for attempted homicide. Then the following holds under English in the time when Roger Smith was good law, and under contemporary German law:
English (E): S attempted intentionally to kill D.
German (G): S versuchte vorsätzlich, D zu töten.

Again from a comparative perspective, we might be tempted to assume that both systems are sufficiently similar. Direct translation fails often even if the systems are virtually identical from a legal perspective. If it is possible, as in the case at hand, we have at least a strong presumption for deeper similarity. Logical analysis now shows that both sentences have a different logical deep structure. From E, we can infer that D exists. Otherwise, the attempt would have been impossible. Under German law, no such inference is possible. Both systems require the belief to violate a norm. But what exactly does that mean? From a logical point of view, both sides have something to say: the Lords obviously intend a *de re* reading of belief and attempt. To use Quine's proposal for a *de re* paraphrase: in order to be culpable of attempted murder, you must believe *of* somebody that your actions are likely to kill him (see Quine 1956). Admittedly, the paraphrase is much less natural for the attempt predicate proper. But there is an old usage of attempt, as in "the army made an attempt on the fortress", which is obviously *de re* and referential. German law, and the British critics of the Law Lords, prefer a *de dicto* reading: it is enough that I believe "I kill John", no matter if John really exists. And it is sufficient that I believe that the goods in front of me are stolen, whatever their legal status might be in reality. This mirrors Williams' remark quoted above: For this position, the only relevant facts can be found in the villain's mind. Informally, we can see already that both sides are equally right and wrong. Outside the legal field, there are plenty of natural language examples that show that *both* readings are possible. Columbus clearly believed that America was an Asian island, even if we do not find (the word, concept, propositional type?) "America" in his head. Substitution of "America" for co-referential expressions is possible: he equally believed of the second largest continent that it were an Asian Island. In this sense, the Lords are immune from William's criticism: it is acceptable and sometimes necessary to keep both in mind, internal contemplation and external facts. On the other hand, Pizarro believed to find his luck in El Dorado. And here, substitution of "El Dorado" for a co-referential place is impossible. He did not believe for instance to find his luck in Walhalla.

I propose a logic with mixed quantifiers, which follows, more in spirit than in words, ideas developed by Leśniewski. Leśniewski's determined nominalism resulted in a rejection of the referential interpretation of quanti-

fiers. Names for non-existing objects, or "meaning" in the form of linguistic entities however can be freely added to the universe of discourse. Already Ajdukiewicz saw the potential of this approach for the analysis of intensional contexts, and refined Leśniewski's ontology to take the distinction between real and intentional objects into account (cf. Dolling, 1995). I will return to the similarities between the solution proposed here and the Ajdukiewicz-Leśniewski formalism after I have introduced an outline of a logic, which I think can make the differences between German and English, law transparent. Alethic, deontic and epistemic expressions are interpreted as predicates, not as operators. Modal predicates take a special kind of structured objects, sentences, as their arguments. The resulting logic has much in common with quotational approaches to epistemic logic, even if no quotation function is introduced explicitly.[7] Each predicate carries a type $\tau =$ "$\bullet$" or "$\circ$", indicating whether its argument position is interpreted referentially ($\bullet$) or substitutionally ($\circ$). Correspondingly, we distinguish *de re* and *de dicto* variables $x^{\bullet}$ and x°. *De dicto* variables correspond closer to Leśniewski's uniform variables. Consequently, a sentence of the form $\exists x^{\circ} P^{\circ} x^{\circ}$ is true if we can find a name which when substituted for the bound variable yields a true sentence.[8] The predicate P could stand for instance for the property of being mystical. If the name "Santa Claus" is in our universe of discourse, the sentence is true. Since identity is of the *de re* type, it is in particular not possible to express the idea that Santa Claus is also the person which comes once a year through the chimney. Speculations about attributes of the object *commonly* associated with Santa are neither necessary nor possible in this framework. Since it depends on the type of the predicate whether a certain parameter is interpreted referentially or substitutionally, irreferential expressions are allowed. Like Leśniewski's ontology, the result is a free logic. Following an idea by Dunn and Belnap (1969), I use the signs of the object language autonomously and I do not restrict the substitution to proper names, but include other entities, most notably sentences, as substitutes. Again, this is in line with Leśniewski's treatment of quantification.[9] Sentences are structured objects in our universe of discourse, and to some extend, they violate the principle of compositionality.[10] If they occur as sub-

[7] On quotational approaches cf. Wray, 1987 p. 77–110.

[8] Cf. Kotarbiński 1966, p. 190.

[9] See Leśniewski 1929, p. 12. Cf. also Srzednicki and Rickey 1984.

[10] Therefore, typical objections against the related quotational approach to belief as expressed by e.g. Cresswell 1980 do not apply.

stitutes in *de dicto* positions, then the truth-value of the complex sentence is not determined by the values of the constituents of this sentence-object. But they are structured, and therefore, quantification into these sentence objects is possible.[11]

The reason to formalise modal expressions as predicates, and to avoid the normal operator based approach, is one of ontological commitment. Not because of any philosophical prejudices by the author, but because of the methodological requirements of a comparative approach. Legal language is not philosophically innocent. Legal doctrine, through various forms of interaction between the disciplines, embodies the philosophical wreckage of centuries. A comparative analysis must be true to these influences. But philosophical ideas influenced different legal systems in different ways, and sometimes even different parts of the same legal system differently. The English law against fraud for instance displays similar examples of modal arguments. It is prohibited to make you believe that I am Bill Gates, if I abuse your mistake for borrowing money from you. Apparently, this is not at all the same (in law) as making you believe that I am filthy rich. Strange creatures inhibit the world of English fraud law, for instance the non-existent banker who backs a fraudulent investment scheme. And legal debate, Quine notwithstanding, will have to address the question whether this non-existent banker has certain necessary and certain contingent properties. Nothing comparable happens in the discussion about impossible attempts. Possible worlds seem absolutely appropriate to analyse *this* part of legislation. On the other hand, it is also a highly contested part of English criminal law, and it is not at all clear whether it is consistent with the more general deliberations about intent and belief which concern us here. To be able to preserve this distinction, the approach proposed here sacrifices neatness of the formal meta-theory for ontological puritanism.

The working of this formalism is best understood if we look at some examples. In our example above, we had the situation that a person, let his name be John Doe, wants to kill another person, John Dee, whom he suspects to be a rival. He has carried out everything necessary for the preparation of his evil deed, when he is apprehended by the police. To ensure conviction, both in Germany and Britain, it must be ascertained that Doe believed that his actions, if uninterrupted, would result in the killing of Dee. "Murder", in its normal usage, is both referential and extensional. You kill only existing people, and if you were to kill the only German in the Law Fac-

[11] A similar understanding of complex substitutes was proposed in Haack 1974.

ulty of Edinburgh University, you would also kill me. This fact is therefore formalised with *de re* predicates, as

$$M^{\bullet\bullet}(a,b)\,. \tag{1}$$

Here, the *de re* types guarantee that both argument positions are interpreted referentially.

Doe now forms a belief about this sentence. As indicated above, sentences are treated as complex objects that can occur at *de dicto* argument positions. Unsurprisingly, the belief predicate has in its second position a *de dicto*-type.

$$B^{\bullet\circ}(a, M^{\bullet\bullet}(a,b)) \tag{2}$$

with B – believes; M – murders; a – John Doe; b – John Dee.

Admittedly, this is for a number of reasons not a very convincing formulation, if only for the occurrence of "a" within the that-complement. Doe is not very likely to refer to himself using his proper name. But for the purpose of this exercise, it will do. It is not very likely that we will learn more about the relevant legal doctrines by getting a better understanding of the logic of personal pronouns. Offenders with multiple personality disorder could pose a problem, but they will generally not incur criminal liability at all.

Formulation (2) leaves it open whether John Dee exists. In our fictitious example above, the only knowledge Doe has about his assumed rival is his name, which he found in a letter by his wife. (2) now holds true for two possible endings of our sad little story. According to the first, there is indeed a John Dee who has an amorous affair with Doe's wife. Dee believed that his actions were likely to kill him, and we get liability for attempted homicide in both German and English law. That a name occurs at a *de dicto* position does not necessarily mean that it is irreferential. But (2) would also be true if the following were the case. Doe's wife, deeply unhappy with her marriage with her jealous husband, asks an agony aunt for advice. In fear that the letter might get published, she changes the names of the persons involved, and in particular, she refers to her husband under the alias "John Dee" — and to spare embarrassment to third parties, she makes sure that nobody else has this name. (2) is still true, the inference of "There is someone whom Doe wants to kill" is blocked. Furthermore, *de dicto* positions are referentially opaque, and therefore, no substitution of "John Dee" by "invented Person" or indeed "John Doe" would be possible in this situation. If a legal system links punitive sanctions to one's belief that one's actions result in the violation of a norm, *and* if belief is understood as in (2), then

the question whether the person or thing threatened by one's illegal actions actually exists is legally irrelevant. This is now indeed the situation under German law, where Dee would face prosecution for attempted murder in *both* variations of the story. Secondly, we note that it *is* possible to quantify into the *de dicto* position in (2) — as long as we use *de dicto* variables. This is necessary since legal norms are usually formulated in general terms and cover typically more then one situation. In the present situation, this means that we can express ideas as:

$$\exists x^{\circ} B^{\bullet\circ}(a, M^{\bullet\bullet}(a, x^{\circ})) \tag{3}$$

A more complete natural language version of (2) would be: John Doe believes to kill John Dee-*de dicto*, i.e. something under the description "John Dee". (2) then expresses the idea that Doe believes under some description that he is going to murder someone. In this form, it is suitable for the antecedents of a general legal norm, for instance

$$\forall y^{\bullet}(\exists x^{\circ} B^{\bullet\circ}(y^{\bullet\bullet\bullet}, M^{\bullet\bullet}(y^{\bullet}, x^{\circ})) \rightarrow A y^{\bullet}) \tag{4}$$

with A – Guilty of attempted murder

Since modern criminal law convicts only existing people, the subject position is *de re*.[12] Note however that the second occurrence of "y" is still in a *de dicto* position. It depends entirely on the predicates, and not on any stipulated identity criteria for intensional objects, if substitution is admissible. Obviously, (3) holds also true in the case of Roger Smith. According to the analysis developed so far, he believed to handle stolen corned beef-*de-dicto*, the fact that is was not-stolen-*de-re* notwithstanding. And there is no doubt that he would have been convicted for attempting to handle stolen goods under German law.[13] Consequently, (4) cannot be a rule of the English legal system.

The Law Lords apparently had a *de re* reading in mind. Two things must be guaranteed here. The first is relatively simple: we must make sure that we can infer from the belief to kill "a" the existence of "a". Secondly, and this will be the more difficult part, we must assure that the perpetrator

[12] This is not trivial! Medieval law would sometimes convict "demons" who had taken over animals. The animal was destroyed, but the demon convicted.

[13] Cf. e.g. K. Geppert , "Zum 'error in persona vel objecto" und zur 'aberratio ictus', insbesondere vor dem Hintergrund der neuen 'Rose-Rosahl-Entscheidung'" in: Jura 1992, p. 163. C. Prittwitz, "Zur Diskrepanz zwischen Tatgeschehen und Tätervorstellung" in: Goltdammer's Archiv für Strafrecht 1983, p. 110 (zit.: GA, Jahrgang, Seite).

refers to his object under a legally relevant description. One first attempt of a formal version could look like this:

(5) $$\exists x^{\circ}(x^{\circ} = b \;\&\; B^{\bullet\circ}(a, M^{\bullet\bullet}(a, x^{\circ})))$$

b – John Dee.

A natural language translation of (5) would be: John Doe believes of Dee that his bomb is going to kill him. The existence of John Dee is here guaranteed by the *de re* identity outside any *de dicto* type. This shows one of the main differences between the proposal here and similar attempts to interpret belief substitutionally. It is possible to quantify with *de dicto* quantifiers into *de re* position, and the variable is then interpreted *referentially*. Again this expresses the idea that it depends on the predicate, not on any abstract considerations about the identity of intensional objects, how variables are to be interpreted. (5) might still be too weak. It requires only that Doe believes of Dee *under some description* that he kills him. In cases of mistakes however, the description might be legally relevant. I shoot at the source of noise in a bush (believing maybe that it is deer). In fact, that source of noise is the local game warden. According to (5), I believed (and therefore attempted) to shoot the local game warden. This is indeed under both legal systems a relevant mistake that would — given that the mistake was not unreasonable — exclude liability. A very strict requirement would demand that I could identify the object *de re* as the one described *de dicto*. Put it differently, I have to know the warden as the source of noise, or formally:

(6) $$\exists x^{\circ}(x^{\circ} = b \;\&\; B^{\bullet\circ}(a, M^{\bullet\bullet}(a, x^{\circ})) \;\&\; K^{\bullet\bullet\bullet}(a, x^{\circ}, b))$$

This seems to be indeed a more accurate description of what the Lords had in mind. It guarantees the existence of the object of the criminal act, and it guarantees that my intent to violate the norm was formed in a relevant way. To some extend, it begs the question, of course. "Knowing-as" is at least as problematic as "believe".

It is now time for a short summary. We started with natural language expressions, which superficially seemed to be perfect translations of each other. It turned out that hidden under this superficial similarity, there are considerable differences in logical structure. "Smith believed to handle stolen goods" could mean either believed-*de re*, (the English version), or believed *de dicto*, preferred reading of the German criminal law.

Smith believed to handle stolen goods

$$B^{\bullet\circ}(s, H^{\bullet\bullet}(s, b))$$

(German law, and the case in the historical example.)

$$\exists x^{\circ}(x^{\circ} = b \;\&\; B^{\bullet\circ}(a, M^{\bullet\bullet}(a, x^{\circ})) \;\&\; K^{\bullet\bullet\bullet}(a, x^{\circ}, b))$$

(English law, and *not* the case in the historical example.)

A meaning postulate which captures the usage of the belief predicate in both examples could be the following: $B^{\bullet\circ}(s, H^{\bullet\bullet}(s, b))$ means that s would (under sufficiently ideal conditions, after enough time of consideration) accept a translation of the sentence "$H^{\bullet\bullet}(s, b)$" into his mental language as sufficiently certain. This would mirror the legal requirements: the court procedures guarantee (ideally) sufficient time and information, and the legal requirement demands only "without any reasonable doubt" and leaves room to ignore particularly eccentric idiolects.

I will try at the end of this paper to give some tentative informal evaluation of these findings.

Firstly, however, we must look at some complications of the picture developed so far. One of the features of *de dicto* belief is that it takes referential opaqueness seriously. It is generally not possible to substitute expressions in *de dicto* positions for co-referential, or indeed co-intensional descriptions. Furthermore, it is not a logical requirement of the system that believes are consistent or closed under deduction. It is, at least in principle, possible that $B^{\bullet\circ}(s, a = b)$ and $B^{\bullet\circ}(s, a \neq b)$ are both true for the same person s.

As was noted above, early German doctrine came to the same conclusion as the Law Lords in Roger Smith. But the reasoning was nonetheless significantly different. With some amendments, the proposed formalism is able to capture some of these differences. British doctrine focused on the notion of impossibility. To attempt the impossible is not prohibited. Again, both legal systems would agree with the natural language expression. And again, they show the same systematic differences to disambiguate this sentence. German law requires again that the impossibility of the act is something that the actor believes, the sentences occurs within the scope of the belief predicate. Our chosen solution can formalise this idea without having to extend the logic. *Imp*, *nec* and *poss* are again *de dicto* predicates, and the complex sentence can therefore occur at the argument position of the *de dicto* belief-predicate.

(7) $$B^{\bullet\circ}(a, Imp^{\circ}(M^{\bullet\bullet}(a, x^{\circ})))$$

This is simply derived from sentences of the form (2) above, the general form for believe sentences. But (7) *excludes* liability. If we wanted to make general statements about this rule-exception structure, which is typical for legal doctrine, we would have to extend our formalism. Leśniewski allowed

quantification into the predicate position of sentences as well, and a very natural extension of the logic proposed here offers the same possibility.[14] With this devise, we could express the idea that certain properties of our belief sentence might exclude criminal liability, without having to specify these predicates.

English law behaves again strictly symmetrical. (5) was the corresponding belief-sentence to (2) for English law. The doctrine of impossible attempt requires only that a certain act is impossible *de re* (as far as the belief-predicate is concerned). Hence we get the corresponding formula for (7) as

(8) $$\exists x^{\circ}(x^{\circ} = b \;\&\; Imp^{\circ}(M^{\bullet\bullet}(a, x^{\circ})) \;\&\; B^{\bullet\circ}(a, M^{\bullet\bullet}(a, x^{\circ})))$$

Again, predicate quantification could help us to express that this is the general exception condition for *all* offences, not only murder. Note that "impossibility" has been formalised as a *de dicto* predicate. States of affairs are impossible under (due to) a description. This is closely in line with the results from the legal debate. The distinction between possible and impossible offences, introduced by the Lords in the form of the list quoted above, was immediately criticised as entirely arbitrary. It was pointed out, rightly so it seems to me, that it is possible to transform all cases of possible attempt into cases of impossible attempt (and vice versa) by changing the description of the case. Attempted murder (2) above becomes an impossible attempt, because I could not possibly have shot my victim with *this* gun. Impossible attempt (f) above becomes a possible attempt, because I could have chosen different food.[15] There are several proposals in the literature to find a distinction between possible and impossible attempts which is true to the spirit of the Lords, but less arbitrary and not description sensitive. So far, these attempts have failed.[16] More recently, Duff tried to take these failures serious. He proposes a solution that explicitly quantifies over possible descriptions. If we extend the formalism as indicated above and allow quantification of predicates, it seems possible to give a formal account of this solution (Duff 1995).

So far, we ignored deontic modalities in our account. They were however the staring point for Binding's analysis. English and German law alike require an "intent to commit an offence". Belief that one's actions constitute a breach of a law is part of this requirement. Again, this formulation is

[14] Cf. Wojciechowski 1994, p. 165–200.

[15] Cf. Williams 1978, p. 397.

[16] For a good overview cf. Simons 1990.

ambiguous. It could mean that I consciously commit an act that is in fact prohibited, but neither do I know necessarily about this prohibition, nor is my description of the act necessarily the same as the one chosen by the criminal law. More concretely: I will typically only know that I'm just about to kill someone, not necessarily that in doing so I also violate Art 212 of the German Criminal Code. Alternatively, we can require that a potential perpetrator knows about the legal status of her actions and describes them in the terminology of the criminal law. Unsurprisingly, we find the same pattern that we have encountered so far. German law opts for a reading with the belief predicate at the leftmost position, and all other modalities embedded.

(9) $$B^{\bullet\circ}(a, Prohb^{\circ}(M^{\bullet\bullet}(a, b)))$$

Prohb – It is prohibited that[17]

English law opts again for the rightmost reading of the belief-predicate, and we get

(10) $$\exists x^{\circ}(Prohib^{\circ}x^{\circ} \;\&\; B^{\bullet\circ}(a, C^{\bullet\bullet}(a, x^{\circ})))$$

C – Commits.

(10) expresses the legal doctrine: error iuris non nocet — ignorance of the law is no excuse. It is under German law. Or rather would be, if German law would not impute the belief expressed by (9) unless proven otherwise.[18] Apparently, German law adopted here for reasons of conceptual consistency some pragmatic amendments to the general rule. (9) requires that every offender has intimate knowledge of the criminal law. He must not only know that his actions are prohibited, but he must also use legal vocabulary to describe his actions. Remember that the *de dicto* predicate "prohibited" induces referential opacity. The relevant legal doctrine is the "parallel evaluation by the layman". This mean that factual premises have to be added, contingent e.g. upon education and intellect of the accused, to move from the description with which he describes his act, to the equivalent description of the criminal law. But these are factual premises and open to proof and refutation.[19] Even if nothing more is at stake than to move from: *A* believed to kill *B* (using his own expression "kill") to: *A* believed to murder *B*. No

[17] (9) expresses only a's belief that murder is prohibited for him. This might be the most general form of the legal rule that we can get, because a must not belief that a legally recognised exception applies to him.

[18] Cf. Krueger 1994, p. 37.

[19] This supports a claim made in Lycan 1979 against Quine.

other from of substitution of co-intensional expressions inside a "$\circ$" type is possible.

Analogously, we can differentiate offences of full "mens rea", where the entire norm content occurs inside the scope of the *de dicto* predicate "prohibited", from offences of "half mens rea".[20] The criminal law norm: "It is prohibited to kill policeman" can then be read either as

$$P^{\circ}(\forall x^{\circ} O^{\bullet} x^{\circ} \rightarrow M^{\bullet} x^{\circ}) \tag{11}$$

P – prohibited; O – policeman; M – murder.

Where the relevant belief to constitute (at least) an attempted crime requires the (possibly mistaken) belief to kill someone whom you belief to be a policeman or as

$$\forall x^{\circ} O^{\bullet} x^{\circ} \rightarrow P^{\circ}(M^{\bullet} x^{\circ}) \tag{12}$$

where it is necessary and sufficient for the prosecution of anyone violating this norm that the victim is in fact a policeman, even if the offender does not know this.

Note that the "norm content sentence" in (11) (that is the part after the predicate P) is a complex object. This means firstly that the "$\rightarrow$" does not function as a truth functional connective. The usual problems of the material implication in norm sentences do not occur.[21] Secondly, I follow again Leśniewski and leave the ontological status of this object open. The names that are substituted for variables do not "loose" the objects they refer to. Only this reference is irrelevant for the logical rules. It is possible, but not necessary to interpret it as a sentence. It is equally admissible to interpret it intuitively as any other object that is determined up to linguistic description, e.g. as an event or an action.[22]

3. Outline of the formalism

For the purpose of this paper, I will give only a very short version of the formal semantics, insofar it deviates from classical logic.

As primitive symbols, we have the logical constants $\neg$, $\&$, $\forall$, $=$ (identity is of type $\bullet$); infinitely many *de re* (object) variables: x, y, z, z_1, ...; infinitely

[20] For the distinction in English criminal law doctrine cf. Williams 1978, p. 51.

[21] Haage in 1997 proposes a similar interpretation of legal rules as sentences-like objects, but for entirely different reason.

[22] Cf. Küng, Canty 1970, p. 178, 181.

many *de dicto* (expression) variables: x°, y°, z°, z_1°, ...; infinitely many object parameter: a, b, c, a_1, ...; and infinitely many predicate parameter for each type $t = t_1, \ldots, t_r$ and $t_i =$ "$\circ$" or "$\bullet$" with "$\bullet$" marking *de re* and "$\circ$" marking *de dicto* argument positions.

The *terms* of L in basic notation (BN) are the *de re* and *de dicto* variables, and the object parameters.

The formulas of L in BN are either elemental or complex. Elemental formulas are

$$t_1 = t_2, \qquad P, \qquad X, \qquad P^{\tau_1 \ldots \tau_r}(e_1, \ldots, e_r), \qquad X^{\tau_1 \ldots \tau_r}(e_1, \ldots, e_r)$$

so that t_1, t_2 are terms in BN and for $i = 1, \ldots, r$:
a) if $t_i = \bullet$ then e_i is a term in BN,
b) if $t_i = \circ$ then e_i is a (possibly defined) term without free *de re* variables.

Then $Pe_1 \ldots e_r$ is called a formula which is free for exactly those variables where the e_1, ..., e_r are free.[23]

The condition for complex formula of L is:

Let A, B be formulas in BN, v be a *de re* or *de dicto* variable. Then $\neg A$, $A \,\&\, B$, $\forall v A$ are formulas in BN (sentences are as usual formulas without free variables).

We have the usual definition for $\forall$, $\rightarrow$, $\leftrightarrow$, $\vee$ and definite descriptions.

4. Semantics

A universe for L is an arbitrary set D. For each $d \in D$ we assume a fictitious object name $\boldsymbol{d} \in \boldsymbol{D}$ which is either an object parameter of L or a new symbol which is not element of L. $\boldsymbol{D}$ be the set of these names. We get the formulas and terms of L_D from the terms and formulas of L by substituting object names for one or more free object variables (the additional names are not part of the language of L but of the interpreted language QDL_φ. They are meta-theoretical tools to simplify the semantic rules for the quantifiers. Therefore, they do not appear in *de dicto* positions, where the linguistical forms of the expressions *as used by a speaker* play a role). Expressions without object names are called pure expressions.

Unlike in standard interpretations, we do not interpret the predicate parameters, but the elemental *de re* predicates.

[23] Condition b) expresses the idea that you can not quantify with *de re* variables into *de dicto* contexts.

$Pe_1 \dots e_r$ be a pure formula in basic notation, P predicate parameter of type $t_1, \dots, t_r$, so that for each $i = 1, \dots, r$:

– if $t_1 = \bullet$ then e_i is the alphabetically first *de re* variable different from $e_1, \dots, e_{i-1}$,
– if $t_i = \circ$ then e_i is a pure description (parameter, definite description).

Let $x_1, \dots, x_k$ be the alphabetically first free *de re* variables in $Pe_1 \dots e_r$ $(0 \leq k \leq r)$. Then we call this formula an *elemental predicate* in $x_1, \dots, x_k$ and introduce the metatheoretical abbreviation E^k. From E^k we derive $En_1 \dots n_k$ by substituting terms n_i for x_i.

An *interpretation* for L over D is a function f that fulfils the four conditions:

(I1) $f(\boldsymbol{d}) = d$ for all $d \in D$,
(I2) $f(a) \in D$ for all parameters a,
(I3) $f(E^0) \in \{W, F\}$ for elemental predicates E^0 of arity 0,
(I4) $f(E^k) \subset U^k$ for each elemental predicate E^k of arity k.

The truth-values of elemental sentences are determined by the following rules

$$|a_1 = a_2|_f = \begin{cases} \mathbf{t} & \text{if } f(a_1) = f(a_2) \text{ and both exist} \\ \mathbf{f} & \text{otherwise} \end{cases}$$

$$|Ea_1 \dots a_k|_f = \begin{cases} \mathbf{t} & \text{if } \langle f(a_1), \dots, f(a_k) \rangle \in f(E^k) \\ \mathbf{f} & \text{otherwise} \end{cases}$$

From the rules for complex sentences, only the rules for quantification differ from the usual definitions, and are therefore given:

$$|\forall x Ax|_f = \begin{cases} \mathbf{t} & \text{if } |A\boldsymbol{d}|_f = \mathbf{t} \text{ for all } d \in D \\ \mathbf{f} & \text{otherwise} \end{cases}$$

$$|\forall x^\circ Ax^\circ|_f = \begin{cases} \mathbf{t} & |Ab|_f = \mathbf{t} \text{ for all pure descriptions} \\ & \text{(names and sentences)} \\ \mathbf{f} & \text{otherwise} \end{cases}$$

Again, place constraints prevent me from a more detailed analysis of the similarities and differences to Leśniewski's original approach. I think however that the reader sceptical about the interpretation of some of the formalisations will find it helpful to understand them with a "Leśniewskian mind-set". On of its distinguishing features is the possibility to quantify with *de dicto* variables, interpreted substitutionally, into *de re* positions.[24] The

[24] This distinguishes this approach e.g. from Barcan-Marcus 1972.

converse is not possible. My own approach started as a quotational approach to the analysis of belief, and was not able to give a convincing intuitive reading of what was introduced above as *de re* belief, and no convincing analysis at all of deontic modalities. The version of substitutional quantification proposed by Leśniewski seems to overcome these shortcomings. Unwarranted substitution and quantification is blocked, without a commitment to the precise status of the objects whose names are substituted. Quantification of the predicates finally seems to be the natural way forward to give a more general analysis of the general doctrine of attempts, which is independent from every concrete offence as murder or forgery.

5. Evaluation from a comparative perspective

What has our formal analysis told us so far? Firstly, we have seen that the legal dispute concerning the interpretation of attempt is not a dispute between a correct and an incorrect understanding of the belief-predicate, at least not as far as purely formal correctness is concerned. Secondly, we have seen how two different legal systems differed systematically in their understanding of some crucial legal modalities. (Modern) German law preferred consistently a *de dicto* understanding of belief, with the belief predicate if possible at the leftmost position and the other modalities embedded. English law after Roger Smith preferred consistently a *de re* reading of belief and tried to transpose the belief predicate to the rightmost position, other modalities if possible outside the scope of the belief-predicate. There are now a number of possibilities available to "exploit" theoretically these findings. At least it offers the possibility to ask new questions. So far, we concentrated on a very small segment of the criminal law. We could now ask the question if these regularities can be found in other parts of the criminal law as well, or maybe more interestingly, if private law follows the same patterns. Cross-border comparison between criminal and private law is something not normally envisaged by comparative lawyers, but the abstractness of a formal approach should allow to extend the analysis to this new field of research. Furthermore, it is possible to combine this approach with one of the rare existing attempts to develop a theoretical vocabulary for comparative law. Rodolfo Sacco introduced the notion of a "legal formant", apparently borrowed from comparative linguistics (Sacco 1991). He describes as a legal formant, the smallest parts of a legal system which "carries legal meaning". Unfortunately, and partly due to his informal approach,

he does not operationalise this notion. His examples are legal rules proper, and ill at ease with his theoretical explanation. As a result, the concept of a legal formant, while promising in principle, remains essentially vague. Our formalisations (2), (3), (5) and (6) could be understood as good candidates for "legal formants". They are not legal rules in themselves. The decision between one of the possible readings of "belief" and "attempt" is prior to any act of parliament. But added to the legal rules on attempt and intention proper, they determine the meaning of these rules and indeed the character of an entire legal system. The *laws* on attempt show considerable similarities in Germany and England, but the "legal formants", the structural dissimilarities, give the two systems almost opposite meanings, an internalistic and subjectivistic meaning under German law, an externalistic and objectivistic understanding in England. Furthermore, it is now possible to compare directly the formalised versions of the belief predicate, and interpret the findings. The concept of belief, which informed the decision in Roger Smith was at least in our analysis here formulated in terms of the *de dicto* interpretation, preferred by German law. It might be possible to draw conclusions for the translatability between the two systems. Finally, this comparison can be embedded into a broader epistemological setting. I have mentioned above that both German and English law started with a position according to which Smith was innocent, and reversed this later on into a position which finds him guilty of an attempted crime. If we compare the corresponding formulas which partly explain the meaning of the belief predicate, i.e. (3) and (6), it becomes obvious that the older formulation (6) is considerably more complex and difficult to read. On the other hand, the move from (6) to (3) also entailed that the "attempt" predicate could be attributed to more cases. Using vocabulary from Lakatos, it seems that to abandon Roger Smith and to move to a subjectivist reading of belief was both a theoretically and empirically progressive step (Lakatos 1974). It was theoretically progressive because it resulted in simpler laws, and it was empirically progressive, because more cases where captured under the new law. Formal methods can help us to understand better those features of legal development, which at least to a certain extent is independent from societal influences To understand and appreciate this "inner rationality" of law should make formal analysis worthwhile for the lawyer.

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