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The modular logic of private international law

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Abstract We provide a logical analysis of private international law, a rather esoteric, but increasingly important, domain of the law. Private international law addresses overlaps and conflicts between legal systems by distributing cases between the authorities of such systems (jurisdiction) and establishing what rules these authorities have to apply to each case (choice of law). A formal model of the resulting interactions between legal systems is proposed based on modular argumentation. It is argued that this model may also be useful for governing the interactions between heterogeneous agents, belonging to different and differently regulated virtual societies, without recourse to a central regulatory agency. The model also provides for multiple interpretations concerning rules of private international law as well as substantive rules of the different legal systems.

Keywords Argumentation · Modular argumentation · Private international law · Interpretation · Logic · Logic programming

1 Introduction: jurisdiction and choice of laws

In our increasingly interconnected world, multiple normative systems have to be taken into account, especially in international contracts and other commercial and social interactions involving different countries. First of all, there are different

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national legal systems. Secondly, there are various transnational or international laws: rules produced by various international organisations (the United Nations, the Word Trade Organisation, the European Union, etc.), various forms of transnational customary or soft law (Internet law, *lex mercatoria*, etc.). Thirdly, there are various sub-national laws: laws of autonomous member States, regions, municipalities, tribal or ethnic communities, etc.

We do not need to enter the discussion on legal pluralism (see for instance Tamanaha 2008) and examine whether we may properly speak of laws (legal systems) with regard to all such diverse normative institutions and sources of norms. What matters for us is that when different normative systems overlap and interfere one with another, lawyers must be able to understand these inter-systemic interactions, namely, the ways in which each system takes into account the existence, the content and the implications of other systems. This is the subject of the the discipline called *private international law* (or *conflicts of laws)*, which enables the coexistence of multiple normative systems, having distinct and often contradictory rules, and the decision of cases involving persons connected to different legal systems, without imposing an additional overarching regulation, and without establishing priorities between the involved systems. Conflicts between competences and between rules are avoided by distributing the cases between the authorities of the different normative systems (jurisdiction), and by establishing what set of norms these authorities have to apply to each given case (choice of law).

Thus, private international law must be distinguished from other ways of solving antinomies (normative conflicts), which address conflicts between norms pertaining to the same legal system by establishing normative priorities (e.g., norms can be prioritised on the basis of the rank of the authorities issuing them, the time when they were issued, or their degree of specificity).

Thus the approach of private international law has not been captured in formal models, according to either of the main formal approaches to normative conflicts, belief-revision and defeasible reasoning.

The *belief-revision* approach pioneered by Carlos Alchourron and David Makinson (1981) has addressed antinomies through change, i.e., through models for rational update: when new norms are added, incompatible with the preexisting ones, the system is revised in order to maintain consistency while minimising change. This model of legal change has led to the development of comprehensive theories of knowledge-dynamics (Alchourrón et al. 1985; Gärdenfors 1987), which examine how, by contracting and expanding a set of information, a new consistent set can be generated, including the new inputs and as much as possible of the antecedent content.

Defeasible reasoning has addressed antinomies through reasoning: conflicting norms coexist in the same knowledge base (legal system), but are processed by taking into account their relative importance, as well as their scope of application. In particular, in argumentation-based models of defeasible reasoning, norms occurr in inferences (arguments) susceptible of being attacked by further inferences (rebutters or undercutters). A legal systems including conflicting rules will only support conclusions established through inferences able to successfully sustain all valid attacks (see for instance the argumentation model developed in Prakken and Sartor

1996b; which uses the semantics of Dung 1995; or the approach of Governatori et al. 2004; for a different perspective, see Boella and van der Torre 2007; for a recent development see Modgil and Prakken 2008; see also Hage 1997; Gordon et al. 2007).

Private international law provides an approach to legal antinomies distinct from both update through belief-revision and defeasible reasoning from conflicting premises: it addresses conflicts between national legal systems by allocating a case to the courts of a certain country, and by determining according to which legal system these courts have to decide. Thus, conflicts between norms belonging to different legal systems (e.g. Italian and English law) are solved by being put aside: such conflicts do not provide dilemmas for the concerned judge, since the latter will have to apply only one system, the one selected by private international law. It is true, there are limited exceptions to this principle: foreign rules contravening fundamental values of a national law, called principles of international public order or public policy, may have to be rejected by national judges (e.g., a foreign polygamous marriage may not be recognised in a country that only admits monogamous marriage), and certain rules of national law, whose application has an overriding importance, may govern some cases even though a foreign law is selected by the choice-of-law rules. However, here we will not consider these exceptions since we want to focus on the ordinary functioning of private international law, i.e., on the selection of a jurisdiction and legal system for a case. In fact, research in either legal theory or AI and law has so far devoted little or no attention to the logical analysis of private international law. This gap needs to be filled, since private international law is an increasingly important domain of the law (given that legal relationships involving citizens of different countries are becoming more and more frequent and important), and also since it can provide a model susceptible of a broader application.

Consider in particular the emergence, over the Internet, of a number of marketplaces and other electronic societies, involving human and artificial agents, and subjecting such agents to different private regulations (different legal systems, broadly understood). Private international law may provide a useful model for governing the relations between agents belonging to different marketplaces (e.g. agent a, belonging to marketplace α, purchases a good from agent b, belonging to marketplace β). For regulating such mixed transactions, rather than introducing additional shared rules (different from the rules pertaining to each marketplace), or establishing what systems is to take priority in case of conflict, or relaying on state laws or international laws (which may fail to provide an adequate discipline of the case), it may be better to adopt the private-international-law approach: to rely on rules establishing when the authorities of one marketplace are going to decide a case, according to the rules of what marketplace.

We leave the exploration of this perspective to further research and focus in this paper on private-international-law properly understood, i.e., to the coordination of different national legal systems.

2 The domain of private international law

Private international law is meant to govern adjudication by national judges, telling them whether they should decide certain cases, and according to what laws. Thus, a court has to take these rules into account before considering how its own legal system regulates the case (this is a logical priority, rather than a temporal one), since these rules may establish that the court should not examine the case at all, or they may require that the court assesses the case according to the substantive rules of a foreign legal system.

When the rules of private international law of different countries do not coincide, there is the possibility of "forum shopping", namely, that the plaintiff brings proceedings in the country whose private international law would submit the case to a legal system more favourable to the plaintiff itself. To avoid forum shopping and ensure coordination, national laws often refer to international agreements, which have been made in order to unify the rules of private international law of different countries, so that these rules converge in attributing jurisdiction to the same judges and in identifying the same applicable laws.

For instance, all members of the European Union have adopted the Brussels Convention on Jurisdiction in Civil and Commercial Matters and the Rome Convention on Contractual Obligations. These conventions have been recently transferred, with minor changes, into EU regulations (Regulations Brussels I on Jurisdiction, Rome I on contracts and Rome II on torts). In the following examples, however, we will only rely on the Brussels and Rome conventions given that the new regulations mostly reproduce the contents of these conventions, which still apply to past cases (on private international law in the EU, see Stone 2006; for private international law in e-commerce, see Svantesson 2008).

Rules on jurisdiction and choice of laws may also govern conflicts between States and non-state institutions having separate court systems. For instance in Italy catholic marriages have the same legal effects as civil marriages, but only ecclesiastic courts have jurisdiction over the validity of catholic marriages. Moreover, catholic marriages are regulated by Canon law (according to statute 121 of 1985, implementing an agreement between the Italian state and the Vatican) which provides rules different from those of Italian law (for instance according to Canon law the marriage is invalid when one party lied about his or her intention not to procreate, or was homosexual).

Finally, in some domains (in particular with regard to contracts) the parties may reject State jurisdiction referring the case to private arbiters, and they may ask the latter to apply non-state law. For instance, disputes on domain names are usually devolved to the ICANN system, whose arbiters decide according to the ICANN policies. Similarly, many disputes pertaining to international commerce are devolved to private arbiters who may apply, for instance, the rules established by Unidroit, the International Institute for the Unification of Private Law, or by customary international merchant law.

3 Examples

To illustrate the operation of private international law, we shall provide some example cases. The following one shows that judges of one country may have jurisdiction over a certain case, but they may have to apply the law of another country.

Example 1 An Italian company and a British one make a contract according to which the Italian company has to deliver certain goods. A clause says that the contract is governed by US law. The English company sues the Italian company for breach of contract. The jurisdiction issue, in both English and Italian laws, has to be decided on the basis of the Brussels Convention (on Jurisdiction and the Enforcement of Judgments in Civil and Commercial Matters), which establishes the jurisdiction of the Italian judge. However, the Italian judge has to apply the law chosen by the parties, i.e., US law, on the basis of the Rome Convention (on the Law Applicable to Contractual Obligations).

Whether a contract is regulated by Italian or US law is important, since the two legal systems lead to different outcomes in many cases. For instance, the Italian law tends to limit liability of the "diligent" defaulting party, while US law is stricter in this regard. Let us assume that the Italian company (a producer of spaghetti), invokes the doctrine of inculpable impossibility in Italian law as a defence (an exception to contractual liability for the case that the defaulting party failed to deliver because performance had become impossible for external causes): it proves that it failed to deliver in time because its supplier of the raw materials (the durum wheat flour) did not provide them in time, due to extraordinary weather conditions. If Italian law had to be applied the defaulting party would not pay damages. On the contrary, under US law damages have to be paid.

In a recent case (*Universal Pictures International No 2 BV v. Curatela del fallimento Academic Pictures S.R.L., Tribunal of Rovereto, 2007*) the Italian judge applied English law and recognised the full validity of a liquidated-damage-clause (a clause that predetermines the compensation to be paid in case of non-fulfillment) requiring the defaulting party to pay a large sum, where Italian law would have enabled the judge to reduce such sum to an "equitable amount" (Art. 1384 of the Italian civil code). The following example reproduces this case with a variation: we assume that the parties did not include in the contract a clause specifying the law to be applied.

Example 2 A British software producer sues an Italian purchaser claiming that the latter did not pay the whole price, and asks for the large compensation established by the liquidated-damage-clause in the contract. The contract does not specify an applicable law. The Italian company must be sued in front of an Italian judge as above, but English law will be applicable, since an English company is providing the characteristic performance to the contract, namely the production of the software. This holds—according to an interpretation of the Rome Convention on contractual obligations—even though the software was delivered in Italy, and contract was made in Italy, using the Italian language, by an agent of the British company (on this interpretation, which prevailed until recently in continental

jurisdictions, and on the alternative interpretive option, see Sect. 7). Since English law requires contractually liquidated damages to be paid in full, this should be the decision of the Italian judge. Had the Italian law been applied, the judge would have had the power to reduce the compensation to an equitable amount.

To exemplify the use of private international law beyond the domain of contracts (to which we will limit our analysis), let us consider an example concerning torts.

Example 3 A car accident in Spain involves two persons, an Italian woman, Eva, and an English man, Adam, who suffers damages as a consequence. Adam can sue Eva either in Italy (the Country where she has her domicile) or Spain (the place of the accident). He cannot sue her elsewhere, for instance in UK, since a UK court has no jurisdiction over such a case. Even if an Italian court is addressed, Spanish law should be applied (the law where the accident happened).

Finally, let us consider two examples involving electronic commerce, one in contract and the other in torts.

Example 4 An Italian consumer has purchased on-line a service (for instance web hosting) from a US company, and the contract says that the New York courts have jurisdiction over the controversies arising from this contract, which will be decided according to US law. Then the Italian consumer has the choice whether to sue the US company in New York or in Italy, since according to EU law, a consumer has the option of suing the professional counterpart in the consumer's domicile. Even though US law governs in principle the contract, Italian consumer-protection rules have to be preferentially applied.

Example 5 The famous case *Yahoo v Licra* (2000, Tribunal de Grande Instance de Paris) concerned liability for distributing Nazi memorabilia (which is illegal in France) through a web site located in the US. In this case the French court considered that it had jurisdiction and that it could apply French law since Yahoo's activity had produced damages (also) in France. Consequently the French Court ordered Yahoo to block access to the pages where these items where auctioned.

The decision of *Yahoo v Licra* would have been different (the auction being legal according to US law) if the judge had applied the law of the place where the tortious fact was accomplished (USA, where the information was posted on the Internet), rather than of the place where the damage took place (France, where the information was accessed). Similarly, in the defamation case *Gutnick v Dow Jones case* (2000) the Australian High Court condemned Dow Jones according to Australian law, assuming that an article posted on the Internet is published at the point where it is downloaded and read.

4 Modelling requirements

Let us summarise the requirements for modelling private international law. We assume the existence of different legal systems $L_1, L_2, \ldots, L_n$. Each L_i includes three sets of rules we need to consider:

- a set of choice of jurisdiction rules $ChJur(L_i)$,
- a set of choice of competence rules $ChComp(L_i)$, and
- a set of choice of law rules $ChLaw(L_i)$.

These rule-sets establish, respectively, whether courts of L_i can decide the case (jurisdiction), what particular court of L_i can do that (competence), and what set of norms, of L_i's or of another legal system, that court should apply (applicable law).

When proceedings are started in front of a court k of a legal system L_i, first of all k should consider the issue of jurisdiction: if $ChJur(L_i)$ establishes L_i's jurisdiction, then k should move on with the case; otherwise k should reject the case, declaring lack of jurisdiction.

Having established jurisdiction for the courts of its legal system L_i, court k will have to address competence, i.e., to establish whether k itself, among all courts of L_i, has the task to decide that case, according to $ChComp(L_i)$. Again, if $ChComp(L_i)$ selects k, then k should decide the case, if $ChComp(L_i)$ does not select k, then k should reject the case, declaring lack of competence.

Having establish its own competence, court k should apply $ChLaw(L_i)$ in order to establish according to what legal system L_j (that could possibly be different from L_i) the case should be decided.

Then k should apply L_j to the relevant facts and adjudicate on the case accordingly.

Thus in Example 3 above, $ChJur(italy)$ selects the Italian legal system (here denoted as *italy*) as the system having jurisdiction, but $ChLaw(italy)$ requires the application of US law. It may also happen that $ChLaw(L_i)$ does not select a municipal legal system, but rather points to the law provided by an international treatise, or a non-state source (e.g. ICANN policies, UNICITRAL regulations, etc.).

For simplicity, we will not here address some further complications.

We will not consider that in any EU member State the courts have to apply two legal systems, the national legal system of that State, L_i plus the EU legal system L_{eu}. Both with regard to jurisdiction and to the applicable law, the solution may be dictated by either one of the two systems, L_i or L_{eu} (L_i being relevant only when L_{eu} does not address the case).

We will not examine the exceptional cases where the rules of the selected legal system are rejected, being incompatible with the public policy of the local system, namely, its inderogable fundamental principles, also called *principles of international public order* ($ChLaw(L_i)$ selects a system L_j regulating the case in a way incompatible with L_i's public policy).

We will not model chains of references: $ChLaw(L_i)$ chooses L_j, $ChLaw(L_j)$ choses L_k, and so on. In fact, the Rome Convention (Art. 15) excludes the effect of further references (the so-called *renvoi*): "the application of the law of any country ... means the application of the rules of law in force in that country other than its rules of private international law". This means that the Convention's rules pointing to a legal system L_j must be understood as referring to $L_j - [ChJur(L_j) \cup ChLaw(L_j)]$, rather than to L_j as a whole. However, the Rome Convention only applies to contracts; chained references in other domain as subject to different rules. For instance according to Art. 15 of Italian law 218 of 1995, where $ChLaw(italy)$

chooses a legal system L', and $ChLaw(L')$ choses a different legal system L'', then the Italian judge should apply L'' only if L'' does not refer to a further legal system L'''; if this reference is made, i.e., if $ChLaw(L'')$ selects a further system L''', Italian law should be applied (rather than L' or L'', both of which reject the reference made to them).

We will also not consider the common law doctrine of *forum non conveniens*, which concerns a court's discretionary power to decline its jurisdiction where another court may more conveniently hear the case. We will not address the *lis pendens* issue, concerning when judges should reject a case since proceedings have already started in another jurisdiction. Finally, we will not consider cases where universal jurisdiction is claimed for violations of international law (in particular, genocide or other serious violation of human rights). We will indeed confine our analysis to cases involving contracts.

5 Modular argumentation

In this paragraph, we will introduce modular argumentation, the logical framework we will use for modelling legal reasoning in the domain of private international law.

As pointed out in Sect. 2, a representation of private international law refers to distinct sets of legal rules, i.e., different national laws and international conventions. Modular argumentation offers itself as an appropriate platform for representing private international laws and different national laws as it allows knowledge to be split in separate modules. Moreover, it enables the different knowledge modules (which may represent legal systems or part of them) to be used by referring to each one of them specific issues. This is done by calling the relevant module and asking it to answer specific queries.

Modular argumentation also facilitates the representation of legal doctrines (different views on what legal rules exist in a certain domain, as a result of different interpretations or constructions of legal sources) concerning both private international laws and substantive laws. This may be obtained by having different modules for the different doctrines, and using these different modules in the context of credulous inferences, i.e., inferences that extract all the alternative incompatible conclusions obtainable from non-prioritised arguments attacking one another. We believe that a legal reasoner who has to take into account multiple legal doctrines should not reason skeptically, i.e., refrain from deriving any conclusions when alternative outcomes are dependant on the adoption of incompatible doctrines. Whenever distinct doctrines could lead to incompatible legal outcomes for the same case, a credulous approach enables us to make a better use of the limited knowledge in our possession, getting awareness of the alternative possibilities, an awareness which is precluded to a merely skeptical reasoner. In fact, for each relevant issue on which alternative doctrines are available, one doctrine is going to be adopted by the decision maker, who will reach one of the alternatively possible conclusion, but we do not know in advance with certainty what doctrine will be adopted. Thus the safest thing is to reason credulously, i.e., consider all incompatible doctrines and their alternative implications as outcomes that may be derived from the available

knowledge. For instance, assume that in a legal system M_2 different doctrines are used for the interpretation of a legislative rule on contractual liability, according to one interpretation (possibly included in a separate module M_{21}, called by M_2) the non-fulfilling party is always liable, according to the other interpretation (possibly included in a separate module module M_{22}, also called by M_2), fault is required for liability. If a legal system M_1 asks system M_2 about the liability of a party having failed to fulfil the contract without fault, the answer should not be that M_2 does not entail liability for this case, but rather that liability is only credulously entailed by M_2, according to one doctrine (M_{21}), since an argument for non-liability is also available in M_2, according to a different doctrine (M_{22}).

In conclusion, by allowing multiple knowledge modules, and different modes of reasoning (including both skeptical and credulous reasoning), modular argumentation offers a natural way to capture the fact that legal reasoners need to apply different legal systems, according to different legal doctrines. Finally, the proof procedures of argumentation (and hence of modular argumentation) are based on an idea of exchange of arguments between a proponent and an opponent, so that they provide a natural way for modelling arguments in court proceedings.

A reader uninterested in formal aspects can skip the rest of this section, remembering that that modular argumentation allows knowledge to be split in different modules, which can "call" one another, that such calls request skeptical or credulous reasoning, and that answers are obtained though dialectical argumentation.

An abstract argumentation framework (Dung 1995) is a pair (*AR*, *attacks*) where *AR* is a set of arguments and *attacks* is a binary relation over *AR*, representing the relation that an argument *A* attacks an argument *B* (*A* attacks *B* iff $(A, B) \in attacks$). The semantics of abstract argumentation is determined by the acceptability of arguments and various associated notions of extensions. For the purpose of this paper, we introduce only one of them, namely, the notion of a preferred extension.

A set of arguments is said to be *conflict-free* if it does not contain two arguments attacking each other. A conflict-free set *S* of arguments is said to be *admissible* if *S* counterattacks each attack against itself (each attack against any argument in *S*): for each argument *A* that attacks some argument *B* in *S* there is an argument *C* in *S* that attacks *A*. A maximally admissible set of arguments is called a *preferred extension*.

Example 6 Consider an argumentation framework (*AR*, *attacks*) where *AR* contains three arguments:

$$AR = \{\alpha_0, \alpha_1, \alpha_2\}$$

Assume that α_0 and α_1 attack each other and that both of them attack α_2:

$$attacks = \{(\alpha_0, \alpha_1), (\alpha_1, \alpha_0), (\alpha_1, \alpha_2), (\alpha_0, \alpha_2)\}$$

There are then three admissible sets of arguments: $\{\}$, $\{\alpha_0\}$, $\{\alpha_1\}$ and two preferred extensions $\{\alpha_1\}$,$\{\alpha_0\}$.

Abstract argumentation provides a natural platform for understanding many aspects of legal reasoning and argumentation (see, also for references, Dung and Thang 2009), but it does not provide a programming environment in which the legal arguments could be constructed automatically. To address this issue we will here

use an instance of abstract argumentation called assumption-based argumentation (ABA) where the arguments are deductive proofs based on assumptions (Dung et al. 2006): we will model multiple interacting legal systems as a MABA (modular assumption-based argumentation) framework. Our purpose is not that of showing that MABA frameworks are the only or the preferable way for modelling private international law, but rather of showing that private international law needs in general a combination of nonmonotonic reasoning and modularisation. Other approaches to non-monotonic reasoning (if supplemented with modularisation facilities), could also be used for this purpose (among the many approaches to non-monotonic reasoning in the law, see for instance Prakken and Sartor 1996a, which also has an abstract-argumentation-based semantics, or Brewka and Gordon 2010; for a recent discussion on argumentation frameworks and their semantics, see Prakken 2010).

An assumption-based argumentation (ABA) framework is a triple $(\mathcal{R}, \mathcal{A}, \text{--})$ where:

- $\mathcal{R}$ is set of inference rules of the form $\alpha \leftarrow \sigma_1, \ldots, \sigma_n$ (for $n \geq 0$) over a language $\mathcal{L}$,
- $\mathcal{A} \subseteq \mathcal{L}$ is a set of assumptions, and
- -- is a (total) mapping from $\mathcal{A}$ into $\mathcal{L}$, where $\overline{x}$ is referred to as the *contrary* of x.

Assumptions in $\mathcal{A}$ do not appear in the heads of rules in $\mathcal{R}$. If $\neg\lambda \in \mathcal{A}$ then $\overline{\lambda} = \lambda$.

Assumption can have the universal form $\forall\neg p(X)$ which stands for $\forall X \neg p(X)$, and represents an assumption whose contrary (and thus potential attacker) is any instance of $p(X)$.

A *(backward) deduction* of a conclusion α based on (or supported by) a set of premises P is a sequence of sets $S_1, \ldots, S_m$, where $S_i \subseteq \mathcal{L}, S_1 = \{\alpha\}, S_m = P$, and for every i, where σ is the selected sentence in $S_i : \sigma \notin P$ and $S_{i+1} = S_i - \{\sigma\} \cup S$ for some inference rule of the form $\sigma \leftarrow S \in \mathcal{R}$. Otherwise $S_{i+1} = S_i$.

A sentence σ is supported by a set of propositions X denoted by $X \vdash \sigma$ if there exists a backward deduction for σ from some $X' \subseteq X$.

An *argument* for $x \in \mathcal{L}$ supported by a set of assumptions X is a (backward) deduction from x to X and denoted by (X, x). An argument (X, x) attacks an argument (Y, y) if x is the contrary of some assumption in Y. The abstract argumentation framework obtained from an ABA $\mathcal{F} = (\mathcal{R}, \mathcal{A}, \text{--})$ is denoted by $AA_{\mathcal{F}}$. The semantics of $\mathcal{F}$ is defined by $AA_{\mathcal{F}}$.

Given an ABA framework $\mathcal{F}$, a proposition $\pi \in \mathcal{L}$ is said to be a *credulous consequence* of $\mathcal{F}$, denoted by $\mathcal{F} \vdash_{cr} \pi$ if it is supported by an argument in some preferred extension E of $AA_{\mathcal{F}}.\pi$ is said to be a *skeptical consequence* of $\mathcal{F}$, denoted by $\mathcal{F} \vdash_{sk} \pi$ if in each preferred extension of $AA_{\mathcal{F}}$ there is an argument supporting π.

Example 7 Consider an ABA framework $\mathcal{F} = (\mathcal{R}, \mathcal{A}, \text{--})$ where:

- $\mathcal{R}$ consists of rules $h \leftarrow p, q$ and $p \leftarrow \neg q$ and $q \leftarrow \neg p$
- $\mathcal{A} = \{\neg p, \neg q\}$
- $\overline{\neg p} = p$ and $\overline{\neg q} = q$.

There are three arguments: $\alpha_0 = (\{\neg p\}, q); \alpha_1 = (\{\neg q\}, p); \alpha_2 = (\{\neg p, \neg q\}, h)$. Arguments α_0 and α_1 attack each other and both of them attack α_2 not being attacked by it. Hence $\mathcal{F} \vdash_{cr} p$ and $\mathcal{F} \vdash_{cr} q$ but $\mathcal{F} \nvdash_{cr} h$.

A *modular assumption-based argumentation (MABA) framework* is structured into distinct modules where exactly one of them is considered as the main module while the others are called submodules. A module is basically an ABA framework such that the premises in its rules are either sentences in $\mathcal{L}$ or a *module call* of the form $call(M, \lambda, t)$ where λ is a sentence in $\mathcal{L}, M$ is a module in which λ occurs, $t \in \{cr, sk\}$ is the type of semantics of M according to which λ is defined (i.e. $M \vdash_t \lambda$).

Example 8 Let $\mathcal{F}$ be a MABA framework consisting of two modules M_1,M_0 where

- M_1 consists of a single rule: $h \leftarrow call(M_0, p, cr), call(M_0, q, cr)$
- M_0 consists of two rules: $p \leftarrow \neg q$ and $q \leftarrow \neg p$
- $\mathcal{A} = \{\neg p, \neg q\}$ and
- $\overline{\neg p} = p$ and $\overline{\neg q} = q$.

M_0 has two arguments $\alpha_0 = (\{\neg p\}, q)$ and $\alpha_1 = (\{\neg q\}, p)$. Modules α_0,α_1 attack each other. Hence, $M_0 \vdash_{cr} p$ and $M_0 \vdash_{cr} q$. Hence both module calls $call(M_0, p, cr)$ and $call(M_0, q, cr)$ are accepted. As result, M_1 has an unique extension in which h is concluded. Note that $\mathcal{F}$ is distinct to the ABA framework consisting of three rules: $h \leftarrow p, q$ and $p \leftarrow \neg q$ and $q \leftarrow \neg p$ in which h is not concluded wrt any semantics.

In this paper, we restrict our consideration to stratified MABA frameworks where the modules names are ranked (by ordinals) such that all module calls in rules belonging to a module of rank k refer to modules of ranks lower than k. The rank of the main module is the highest rank. The MABA framework we will construct for representing jurisdiction and choice of law is indeed an example of stratified modular argumentation.

The semantics of a stratified MABA framework is defined inductively by defining the semantics of the higher ranks modules based on the semantics of lower ranks modules. Suppose that the semantics (i.e. extensions) of all modules of ranks lower than the rank of a module M have been defined. A *(backward) deduction* of a conclusion α wrt module M based on (or supported by) a set of premises P is defined similarly as the backward deduction wrt ABA framework with the exception that when the selected element σ is a module call of the form $call(N, l, t)$ then $N \vdash_t l$ and $S_{i+1} = S_i - \{\sigma\}$.

The notions of arguments, extensions and consequences wrt a module M in MABA are defined similarly as in usual ABA frameworks. For a MABA framework $\mathcal{F}$, we write $\mathcal{F} \vdash_t \pi$ if $M \vdash_t \pi$ where M is the main module of $\mathcal{F}$ and $t \in \{cr, sk\}$.

It has been shown in Dung and Thang (2009) and Dung et al. (2010) that both types of calls are useful for modelling legal doctrines in the common law of contract. But for the purpose of modelling jurisdiction and choice of law in this paper, we need only credulous calls. Thus, for simplicity, we write $call(M, \lambda)$ for $call(M, \lambda, cr)$.

Note that this does not mean that the idea of a skeptical inference should not be useful in analysing the implication of a MABA framework. It only reflects the fact that (as we have observed above) when a piece of legislation M_1 calls another piece of legislation M_2, asking whether conclusion λ holds according to M_2, it would be wrong for M_2 to tell M_1 that λ does not hold, when λ is only credulously derivable from M_2. The right approach in such a case is to take notice that λ is only

credulously implied, while being aware that this only is a possibility (in deciding a case on the basis of such a call, either the λ supporting arguments, or the incompatible ones could dictate the outcome).

6 Modular reasoning about jurisdiction and choice of law

In each legal dispute, to arrive at a decision, the court needs to construct the context of the case at hand by gathering all necessary factual information (what facts are relevant depends on the rules and doctrines invoked by the parties or by the court). In Dung and Thang (2009) and Dung et al. (2010) the context of a contract is modelled through a set of separate knowledge bases (modules) for the party beliefs, knowledge, common knowledge, etc. Here, for simplicity, a module named *Case* (*C*) represents the context of the contract in a case *C*, and contains all relevant information about the facts of the case and the identities of the parties to the dispute (considerations on how this information can be collected and assessed in a judicial framework falls outside the scope of the present paper). We do not aim at modelling the full complexity of the regulation on jurisdiction, competence and choice of laws of different countries, but rather to represent a few national and international rules to illustrate how choice of jurisdiction and choice of laws can be given a modular representation.

Extending the model of Dung and Thang (2009), where legal doctrines are represented as modules, we model the law through sets of modules. We separate different legal system and within each of them we distinguish modules for adjudicating, deciding jurisdiction, allocating competence, establishing the law to be applied, and providing substantive legal outcomes. Thus we assume that the law of a legal system named *Country* (e.g. *italy*, *uk* or *us*) consists of 5 such modules (we focus on countries but the model can also be applied to non-territorial institutions)

- *topMod*(*Country*), governing the top level judicial reasoning process in the search for a legal solutions;
- *jurisdMod*(*Country*), containing the rules determining jurisdiction.
- *compMod*(*Country*), containing the rules establishing the competent courts for the case.
- *applLawMod*(*Country*), containing the rules determining the applicable law.
- *substantiveLawMod*(*Country*), containing all other rules of *Country*.

This rough partition will suffice for our purpose of dealing with jurisdiction and choice of laws, even though a country's law could be modularised in different, more refined ways, e.g., by grouping legal sources pertaining to the same subject or being issued by the same authority.

When a case *C* (e.g. a request for compensation for damage suffered in car accident abroad) is inputted to a judicial authority (*Court*) of a legal system (*Country*), the top module of the system proceeds as follows:

1. First *Court* applies *jurisdMod*(*Country*), to establish whether the (courts of) *Country* should at all process case *C*. This step is represented here by the following call: *call*(*jurisdMod*(*Country*) + *Case* (*C*), *hasJurisdiction(Country)). Jurisdiction*

rules in (the legal system of) Country may govern this issue, or they may refer it to an international source (like the above mentioned Brussels Convention, in our example).

2. If the outcome of step 1 is positive (*Country*'s courts have jurisdiction), then *Court* uses module *compMod*(*Country*) to determine whether *Court* itself is a competent court, among all courts of L_i for case *C*. This step is represented by *call*(*compMod*(*Country*) + *Case* (*C*), *hasCompetence*(*Court*)).
3. If the outcome of step 2 is positive (*Court* is competent), then *Court* uses module *applLawMod*(*Country*) to identify the applicable law. This step is represented by *call*(*applLawMod*(*Country*) + *Case* (*C*), *applicableLaw*(*Country*′)). The called module may refer the issues to further modules, like an international treaty (like the Rome Convention, in our example).
4. Finally, *Court* uses *substantiveLawMod*(*Country*′) to decide the case. This step is represented by *call*(*substantiveLawMod*(*Country*′) + *Case* (*C*), *Outcome*).

6.1 The top module

Let us now consider the internal structure of the components we have identified. The top component has the task of orchestrating the search for the correct legal solution, when a court of a national legal system (e.g., Italy) is asked to deal with a case. We do not address here the complexities of judicial decision-making and of the dialectical interactions between the parties and the judges; our top component is indeed so abstract that we may assume it is the same for every legal system. We model it by means of three rules. The first concerns the cases when there is jurisdiction for the legal system to which the court belongs: the court should then identify the applicable law, and decide accordingly. The second concerns the cases when there is no jurisdiction, and the third the cases where the court is not competent: in these cases the court should just declare its lack of jurisdiction or its incompetence. More specifically, *TopMod*(*italy*) has the following content:

$$
\begin{aligned}
&\mathit{Module\ TopMod}(\mathit{italy})\\
&\mathit{decision}(C, \mathit{Court}, \mathit{Outcome}) \leftarrow\\
&\quad \mathit{call}(\mathit{jurisdMod}(\mathit{italy}) + \mathit{Case}(C), \mathit{hasJurisdiction}(\mathit{italy})),\\
&\quad \mathit{call}(\mathit{compMod}(\mathit{italy}) + \mathit{Case}(C), \mathit{hasCompetence}(\mathit{Court})),\\
&\quad \mathit{call}(\mathit{applLawMod}(\mathit{italy}) + \mathit{Case}(C), \mathit{applicableLaw}(\mathit{Country})),\\
&\quad \mathit{call}(\mathit{substantiveLawMod}(\mathit{Country}) + \mathit{Case}(C), \mathit{Outcome}).\\
&\mathit{decision}(\mathit{case}(\mathit{Identifier}), \mathit{Court}, \mathit{noJurisdiction}) \leftarrow\\
&\quad \mathit{call}(\mathit{jurisdMod}(\mathit{italy}) + \mathit{Case}(C), \neg \mathit{hasJurisdiction}(\mathit{italy})).\\
&\mathit{decision}(\mathit{caseIdentifier}, \mathit{Court}, \mathit{noCompetence}) \leftarrow\\
&\quad \mathit{call}(\mathit{compMod}(\mathit{italy}) + \mathit{Case}(C), \neg \mathit{hasCompetence}(\mathit{Court})).
\end{aligned}
\tag{1}
$$

where *C* is a reference to the case at hand whose module of facts is *Case*(*C*).

Let us assume that *TopMod*(*italy*) is asked to provide an answer for a case *C* involving a court *k* of *italy*. The module will provide a positive answer "the decision for *C* is *D*", if all of the following conditions are satisfied:

- Italian courts have jurisdiction for C according to module *jurisdMod*(*italy*),
- court k has competence for case C according to module *compMod*(*italy*),
- the law of *Country* is applicable according to module *applLawMod*(*italy*), and
- D is the outcome for C according to module *substantiveLawMod*(*Country*).

TopMod(*italy*) will provide the negative answers "no jurisdiction for C" or "no competence for C", when, respectively:

- module *jurisdMod*(*italy*) does not establish the jurisdiction of *italy*, or
- module *compMod*(*italy*) fails to indicate k as one of the courts having competence for C.

Note that a module call having the form $call(M, \neg\lambda)$ is satisfied if $\neg\lambda$ is credulously accepted in M, e.g., M provides no attack against $\neg\lambda, \neg\lambda$ being an assumption of M.

6.2 The jurisdiction module

Italian jurisdiction is regulated by Law 218 of 1995 (Reform of the Italian System of Private International Law). For our purposes a few simplified rules are sufficient:

- Art. 3.1. There is Italian jurisdiction when the defendant has domicile in Italy.
- Art. 3.2. There is Italian jurisdiction when this can be established according to the criteria specified in Sects. 2, 3, 4 of title II Brussels Convention on Jurisdiction.
- Art. 4. There is Italian jurisdiction (beyond the provision of Art. 3) when the parties have agreed to accepts it and acceptance is proved on writing, or when the defendant participates in the proceedings without objecting to the Italian jurisdiction in his or her first defence.

These rules are captured by the clauses in *jurisdMod*(*italy*), which provides alternative conditions (satisfaction of one of them is sufficient) for the Italian legal system to have jurisdiction of a case C.

$$
\begin{aligned}
&\textit{Module jurisdMod}(italy)\\
&hasJurisdiction(italy) \leftarrow\\
&\quad defendantHasDomicileIn(italy).\\
&hasJurisdiction(italy) \leftarrow\\
&\quad call(BrusselsConventionMod + Case(C), hasJurisdiction(italy)).\\
&hasJurisdiction(italy) \leftarrow\\
&\quad agreedJurisdiction(italy).\\
&hasJurisdiction(italy) \leftarrow\\
&\quad \neg defendantObjectsToJurisdiction(italy).\\
&assumption(\neg defendantObjectsToJurisdiction(italy)).\\
&assumption(\neg hasJurisdiction(italy)).
\end{aligned}
\tag{2}
$$

Here, as in the following examples, we provide a very rough formalisation, using long non-analysed predicates (as in earlier representations of the law based on logic programming, see Sergot et al. 1986 and rule-base expert systems, see Dayal and Johnson 1999), since we want to focus on modular representation and on calls between legal systems (and submodules of them), without addressing other complexities of legal knowledge. For this reason we do not model explicitly rule priorities, undercutting, presumptions and burdens of proof (as in Prakken and Sartor 1997, 2009), but deal with hierarchies of exceptions using defeasible assumptions (having the form $\neg p$ or $\forall \neg p(X)$).

6.3 The Brussels-convention module

Let us now consider the module *brusselsConventionMod* (or *brusselsRegulation-IMod*, since the substance of these rules has not been modified by the Brussels I regulation, which entered into force in 2002, substituting the Convention):

- Art. 2. Persons domiciled in a Contracting State shall, whatever their nationality, be sued in the courts of that State.
- Art. 5. A person domiciled in a Contracting State may, in another Contracting State, be sued: (1) in matters relating to a contract, in the courts for the place of performance of the obligation in question; ... (3) in matters relating to tort, delict or quasi-delict, in the courts for the place where the harmful event occurred;

$$
\begin{aligned}
&\textit{Module brusselsConventionMod}\\
&\textit{hasJurisdiction}(\textit{Country}) \leftarrow\\
&\quad \textit{defendantHasDomicileIn}(\textit{Country}),\\
&\quad \textit{contractingState}(\textit{Country}).\\
&\textit{hasJurisdiction}(\textit{Country}) \leftarrow\\
&\quad \textit{contractDispute}, \textit{placePerformance}(\textit{Country}).\\
&\textit{hasJurisdiction}(\textit{Country}) \leftarrow\\
&\quad \textit{tortDispute}, \textit{placeHarmfulEvent}(\textit{Country}).
\end{aligned}
\tag{3}
$$

Note that articles 2 and 5 could yield jurisdiction for the same case to more than one countries (so that the plaintiff can choose in which country to start proceedings). When module *brusselsConventionMod* (called by the Italian jurisdiction module, to establish whether Italy has jurisdiction for case C) fails to give an affirmative answer to the call:

$$\textit{call}(\textit{brusselsConventionMod} + \textit{Case}(C), \textit{hasJurisdiction}(\textit{italy}))$$

the Italian judge will reject case C for lack of jurisdiction.

6.4 The Italian competence-module

We cannot here provide a formalisation of the complex rules distributing competence among Italian judges of different degrees and located in different districts. Two simplified rules (from Art. 18 of Italian code of Civil Procedure) will suffice, one establishing competence for the court in whose district the defendant has domicile, and the other saying that if the defendant has no known domicile in Italy, then the court is competent in whose district the plaintiff has domicile:

$$\begin{aligned} &Module\ compMod(italy)\\ &hasCompetence(Court) \leftarrow coversDefendantsDomicile(Court).\\ &hasCompetence(Court) \leftarrow coversPlaintiffsDomicile(Court),\\ &\quad \neg defendantHasDomicileIn(italy).\\ &assumption(\neg defendantHasDomicileIn(italy)).\\ &assumption(\neg hasCompetence(Court)). \end{aligned} \tag{4}$$

6.5 The Italian choice-of-law module

With regard to the choice of law, we represent the following rules from Italian law (Law 218 of 1995):

- Art. 57. Contractual obligation are always governed by the Rome Convention.
- Art. 62.1. Tort liability is regulated by the law of the country in which the event took place. However, the damaged person may request the application of the law of the country where the fact that caused the damage took place.
- Art. 62.2. When only citizen of the same country, residing in that country are involved, the law of that country is to be applied.

Thus the *applLawMod*(*italy*) will start with the following clauses, the first one calling the Rome Convention for contracts, the second addressing torts.

$$\begin{aligned} &Module\ applLawMod(italy)\\ &applicableLaw(Country) \leftarrow\\ &\quad contractDispute,\\ &\quad call(romeConventionMod + Case(C), applicableLaw(Country)).\\ &applicableLaw(Country) \leftarrow\\ &\quad tortDispute,\\ &\quad applicableTortLaw(Country). \end{aligned} \tag{5}$$

Module *applLawMod*(*italy*) will also contain the following clauses prioritising the different laws applying to tort cases.

$$
\begin{aligned}
&applicableTortLaw(Country) \leftarrow \\
&\quad lawOfEvent(Country), \\
&\quad \forall \neg lawOfCauseRequestedByDamagedParty(Country'), \\
&\quad \forall \neg lawCommonToParties(Country''). \\
&applicableTortLaw(Country) \leftarrow \\
&\quad lawOfCauseRequestedByDamagedParty(Country), \\
&\quad \forall \neg lawCommonToParties(Country'). \\
&applicableTortLaw(Country) \leftarrow \\
&\quad lawCommonToParties(Country). \\
&assumption(\forall \neg lawOfCauseRequestedByDamagedParty(Country)). \\
&assumption(\forall \neg lawCommonToParties(Country)).
\end{aligned}
\tag{6}
$$

Note that a formula $\forall \neg p(X)$ stands for $\forall X \neg p(X)$, and represents an assumption whose contrary (and thus potential attacker) is any instance of $p(X)$. For instance if the damaged party requests the application of the law of the particular country where the cause of the damage took place (e.g. Spain), the assumption that there is no such request is attacked, and the rule referring to the place of the damaging event (e.g. Italy), which includes this assumption, is made inapplicable.

Finally, module *applLawMod*(*italy*) contains the following clauses that specify the three laws applicable to torts. The first refers to the law of the country where the tortious event took place.

$$
\begin{aligned}
&lawOfEvent(Country) \leftarrow \\
&\quad eventHappenedIn(Country).
\end{aligned}
\tag{7}
$$

The second, only applicable at request of the concerned party, refers to the law of the country where the damage happened.

$$
\begin{aligned}
&lawOfCauseRequestedByDamagedParty(Country) \leftarrow \\
&\quad causeOfDamageHappenedIn(Country), \\
&\quad damagedPartyRequests(Country).
\end{aligned}
\tag{8}
$$

The third refers to the law of the country where all parties reside.

$$
\begin{aligned}
&lawCommonToParties(Country) \leftarrow \\
&\quad allPartiesResideIn(Country).
\end{aligned}
\tag{9}
$$

6.6 The Rome-convention module

In the EU, national laws determine the laws applicable to contracts by referring to an international agreement, namely, the Rome Convention on the Law Applicable to Contractual Obligations (substituted by the Rome II regulation, which entered into force on 17 December 2009 and applies to contracts). Here we only consider parts

of articles 3 and 4 of this convention. In particular we focus on Art. 4, whose structure is particularly complicated.

- Art. 3.1. A contract shall be governed by the law chosen by the parties.
- Art. 4.1. To the extent that the law applicable to the contract has not been chosen in accordance with Article 3, the contract shall be governed by the law of the country to which the contract is most closely connected.
- Art. 4.2. Subject to the provisions of paragraph 5 of this Article, it shall be presumed that the contract is most closely connected to the country where the party who is to effect the performance which is characteristic of the contract has, at the time of conclusion of the contract, its habitual residence ... However, if the contract is entered into in the course of that party's trade or profession, that country shall be the country in which the principal place of business is situated or, where under the terms of the contract the performance is to be effected through a place of business other than the principal place of business, the country in which that other place of business is situated.
- Art. 4.5. ... the presumptions in paragraphs 2, 3 and 4 shall be disregarded if it appears from the circumstances as a whole that the contract is more closely connected with another country.

Art. 3.1 enables the parties to choose what law applies to their contract (this choice is usually expressed by a clause in the contract itself).

The default rule of art. Art. 4.1, only applies if the parties have not made a choice, and introduces the idea that law of the country most connected to the contract should be applied.

$$\begin{aligned} &applicableLaw(Country) \leftarrow \\ &\quad chosenByParties(Country). \\ &applicableLaw(Country), \\ &\quad contractMostConnectedTo(Country), \\ &\quad chosenByParties(Country'), \\ &\quad assumption(chosenByParties(Country')). \end{aligned} \tag{10}$$

For simplicity's sake we do not consider how the predicate *chosenByParties* is determined (various legal doctrines exist, see Atrill 2004). Article 4.2. is the heart of article 4, where the most-connected country is defined as the one connected to the contract via the performer of the contract.

However, the contract-country connection via the performer may be overridden when other factors establish a stricter link to a different country, i.e., when "it appears from the circumstances as a whole that the contract is more closely connected with another country", a condition we express through the predicate

$$overriddenConnViaPerformerTo(Country)$$

In this case the law of the country most connected through these other factors should be applied.

$$
\begin{aligned}
&contractMostConnectedTo(Country) \leftarrow \\
&\quad contractConnectedViaPerformerTo(Country), \\
&\quad \neg overriddenConnViaPerformerTo(Country). \\
&contractMostConnectedTo(Country) \leftarrow \\
&\quad overriddenConnViaPerformerTo(Country'), \\
&\quad contractMostConnectedByOtherFactorsTo(Country). \\
&assumption(\neg overriddenConnViaPerformerTo(Country)).
\end{aligned} \tag{11}
$$

The conditions for connection through performer are established in art. 4.2.

$$
\begin{aligned}
&contractConnectedViaPerformerTo(Country) \leftarrow \\
&\quad \neg contractEnteredInTradeOrProfession, \\
&\quad connectedByResidenceOfPerformer(Country). \\
&contractConnectedViaPerformerTo(Country) \leftarrow \\
&\quad contractEnteredInTradeOrProfession, \\
&\quad contractConnectedByBusinUnitTo(Country). \\
&assumption(\neg contractEnteredInTradeOrProfession).
\end{aligned} \tag{12}
$$

The first part of article 4.2 states that the country connected by performance is the country where the performer of the characteristic performance has habitual residence.

$$
\begin{aligned}
&contractConnectedByResidenceOfPerformer(Country) \leftarrow \\
&\quad contractHasCharacteristicPerformer(X), \\
&\quad residesIn(X, Country).
\end{aligned} \tag{13}
$$

The notion of a characteristic performer can be defined as follows:

$$
\begin{aligned}
&contractHasCharacteristicPerformer(X) \leftarrow \\
&\quad contactHasCharacteristicPerformance(Perf), \\
&\quad obligedToAccomplish(X, Perf).
\end{aligned} \tag{14}
$$

We here assume that the notion of a characteristic performance (on which a vast debate exists) is given.

If the contract is signed in the exercise of the trade or profession of the characteristic performer, then the business place of the performer becomes relevant. In this case, according to art. 4.2 the default connection is that to the main business place of the performer, as expressed in first rule of definition 15. This default is overridden "where under the terms of the contracts, the performance is to be effected through a place of business other than the principal place of business". The

connection is then with the most connected subsidiary place of business, as expressed in the second rule of definition 15.

$$\begin{aligned}
&contractConnectedByBusinUnitTo(Country) \leftarrow \\
&\quad contractConnectedByMainBusinUnitTo(Country), \\
&\quad \neg overriddenPresFromMainBusinUnitTo(Country). \\
&contractConnectedByBusinUnitTo(Country) \leftarrow \\
&\quad overriddenPresFromMainBusinUnitTo(Country'), \\
&\quad contractMostConnectedBySubsidiaryBusinUnitTo(Country). \\
&assumption(\neg overriddenPresFromMainBusinUnitTo(Country)).
\end{aligned} \tag{15}$$

Rule 16 addresses connection through the main business unit of the performer,

$$\begin{aligned}
&contractConnectedByMainBusinUnitTo(Country) \leftarrow \\
&\quad characteristicPerformer(X), \\
&\quad hasMainBusinUnitIn(X, Country).
\end{aligned} \tag{16}$$

Finally rule 17 specifies when the contract is rather linked to a subsidiary unity.

$$\begin{aligned}
&contractConnectedBySubsidiaryBusinUnitTo(Country) \leftarrow \\
&\quad characteristicPerformer(X), \\
&\quad hasSubsidiaryBusinUnitIn(X, Country), \\
&\quad contractRequiresPerformanceIn(Country).
\end{aligned} \tag{17}$$

We now give a theorem stating that the modular modules we have constructed are well-defined.

Theorem 1 *The set* {*topMod*(*italy*), *jurisdMod*(*italy*), *brusselConventionMod*, *comp Mod*(*italy*), *applLawMod*(*italy*), *romeConventionMod*, *substantiveLawMod*(*italy*)} *with topMod*(*italy*) *as the main module is a stratified assumption-based argumentation framework.*

Proof The theorem follows immediately by observing the structure of the rules where *topMod*(*italy*) is assigned the highest rank, *brusselConventionMod* and *romeConventionMod* the lowest and the others a middle rank. □

6.7 An example

In this section, we shall go back to contractual case of 3 to exemplify the application of the method. The case which opposes the Italian company Rossi and its British supplier James can be modelled as follows:

$$
\begin{aligned}
&\textit{Module Case}(\textit{rossiVjones})\\
&\textit{contractDispute}.\\
&\textit{defendantHasDomicileIn}(\textit{italy}).\\
&\textit{coversDefendantsDomicile}(\textit{tribunalOfBologna}).\\
&\textit{contractEnteredInTradeOrProfession}.\\
&\textit{contractHasCharacteristicPerformance}(\textit{provideSoftware}).\\
&\textit{obligedToAccomplish}(\textit{jonesInc}, \textit{provideSoftware}).\\
&\textit{hasMainBusinUnitIn}(\textit{jonesInc}, \textit{uk}).\\
&\textit{failedToPerform}(\textit{rossiSpa}).\\
&\textit{liquidatedDamage}(20000).\\
&\textit{inequitablyHighForContract}(20000).
\end{aligned}
\tag{18}
$$

With regard to the substantive UK law *substantiveLawMod*(*uk*) in this example we need only the rule establishing that a party has to pay the established liquidated damage (whatever its amount).

$$
\begin{aligned}
&\textit{Module substantiveLawMod}(\textit{uk})\\
&\textit{hasToPay}(P, X) \leftarrow\\
&\quad \textit{failedToPerform}(P), \textit{liquidatedDamage}(X).
\end{aligned}
\tag{19}
$$

Let us assume that the case starts when *jonesInc* addresses the Tribunal of Bologna (module *topMod*(*italy*)), asking for the declaration that Rossi has to pay a compensation of 20,000 euros (*hasToPay*(*rossiSpa*, 20000)) in the case *rossiVjones*.

$$\textit{call}(\textit{topMod}(\textit{italy}) + \textit{Case}(\textit{rossiVjones}), \textit{hasToPay}(\textit{rossiSpa}, 20000))$$

This leads to a further call, to the Italian jurisdiction module

$$\textit{call}(\textit{jurisdMod}(\textit{italy}) + \textit{Case}(\textit{rossiVjones}), \textit{hasJurisdiction}(\textit{italy}))$$

which would be satisfied by the first rule of the definition 2, as applied to the case-fact *defendantHasDomicileIn*(*italy*).

The competence of the tribunal of Bologna is recognised according to

$$\textit{call}(\textit{compMod}(\textit{italy}) + \textit{Case}(\textit{rossiVjones}), \textit{hasCompetence}(\textit{tribunalOfBologna}))$$

given that the court *tribunalOfBologna* covers the defendant's domicile. Consequently the following call is activated, which concerns the determination of the applicable law.

$$\textit{call}(\textit{applLawMod}(\textit{italy}) + \textit{Case}(\textit{rossiVjones}), \textit{applicableLaw}(\textit{Country}))$$

This leads to *Country* being instantiated to *uk*. In fact, given that the case includes fact *contractDispute*, the following call will be activated (first rule of definition 10):

$$\textit{call}(\textit{romeConventionMod} + \textit{Case}(\textit{rossiVjones}), \textit{applicableLaw}(\textit{Country}))$$

According to the second rule in rule set 10, we need then to look for the country most connected to the contract, a fact that can be established by identifying the

performer of the characteristic obligation (rule 12). Note that we can develop our argument in this way since a there the parties have not agreed to choose a different law, e.g., the law of *italy*. Had they made such agreement, the assumption $\forall \neg chosenByParties(Country')$ would have been defeated by the trivial argument $chosenByParties(italy)$ and the first rule in rule set 10 would rather have been applied.

Given that the contract concerns Jones's trade, we need to establish what country is connected to the relevant business unit of that performer (see rule 15). This is the country where the main business unit of the performer (Jones) is located (rule set 16), which is UK. This inference uses the assumption

$$\neg overriddenConnViaPerformerTo(Country)$$

which would have been unavailable in case we had an argument to the effect that

$$overriddenConnViaPerformerTo(Country).$$

Putting all of this together we are able to state, by calling module *romeConventionMod* + Case(*rossiVjones*), that *substantiveLawMod*(*uk*) is the applicable law.

On the basis of this condition, we can decide the case by applying module

$$substantiveLawMod(uk)$$

and in particular rule 19, which does not give relevance (as Italian law would have done) to the fact that the damage clause may be seen as inequitably high for the contract. Consequently, we can conclude that *rossiSpa* has to pay damages for 20,000 Euros, having failed to perform the contract.

7 Doctrines on the Rome Convention

In this final paragraph we will consider an extension to the model developed in the previous section, namely, a method for representing alternative interpretations. In fact, the legal rules we modelled in the previous sections have been interpreted according to different doctrines (see Hill 2004; Atrill 2004). As an example, let us consider two predicates, namely, the predicate

$$overridenConnViaPerformerTo(Country)$$

which undercuts the application of rule 11 and the predicate

$$overriddenPresFromMainBusinUnitTo(Country)$$

which undercuts the application of rule 15.

With regard to the the first predicate, Art. 4 of the Rome Convention says that the presumption connecting the contract to the country of the characteristic performer (the country of the performer's residence or business unity) is to be disregarded when "it appears from the circumstances as a whole that the contract is more closely connected with another country". This has been interpreted in different ways, as noted by Hill (2004):

> According to one view, the presumption in Art. 4 (2) is "very weak". In its most extreme versions, the "weak presumption" theory postulates that the presumption operates as a tie breaker and determines the applicable law only in cases where the contract is equally strongly connected with more than one country; in other cases, if the contract is more closely connected with a country other than identified by the presumption in Article 4 (2), the presumption is to be "disregarded" under paragraph 5. The opposing view is that as the presumption represents the general rule, it should be disregarded only in exceptional cases. According to the most extreme version of this "strong presumption" theory, the court should not disregard the presumption unless the characteristic performer's principal place of business has no real significance as a connecting factor

Here we will only model the two "extreme" versions, the "weak presumption doctrine", and the "strong presumption doctrine". According to the weak presumption doctrine the connection by the performer is overridden in a larger set of cases, namely, in all the cases where other elements (nationality of the parties, their expectations, the place where the contract was made, and so on) establish a stronger link to a different country.

This doctrine corresponds to the traditional common law approach and was affirmed in various English cases, such as, for instance, *Samcrete Egypt Engineers and Contractors SAE v Land Rover Exports Ltd*, where the characteristic performer was the Egyptian company Samcrete, who was guaranteeing another company's payment to the English company Land Rover. The court considered that other factors where more important than the place of the performer (Egypt), i.e., the fact that the payment under the guarantee had to be provided in England, and that the guaranteed obligation concerned delivery of goods in England. Similarly, in *Definitely Maybe (Touring) Ltd v Marek Lieberbert*, German law was applied to a contract between a German organiser of concerts and the English band Oasis (the characteristic performer). Let us call this doctrine *weakPresViaPerformerMod*.

$$
\begin{aligned}
&\textit{Module weakPresViaPerformerMod}\\
&\textit{overriddenConnViaPerformerTo}(\textit{Country}) \leftarrow\\
&\quad \textit{moreConnectedToContract}(\textit{Country}', \textit{Country}).\\
&\textit{moreConnectedToContract}(\textit{Country}', \textit{Country})\\
&\quad \textit{degreeOfConnectionTo}(\textit{Country}', X),\\
&\quad \textit{degreeOfConnectionTo}(\textit{Country}, Z),\\
&\quad X > Z.
\end{aligned}
\tag{20}
$$

Let us now consider the second doctrine, according to which the presumption can only be disregarded if the performer is of "no real significance as a connecting factor", so that the default rule is almost never undercut. This doctrine has been held in continental Europe and was affirmed in the leading *Dutch* case *Societé Nouvelle*

des Papéterie d'Aa vs Machinefabriek BO (1992). In this case a Dutch company sued a French one for the payment of the price of a paper press and the Dutch court applied Dutch law (the Dutch company being the characteristic performer), even though all other factors pointed to France (the contract was concluded though a French agent, and all documents where in French). We can represent this doctrine by saying that the place of the performer is overridden only when it is completely insignificant.

$$\begin{gathered} Module\ strongPresViaPerformerMod \\ overriddenConnViaPerformerTo(Country) \leftarrow \\ insignificantConnectionViaPerformerTo(Country). \end{gathered} \tag{21}$$

The doctrine *strongPresViaPerformerMod* has been adopted by continental judges until recently, for the sake of legal security. In fact it provides a clear guidance for establishing the applicable law, a guidance that would be overridden only in a few very exceptional cases (when the connection by performer is completely insignificant). Recently, however, the European Court of Justice has intervened adopting the weak presumption doctrine. In case *Intercontainer Interfrigo SC (ICF) v. Balkenende Oosthuizen BV and MIC Operations BV* (decided in 2009) the Court issued the following statement:

> Since the primary objective of Article 4 of the Convention is to have applied to the contract the law of the country with which it is most closely connected, Article 4(5) must be interpreted as allowing the court before which a case has been brought to apply, in all cases, the criterion which serves to establish the existence of such connections, by disregarding the presumptions if they do not identify the country with which the contract is most closely connected.

To include the two doctrines in our model, we need to insert an additional clause in the module *romeConventionMod*, specifying that the predicate

$$overriddenConnViaPerformerTo(Country)$$

can be solved according to the two available doctrines, one being the contrary of the other.

$$\begin{gathered} overriddenConnViaPerformerTo(Country) : - \\ \quad strongPresViaPerformerDoctr, \\ \quad call(strongPresViaPerformerMod + Case(C), \\ \qquad overriddenConnViaPerformerTo(Country)). \\ overriddenConnViaPerformerTo(Country) : - \\ \quad weakPresViaPerformerDoctr, \\ \quad call(weakPresViaPerformerMod + Case(C), \\ \qquad overriddenConnViaPerformerTo(Country)). \end{gathered} \tag{22}$$

Only one of the two doctrines can be adopted within the a coherent set of legal arguments (so that the corresponding module is called). This is expressed by the fact

that predicates *weakPresViaPerformerDoctr* and *strongPresViaPerformerDoctr* are viewed as contrary assumptions.

$$\begin{aligned} &assumption(weakPresViaPerformerDoctr).\\ &assumption(strongPresViaPerformerDoctr).\\ &contrary(weakPresViaPerformerDoctr, strongPresViaPerformerDoctr).\\ &contrary(strongPresViaPerformerDoctr, weakPresViaPerformerDoctr). \end{aligned} \tag{23}$$

Given that we have defined our inference relation to be credulous, when asking for the applicable law in cases where there is a non insignificat connection via performer to a certain country, but there is also a stronger connection via other factors to a different country, we get two credulous answers (entailed by different preferred extensions). This would happen for instance, if the party providing the characteristic performance were resident in Italy, and this connection were not irrelevant, but nevertheless the contract had a stronger connection with England, this being the place where the other party resided and where the performance had to take place.

Similarly, two doctrines can be distinguished with regard to the interpretation of the predicate *presFromMainBusinUnitOverridden*. One doctrine expresses a weaker presumption in favour of the main business unit of the performer, namely, a presumption which is overridden whenever the contract indicates that the characteristic performance will be made in a subsidiary business unit. This doctrine was affirmed in case Iran Continental Shelf Oil Company v IRI International Corporation, where an English court applied English law to a contract between the English office of an American company (a company having the main business unit in the US) and the Iranian counterpart.

The other doctrine expresses a stronger presumption in favour of the main business unit of the performer, namely, a presumption which is only overridden when performance in this different business place is required as a matter of contractual obligation, so that the "contract would be broken by performance through a particular place of business", as stated in the case *Ennstone Building Products Ltd v Stanger Ltd*. In this case the court applied English Law even though the parties envisaged—but the contract did not require, as a matter of contractual obligation—that the performance (consultancy on building) had to be executed though the Scottish branch of the English company Ennstone.

The main idea of first doctrine, the weak presumption for the main business unit, is expressed by the following module:

$$\begin{aligned} &Module\ weakPresFromMainBusinUnitMod\\ &overriddenPresFromMainBusinUnit \leftarrow\\ &\quad contractEnvisagesPerfomanceInSubsidiaryBusinUnit. \end{aligned} \tag{24}$$

The second doctrine, the stronger presumption is expressed by the following:

$$\begin{aligned} &\mathit{Module\ strongPresFromMainBusinUnitMod} \\ &\mathit{overriddenPresFromMainBusinUnit} \leftarrow \\ &\quad \mathit{contractMandatesPerformanceInSubsidiaryBusinUnit}. \end{aligned} \tag{25}$$

Again, the use of the two doctrines can be modelled by extending the *romeConventionMod* module with the following clauses.

$$\begin{aligned} &\mathit{overriddenPresFromMainBusinUnit} \leftarrow \\ &\quad \mathit{weakPresFromMainBusinUnitDoctr}, \\ &\quad \mathit{call}(\mathit{weakPresFromMainBusinUnitMod} + \mathit{Case}(C), \\ &\qquad \mathit{presFromMainBusinUnitOverridden}). \\ &\mathit{overriddenPresFromMainBusinUnit} \leftarrow \\ &\quad \mathit{strongPresFromMainBusinUnitDoctr}, \\ &\quad \mathit{call}(\mathit{strongPresFromMainBusinUnitMod} + \mathit{Case}(C), \\ &\qquad \mathit{presFromMainBusinUnitOverridden}). \\ &\mathit{assumption}(\mathit{weakPresFromMainBusinUnitDoctr}). \\ &\mathit{assumption}(\mathit{strongPresFromMainBusinUnitDoctr}). \\ &\mathit{contrary}(\mathit{weakPresFromMainBusinUnitDoctr}, \\ &\quad \mathit{strongPresFromMainBusinUnitDoctr}). \\ &\mathit{contrary}(\mathit{strongPresFromMainBusinUnitDoctr}, \\ &\quad \mathit{weakPresFromMainBusinUnitDoctr}). \end{aligned} \tag{26}$$

These two doctrines may provide for alternative solutions. This happens when performance is provided by a subsidiary business unity, but this is not required by the contract. According to the first doctrine (*weakPresFromMainBusinUnitDoctr*) the law of the performer is determined by the location of the performer's subsidiary unit, according to the second doctrine (*weakPresFromMainBusinUnitDoctr*) it is still determined by the performer's main unit. Figure 1 shows the modules calls that may be originated by the above example, when different doctrines may apply.

8 Conclusion

This paper has shown how using modular argumentation we can model the relationships between legal systems and sections of them that characterise private international law. We think that our work may be relevant for the construction of knowledge-based systems dealing with conflict of laws, which can help practitioners and citizens (especially commercial operators) to deal which this rather esoteric and logically complex, but increasingly important domain of the law. Moreover, this logical model may be useful for the scholarly analysis of private international law, and in particular for the comparison of different regimes.

We think however that our work may have a further cultural and practical significance: private international law provides a pattern for the decentralised

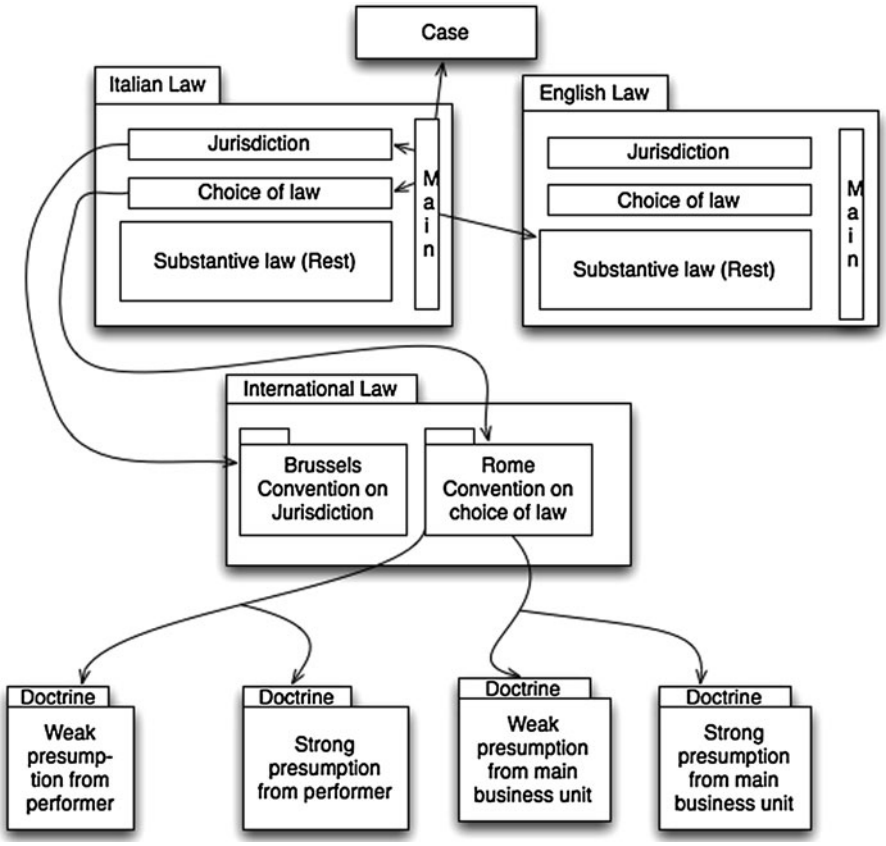

Fig. 1 Modules calls

regulation of heterogeneous agents, in particular when they are interacting over the Internet. When heterogeneous agents pertaining to different, and differently regulated electronic societies (e.g., different marketplaces) engage in contractual or other interaction there may be no normative systems covering all of them. Thus the best way to govern their interactions may consist in providing, within each society or though inter-societal agreements, rules for jurisdiction and choice of law, following the logic of private international law.

In addition to the aspects already modelled in Dung and Sartor (2010), here we have added ways of modelling different doctrines on choice of law, so that alternative credulous conclusions can be derived according to those different doctrines.

Many development are possible for the model here provided: representing a broader set of rules and countries, modelling explicitly the different logical forms (obligations, permissions, powers and other normative positions, count-as conditionals, hierarchies of norms, etc.) involved in the regulation of jurisdiction and choice of law, and in the substantive regulations they select (for an analysis of some of these issues, see Sartor 2005, 2006). We have preferred to limit ourselves to the

simple language of first order logic, to focus on the main objective or our paper: providing a logical model of private international law, as a technique to coordinate different normative systems without imposing a hierarchical order over them.

References

Alchourrón CE, Makinson D (1981) Hierarchies of regulations and their logic. In: Hilpinen R (ed) New studies on deontic logic. Reidel, Dordrecht, pp 123–148

Alchourrón CE, Gärdenfors P, Makinson D (1985) On the logic of theory change: partial meet functions for contractions and revisions. J Symb Log 50:510–530

Atrill S (2004) Choice of law in contract: the missing pieces of the article 4 jigsaw. Int Comp Law Q 53:549–577

Boella G, van der Torre L (2007) Institutions with a hierarchy of authorities in distributed dynamic environments. Artif Intell Law 16:53–71

Brewka G, Gordon TF (2010) Carneades and abstract dialectical frameworks: a reconstruction. In: Computational models of argument—proceedings of COMMA 2010, IOS, pp 3–12

Dayal S, Johnson P (1999) A web-based revolution in Australian public administration. In: Proceedings law via the internet '99: 2nd AustLII conference on computerisation of law via the internet. Sydney: University of Technology. (Electronc publication. Also Published in the on line journal JILT, 2000, Issue 1.)

Dung PM (1995) On the acceptability of arguments and its fundamental role in nonmonotonic reasoning, logic programming, and n-person games. Artif Intell 77:321–357

Dung PM, Kowalski R, Toni F (2006) Dialectic proof procedures for assumption-based, admissible argumentation. Artif Intell 170:114–159

Dung PM, Thang PM (2009) Modular argumentation for modelling legal doctrines in common law of contract. Artif Intell Law 17:167–182

Dung PM, Sartor G (2010) A logical model of private international law. In: Governatori G, Sartor G (eds) Proceedings of the 10th international conference on deontic logic in computer science (DEON 2010). Springer, Berlin, pp 229–246

Dung PM, Thang PM, Hung ND (2010) Modular argumentation for modelling legal doctrines of performance relief. J Argument Comput 1:47–69

Gärdenfors P (1987) Knowledge in flux. MIT, Cambridge

Gordon TF, Prakken H, Walton DN (2007) The carneades model of argument and burden of proof. Artif Intell 171:875–896. Forthcoming

Governatori G, Maher MJ, Billington D, Antoniou G (2004) Argumentation semantics for defeasible logics. J Logic Comput 14:675–702

Hage JC (1997) Reasoning with rules: an essay on legal reasoning and its underlying logic. Kluwer, Dordrecht

Hill J (2004) Choice of law in contact under the rome convention: the approach of the uk courts. Int Comp Law Q 53:325–350

Modgil S, Prakken H (2008) Applying preferences to dialogue graphs. In: Hunter A (ed) Proceedings of COMMA-08. Computational models of argument. IOS, Amsterdam

Prakken H (2010) An abstract framework for argumentation with structured arguments. Argument Comput 1:93–124

Prakken H, Sartor G (1996a) Rules about rules: assessing conflicting arguments in legal reasoning. Artif Intell Law 4:331–368

Prakken H, Sartor G (1996b) System for defeasible argumentation with defeasible priorities. In: Proceedings of the international conference on formal and applied practical reasoning. Springer, Berlin, pp 510–524

Prakken H, Sartor G (1997) Argument-based extended logic programming with defeasible priorities. J Appl Non Class Log 7:25–75

Prakken H, Sartor G (2009) A logical analysis of burdens of proof. In: Kaptein H, Prakken H, Verheij B (eds) Legal evidence and proof: statistics, stories, logic. Ashgate, Aldershot, pp 223–253

Sartor G (2005) Legal reasoning: a cognitive approach to the law, volume 5 of treatise on legal philosophy and general jurisprudence. Springer, Berlin
Sartor G (2006) Fundamental legal concepts: a formal and teleological characterisation. Artif Intell Law 21:101–142
Sergot MJ, Sadri F, Kowalski RA, Kriwaczek F, Hammond P, Cory H (1986) The British Nationality Act as a logic program. Commun ACM 29:370–386
Stone P (2006) EU private international law: harmonisation of laws. Elgar
Svantesson DJ (2008) Private international law and the internet. Kluwer Law International, Dordrecht
Tamanaha BZ (2008) Understanding legal pluralism: past to present, local to global. Syd Law Rev 30:375–411