this case, we say that incomplete agreements are non binding.

Our analysis survives the fact that incomplete agreements may be non binding, provided that violating a prior incomplete agreement requires to trigger a fresh round of negotiation. In this case, in period 2, the players know that they can trigger a third round of negotiation. Hence, the outcome of this third negotiating round must be an element of the period-2 consideration set. Call such an outcome k_3, t_3. It follows that any cap $\hat{t} < t_3$ will not have any effect on the players period-2 preferences, because independently on the constraint imposed on the transfers that can be agreed upon in period 2, the players can implement t_3 by going to a third round of negotiation. Hence, the period-2 focus weights on transfer for given $\hat{t}$ are now $h_j(\max\{t_3, \min\{\hat{t}, \bar{t}_o\}\})$ for $j \in \{a, b\}$.

To summarize, the fact that incomplete agreements are non binding imposes an additional constraint on the period-1 problem, without, however, changing its basic tradeoff.

5.3 Beyond Assumption 3: one-step negotiation as an outside option

So far we have assumed that a disagreement in either period triggers the end of the negotiation. This is, clearly, the only possibility in period 2, which is the last period of the game. It is however possible that, in period 1, the one-step negotiation is the threat point, in the sense that, in period 1, each player can unilaterally decide to negotiate in one step in the following period. We next allow for this possibility.

If, in period 1, the players are in a cold state, then the players will sign an incomplete agreement if and only if the outcome generated by this agreement is preferred by both players to the outcome achieved in the one-step negotiation. That is, incomplete agreements are used if and only if they increase material efficiency. We provide in the body of the text a numerical example in which the players sign an incomplete agreement that improves the material efficiency of the negotiation relative to the one-step negotiation. It follows that also under this alternative assumption incomplete agreements may be used in equilibrium, yet, contrary to the case considered in the body of the paper, their effect on material efficiency is here unambiguously positive.

In the warm-state case, an additional consideration emerges. No player will settle for less than what he/she can earn in the one-step negotiation, and this imposes a minimum to the level of transfers and the number of issues in the consideration set. This, in turn, has an impact on the player's preferences, which are now:

$$u^a(q_1, q_2, t) = h_a(t^\star_{\max} - \underline{t})t - \sum_{i=1}^{k(t^\star_{\max})} h_a\left(\frac{(\bar{q}_i - \underline{q}_i)c}{v_i}\right)\frac{q_i c}{v_i},$$

$$u^b(q_1, q_2, t) = \sum_{i=1}^{k(t^\star_{\max})} h_b((\bar{q}_i - \underline{q}_i))v_i - h_b(t^\star_{\max} - \underline{t})t.$$

Without fully solving for $\underline{t}$ and $\underline{q}_i$, it suffices to note that the presence of the lower bounds decreases both players' focus weights and therefore decreases the distortion generated by the focusing effect. Given these preferences, similarly to the cold-state case, the players will sign an incomplete agreement if and only if it increases surplus (as measured using period-1 preferences) relative to the one-step negotiation.

5.4 Other models of context dependence

We develop our argument using Kőszegi and Szeidl (2013) because, as already discussed in the introduction, practitioners believe that reducing the range of possible outcomes on a dimension reduces the importance of this dimension within a negotiation (see Raiffa, 1982, p.216). However, other models of context dependence have been proposed. As Section 4 illustrates, the fact that the players may want to use an incomplete agreement in order to shrink their bargaining set generalizes to any form of context dependence. However, some of the results derived in Section 3 depend on the specific form of context dependence used.

Bushong, Rabin and Schwartzstein (2015) propose a model in which the salience of a dimension decreases with the range of possible options in that dimension. Mathematically, the model is identical to that of Kőszegi and Szeidl (2013), except that the focus functions $h_a()$ and $h_b()$ are decreasing. For our purposes, the fact that the focus functions are decreasing implies that a cap on transfers will *increase* the salience of the transfer dimension relative to no cap. It follows that the results derived in Proposition 1 are now reversed. The salience of the transfer dimension increases whenever v_1 *decreases*. Hence the inefficient outcomes become more likely to occur when v_1 is small rather than large.

The goal of Bushong, Rabin and Schwartzstein (2015) is to model range-based relative thinking: the idea that given "the presence of greater ranges along a dimension, all changes along that dimension loom smaller." An implication of range-based relative thinking is the notion of diminishing sensitivity, where a fixed change is less salient the wider the range of utility differences. In their introduction, they propose the example of a 100 dollars optional "convenience" charge on a flight that costs 200 vs 500. When the starting price is higher, the additional charge will be less salient and the consumer is more likely to purchase it.

An important element of this example is that the optional "convenience" charge cannot be purchased independently from the flight.[20] In our model, instead, the players can agree on only the first issue, or only the second issue. In other words, the second issue is not an “add on” to the first issue, but rather a different dimension of the problem. Given this interpretation, we do not think that diminishing sensitivity should be prominent in our analyses, and therefore prefer to use Kőszegi and Szeidl (2013). Of course, in some negotiations the second issue will be an “add on” to the first one, in which case the model proposed by Bushong, Rabin and Schwartzstein (2015) is probably better suited to study the bargaining problem.

Bordalo, Gennaioli and Shleifer (2013) propose a model of salience in which different options are evaluated relative to a reference point. This model could be applied to our framework by assuming that imposing a cap on transfers shifts the reference point of the transfer dimension. The effect of introducing a cap will then depend on whether the transfer dimension becomes more or less salient with the introduction of the cap. If its salience decreases, then we are back to a logic similar to Kőszegi and Szeidl (2013), leading to results qualitatively similar to the ones discussed in the body of the paper. If instead its salience increases, then we are back to a logic similar to Bushong, Rabin and Schwartzstein (2015), leading to results qualitatively similar to the ones discussed above. We will be in one or the other case depending on how exactly imposing a bound affects the reference point; which is an issue beyond the scope of this paper.

5.5 The consideration set

We want to provide here a justification to one of our key assumptions: that the consideration set is equivalent to the entire bargaining set. Consider a generic bargaining problem with context-dependent preferences (such as the one discussed in

[20] This is an important element of many examples of diminishing sensitivity. A famous one is the observation that people are willing to travel 10 minutes to another shop to save 30 dollars on a product whenever the initial cost of the product is low (say 100 dollars) but not when it is high (say 1000 dollars). Also here, it is not possible to get the discount independently from purchasing the product.

Section 4), solved using a Generalized Nash Bargaining (GNB) solution:

$$\max_{x \in C} \left\{ U^a(x, C)^{\nu_a} U^b(x, C)^{\nu_b} \right\},$$

subject to the players' rationality constraint, where the weights ν_a and ν_b represent the player's ability to influence the bargaining process. The GNB solution is equivalent to the Nash bargaining solution whenever $\nu_a = \nu_b$. The GNB solution is obtained starting from the same axioms underlying the Nash bargaining solution, and weakening the symmetry axiom (see Roth, 1979).

At the limit case $\nu_a = 0$ (or $\nu_b = 0$), the bargaining problem is equivalent to a choice problem: choose the x preferred by player b (or player a) subject to both players' rationality constraints. Hence, the players' rationality constraints define the choice set of the problem. As discussed in the Introduction, in a choice problem the consideration set is equivalent to the choice set. Therefore, to be consistent with the choice problem, when $\nu_a = 0$ or $\nu_b = 0$, the consideration set should be equal to the bargaining set. If the consideration set is independent from ν_a and ν_b (so that the players' *preferences* over each bargaining outcome do not depend on ν_a and ν_b), by consistency with the limit cases $\nu_a = 0$ and $\nu_b = 0$, the consideration set should be equivalent to the entire bargaining set for all ν_a and ν_b, including for $\nu_a = \nu_b$.

Finally, note that a similar argument holds if we modify the bargaining problems analyzed by adding either a second player a or a second player b, and assuming that each player signs only one agreement. Due to Bertrand competition, the resulting bargaining problem is equivalent to a choice problem for the player that is the short side of the market. Again, if we assume that preferences over bargaining outcomes do not change with the number of players, then we should also assume that for any number of players the consideration set is equivalent to the bargaining set.

6 Conclusion

We provide a theory of incomplete agreements in the absence of uncertainty. When the players' preferences are context dependent, the presence of previous incomplete agreements which restrict the set of possible bargaining outcomes may affect the bargaining solution. More interestingly, a player who anticipates having context-dependent preferences values the possibility of aligning her present and future preferences. Achieving this alignment may require the players to sign an incomplete agreement restricting the future bargaining possibilities. However, doing so may eliminate options that are optimal ex ante. The choice of what incomplete agreement to implement is therefore determined by the tradeoff between the benefit of preference alignment and the cost of imposing restrictions to the bargaining set.

We assumed that the players are exogenously given the opportunity to shrink their bargaining set via an incomplete agreement, and showed that the players may want to do it. One open question is where this possibility comes from. That is, one could introduce a period-0 in which players have to adopt a negotiation structure $\mathbb{S}$ out of a set of possible negotiation structures. We speculate that the logic discussed in the body of the paper applies in this case as well. If preferences are rational both in period 0 and in period 1, then the period-0 choice is the one that makes the period-1 tradeoff between preference alignment and restriction of the bargaining set less stringent.[21] If instead players are context dependent in all periods, then the period-0 choice is, again, determined by a tradeoff between the desire to align period-0 and period-1 preferences and the desire to leave as much flexibility as possible to the future selves.

[21]Of course, in period 0, the players cannot do better than allowing their period-1 selves to directly choose the bargaining outcome. But if the players can choose the bargaining outcome in period 1, then their period-1 preferences should not be rational but rather context dependent.

Appendix

Proof of Lemma 1. That agreeing on all issues is in the consideration set is shown in the body of the paper. We now show that there can only be n issues in the consideration set. Suppose $n-l$ issues are in the consideration set, for $1 < l < n$. If this is the case, player b's utility is given by

$$\sum_{i=1}^{n-l} h_b(v_i)v_i - h_b(\bar{t})t,$$

and $\bar{t}$ solves

$$\sum_{i=1}^{n-l} h_b(v_i)v_i = h_b(\bar{t})\bar{t},$$

However, if $v_1 \geq n \cdot c$, it must be that $\bar{t} \geq v_1$, $h_a(\bar{t}) \geq h_a(c)$ and

$$h_a(\bar{t})\bar{t} \geq n \cdot h_a(c)c.$$

Therefore player a's rationality constraint is satisfied when *all* issues are included in the agreement and the transfer is $\bar{t}$. Because all v_i are positive, this implies that including all issues and transfer $\bar{t}$ also satisfies b's rationality constraint. Hence, it is not possible to have $n-l$ issues in the consideration set.

To conclude the proof we need to show that it is not possible to have no issues in the consideration set. By contradiction: if the only element of the consideration set is the no agreement outcome, then player a's focus weights on all dimensions are equal to $h_a(0)$, while player b's focus weights on all dimensions are equal to $h_b(0)$. Being equally focused an all dimensions, the players behave "as if" they are rational But this implies that they will want to include at least issue 1 in the agreement (remember that $v_1 > c$ by assumption), leading to a contradiction.

□

References

Bac, Mehmet and Horst Raff, "Issue-by-issue Negotiations: The Role Of Information And Time Preference," *Games and Economic Behavior*, 1996, *13* (1), 125–134.

Battaglini, Marco and Bård Harstad, "Participation and Duration of Environmental Agreements," *The Journal of Political Economy*, 2014, p. forthcoming.

Battigalli, Pierpaolo and Giovanni Maggi, "Rigidity, Discretion, and the Costs of Writing Contracts," *The American Economic Review*, 2002, pp. 798–817.

Bernheim, B Douglas and Michael D Whinston, "Incomplete contracts and strategic ambiguity," *The American Economic Review*, 1998, pp. 902–932.

Bolton, Patrick and Antoine Faure-Grimaud, "Satisficing Contracts," *The Review of Economic Studies*, 2010, *77* (3), 937–971.

Bordalo, Pedro, Nicola Gennaioli, and Andrei Shleifer, "Salience and Consumer Choice," *The Journal of Political Economy*, 2013, *121* (5), 803–843.

Busch, Lutz-Alexander and Ignatius J Horstmann, "Endogenous Incomplete Contracts: A Bargaining Approach," *Canadian Journal of Economics*, 1999, pp. 956–975.

_ and _ , "Signaling via an Agenda in Multi-issue Bargaining with Incomplete Information," *Economic Theory*, 1999, *13* (3), 561–575.

Bushong, Benjamin, Matthew Rabin, and Joshua Schwartzstein, "A model of relative thinking," 2015.

Compte, Olivier and Philippe Jehiel, "Bargaining with Reference Dependent Preferences," *Working Paper*, 2003.

Dekel, Eddie, Barton L Lipman, and Aldo Rustichini, "Representing preferences with a unique subjective state space," *Econometrica*, 2001, *69* (4), 891–934.

Esteban, Joan and József Sákovics, "A Theory of Agreements in the Shadow of Conflict: The Genesis of Bargaining Power," *Theory and Decision*, 2008, *65* (3), 227–252.

Fisher, Roger, William L. Ury, and Bruce Patton, *Getting to Yes: Negotiating Agreement Without Giving In*, Penguin Group, 1991.

Flamini, Francesca, "First Things First? The Agenda Formation Problem for Multi-issue Committees," *Journal of Economic Behavior & Organization*, 2007, *63* (1), 138–157.

Gul, Faruk and Wolfgang Pesendorfer, "Temptation and Self-Control," *Econometrica*, 2001, *69* (6), 1403–1435.

Harstad, Bård, "Harmonization and side payments in political cooperation," *The American Economic Review*, 2007, *97* (3), 871–889.

Hart, Oliver and John Moore, "Contracts as Reference Points," *The Quarterly Journal of Economics*, 2008, *123* (1), 1–48.

Herweg, Fabian and Klaus M. Schmidt, "Loss Aversion and Inefficient Renegotiation," *The Review of Economic Studies*, 2015, *82* (1), 297–332.

_ , Heiko Karle, and Daniel Müller, "Incomplete Contracting, Renegotiation, and Expectation-Based Loss Aversion," *Journal of Economic Behavior & Organization*, 2017, *(forthcoming).*

Inderst, Roman, "Multi-issue Bargaining with Endogenous Agenda," *Games and Economic Behavior*, 2000, *30* (1), 64–82.

Kőszegi, Botond and Adam Szeidl, "A Model of Focusing in Economic Choice," *The Quarterly Journal of Economics*, 2013, *128* (1), 53–104.

Lang, Kevin and Robert W Rosenthal, "Bargaining Piecemeal or All At Once?," *The Economic Journal*, 2001, *111* (473), 526–540.

Noor, Jawwad, "Temptation and Revealed Preference," *Econometrica*, 2011, *79* (2), 601–644.

Raiffa, Howard, *The Art and Science of Negotiation*, Harvard University Press, 1982.

Roth, Alvin E, *Axiomatic Models of Bargaining* number 170, Springer-Verlag Berlin, 1979.

Sarver, Todd, "Anticipating regret: Why fewer options may be better," *Econometrica*, 2008, *76* (2), 263–305.

Segal, Ilya, "Complexity and Renegotiation: A Foundation for Incomplete Contracts," *The Review of Economic Studies*, 1999, *66* (1), 57–82.

Strotz, R. H., "Myopia and Inconsistency in Dynamic Utility Maximization," *The*

Review of Economic Studies, 1955, *23* (3), 165–180.

Tirole, Jean, "Cognition and Incomplete Contracts," *The American Economic Review*, 2009, *99* (1), 265–294.