A Logical Model of Private International Law

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Abstract. We provide a logical analysis of private international law, the body of law establishing when courts of a country should decide a case (jurisdiction) and what legal system they should apply to this purpose (choice of law). A formal model of the resulting interaction among multiple legal systems is proposed based on modular argumentation. It is argued that the model provided might be useful for understanding this rather esoteric, but increasingly important, domain of the law. Moreover, it may be useful for modelling the way in which interactions between heterogeneous agents, belonging to different and differently regulated virtual societies, can be governed without recourse to a central regulatory agency.

1 Introduction: Jurisdiction and Choice of Laws

In our increasingly interconnected world, multiple normative systems have to be taken into account by lawyers and judges, especially in international contracts and other commercial and social interactions involving different countries. First of all, there are different 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 Community, and so on), various forms of transnational customary or soft law (Internet law, *lex mercatoria*, and so forth). 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 and examine whether we may properly speak of laws (legal systems) with regard to such diverse normative institutions and materials (see for instance [18]). What matters for us is that when different normative systems overlap, interact, and sometimes compete, lawyers must be able to understand their interactions, namely, the ways in which each normative system takes into account the existence, the content and implications of other normative systems. This is the subject of the the discipline called *private international law-* (or *conflicts of laws)*, which uses two fundamental mechanisms, *jurisdiction* and *choice of law* to coordinate the working of distinct legal systems, each having its own norms and adjudicative authorities:

– jurisdiction concerns establishing whether the authorities of a certain legal system can (and should, if asked by the plaintiff) decide a case;

– choice of law concerns establishing what legal rules should be applied by such authorities in deciding the case.

The approach of private international law enables the coexistence of multiple normative systems, having different and often contradictory rules, and the decision of cases involving subjects of those different systems, without imposing an additional overarching normative system, and without establishing priorities between the involved legal systems: conflicts between competences and between rules are rather avoided by distributing the cases between the different authorities (jurisdiction), and establishing what normative system they have to apply to the given case (choice of law).

This complements other ways in which the law addresses normative conflicts. It must be distinguished from the issue of dealing with inconsistent norms pertaining to the same legal system, an issue addressed to a large extent in many contributions to deontic logic, legal theory and artificial intelligence and law. In this regard two main approaches much be distinguished, belief-revision and defeasible reasoning. The belief-revision approach pioneered by Carlos Alchourron and David Makinson ([2]) models the dynamics of normative systems: when new norms are added, incompatible with the preexisting ones, the system is revised to maintain consistency while minimising change (for modelling legal dynamics it needs to be complemented with explicit modification or abrogation of particular norms, see [11]). This model of legal change has led to the development of a comprehensive theory of knowledge-dynamics ([1]), which examines how, by contracting and expanding a set of information, a new consistent set can be generated, including new pieces information and as much as possible of the old ones. Defeasible reasoning rather than maintaining consistency, provides models for reasoning with conflicting norms, taking into account their relative importance, as well as their scope of application. In particular, in argumentation-based models of defeasible reasoning, norms are represented as defaults that can be used in inferences (arguments) susceptible of being attacked by inferences to the contrary. A legal systems including conflicting rules will only support legal conclusions established through inferences able to successfully sustain all valid attacks (see for instance the argumentation model developed in [12], which uses the semantics of [5], or the approach of [10]; for a different perspective, see [4]).

Private international law provides an approach distinct from both belief-revision and defeasible reasoning, being inspired inspired by a different concern and addressing a different conflict, between distinct normative systems rather then between inconsistent norms. Given the assumptions that in principle just one court should decide a case, and it should do that by using just one legal system, the issue is to determine what court should decide the case, under what legal system. Private international law is not concerned with conflicts between rules pertaining to legal system it chooses, since its task only consist in making that choice. It is also not concerned with inconsistencies between rules pertaining to different legal system (though the existence of different, consistent or inconsistent, rules in different systems is an obvious presupposition), since the selected system has usually to be applied regardless of how other legal systems

would regulate the same case. Conflicts between norms belonging to different legal systems are not solved, but rather put aside: Italian law and English law may regulate in the same way or in different ways the case, through consistent or inconsistent norms, but only one of the two system will have to be chosen and applied. It is true, there are limited exceptions to this principle: foreign rules contravening certain fundamental values of the local law, called principles of international public order, or public policy, cannot be applied (e.g., a foreign polygamous marriage may not be recognised), and certain rules of the local law, whose application has an overriding importance, may govern some cases even if a foreign law is selected by the choice-of-law rules. However, here we shall not consider these exceptions since we want to focus on the ordinary functioning of private international law, i.e., on its function to select a jurisdiction and legal system for a case.

In fact little or no attention has been so far devoted to the logical analysis of private international law and to the development of formal models of it. This gap needs to be filled, since this 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 to 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 subject b, belonging to marketplace β). For regulating such mixed transactions, rather than establishing additional shared rules (different from the rule pertaining to each marketplace), or to establish what systems is to take priority in case of conflict, ot to relay 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 the operation of different national legal systems, a coordination which may requires the application of international treaties and supranational laws.

2 Sources of Private International Law

The rules on jurisdiction and choice of laws are meant to govern adjudication by national judges, telling them whether they should decide certain cases, and according to what law. Thus generally, they are national rules, pertaining to the different national systems: each national legal systems includes its own rules on jurisdiction and choice of law. As we shall see in the following, a court in a legal system has to take these rules into account before considering how that legal

system regulates the case, since these rules may establish that the court should not examine the case at all, or they may require that it assesses according to the substantive rules of a different legal system.

National rules of private international law often refer to international agreements, which have been made in order to unify the rules of private international law of different countries, so that they 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 rely on the Brussels and Rome conventions given that and the new regulations mostly reproduce the contents of the two conventions, which still apply to past cases (on private international law in the EU, see [16]; for private international law in e-commerce, see[17]).

We cannot here examine all complex issues pertaining to private international law. Before moving into a formal analysis, we shall provide some examples, to illustrate the relevance of the issues addressed by Private International Law. The first 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 esternal 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 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 the prevailing interpretation of the Rome Convention on contractual obligations even if the software has to be delivered in Italy, and contract was made in Italy, using the Italian language, by an agent of the British company. Since English law requires the contractually liquidated damage to be paid in full, this should be the decision of the Italian judge.

To exemplify the use of private international law beyond the domain of contracts (to which we shall limit our formal analysis), let us consider a further 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 State 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).

3 Modelling Requirements

Let us summarise the requirements that emerge from the presentation of the many legal issues above described. We assume the existence of different legal systems $L_1, L_2, \ldots, L_n$. Each system 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 for this purpose.

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 decide 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 what legal system the case should be decided. If $ChLaw(L_i)$ selects a legal system L_j (that could be different from L_i), then k should apply L_j. Thus in one of the example above, $ChJur(italy)$ selects the Italian legal system, which we denote as *italy* as the system having jurisdiction, but $ChJur(italy)$ requires the application of English law. It may also happen that $ChJur(L_i)$ does not select a foreign 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.).

In a EU member state, the courts have to apply two legal systems, the national legal system, 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).

For simplicity, we shall not here consider some further complications. We do not consider those exceptional cases where the rules of the selected legal system are rejected being incompatible the fundamental principles of international public order of the local system ($ChLaw(L_i$ selects a system L_j providing of the case incompatible with L_i's public policy) We do not model chains of references: $ChLaw(L_i)$ chooses L_j, and $ChLaw(L_j)$ choses L_k, etc. 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 the law of L_j must be understood as referring to $L_j - [ChJur(L_i) \cup ChLaw(L_j)]$, rather than to L_j as a whole. Outside the domain of contracts, different rules may apply to chained references. For instance according to art 15 of Italian law 218 of 1995, where $ChLaw(L_{italy})$ chooses L_j, and $ChLaw(L_j)$ choses L_k, then the Italian judge should apply L_k's law if this law does not refer to a further legal systems (or refers back to L_{italy}); in the latter is the case, Italian law should be applied (rather than L_j or L_k, both of which reject the reference made to them). We shall also not consider the common law doctrine of *forum non conveniens*, which concerns a court's discretionary power to decline to exercise its jurisdiction where another court may more conveniently hear a case. We shall not address the *lis pendens* issue, concerning when judges should reject a case since proceedings have already started in another jurisdiction. Finally, we shall not consider cases where universal jurisdiction is claimed for violations of international law (in particular, genocide or other serious violation of human rights). We shall indeed confine our analysis to cases involving contracts or torts.

4 Modular Argumentation

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

An abstract argumentation framework ([5]) 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 for $(A, B) \in attacks$. 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. A set of arguments is said to be *conflict-free* if it does not contain two arguments attacking each other. An argument A is said to be acceptable wrt a set of arguments S, if each attack against A is counterattacked by S (i.e. there is an argument in S attacking A). A conflict-free set S of arguments is said to be *admissible* if S counterattacks each attack against itself, i.e. for each argument A that attacks some argument B in S there is an argument C in S that attacks A. A maximal admissible set of arguments is called a *preferred extension*.

Abstract argumentation provides a natural platform for understanding many procedures for legal reasoning and argumentation (see, also for references, [8]). But it does not provide a programming environment in which the arguments for such procedures could be constructed automatically. To address this issue, an instance of abstract argumentation called assumption-based argumentation where the arguments are deductive proofs based on assumptions ([6]) could be used.

An assumption-based argumentation (ABA) framework is a triple $(\mathcal{R}, \mathcal{A}, \overline{})$ 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 $\mathcal{L}$, and $\mathcal{A} \subseteq \mathcal{L}$ is a set of assumptions, and $\overline{}$ is a (total) mapping from $\mathcal{A}$ into $\mathcal{L}$, where $\overline{x}$ is referred to as the *contrary* of x. In the our examples, when convenient we shall denote $\overline{L}$ as $\sim L$. Assumptions in $\mathcal{A}$ do not appear in the heads of rules in $\mathcal{R}$.

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 $\sigma \leftarrow S \in \mathcal{R}$.

A sentence σ is supported by a set of propositions X denoted by $X \models \sigma$ if there exists a backward deduction for l 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 obtained abstract argumentation framework is denoted by $AA_\mathcal{F}$. The semantics of an ABA $\mathcal{F}$ 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 $AA_\mathcal{F}$. π 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.

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 $call(l, M, t)$ where l is a non-assumption sentence in $\mathcal{L}$, M is a module in which l occurs, $t \in \{cr, sk\}$ is the type of semantics of M according to which l is defined (i.e. $M \vdash_t l$).

It has been demonstrated in [7,8,9] that both types of the calls are necessary to model legal doctrines in common law of contract. But for the purpose of modelling jurisdiction and choice of law in this paper, we need only the skeptical calls.

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 an example of stratified modular argumentation.

The semantics of 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 $call(l, N, t)$ 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 $\mathcal{F} \vdash_t p$ if $M \vdash_t p$ where M is the main module of $\mathcal{F}$ and $t \in \{cr, sk\}$.

5 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 [8,9] 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 $Case$, represents the context of the contract, containing 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 these countries,

but rather to represent a few national and international rules to illustrate how choice of jurisdiction and choice of laws can be represented though modular argumentation. Extending the model of [8], where legal doctrines are represented as modules, we model laws as set of modules. We separate different legal system and within each of them we distinguish modules for adjudicating, for deciding jurisdiction, for allocating competence, for establishing the law to be applied, and for providing substantive legal outcomes. Thus we assume that the law of a *Country* 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 for determining jurisdiction.
- $compMod(Country)$, containing the rules for establishing competent courts for the case.
- $applLawMod(Country)$, containing the rules for determining the applicable law.
- $substantiveLawMod(Country)$, containing all other rules of the Country.

Even though the substantive law would normally be kept separate to other forms of procedural rules as well, such as rules of evidence, and more generally a country's law could be modularised in different, more refined ways—distinguishing individual legal sources or groups of them pertaining to the same subject or being issued by the same authority—this rough partition will suffice for our purpose of dealing with jurisdiction and choice of laws.

When a case (e.g. a request for compensation for damage suffered in car accident abroad) is inputted to a court k of a country the top module of the system proceeds as follows:

1. First k applies $jurisdMod$(Country) to the case, to establish whether the (courts of the) *Country* should at all process the *Case*. This step is formally represented by $call(jurisdMod(Country)+Case, hasJurisdiction(Country))$. Jurisdiction rules in *Case* may govern this issue, or they may refer it to an international treaty (like the above mentioned Brussels convention, in our example).
2. If the outcome of step 1) is positive (L_i's courts have jurisdiction), then k uses $compMod(Country)$ to determine whether k itself is a competent one, among all courts of L_i. This step is represented by a $call(compMod(Country) + Case, hasCompetence(Court))$.
3. If the outcome of step 2) is positive (k is competent), then k uses $applLawMod(Country)$ to identify the applicable law. This step is represented by $call(applLawMod(Country)+Case, applicableLaw(Country'))$. The called module may refer the issues to further modules, like an international treaty (like the Rome convention, in our example). .
4. Finally, k uses $substantiveLawMod(Country')$ to decide the case. This step is represented by a call $call(substantiveLawMod(Country')+Case, Outcome)$.

5.1 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 is asked to deal with a case. For our very limited purposes (we do not intend to address here the complexities of judicial decision-making, and we abstract away from dialectical interactions between the parties and the judges), $TopMod(italy)$ consists of three rules. The first concerns the case when there is Italian jurisdiction: the court should identify the applicable law, and decide the case accordingly. The second and third are concerned with the cases where there is no Italian jurisdiction or the concerned court is not competent respectively, in which case the court should simply declare it.

$$
\begin{aligned}
&decision(Case, Court, Outcome) \leftarrow \\
&\quad call(jurisdMod(italy) + Case, hasJurisdiction(italy)), \\
&\quad call(compMod(italy) + Case, hasCompetence(Court)), \\
&\quad call(applLawMod(italy) + Case, applicableLaw(Country)), \\
&\quad call(substantiveLawMod(Country) + Case, Outcome). \qquad (1) \\
&decision(Case, Court, noJurisdiction) \leftarrow \\
&\quad call(jurisdMod(italy) + Case, \sim hasJurisdiction(italy)). \\
&decision(Case, Court, noCompetence) \leftarrow \\
&\quad call(compMod(italy) + Case, \sim hasCompetence(Court)).
\end{aligned}
$$

This module provides the following answers, where a court k of $italy$ is asked to provide an answer with regard to a case:

- the positive answer "the decision for $Case$ is D", if (a) Italian courts have jurisdiction according to $jurisdMod(italy)$ (b) court k has competence for $Case$ according to $compMod(italy)$ (c) the law of $Country$ is applicable, $applLawMod(italy)$, D is the outcome for $Case$ according to $substantiveLawMod(Country)$.
- the negative answers "no jurisdiction for C" or "no competence for C", when respectively $jurisdMod(italy)$ does not establish the jurisdiction of $italy$ or $compMod(italy)$ says that k is not one of the courts having competence for C".

5.2 The Jurisdiction Module

Italian jurisdiction is regulated by Law 218 of 1995 (Reform of the Itaian 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 his or her domicile in Italy, or has in Italy a representative authorised to participate in judicial proceedings
- art. 3.2. There is Italian jurisdiction according to the criteria specified in Sections 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 following clauses in $jurisdMod(italy)$, which provide alternative conditions (satisfaction of one of them is sufficient) for the Italian legal system to have jurisdiction of the case:

$$
\begin{aligned}
&hasJurisdiction(italy) \leftarrow defendantHasDomicileIn(italy)\\
&hasJurisdiction(italy) \leftarrow defendantHasRepresentativeIn(italy)\\
&hasJurisdiction(italy) \leftarrow\\
&\quad call(BrusselsConvention + Case, hasJurisdiction(italy))\\
&hasJurisdiction(italy) \leftarrow agreedJurisdiction(italy)\\
&hasJurisdiction(italy) \leftarrow \sim defendantObjectsToJurisdiction(italy)
\end{aligned}
\tag{2}
$$

We provide a very rough formalisation, using long non-analysed predicates, since we want to focus on modular representation and on calls between legal systems (and submodules of them), without addressing other complexities in legal knowledge. For this reason we do not model explicitly rule priorities, undercutting and presumptions (as in [13,14]), but deal with hierarchies of exceptions by only using defeasible assumptions.

5.3 The Brussels-Convention Module

Let us now consider the module $brusselsConvention$ (or $brusselsRegulationI$, since the substance of these rules has not been modified in 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;

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

Note that articles 2 and 5 could yield different countries with jurisdiction for the same case. When module $BrusselsConvention$, called by the Italian jurisdiction module to establish whether Italy has jurisdiction, fails to give an affirmative answer, the case will have to be rejected (by the top module).

5.4 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 Civil procedure code) will suffice for our example, one establishing competence for the court in whose district the defendant has domicile, and the other saying that if the defendant has no known residence in Italy, then the court is competent in whose district the plaintiff has domicile:

$$
\begin{aligned}
&hasCompetence(Court) \leftarrow coversDefendantsDomicile(Court). \\
&hasCompetence(Court) \leftarrow coversPlaintiffsDomicile(Court), \qquad (4) \\
&\quad \sim defendantHasDomicileIn(italy).
\end{aligned}
$$

5.5 The Italian Choice-of-law Module

With regard to the choice of law, again, 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. Tort liability is regulated by the law of the state in which the event took place. However, the damaged person may request the application of the law of the state 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 consists of the following clauses, the first one calling the Rome Convention for contracts, the second addressing torts:

$$
\begin{aligned}
&applicableLaw(Country) \leftarrow contractDispute, \\
&\quad call(RomeConvention + Case, applicableLaw(Country)) \\
&applicableLaw(Country) \leftarrow tortDispute, \qquad\qquad\qquad (5) \\
&\quad applicableTortLaw(Country).
\end{aligned}
$$

The three alternative laws for torts are indicated and prioritised.

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

where $\forall \sim p(x)$ stands for $\forall x \sim p(x)$ and the contrary of $\forall \sim p(x)$ is an atom of the form $p(c)$ for any constant c. The three laws are further specified by definitions of predicates appearing in their bodies.

$$lawOfEvent(Country) \leftarrow eventHappenedIn(Country). \qquad (7)$$

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

$$\begin{aligned} lawCommonToParties(Country) \leftarrow allPartiesNationalsOf(Country), \\ allPartiesResideIn(Country). \end{aligned} \qquad (9)$$

5.6 The Rome-Convention Module

In the EU, national laws address 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, for contracts made after 17 December 2009). Here we only consider parts of articles 3 and 4 of this convention. In particular we focus on article 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 with which it 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 with 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, his 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 enables choice of the applicable law by the parties (this choice is expressed by a clause in the contract establishing the obligations at issue in the case). 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.

$$applicableLaw(Country) \leftarrow chosenByParties(Country).$$

$$applicableLaw(Country) \leftarrow \forall \sim chosenByParties(Country'), \quad (10)$$
$$contractMostConnectedTo(Country).$$

For simplicity's sake we do not consider how the predicate *chosenByParties* is determined (various legal doctrines exist, see [3]). Article 4.2. is the heart of article 4, where the most-connected country is defined as the one connected to the performer of the contract, unless connection through performer is overridden by other factors, establishing 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 which we express through the predicate *presumptionFromPerformerOverriden*. In this case the law of another country, i.e., the one most closely connected though these other factors should be applied:

$$contractMostConnectedTo(Country) \leftarrow$$
$$contractConnectedByPerformerTo(Country),$$
$$\sim presumptionFromPerformerOverriden.$$
$$contractMostConnectedTo(Country) \leftarrow \quad (11)$$
$$presumptionFromPerformerOverriden,$$
$$contractMostConnectedByOtherFactorsTo(Country).$$

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

$$contractConnectedByPerformerTo(Country) \leftarrow$$
$$\sim contractEnteredInTradeOrProfession,$$
$$connectedByResidenceOfPerformer(Country)$$
$$contractConnectedByPerformerTo(Country) \leftarrow \quad (12)$$
$$contractEnteredInTradeOrProfession,$$
$$contractConnectedByBusinessUnitTo(Country).$$

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 (with an implicit assumption that it is not done in the exercise of trade or profession of the characteristic performer):

$$contractConnectedByResidenceOfPerformer(Country) \leftarrow$$
$$contractHasCharacteristicPerformer(X), \quad (13)$$
$$residesIn(X, Country).$$

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

$$contractHasCharacteristicPerformer(X) \leftarrow$$
$$contactHasCharacteristicPerformance(Perf), \quad (14)$$
$$obligedToAccomplish(X, Perf).$$

We hence 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 trade or profession of the characteristic performer, then the business place of the performer becomes relevant, and it is to be established according to the following rules, extracted from art. 4.2. The default connection is that to the main business place of the performer. The first rule of definition 15 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.

$$
\begin{aligned}
& contractConnectedByBusinessUnitTo(Country) \leftarrow \\
& \quad contractConnectedByMainBusinessUnitTo(Country), \\
& \quad \sim presumptionFromMainBusinessUnitOverridden. \\
& contractConnectedByBusinessUnitTo(Country) \leftarrow \\
& \quad presumptionFromMainBusinessUnitOverridden, \\
& \quad contractMostConnectedBySubsidiaryBusinessUnitTo(Country).
\end{aligned}
\tag{15}
$$

Rule 16 specifies connections to the main business unit:

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

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

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

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

Theorem 1. *The set {topMod(italy), jurisdMod(italy), brusselConvention, compMod(italy), applLawMod(italy), romeConvention, 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, $brusselConvention$ and $romeConvention$ the lowest and the others a middle rank.

5.7 An Example

In this final section, we shall go back to contractual case of 2 to exemplify the application of the method. The case may be represented by the following module

$rossiVjones$:

$$contractDispute$$
$$defendantHasDomicileIn(italy)$$
$$coversDefendantsDomicile(tribunalOfBologna)$$
$$contractEnteredInTradeOrProfession$$
$$contractHasCharacteristicPerformance(provideSoftware)$$
$$obligedToAccomplish(jonesInc, provideSoftware)$$
$$hasMainBusinessUnitIn(jonesInc, britain)$$
$$failedToPerform(rossiSpa)$$
$$liquidatedDamage(20000)$$
$$inequitablyHighForContract(20000)$$
$$party(joneslnc)$$
$$party(rossiSpa)$$

(18)

With regard to the substantive British law $substantiveLawMod(britain)$ in this example we need only the rule establishing that a party has to pay the established liquidated damage (whatever its amount):

$$hasToPay(P, X) \leftarrow$$
$$failedToPerform(P), liquidatedDamage(X)$$

(19)

Let us assume that the case starts when $jonesInc$ addresses the Tribunal of Bologna (module $topMod(italy)$, asking for the decision that $hasToPay(rossiSpa, 20000)$ with regard to the case $rossiVjone$:

$$call(topMod(italy) + rossiVjones, hasToPay(rossiSpa, 20000))$$

This leads to

$$call(jurisdMod(italy) + rossiVjones, hasJurisdiction(italy))$$

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 be recognised according to

$$call(compMod(italy) + rossiVjone, hasCompetence(tribunalOfBologna))$$

given that this office covers the defendant's domicle.

Consequently the following call is be activated:

$$call(applLawMod(italy) + rossiVjones, applicableLaw(Country))$$

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

$$call(romeConvention + Case, applicableLaw(Country))$$

According to the second rule in 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). In this case, given that the contract $contrRossiJones$ was done in trade or profession, 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 is located (definition 16), which is Britain.Putting all of this together we are able to state, by calling $romeConvention + rossiVjones$, that $substantiveLawMod(britain)$ is the applicable law.

On the basis of this condition, we can decide the case by applying module $substantiveLawOf(britain)$, 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 20000 Euros, having breached the contract.

6 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 broader cultural and practical significance: private international law may provide a pattern for the decentralised regulation of heterogeneous agents 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.

Many development are possible for the model here provided: representing a broader set of rules and countries, addressing the different doctrines existing on many issues, 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 many of these issues, see [15]). We have preferred in this paper to limit ourselves to the simple language of first order logic, to focus on the main objective or our paper, i.e., modelling the modular connections between different normative systems, and use private international law for integrating them in the legal reasoning.

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