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An integrated view on rules and principles 25-38
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AN INTEGRATED VIEW ON RULES AND PRINCIPLES

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Abstract

It is generally acknowledged that there are intuitive differences between reasoning with rules and with principles. For instance, a rule seems to lead directly to its conclusion if its condition is satisfied, while a principle seems to lead merely to a reason for its conclusion. However, the implications of these intuitive differences for the logical status of rules and principles remain controversial.

A radical opinion has been put forward by Dworkin (1978). The intuitive differences led him to argue for a strict logical distinction between rules and principles. Ever since, there has been a controversy whether the intuitive differences between rules and principles require a strict logical distinction between the two. For instance, Soeteman (1991) disagrees with Dworkin's opinion, and argues that rules and principles cannot be strictly distinguished, and do not have a different logical structure.

In this paper, we claim that the differences between rules and principles are merely a matter of degree. We give an integrated view on rules and principles in which rules and principles have the same logical structure, but different behavior in reasoning. In this view, both rules and principles are considered as objects that consist of a condition and a conclusion. The differences between rules and principles are the result of different types of relationships that they have with other rules and principles. In the integrated view, typical rules and typical principles are the extremes of a spectrum of hybrid rules/principles.

We support our claim by giving an explicit formalization of our integrated view using the recently developed formal tools provided by Reason-Based Logic (see, *e.g.*, Hage, 1991, and Hage and Verheij, 1994).

1 Reasoning with rules *vs.* reasoning with principles

There seem to be two types of reasoning:

- *Reasoning with rules*
  A rule is applied if its conditions are satisfied. If a rule is applied, its conclusion follows directly.

- *Reasoning with principles*
  In contrast with a rule, a principle only gives rise to a reason for its conclusion if it applies. Moreover, there can be other applying principles that give rise to both reasons for and reasons against the conclusion. As a result, a conclusion then only follows by weighing the pros and cons.

Dworkin (1978, pp. 22ff. and 71ff.) has made a strict distinction between rules and principles in the field of law. According to Dworkin, rules have an all-or-nothing

character, while principles have a dimension of weight or importance. An example of a typical rule, he says, is the proposition "A will is invalid unless signed by three witnesses". An example of a typical principle is "No man may profit from his own wrong".[1]

There are at least three seeming differences between rules and principles. The first is that rules lead directly to their conclusion if they are applied, while principles lead to their conclusion in two steps: first principles give rise to reasons, then these reasons are weighed.

The second difference between rules and principles appears in the case of a conflict. In case of conflicting rules, *i.e.*, rules with incompatible conclusions that apply to a single case, the rules lead directly to their conclusions, and therefore to a contradiction.

On the other hand, in case of conflicting principles, *i.e.*, if there are principles with incompatible conclusions that apply to a single case, no such problems occur. The application of conflicting principles only leads to reasons that plead for incompatible conclusions, so no contradiction is involved. In such cases, a conflict can involve several distinct reasons, some of which plead for a conclusion, others against it. Weighing the pros and cons determines the final conclusion.

The third difference is that rules lead to their conclusion in isolation, while principles interact with other principles. For instance, additional reasons arising from other principles can influence the result of the weighing of the reasons.

These differences are summarized in Table 1.

	Rule	*Principle*
Application	Conclusion	Reason
Conflict	Contradiction	Weighing
Other rules/principles	Independent	Dependent

Table 1: The seeming differences between rules and reasons

This leads to the question whether rules and principles are logically different. There is no agreement. For instance, Dworkin has a strong opinion:

> "The difference between legal principles and legal rules is a logical distinction" (Dworkin, 1978, p. 24)

Soeteman (1991), on the other hand, in his discussion of rules and principles, takes an apparently opposite stand:

> "I know of no difference in logical structure between rules and principles." (Soeteman, 1991, p. 34)[2]

---

[1] As Soeteman (1991, p. 33) notes, the usage of the terms 'rule' and 'principle' is not at all uniform. For instance, 'Ne bis in idem' is called a principle, but has a rule-like nature, while 'A contract must be executed in good faith' is a principle-like rule. Here, we will not deal with the usage of the terms 'rule' and 'principle', but with the nature of typical rules and principles.

[2] My translation from the original in Dutch: 'Ik ken (...) geen verschil in logische structuur tussen regels en beginselen'.

Indeed, there are clear similarities between rules and principles. We mention two of them. First, rules and principles both are basically a connection of some sort between a *condition* and a *conclusion*. The difference is only that, in the case of a rule, this connection seems stronger than in the case of a principle.

Second, for a rule or principle *in isolation* the difference disappears. In isolation, the conclusion of both a rule and a principle follows if the condition is satisfied.

Because of these similarities, we claim that the seeming differences between rules and principles are merely a matter of degree. There is no clear border between reasoning with rules and principles. They are just the two extremes of a spectrum. This idea is not new, *e.g.*, Soeteman (1991) makes a similar claim. Soeteman's argument is based on the problems that one encounters if one tries to capture rules and principles in classical logic. However, within classical logic, it is hard, if not impossible, to give an account of rules and principles in such a way that all observations on rules and principles above - differences and similarities - have an explicit counterpart.

In recent years, several logical "tools" - an appropriate term used by Prakken (1993) - have been developed that can be used to give a more satisfactory account of rules and principles. Especially dealing with the applicability of rules/principles, priority relations between rules/principles and reasoning about rules/principles in logic is currently better understood (see, *e.g.*, Prakken, 1993; Hage and Verheij, 1994; Prakken and Sartor, 1995; Yoshino, 1995).

The account in this paper uses the tools that are available in Reason-Based Logic (see, *e.g.*, Hage, 1991, and Hage and Verheij, 1994). Using these tools, we are able to support the claim that the difference between reasoning with rules and principles are merely gradual by giving an integrated formal representation.[3]

The paper is organized as follows. We start with an informal presentation of our integrated view on rules and principles (section 2). Then we discuss the formal tools needed for the satisfactory representation of exceptions to rules and the weighing of reasons (section 3). After that, the integrated view is formally elaborated (section 4). The paper ends with the conclusions that can be drawn from the results in this paper (section 5).

2 An integrated view on rules and principles

Our integrated view on rules and principles is based on two main assumptions:

- Both rules and principles give rise to reasons if they are applied.
- The differences between reasoning with rules and principles result from different types of relationships with other rules and principles, that can interfere with it.

As a basic example of the role of the relationships between rules and principles, we discuss a rule and its underlying principles (section 2.1). Then we discuss our view on a typical rule (section 2.2), a typical principle (section 2.3), and a hybrid rule/principle (section 2.4).

[3] Verheij and Hage (1994) give a reconstruction of reasoning by analogy, based on a similar view on rules and principles. The focus was on analogy. To clarify the view on rules and principles, it is now worked out in detail, both informally and formally.

2.1 A rule and its underlying principles

A basic example of the relationships between rules and principles occurs when a rule has underlying principles.

For instance, if the legislator makes a legal rule, this is often based on a decision in which several factors are taken into account. These factors, or using another already familiar term, reasons, are based on other rules and principles. If these reasons are in conflict, the legislator decides (either explicitly or implicitly) how they have to be weighed. We say that the rules and principles taken into account by the legislator *underlie* the newly made legal rule. In Figure 1, the situation is depicted. The principles underlying the rule that can lead to a reason for the conclusion of the rule are indicated as pro-principles, those that can lead to a reason against the conclusion are indicated as con-principles.

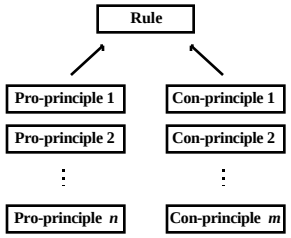

Figure 1: A rule and its underlying principles

As an example, we take the legal rule from Dutch civil law that sale of a house should not terminate an existing rent contract (Art. 7A:1612 BW).[4] This rule has for instance as underlying principles that somebody who lives in a house should be protected against measures that threaten the enjoyment of the house and that contracts only bind the contracting parties. The first pleads against termination of an existing rent contract; the second pleads for termination. As a result, there is (at least) one underlying pro-principle, and one underlying con-principle.

Let's see what happens if the legal rule applies. Of course, its principles should normally not also be applicable since they have already been considered by the legislator. We say that the legal rule when it applies *replaces* its underlying principles. As a result, if the rule of Art. 7A:1612 BW applies, its two underlying principles should not be applicable. The situation is shown in Figure 2.

[4] This example is also discussed by Prakken (1993, pp. 22-23) and Verheij and Hage (1994), in the context of analogy. The discussion here follows the latter.

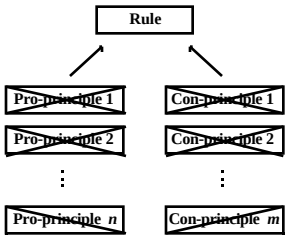

Figure 2: A rule replaces its underlying principles if it applies

If the rule would not replace its underlying principles, several reasons would arise that already had been taken account in the rule itself. Because of the special relationships of the rule with its underlying principles, the principles should however not be applicable.

2.2 A typical rule

In general, the relations between rules and principles can be less clear than in the situation of a rule and its underlying principles. In the following, we focus on the set of rules and principles that interfere, and do not specify these relations, as in Figure 3.

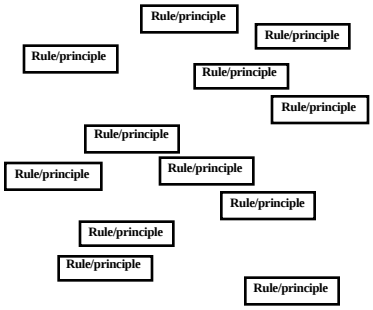

Figure 3: Interfering rules and principles

Suppose now that the rule/principle in the upper left corner is in fact a typical rule. In our view on rules and principles, if this typical rule applies, it blocks all interfering rules/principles. This situation is shown in Figure 4.

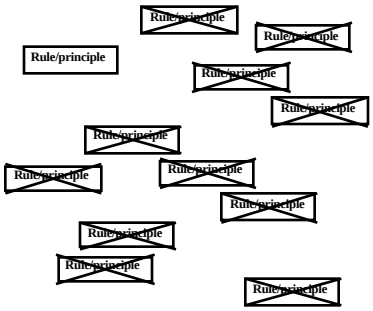

Figure 4: A typical rule applies

As a result, the conclusion of the rule follows directly.

2.3 A typical principle

If the rule/principle in the upper left corner were a typical principle, it would not block any of the interfering rules/principles in case it applies. The situation is shown in Figure 5.

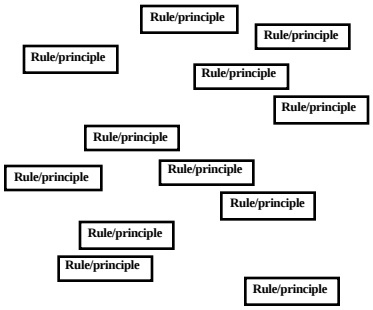

Figure 5: A typical principle applies

As a result, the conclusion of the principle does not follow directly, but only after weighing the reasons arising from the other rules/principles.

2.4 A hybrid rule/principle

Typical rules and typical principles are the extreme cases. Most rules/principles are hybrid: they are neither a typical rule, nor a typical principle. A hybrid rule/principle blocks some, but not all interfering rules/principles. The situation that the rule/principle in the upper left corner were a hybrid rule/principle and applies is shown in Figure 6.

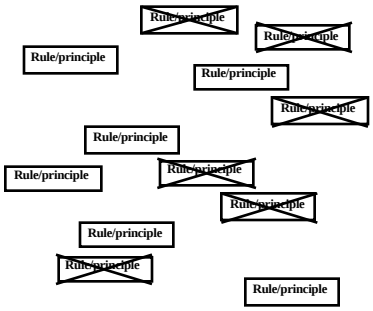

Figure 6: A hybrid rule/principle applies

As a result, the conclusion of the hybrid rule/principle does not follow directly, but only after weighing the reasons arising from the other rules/principles, that are not blocked.

In section 4, this informal sketch of an integrated view on rules and principles will be formalized using the formal tools provided by Reason-Based Logic. These are introduced in the next section on representing exceptions to rules and the weighing of reasons.

3 Representing exceptions to rules and the weighing of reasons

In this section, we discuss the tools needed to satisfactorily represent exceptions to rules and the weighing of reasons. First, we describe our use of the notions "argument", "reason", and "rule" (section 3.1). Second, we discuss the representation of exceptions to rules and the weighing of reasons using material conditionals in classical logic, and explain why this is unsatisfactory (section 3.2). Third, we give a brief overview of the formal tools of Reason-Based Logic, that will be used for the formal elaboration of our integrated view on rules and principles (section 3.3).

3.1 Arguments, reasons, rules

We start with our use of the notions "argument", "reason", and "rule". A simple example of an argument is the following:

Mary is driving a car. So, Mary should have a driver's license.

In this argument, the conclusion that Mary should have a driver's license is supported by the reason that Mary is driving a car. An argument is considered acceptable because there is some kind of connection between the reason and the conclusion of the argument. It is this connection between condition and conclusion that we call a rule.[5] In Toulmin's (1958) argument scheme, this connection between condition and conclusion corresponds to the warrant of the argument.[6]

[5] We consider a principle also as a connection between a condition and a conclusion. As said, the differences between rules and principles only arise by their behavior in reasoning.

[6] Toulmin also discusses backings of warrants. Loui and Norman (1995) give a partial taxonomy of types of rationales for the adoption of rules. Rationales correspond to Toulmin's backings of warrants. It would be interesting to investigate how the different types of rationales influence the relations between rules and principles, as we describe in this paper.

In classical logic, the natural candidate to represent a rule is the material conditional. For instance, the rule warranting the argument above can be represented by the following material conditional:

Mary_is_driving_a_car → Mary_should_have_a_driver's_license

The underscores are meant to suggest that the left and right hand side of the conditional are elements of the logical language.

Arguments are represented using the classical inference relation $\vdash$. The argument above would be represented (relative to a theory of the world T) as follows:

Mary_is_driving_a_car $\vdash_T$ Mary_should_have_a_driver's_license[7]

Informally, this says that the argument "Mary is driving a car. So, Mary should have a driver's license" is acceptable (with respect to the theory of the world T).

In classical logic, there is a strong connection between acceptable arguments and the material conditionals warranting them. We have the following property:

$\boldsymbol{A} \vdash_T \boldsymbol{B}$ if and only if $\vdash_T \boldsymbol{A} \rightarrow \boldsymbol{B}$

Informally, this relation says that the argument "*A*. So, *B*" is acceptable (with respect to T) if and only if its warrant "If *A*, then *B*" is true (with respect to T).

3.2 Exceptions to rules and the weighing of reasons in classical logic

The picture of arguments becomes less simple, as soon as one acknowledges that not all arguments are strict. For instance, the argument (resembling the one in the previous subsection)

Mary is driving a car. So, Mary has a driver's license.

is clearly not strict, although it is acceptable for many purposes. There is a connection between the condition and the conclusion of the argument, so we can again speak of a rule warranting the argument. However, this connection is not as strong as it is in a rule warranting a strict argument.

It turns out that the representation of rules warranting non-strict arguments as material conditionals in classical logic is not satisfactory.[8] We show this by focusing on two phenomena: exceptions to rules and the weighing of reasons.

We start with exceptions to rules. We consider an argument of the form

Condition. So, *conclusion*.

The material conditional representing the rule warranting this argument is the following:

Condition → Conclusion

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[7] Here $\boldsymbol{A} \vdash_T \boldsymbol{B}$ abbreviates T, $\boldsymbol{A} \vdash_T \boldsymbol{B}$.

[8] We do not discuss the problems that classical logic has with defeasible reasoning with non-strict arguments. We refer the reader to the work of, *e.g.*, Prakken (1993), Hage and Verheij (1994), and Prakken and Sartor (1995).

Now assume that there is an exception to this rule, *i.e.*, some exceptional situation in which the argument does not justify its conclusion.[9] The material conditional above does not any longer correctly represent the situation, and should be replaced by the following:

Condition $\neg$ ***Exception*** $\rightarrow$ ***Conclusion***.[10]

There are two problems with this representation. First, if we consistently interpret material conditionals as rules warranting arguments, this material conditional warrants another argument than the one above, namely:

Condition and not *exception*. So, *conclusion*.

Second, the representation of the rule depends on its exceptions. For each additional exception, the representation of the rule should be changed.[11] Both problems show that, for a rule that can have exceptions, its nature as a fixed connection between a condition and a conclusion is obscured if it is represented as a material conditional.

We continue with the weighing of reasons. As we discussed in the previous section, a principle (that just as a rule warrants an argument, see note 5) does not directly lead to its conclusion, if its condition is satisfied, but gives rise to a reason for its conclusion. It can however be the case that there are conflicting reasons. For instance, there might be principles warranting arguments of the following forms:

$Condition_1$. So, *conclusion*.
$Condition_2$. So, *not_conclusion*.

Initially, the principles warranting these arguments can be represented as the two material conditionals

$\mathbf{Condition_1} \rightarrow \mathbf{Conclusion}$
$\mathbf{Condition_2} \rightarrow \neg\,\mathbf{Conclusion}$

If the conditions of both conditionals are satisfied, a contradiction arises. However, what we want is that the principles represented by the conditionals only give rise to conflicting reasons, that can subsequently be weighed. As a result, the principles are not correctly represented by the conditionals, and, again, the strategy is to adapt the representation. Assuming that the reason $Condition_1$ for *Conclusion* outweighs the reason $Condition_2$ against *Conclusion*, the representation becomes

$\mathbf{Condition_1}$ $\mathbf{Condition_2} \rightarrow \mathbf{Conclusion}$

The problem with this approach of representing the weighing of reasons resulting from principles is similar to the objection made previously for exceptions to rules: The nature

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[9] The argument is then called *defeated*. For more information on defeasible arguments, the reader can consult for instance Pollock (1987), Vreeswijk (1993) or Verheij (1995).

[10] This does not capture the case that it is indeterminate whether there is an exception or not. See note 8.

[11] This objection is closely related to the requirement on formal representations that is sometimes called 'isomorphism' (see, for instance, Bench-Capon and Coenen, 1992).

of a principle as a connection between a condition and a conclusion is obscured. Looking at the conditional above, one cannot determine the principles implicitly represented in it.[12] Moreover, the conditional only represents the effects of the principles in case the conditions of both are satisfied. The following conditionals would represent the case in which only one of the conditions is satisfied:[13]

$\mathit{Condition}_1 \quad \neg\, \mathit{Condition}_2 \rightarrow \mathit{Conclusion}$
$\neg\, \mathit{Condition}_1 \quad \mathit{Condition}_2 \rightarrow \neg\, \mathit{Conclusion}$

The solution to these problems with the representation of exceptions to rules and the weighing of reasons is to use a richer representation language in which rules (and principles) and their properties can be represented explicitly, as in Reason-Based Logic. In the next section, we give a brief overview of Reason-Based Logic.

3.3 Reason-Based Logic: a brief overview

In the previous subsection, we encountered several types of facts concerning rules and principles that could not be explicitly represented in classical logic, such as:

> There is a (valid) rule (or principle) with condition *Condition* and conclusion *Conclusion*.
> There is an exception to the rule/principle with condition *Condition* and conclusion *Conclusion*.
> *Reason* is a reason for *Conclusion*.
> The reasons $Pro_1, \ldots, Pro_n$ for *Conclusion* outweigh the reasons $Con_1, \ldots, Con_m$ against *Conclusion*.

In this paper, these types of facts are represented as follows, in a Reason-Based Logic style:[14]

> Valid(rule(***condition***, ***conclusion***))[15]
> Exception(rule(***condition***, ***conclusion***))
> Reason(***reason***, ***conclusion***)
> Outweighs({$\mathit{pro}_1, \ldots, \mathit{pro}_n$}, {$\mathit{con}_1, \ldots, \mathit{con}_m$}, ***conclusion***)

The language of Reason-Based Logic is basically a classical first-order language, with some adaptations to express these types of sentences.

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[12] See note 11.
[13] This does not capture the case that one of the conditions is satisfied, while the other is indeterminate, *i.e.*, neither the condition nor its opposite is satisfied. See note 8.
[14] Hage started the development of Reason-Based Logic; later the research was done in close cooperation with Verheij. Over the years, there have been many versions of Reason-Based Logic. An early version is Hage's (1991), already describing the basic informal ideas. Hage and Verheij (1994) describe the first version that is formally satisfactory. Here we use a version of Reason-Based Logic that just contains the formal tools needed for the formal elaboration of our view on rules and principles.
[15] We do not distinguish expressions for the existence of a rule and of a principle. As we will see, the distinctions between rules and principles arise by their relations with other rules/principles. Formally, we write rule(***condition***, ***conclusion***), because that is the convention in Reason-Based Logic (abbreviated RBL). If we want to distinguish the formal rule from the rule or principle it represents, we call it an RBL rule.

Moreover, we use a convention, that is fundamental for Reason-Based Logic: We assume a translation from logical sentences to logical terms. Any sentence begins with an uppercase character, and any term with a lowercase. Each sentence translates to a term by changing its initial uppercase to a lowercase. The translation extends to the metavariables, written in italics.

In Reason-Based Logic, the semantics of the classical connectives is as usual. There are however some additional properties that determine the semantics of the special sentences above. We present them here as logical axioms (or, better, axiom schemes).

These are the most important:[16]

Valid(rule(***condition***, ***conclusion***))
  Condition
  ¬ Exception(rule(***condition***, ***conclusion***))
  → Reason(***condition***, ***conclusion***)

Reason(***pro***$_1$, ***conclusion***) … Reason(***pro***$_n$, ***conclusion***)
  Reason(***con***$_1$, ***not_conclusion***) … Reason(***con***$_m$, ***not_conclusion***)
  Outweighs({***pro***$_1$, …, ***pro***$_n$}, {***con***$_1$, …, ***con***$_m$}, ***conclusion***)
  → ***Conclusion***

con: (Reason(***con***, ***not_conclusion***) ¬ ***con*** = ***con***$_1$ … ¬ ***con*** = ***con***$_m$)

The first means that, if the condition of a formal rule (representing a rule or principle) is satisfied and there is no exception to the rule, then the (state of affairs expressed by the) condition of the rule is a reason for the (state of affairs expressed by the) conclusion. If the condition of a rule is satisfied and there is no exception to the rule, we say that the rule applies. The second means that, if there are reasons for some conclusion that outweigh certain reasons against it, the conclusion follows, unless a reason against the conclusion is not considered in the weighing.

In Reason-Based Logic, reasons for a conclusion with reasons against its opposite are not distinguished. Therefore, in the axioms above, ***conclusion*** and ***not_conclusion*** correspond to opposite literals.

The following are some axioms of a more auxiliary nature:

¬ ***pros*** = {} → Outweighs(***pros***, {}, ***conclusion***)

Reason(***reason***, ***conclusion***) → ***Reason***

Reason(***pro***, ***conclusion***) Exception(rule(***pro***, ***conclusion***))
  → Valid(rule(***pro***, ***conclusion***))

Outweighs({***pro***$_1$, …, ***pro***$_n$}, {***con***$_1$, …, ***con***$_m$}, ***conclusion***)
  → Valid(rule(***pro***$_1$, ***conclusion***)) … Valid(rule(***pro***$_n$, ***conclusion***))
    Valid(rule(***con***$_1$, ***not_conclusion***)) … Valid(rule(***con***$_m$, ***not_conclusion***))

The first says that a non-empty set of reasons outweighs an empty set (denoted {}). The second says that a state of affairs is only a reason if it obtains. The third says that reasons can only arise from (valid) rules, and that only (valid) rules can have exceptions. The fourth says that only reasons that arise from rules can be weighed.

This ends the admittedly dense survey of (a variant of) Reason-Based Logic, as used in this paper. For details, the reader can consult for instance Hage and Verheij (1994).

[16] We have used the usual conventions to reduce the number of brackets in logical formulas.

4 Rules and principles in Reason-Based Logic

We now come back to our integrated view on rules and principles, as introduced in section 2. Recall that our view was based on the two assumptions that both rules and principles give rise to reasons if they are applied, and that the differences between reasoning with rules and reasoning with principles result from different types of relationships with other interfering rules and principles.

We will first discuss our basic example of the role of the relationships between rules and principles, namely a rule with underlying principles (section 4.1).[17] Then we come back to the differences between rules and principles as discussed in section 1 (section 4.2).

4.1 A rule and its underlying principles

In section 2.1, we discussed the legal rule that sale of a house should not terminate an existing rent contract. This rule can be represented in Reason-Based Logic as follows:

(1) Valid(rule(sale_house,
ought_to_be_done(continuation_contract)))

We considered two principles underlying this rule, namely a pro-principle that somebody who lives in a house should be protected against measures that threaten the enjoyment of the house, and a con-principle that contracts only bind the contracting parties. These principles can be represented as RBL rules as follows:

(2) Valid(rule(protects_inhabitants(***act***),
ought_to_be_done(***act***)))
(3) Valid(rule(¬ party_bound_by_contract,
¬ ought_to_be_done(continuation_contract)))

The fact that these principles underlie the rule (1) is represented using a two-place predicate Underlies(***rule***$_1$, ***rule***$_2$), as follows:

Underlies(rule(protects_inhabitants(***act***),
ought_to_be_done(***act***)),
rule(sale_house,
ought_to_be_done(continuation_contract)))
Underlies(rule(¬ party_bound_by_contract,
¬ ought_to_be_done(continuation_contract)),
rule(sale_house,
ought_to_be_done(continuation_contract)))

The rule and its underlying principles are schematically shown in Figure 7.

[17] The formalization of the example is similar to that of Verheij and Hage (1994). See note 3 and 4.

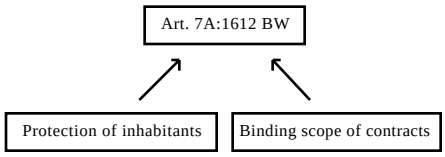

Figure 7: The rule of Art. 7A:1612 BW and its underlying principles

If a house with renting inhabitants is sold, the two principles lead to conflicting reasons, since continuation of an existing rent contract protects the inhabitants of a house, while the new owner is not bound by the contract. We have:

Protects_inhabitants(continuation_contract)
¬ Party_bound_by_contract

and therefore the two RBL rules (2) and (3) lead to the conflicting reasons:

Reason(protects_inhabitants(continuation_contract),
    ought_to_be_done(continuation_contract))
Reason(¬ party_bound_by_contract,
    ¬ ought_to_be_done(continuation_contract))

By making the legal rule (1), the legislator has however balanced the conflicting principles, and decided how the reasons generated by them should be weighed against each other. Therefore, if we have the fact

Sale_house

the rule (1) should lead to the conclusion

Ought_to_be_done(continuation_contract)

without the interference of the two underlying principles: the rule (1) replaces its underlying principles if it applies (see section 2.1), and the two principles should not lead to reasons. The required situation is shown in Figure 8.

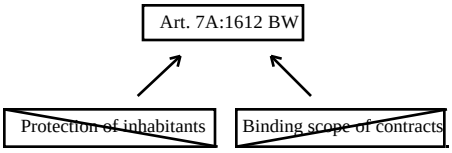

Figure 8: The rule of Art. 7A:1612 BW replaces its underlying principles if it applies

In Reason-Based Logic, replacement can be modeled using exceptions to rules. We need the following rule:

(4) Valid(rule(underlies(***rule***$_1$, ***rule***$_2$) applies(***rule***$_2$),
    exception(***rule***$_1$)))

Here Applies(rule(***condition***, ***conclusion***) is an abbreviation of ***Condition*** ¬ Exception(***condition***, ***conclusion***). Since we can conclude

Applies(rule(sale_house,
ought_to_be_done(continuation_contract)))

we find:

Exception(rule(protects_inhabitants(continuation_contract),
ought_to_be_done(continuation_contract)))
Exception(rule(¬ party_bound_by_contract,
¬ ought_to_be_done(continuation_contract)))

The principles (2) and (3) do not anymore lead to reasons. As a result, the rule (1) leads without interference to the conclusion:

Ought_to_be_done(continuation_contract),

just as required.

4.2 The differences between rules and principles

We can now finish the discussion of our integrated view on rules and principles, as represented in Reason-Based Logic. Just as in the case of a rule that replaces its underlying principles, a typical rule is an RBL rule that makes any interfering rule or principle not apply. A typical principle is an RBL rule that does not make any of the interfering rules/principles not apply. Interfering rules and principles are typically rules and principles with equal or opposite conclusion. This is in line with our two main assumptions:

- Both rules and principles give rise to reasons if they are applied. The difference between the two is that an applying rule not only generates a reason for its conclusion, but also makes the principles it replaces not apply.
- The differences between reasoning with rules and principles result from different types of relationships with other rules and principles, that can interfere with it: Rules make interfering rules and principles not apply, while principles lead to reasons that are weighed in case of a conflict.

It is clear that in this view there is no clear border between rules and principles. For instance, an isolated rule cannot be distinguished from an isolated principle. Only if there are interfering rules and principles, gradual differences can be seen. On the one end there is the typical principle that, if it applies, does not make any of the rules and principles that interfere with it not apply. On the other end there is the typical rule that, if it applies, makes all interfering rules and principles not apply. In between these two extremes there are many degrees of hybrid rules/principles, some more principle-like, others more rule-like.

In section 1, we discussed three differences between rules and principles. We discuss what remained of them in our integrated view. First it seemed that rules lead directly to their conclusion if they apply, while principles only lead to reasons that then have to be weighed. This difference has disappeared since in our view both rules and principles

generate reasons. Therefore both rules and principles first only lead to reasons that then are weighed. Nevertheless also in our view rules *seem* to lead directly to their conclusion. This is the result of the fact that in the case of an applying rule no weighing of reasons is necessary since no interfering rules and principles apply. As a result, the step from reason to conclusion is trivial and immediate.

Second it seemed that conflicting rules lead to a contradiction if they apply, while conflicting principles only lead to conflicting reasons. In our representation, no true contradiction can arise by the application of rules with opposite conclusions, since rules just like principles only generate reasons. Moreover if an apparent rule gives rise to a reason that conflicts with another reason, this is a sign that it is *not* a typical rule, but somewhat more principle-like.

Third it seemed that rules seem to lead to their conclusion in isolation, while principles do not, since additional relevant reasons arising from other principles can influence the result of weighing. In our view, this is beside the point since rules do not differ from principles in isolation. The rule-like character of a rule can only be appreciated if there are interfering rules or principles.

5 Conclusion

In this paper, we claimed that the differences between reasoning with rules and principles, as for instance put forward by Dworkin (1978), are merely gradual, and do not require a strict logical distinction between rules and principles. We have supported our claim by giving a formal elaboration using the logical tools for the representation of rules with exceptions and the weighing of reasons, as provided by Reason-Based Logic.

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References

Bench-Capon, T.J.M., and Coenen, F.P. (1992). Isomorphism and legal knowledge based systems. *Artificial Intelligence and Law*, Vol. 1, pp. 65-86.

Bench-Capon, T.J.M. (1995). Argument in Artificial Intelligence and Law. *Legal knowledge based systems. Telecommunication and AI & Law* (eds. J.C. Hage, T.J.M. Bench-Capon, M.J. Cohen and H.J. van den Herik), pp. 5-14. Koninklijke Vermande, Lelystad.

Dworkin, R. (1978). *Taking Rights Seriously. New Impression with a Reply to Critics.* Duckworth, London.

Haack, S. (1978). *Philosophy of logics.* Cambridge University Press, Cambridge.

Hage, J.C. (1991). Monological reason based reasoning. *Legal knowledge based systems. Model-based legal reasoning* (eds. J.A. Breuker, R.V. de Mulder and J.C. Hage), pp. 77-91. Vermande, Lelystad.

Hage, J.C. and Verheij, B. (1994). Reason-based Logic: a logic for reasoning with rules and reasons. *Law, Computers and Artificial Intelligence*, Vol. 3, No. 2/3, pp. 171-209.

Loui, R.P., and Norman, J. (1995). Rationales and Argument Moves. *Artificial Intelligence and Law*, Vol. 3, pp. 159-189.

Pollock, J.L. (1987). Defeasible reasoning. *Cognitive Science*, Vol. 11, pp. 481-518.

Prakken, H. (1993). *Logical tools for modelling legal argument*. Doctoral thesis, Free University, Amsterdam.

Prakken, H., and Sartor, G. (1995). On the relation between legal language and legal argument: assumptions, applicability and dynamic properties. *The Fifth International Conference on Artificial Intelligence and Law. Proceedings of the Conference*, pp. 1-10. ACM, New York (New York).

Soeteman, A. (1991). Hercules aan het werk. Over de rol van rechtsbeginselen in het recht. *Rechtsbeginselen*, pp. 41-56. Ars Aequi, Nijmegen.

Toulmin, S.E. (1958). *The uses of argument.* University Press, Cambridge.

Verheij, B. (1995). Arguments and defeat in argument-based nonmonotonic reasoning. *Progress in Artificial Intelligence. 7th Portuguese Conference on Artificial Intelligence (EPIA '95; Lecture Notes in Artificial Intelligence 990)* (eds. C. Pinto-Ferreira and N.J. Mamede), pp. 213-224. Springer, Berlin.

Verheij, B., and Hage, J.C. (1994). Reasoning by analogy: a formal reconstruction. *Legal knowledge based systems. The relation with legal theory* (eds. H. Prakken, A.J. Muntjewerff and A. Soeteman), pp. 65-78. Koninklijke Vermande, Lelystad.

Vreeswijk, G. (1993). *Studies in defeasible argumentation*. Doctoral thesis, Free University, Amsterdam.

Yoshino, H. (1995). The Systematization of Legal Meta-inference. *The Fifth International Conference on Artificial Intelligence and Law. Proceedings of the Conference*, pp. 266-275. ACM, New York (New York).