

THETA ROLES AND THE THEORY OF THETA-BINDING

PIOTR STALMASZCZYK

University of Łódź

1. Introduction

One of the main problems preoccupying researchers within the **Principles-and-Parameters** model of grammar (e.g. Chomsky 1986, 1993) is the adequate formulation of appropriate characteristics for systems of principles (i.e. modules) and establishing their mutual relations. The principles apply at various levels of representation: Binding, Case, the *pro* module apply at S-Structure; whereas the Projection Principle and the Theta-Criterion at D-Structure (cf. Chomsky 1993:20), etc.

The aim of this note is to discuss two modules which deal with structural positions: Theta theory and Binding theory.

2. Theta theory

In standard formulations of the Government and Binding theory (Chomsky 1981, 1986) Theta theory and Binding theory form two distinct systems of principles. **Theta principles** describe the semantic relations holding between arguments and predicates (*s-selection* in Chomsky 1986:86) syntactically implementing the lexical properties of heads.

Whereas the lexicon determines the theta-marking properties of lexical heads (predicators), theta theory is concerned with proper assignment of semantic roles by heads to their complements (in the sense of X-bar theory).

The fundamental principle of theta theory is the **Theta-Criterion**, a biuniqueness condition on theta-role assignment, which forces the requirements of the lexicon to be projected into the syntax. The standard formulation of the Theta-Criterion relates roles to arguments (Chomsky 1981:36):

- (1) **Theta-Criterion:**
Each argument bears one and only one theta-role, and each theta-role is assigned to one and only one argument.

An argument is an element with referential content; this notion includes ex-

pressions such as names, definite descriptions, variables, pronouns, lexical anaphors and the empty element PRO. A theta-role (θ -role) is a semantic argument of a predicate, it is the semantic dependency assigned by the lexical head, such as Agent, Theme, Patient, Source, Goal, etc.

2.1. Thematic roles

Thematic roles used by researchers in the GB framework originate from the early work connected with lexical semantics, especially Fillmore (1968) and Gruber (1965). Both Fillmore and Gruber postulate a finite set of underlying categories which serve to unite the semantic and syntactic levels.

For Fillmore (1968:20) it is **case** which is an “underlying syntactic-semantic relationship”. Cases can be identified both semantically and syntactically. The semantic identification proceeds through pointing to intuitive natural classes based on the way in which we conceptualize states and events, whereas the syntactic identification is done by showing covert grammatical distinctions in the ways in which nominals behave in the syntax. Fillmore (1968:24-25) suggests that the following cases exist: agentive, dative, instrumental, factive, locative, objective (sentential and nominal), benefactive and temporal.

Gruber (1965, 1976) proposed a set of **thematic relations**, originally based on verbs of motion. Working in the context of the Standard Theory, Gruber proposed a prelexical categorial structure deeper than the level of deep structure in syntax (Gruber 1976:2). This structure provides a base for the syntactic structure and at the same time provides the meaning relations between the parts of a sentence. The verb is the central element in the prelexical structure, other elements are given labels (roles) associated with particular verbs. The basic role is Theme, other labels include Location, Source, Goal and Agent. The system was further elaborated by Jackendoff (1972), and incorporated into the theta-theory module of the GB framework (cf. Chomsky 1981; Stowell 1981; Williams 1981). The following is a list of thematic relations developed by Jackendoff (1972) together with some later modifications and additions¹:

- (2) Agent – an NP expressing will toward the action;
- Theme – for verbs of motion: the moving object, for verbs of location: the thing which is located;
- Location – the NP (usually within a PP) expressing location;
- Source – the initial position of the Theme;
- Goal – the final destination of the Theme;
- Experiencer – the individual who feels or perceives the event;
- Percept – an entity which is experienced or perceived;
- Patient – an entity which undergoes an action;
- Instrument – the object with which the action is performed;
- Benefactive – the entity for whose benefit the event took place.

The Fillmore/Gruber/Jackendoff account is based on the following main assumptions:

- (3) a. Thematic relations are atomic labels;
- b. The labels are drawn from a fixed list;
- c. The labels are ordered in a hierarchy;
- d. The roles are linked to syntactic positions;
- e. Every argument has exactly one thematic role.

A different approach is advocated by Andrews (1985). He suggests that there are probably *infinitely many* semantic roles significant for a grammar of a language. The ones he mentions belong to two main groups: the **Participatory** roles (“borne by what one would think of as actual participants in the situation implied by the verb”, 1985:68), and the **Circumstantial** roles (“borne by entities that do not really participate, but instead form part of the setting of the event”, 1985:69).

There are two Participatory roles – Agent (vaguely characterised as a participant which the meaning of the verb specifies as doing or causing something, possibly intentionally) and Patient (a participant which the verb characterises as having something happen to it, and as being affected by what happens to it). The Circumstantial roles include Directional (Source and Goal), Experiencer, Recipient, Inner Locative, Theme, Causer, Instrumental, Reason, Benefactive, Outer Locative, Circumstantial Comitative, and Temporal.

Andrews (1985:70) stresses the fact that “no presently known system of semantic roles can be comprehensively applied in a convincing manner”. Nevertheless, various researchers have suggested that reference to θ -role labels is involved in the description of numerous linguistic phenomena: grammar of anaphora (Jackendoff 1972), theory of control (Jackendoff 1972), adjectival passive formation (Williams 1981), middle constructions (Roberts 1987), etc.

2.2. Problems with theta roles

There is, however, no consensus among linguists on the importance and contents of θ -roles, and some researchers seem to diverge from explicit reference to θ -role labels. This tendency is motivated by the fact that there appear not to exist any clear criteria for determining what θ -roles given arguments bear. For example, Hoekstra (1984:34) states that the specific content of notions such as Agent, Theme, etc., may be of some relevance for the ultimate semantic representation, but not for the purposes of sentence grammar. Also Zubizarreta (1987:12) arrives at a similar conclusion: “[...] substantive notions like *theme*, *patient*, *goal*, *experiencer* have no grammatical import: rules and principles of grammar are never formulated in terms of these notions.”

Jaeggli (1986:588) points to the frequent “indeterminacy surrounding the nature of the particular thematic role assigned to any particular argument”, and therefore he introduces the following symbols to cover the θ -roles (without attributing to them any theoretical significance):

¹ For a comprehensive overview of these issues see Levin (1985) and Rozwadowska (1992).

- (4) θ -s – represents the θ -role assigned to the subject of a predicate;
 θ -d – represents the θ -role assigned to the direct object of a predicate;
 θ -l – represents the traditional Location;
 θ -g – represents the traditional Goal, etc.

More recently, Rozwadowska (1989) proposes a feature-based approach to θ -roles. After analysing derived nominals, Polish impersonal constructions, Polish reflexive verbs, and binding of anaphora in experiential constructions, she comes to a conclusion that instead of treating θ -roles as discrete undecomposable atomic wholes, it is more appropriate to view them as bundles of features, such as [\pm sentient], [\pm cause], and [\pm change].

With features it is possible to account for a great deal of overlap among θ -roles, however, even a very small set of features can be combined in such a way that it produces definitions not corresponding to any attested roles. This is also true about the system devised by Rozwadowska – of the 9 possible feature combinations, two ([+sentient, –cause, –change] and [–sentient, +cause, +change]) seem not to define any known relations.

Still other researchers – Jackendoff (1987), Rappaport, Laughren and Levin (1988), and Zubizarreta (1987) – present several arguments against any usage and reference to the contents of θ -roles.

And so, Jackendoff (1987:378) argues that some concepts, though of the same formal type as Source or Goal, do not have any traditional label, such as the role of the object NP of the verb *pass* in (5):

- (5) John passed *the house*.

Also the direct object NPs of *jump*, *approach*, *pierce* in sentences (6) have no standard names for their θ -roles (Jackendoff 1987:378):

- (6) a. John jumped *the gorge*.
 b. John approached *Harry*.
 c. The arrow pierced *the target*.

Another problem arises with argument NPs having multiple θ -roles, such as the subject of *give* which is an agent and a Source at the same time. The subject of *roll down the hill* could be an Agent or a Theme. Also in sentences with verbs such as *buy*, *sell*, *exchange*, *trade*, two actions are going at the same time, and therefore the subject and the (prepositional) object NPs bear two θ -roles each. As pointed out by Jackendoff (1987:382) another verb with multiple θ -roles on each NP argument is *chase*. This is so because for an action of the form *X chase Y* to be true, at least three conditions must be satisfied, from which it follows that X has two roles and Y three:

- (7) a. Y is in motion,
 b. X moves toward (or in path of) Y,
 c. X intends to go to (or catch) Y.

Jackendoff (1987:382-383) also discusses cases where multiple NPs hold a single θ -role, as illustrated below:

- (8) a. *The box* has books in *it*.
 b. *The list* includes my name on *it*.

In both (8a) and (8b) two different NPs in the same sentence satisfy the same θ -role. Together with cases of arguments which have multiple θ -roles the sentences in (8) constitute counterexamples to both clauses of the Theta-Criterion as formulated by Chomsky (1981:36) (cf. (1) above).

Jackendoff's conclusion is clear: "thematic relations are to be reduced to structural configurations in conceptual structure; the names for them are just convenient mnemonics for particularly prominent configurations [...] the terms Theme, Agent, and so on are not primitives of semantic theory." (1987:378).

Several other papers clearly demonstrate that in a number of morphological processes and syntactic alternations appropriate rules (or generalisations) are " θ -blind". Levin and Rappaport (1986) and Rappaport, Laughren and Levin (1988) discuss the adjectival passive formation (APF). Previous accounts of APF (e.g. Williams 1981) used the θ -role Theme to single out the argument of a verb which becomes the external argument of the related adjectival passive. However, as demonstrated by Laughren, Levin and Rappaport, reference to this role is both unnecessary and untenable, and it is possible and desirable to recast the rule of APF as a rule which results in the externalization of a single argument of the base verb. The interaction of various principles of grammar ensures that the appropriate argument is externalized, what is important however, is that the principles discriminate between arguments in terms of **manner** of θ -role assignment without referring to their **content**. Under this account the θ -grid becomes an annotated list of arguments, specifying that the verb *put* takes three arguments – external (realized in the syntax as the subject of the verb), direct – realized as the object of the verb, and the indirect argument realized as the prepositional object²:

- (9) put: x <y, Pz>

Similar conclusions follow from the analysis of non-agentive *-er* nominals (Levin and Rappaport 1988), relations between morphology and syntax in Dutch and English word-formation (Booij 1992), and the direction of θ -role assignment (Travis 1984). In discussing such issues the term θ -role is used as a synonym of the term 'argument' and particular semantic content of this argument is irrelevant for the morphological or syntactic processes.

Additionally, an analysis of such phenomena as the locative alternation, middle, unaccusative and inchoative constructions, points towards the existence of deep semantic processes, more general than those described by conventional θ -roles³.

² Cf. Williams (1981) for a discussion of argument types, and Stalmaszczyk (1992) for mechanisms of argument identification and various aspects of lexico-syntactic representations for verbs.

³ For an overview see Stalmaszczyk (1992).

2.3. *Theta roles and arguments*

The interaction between θ -role assignment and arguments gives rise to four possible positions (cf. also Safir 1985:24):

- (10) i. A θ -position is a position to which a given predicate assigns a given θ -role by virtue of its lexical properties or its position;
 ii. An argument-position (A-position) is any position that can be a θ -position for some predicate (e.g. subject, object, etc.);
 iii. A non- θ -position (θ -bar-position – θ') is any position that is not a θ -position (e.g. pleonastics);
 iv. A non-argument-position (A-bar-position – A') is any position that is not an A-position (e.g. dislocated or adjunct NPs)..

Each type of position is represented in (12) – the S-structure representation of sentence (11):

(11) Who was injured?

(12) [_{CP} [_{COMP} who_i] [_{IP} t_i was injured t_i]]

In (12) the empty category (trace – t) in the direct object is in a θ -position as it acquires the Theme θ -role from the verb; the subject empty category is a θ -position since passivized verbs do not assign subject θ -roles, however, the subject position can be assigned a θ -role by other predicates and therefore it is also an A-position. The position of *who* in COMP is never assigned a θ -role by any predicate, and so COMP is both a θ and A position. An A-position is typically clause-external and occupied by operators (*who*, *what*, etc.) or specifiers, whereas a θ -position can be occupied also by expletive non-argument *it* or *there*.

It is assumed that θ -roles are assigned from one specified position to another specified position, and both the θ -role assigner and the argument are associated with their position either by actually occupying it, or by being the antecedent of a trace that occupies it. In sentence (13), the trace of *Tom* – t_i – but not the NP occupies a θ -position (and an A-position):

(13) Tom_i seems [_{t_i} to be in love]

This means that the Theta-Criterion holds of sequences of coindexed elements that contain exactly one argument. Such sequences are dubbed **chains**, and the Theta-Criterion is reformulated as (14) (cf. Chomsky 1986:97):

- (14) Each argument A appears in a chain containing a unique visible θ -position P, and each θ -position P is visible in a chain containing a unique argument A.

It follows from the above brief discussion, that the Theta principles, though dealing with semantic relations, are in fact concerned with syntactic *positions*. The importance of positions is seen even in the characteristic reformulations of theta

grids: from (15) (as in e.g. Stowell 1981, Chomsky 1981) to (16), (17), or (18) – annotated lists of arguments:

(15) put: <Agent, Theme, Location>

(16) put: θ -s, θ -d, θ -l (Jaeggli 1986)
 put: θ -1, θ -2, θ -3 (Hoekstra 1984)

(17) hit: <1,2> E (Higginbotham 1985)

(18) put: x < y, P_{locz}> (Rappaport, Levin, and Laughren 1988)
 put: put \cap y, x, Loc P \cap z (Zubizarreta 1987)

The additional, non-thematic, argument E in (17) represents the 'Event position' present in the argument structure of verbs. Other such non-lexical arguments include the semantic types Proposition, Question, Exclamation (see Higginbotham 1985; Zubizarreta 1987; Grimshaw 1990).

As a consequence of this restricted approach, θ -grids might be identified with lexical structure, the abstract syntactic projection of a verbal lexical item (as in Hale and Keyser (1986:22)). For practical reasons however, and following the practice of Williams (1987, 1989, 1994) I will continue to use notions like Theme or Agent, though with no commitment as to their semantic contents. In line with the positional analysis, Agent is equated with the external argument (i.e. A = x), and Theme with the internal one (Th = y) in the sense of Predicate Argument Structure (cf. Stalmaszczyk 1992).

3. *Binding theory*

The **binding principles** are concerned with the referential dependencies between NPs. There are three types of NPs: anaphors, pronouns, and R (referential) NPs. Depending on the type, the following principles hold (Chomsky 1986:166):

- (19) (A) An anaphor is bound in a local domain;
 (B) A pronominal is free in a local domain;
 (C) An R-expression is free in the domain of the head of its chain.

If we analyse binding as a relation holding over argument positions rather than arguments themselves, it is possible to introduce the distinction between A(argument)-binding and binding from non-argument positions – A-binding (cf. Chomsky 1981:184f.). This distinction enables, among others, distinguishing between NP-movement and wh-movement in terms of trace binding:

- (20) a. A trace is A-bound when its most local antecedent is in a A-position;
 b. A trace is A-bound when its most local antecedent is in a A'-position;

Thus, NP-movement creates A-binding, and wh-movement creates A-binding.

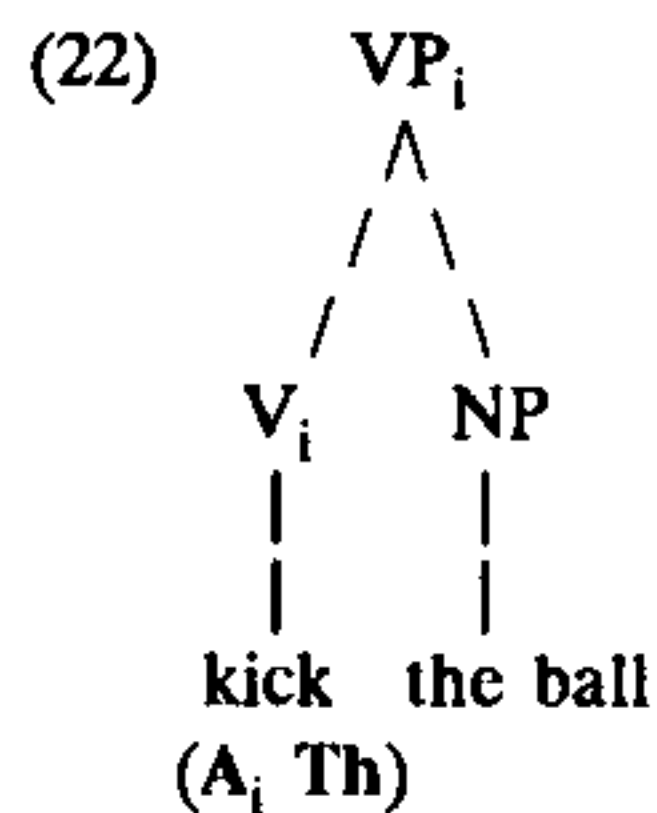
4. *Theta-binding theory*

Theta theory and binding theory investigate relations holding between positions; it is therefore plausible to suggest a stronger relation between them in order to reduce certain redundancy within the components of GB theory. Such a move has been advocated over the years by Edwin Williams. Recently, he has proposed a number of reformulations within the theta theory and binding theory components, so that closer links between the two can be established. The basic idea under these propositions is to consider binding theory as dealing with theta roles, and theta theory with binding relations (Williams 1994:206).

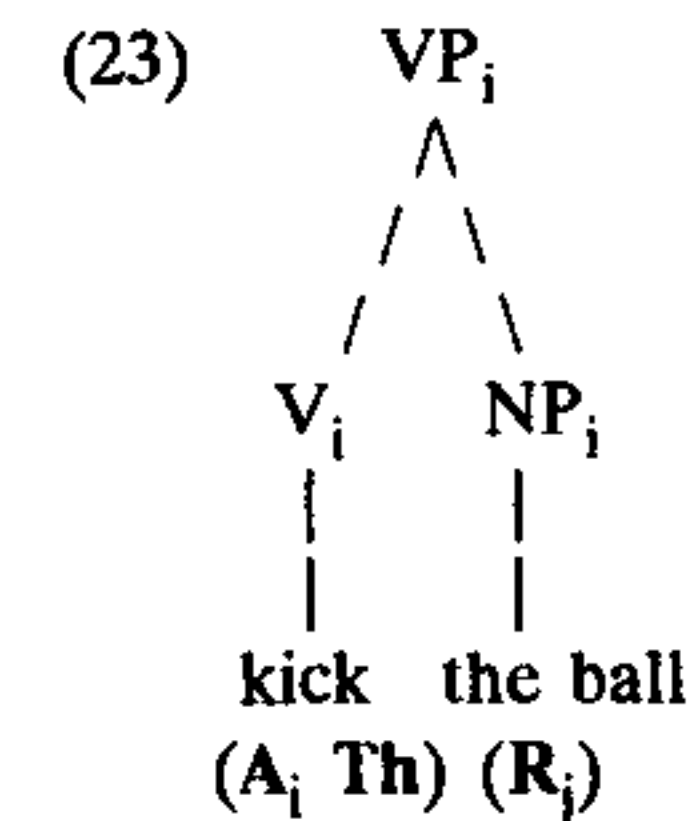
Under this view, θ -role assignment reflects anaphoric links between pairs of θ -roles and binding principles hold of relations among θ -roles. The following binding relations are proposed (Williams 1989:450):

- (21) a. The (symmetric) binding of the external argument to the maximal projection;
 b. Theta-role assignment;
 c. Anaphoric binding.

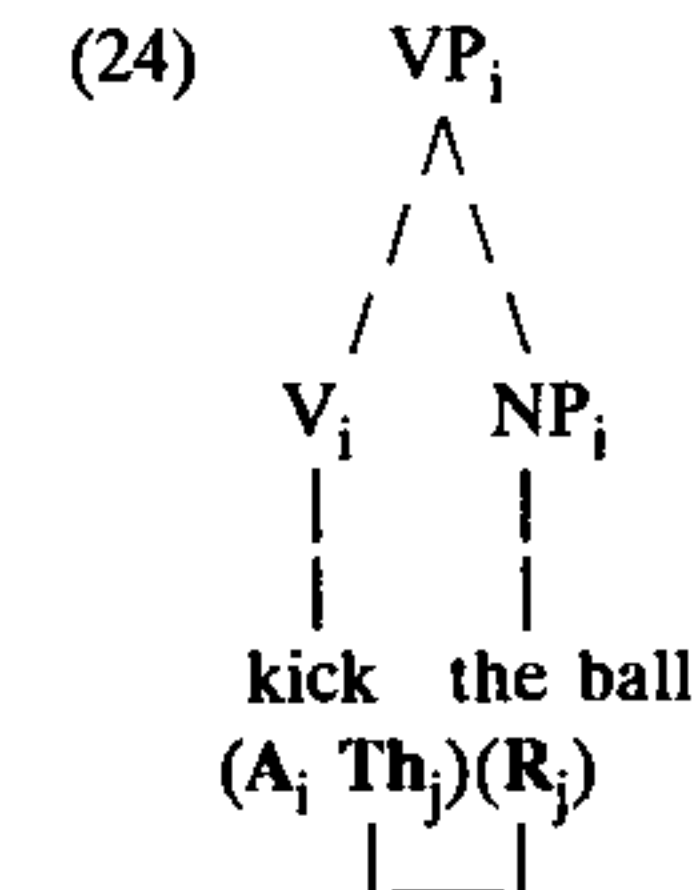
Symmetric binding of an external argument to a maximal projection refers to index sharing between a zero-level category X and its phrasal node XP^4 . For $X = V$ the external argument A (agent) of the main verb is bound by VP :



The binding link between the verb and its maximal projection is symmetric', a product of co-indexation rather than assignment. The maximal projection mentioned in (21a) also includes NP, and Williams assumes that nouns have a referential role R which is bound by NP^5 . The above diagram may be thus completed to indicate all head-binding relations between co-dependents':



The second binding relation which applies in the above structure is θ -role assignment (21b). This link is asymmetric: from the assigner (or antecedent) to the argument (anaphor). In the case of (23) the verb's internal theme role Th is assigned to the external role of the direct object, which means in effect that the index on Th is identical with that of R :



The indexing effects of (21a) and (21b) result in a restated version of the Theta-Criterion (cf. Williams 1994:28):

- (25) a. Every (referential) NP must receive a θ -role;
 b. Every external θ -role must be assigned.

The referential role R of *the ball* in (24) receives its interpretation from its antecedent Th , the internal θ -role of the main verb, by (25a). The external θ -role of the main verb, by (25b), must be assigned to the subject's (i.e. external argument's) referential role R , interpreted as the agent of kicking the ball in (24):

- (26) Kevin_i kicked the ball_j
 (A_i, Th_j)

NPs are treated as 'conditions on the reference' (Williams 1994:209) of theta roles; in (26) the agent and theme arguments refer, and the NPs *Kevin* and *the ball* condition the reference, in that the referents must satisfy the respective NP descriptions "Kevin (x)" and "the ball (y)".

Since theta roles are assigned to R-expressions, pronouns and anaphors, the

⁴ The term external argument encapsulates the links between X-bar theory and theta theory.

⁵ R is a non-thematic argument which serves as the external argument of nouns and it is therefore distinguished from other arguments by not being the realization of a participant in the conceptual structure of the word (cf. Grimshaw 1990:63).

following interpretation of binding conditions in the theta-binding theory can be proposed (definitions from Williams 1994:209f.):

- (37) A. A θ -anaphor must be θ -bound in some domain;
 B. A θ -pronoun must be θ -free in some domain;
 C. A θ -R-expression must be θ -free.

The objects to which the above principles apply are defined in (27), and theta-binding is formulated in (29):

- (28) i. A θ -anaphor is a theta role assigned to an anaphor;
 ii. A θ -pronoun is a theta role assigned to a pronoun;
 iii. A θ -R-expression is a theta role assigned to an R-expression.
- (29) X is theta-bound if there is a theta role c-commanding X and coindexed with X.

To demonstrate how theta-binding theory works I shall try to restate certain observations about one type of control structures and passive constructions in terms of the proposed theory.

5. Control structures

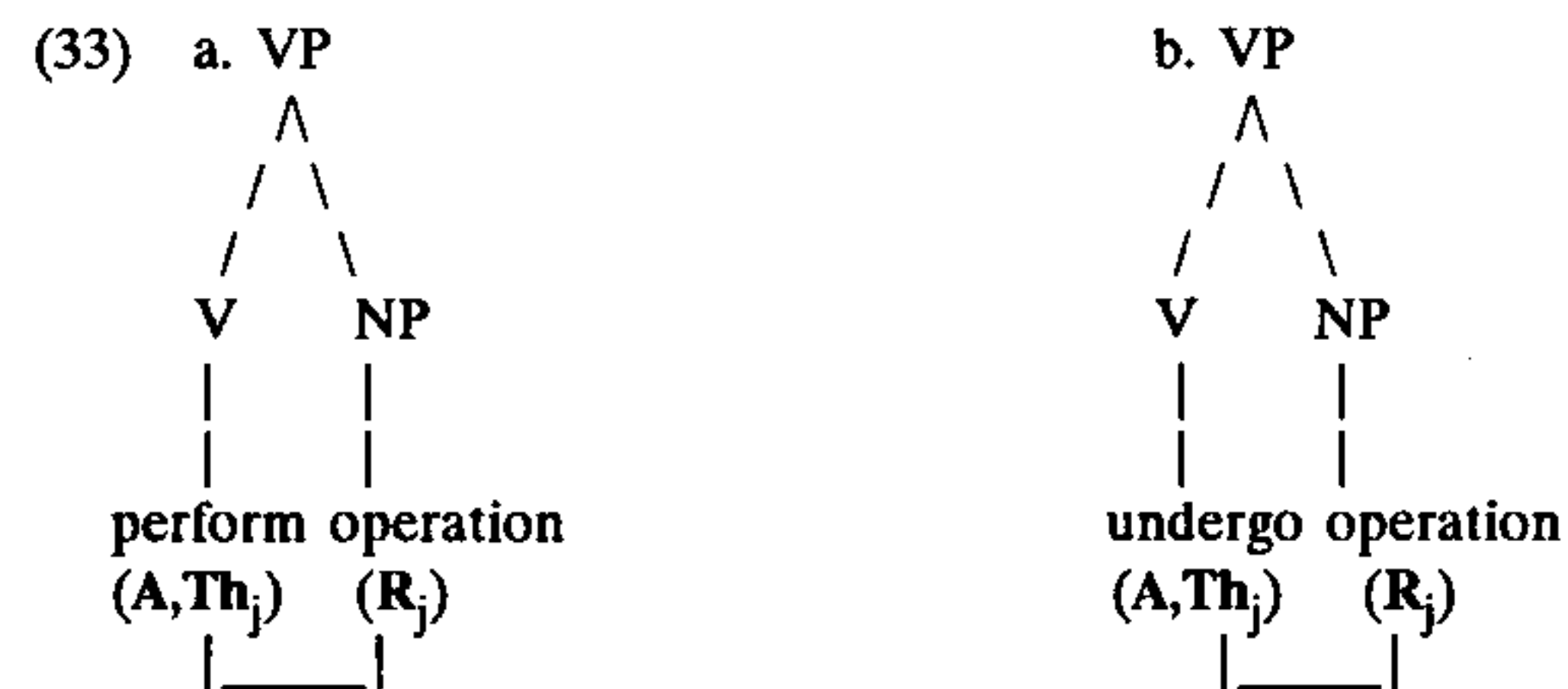
Control may be seen as a relation between pairs of θ -roles and the formula for such structures is given in (Williams 1987:155):

- (30) Argument X controls argument Y of argument Z.

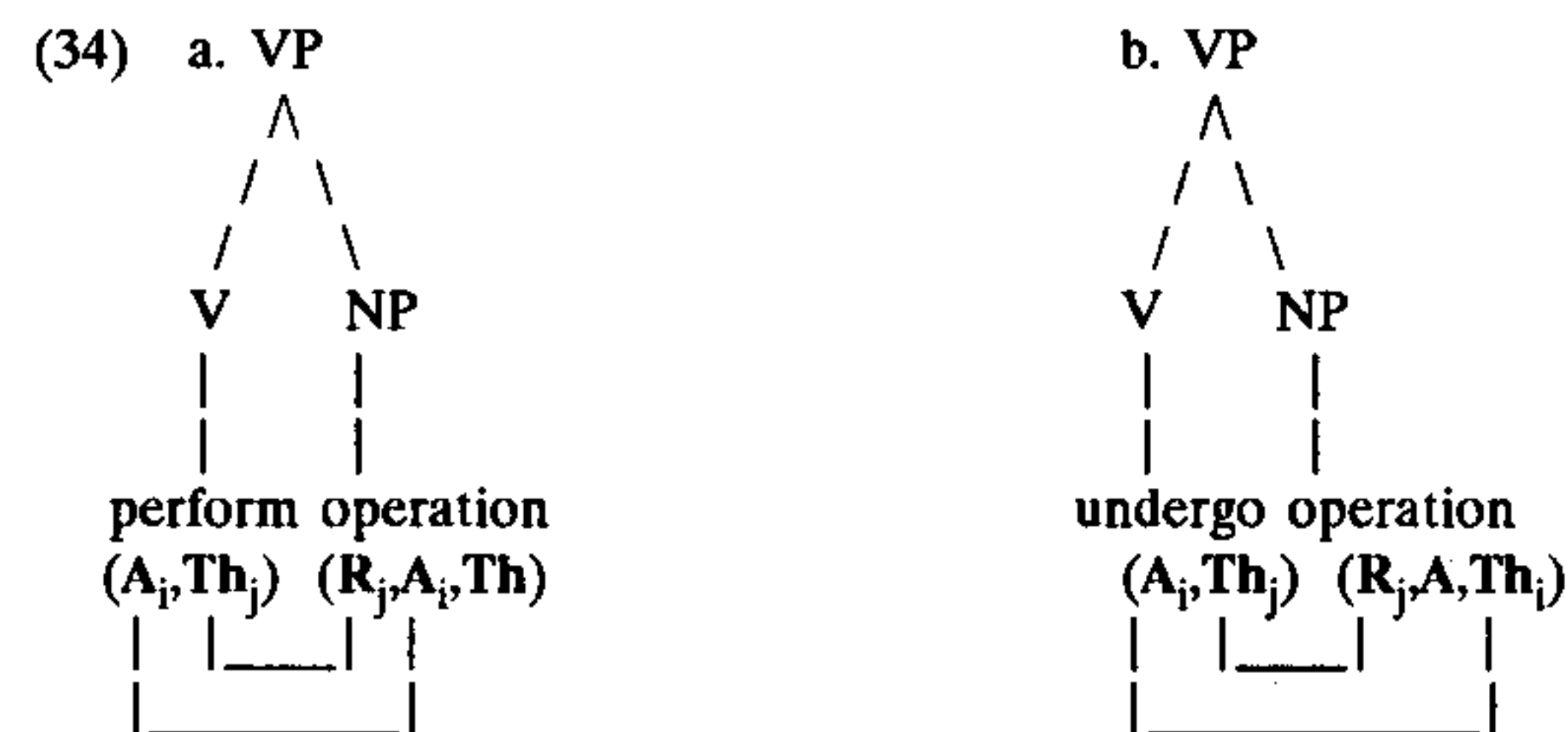
Under this interpretation, the difference in control patterns between (31) and (32) can be restated in terms of theta-binding⁶:

- (31) John performed an operation.
 (R_i) (A_i,Th_j) (R_j,A_i,Th)
- (32) John underwent an operation.
 (R_i) (A_i,Th_j) (R_j,A,Th_i)

In both sentences the referential roles are bound by appropriate NPs (by the principle of symmetric binding (21a)). By θ -role assignment (21b) the VP internal Theme role is assigned to the external role of the direct object:



The control pattern, however, is different. In (31) the sentence subject controls the Agent role of *operation*, leaving the NP Theme role unbound (cf. (34a)). In (32) on the other hand, the sentence subject controls the Theme role of *operation* with the NP Agent unbound (cf. (33b)). The process of control can be seen as an interaction between θ -grids of verbs and nouns:



The formula (30) is realized as (35) for (34a), and as (36) for (34b):

- (35) A controls A of Th.
 (36) A controls Th of Th.

Analogous control structures occur in sentences with a pronominal (cf. Williams 1994:211f.):

- (37) John performed his first operation in 1948.
 (R_i) (A_i,Th_j) (R_i) (R_j,A_i,Th)
- (38) John underwent his first operation in 1948.
 (R_i) (A_i,Th_j) (R_i) (R_j,A,Th_i)

In the above sentences the index *i* of the verb's external θ -role A spreads by three different mechanisms: to the subject by θ -role assignment (21b) (and predication – cf. Williams 1980, 1994:120); to the NP A role by control (30); and finally, to the pronoun *his* by Binding Principle (27.b).

⁶ For the discussion of the argument structure of nominals cf. Grimshaw (1990:63-68).

6. *Passive*

The second part of Williams' Theta-Criterion (21b) states that the external role must be assigned, from which follows that internal θ -roles may remain unassigned. This is illustrated, for instance, by the behaviour of the (nominal) internal roles in (37) and (38) above: in (37) the Theme role is not co-indexed with any other role (ie. the Theme of *operation* remains unspecified); whereas in (38) it is the Agent role which is not co-indexed (ie. the Agent of the *operation* is not mentioned). The process responsible for this behaviour is *argument demotion*. Williams (1987:173f.) discusses the classical pair <destroy, N destruction>, and assumes that the derivational morpheme NOM is the head of N and that it demotes the verb's external role (the underlined role represents the external position):

(39) [NOM [destroy]] --> [destruction]
 (R) (A, Th) (R, A, Th)

In the case of the nominalization, both roles (A, Th) are internal, and therefore both can be assigned (40a), one could be assigned (40b), or none (40c):

- (40) a. the destruction of Rome by the barbarians
 b. the destruction of Rome
 c. the destruction

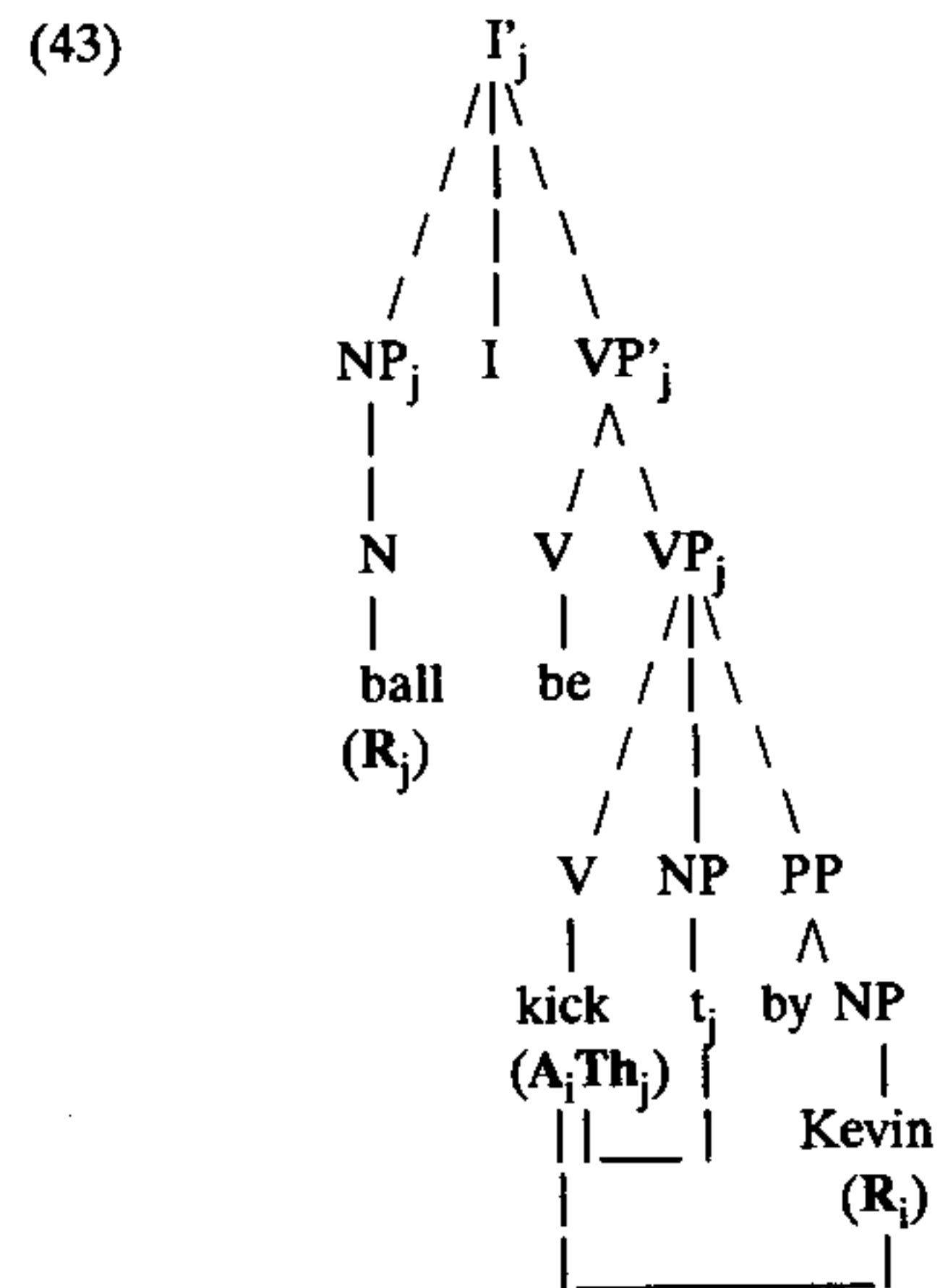
Passivization also involves demoting the main verb's external role. As a result a verb with passive morphology may assign both internal roles (41a) or leave the Agent role unassigned (41b):

- (41) a. the ball was kicked by Kevin
 b. the ball was kicked
 c. *was kicked

There appear not to be any passive constructions in English in which both internal roles would remain unassigned (cf. the contrast between (40c) and (41c)). This option, however, does exist in Polish⁷:

- (42) a. Strzelano
 (There was shooting going on)
 b. Spacerowano
 (One would walk)

The simplified S-structure representation of (41a) is given below:



Both θ -roles of the passive verb are internal (internalized) and therefore they are assigned internally. However, as pointed out by Williams "a theta role assigned to an NP trace cannot be satisfied by that trace" (Williams 1987:169) and therefore the index is passed up (percolated) and then predicated onto the subject⁸. Passive formation involves processes occurring in the lexicon (dethematization, retraction of accusative Case) and in the syntax (externalization of the Theme argument). Crucially in this approach, it does not involve movement but rather (vertical) binding of the Theme argument.

7. *Conclusion*

Theta-Binding theory integrates mechanisms from different modules, applying at different levels of representation: θ -government, θ -binding, theta role assignment, control, and movement. Regularities underlying separate modules of the GB theory are revealed and no new levels of linguistic structure are postulated, which makes this approach compatible with the minimalist program (cf. Chomsky 1994:4).

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⁸ In Williams (1994:119f.) this trace is treated as a Caseless empty category, which is not a result of movement but rather is base-generable.

⁷ Cf. Rozwadowska (1992:62-64) for a discussion of these constructions in Polish.

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