

An Empirical Research of Non-core Argument Case Markers Under Semantic Events

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Abstract—Case markers play a crucial role in unveiling argument relationships within Chinese sentences, contributing significantly to a deeper comprehension of both the syntactic and semantic aspects of these sentences. This study adopts a perspective rooted in semantic events to analyze the distinctive syntactic environment that differs from prepositional phrases functioning as adverbials, which serves to introduce non-core arguments. It centres on the syntactic distribution environment where event attribute nouns are attached to the semantic main events as sentence subjects or objects, subsequently marking the environment for non-core arguments. Subsequently, case markers for non-core arguments were annotated in a multi-genre corpus, accumulating 643 sentences featuring annotated case markers for non-core arguments. Drawing from these annotated resources, this study empirically examines the syntactic and semantic characteristics of case markers for non-core arguments. Specifically, the research explores their role as syntactic constituents in introducing non-core arguments, their correlation with the main event, and their influence on selecting core predicate verbs within the sentences.

Index Terms—non-core argument, semantic event, case marker

I. INTRODUCTION

In previous argument studies, scholars have primarily focused on determining the number of argument roles to establish and how to differentiate between core and non-core arguments based on specific syntactic or semantic criteria. Yuan [1] established a hierarchical system of argument roles for Chinese verbs, defining 17 typical argument roles in Chinese. Lu Chuan [2], [3] divided the case system into four levels: the first level being 格(case), the second level including 角色(role) and 情景(scenario), the third level encompassing seven categories: 主体(agent), 客体(patient), 邻体(experiencer), 系体(stative), 凭借(means), 环境(environment), and 根由(reason). These seven categories at the third level can be further subdivided into 22 semantic cases. Zhu [4] defined 14 semantic roles. Meng [5] expanded on Ding [6]’s perspective and, in the Dictionary of Verb Usage, categorized 14 classes based on the types of noun objects in verb-object structures. Subsequent scholars [7]–[9] have held different viewpoints on the number of cases, leading to various insights into the nature and classification of cases.

Regarding the markers used to introduce non-core arguments, the opinions of most scholars are generally consistent: prepositions serve as typical formal indicators for non-core

arguments in Chinese, allowing the arguments of predicates to appear in adverbial positions. Therefore, in tasks involving the annotation, identification, or extraction of argument roles, the focus is predominantly on exploring prepositional case markers, with a typical emphasis on their occurrence in adverbial positions [10].

In contrast to the traditional viewpoint that emphasizes prepositions introducing predicate arguments in adverbial positions, there are numerous other Chinese cases where this is not the norm. For instance, consider sentences like “造成他起来晚的原因是他昨天夜里打了很长时间的游戏 (The reason he woke up late is that he played games for a long time last night)” and “我这样做旨在获取更多的奖励 (I do this to obtain more rewards)”. From a semantic understanding perspective, in the first sentence, the main event “起晚(woke up late)” is encapsulated within the construct “造成*的原因(the reason * is)” and the subsequent part of the construct, marked by “是(be)”, presents the causal argument of that event. In the second sentence, semantically, the main event is “我这样做(I do this)”, and the verb “旨在(intends to)” conveys the purpose argument. Words like “旨在(intend to)” and “意欲(want to)” effectively connect the event and purpose arguments. By closely examining the two aforementioned examples, it becomes evident that exploring formal markers beyond prepositions governing objects in adverbial positions offers a broader approach to investigating non-core argument formal markers. Simultaneously, analyzing the structure and semantic relationships between main events and non-core arguments (especially prepositional non-core arguments) from a semantic events perspective holds crucial theoretical significance in clarifying the event semantics of sentences.

II. SEMANTIC EVENTS

Xiao Guozheng [12] pointed out that grammatical events are defined from the perspective of language generation, while semantic events pertain to the comprehension of natural language meanings. He also indicated that semantic events are one aspect of symbolic events. Applying the aforementioned theory, he analyzed the semantic event of the sentence “日前美军在叙利亚东南部的一座基地遭到了伊朗“圣城旅”的突袭。(Recently, a base of the US military in the southeastern part of Syria was attacked by the Quds Force of Iran)”.

From a syntactic perspective, the core triggering word of this event is “遭到(to encounter)” and the corresponding syntactic form reveals the event as “美军基地遭到伊朗圣城旅突袭”(The US military base was attacked by the Quds Force of Iran). In terms of meaning, the corresponding event for this sentence is “伊朗圣城旅突袭美军基地。(The Quds Force of Iran attacked a US military base)”. Xiao pointed out that in semantic analysis, it is important to establish the easily operable correspondence between spaces, as demonstrated by “伊朗圣城旅突袭美军基地。(The Quds Force of Iran attacked a US military base)”. This forms the foundational pattern and cognitive basis for language intelligence. From the perspective of meaning, the content structure of the event is simpler than what is highlighted from the syntactic angle. When expressing similar meaningful events, the sentence “伊朗圣城旅突袭美军基地。(The Quds Force of Iran attacked a US military base)” appears more frequently.

From the perspective of natural language understanding, it is important to emphasize the analysis of semantic events within sentences and to represent the results of semantic analysis. Only when the original event semantics corresponding to cognition are clearly represented, can further intelligent language analysis be built upon it. Here, let's take the sentence “我吃了苹果(I ate an apple)” as an example to illustrate the relationship between grammatical events and semantic events through the analysis of transformations of the prototype base sentence and its semantic events. For example:

Example (1):

- a. 我吃了苹果。(I ate an apple.)
- b. 苹果我吃了。(Apple, I ate.)
- c. 我把苹果吃了。(I ate the apple.)
- d. 苹果被我吃了。(The apple was eaten by me.)

From an objective perspective, the statements conveyed by the four sentences above are consistent, which is “我吃了苹果(I ate an apple)”. Example (1a) is the most direct linguistic expression corresponding to this objective event. Example (1b) takes the form of a subject-verb predicate sentence, placing “苹果(apple)” in the prominent subject position to highlight it. Example (1c) employs a “把(ba)” construction to indicate the disposal of “苹果(apple)”. Example (1d) uses a passive voice sentence to convey a passive meaning. Different linguistic expressions depend on the speaker's perspective and communicative intentions. However, from the perspective of intelligent language understanding, the expression form of Example (1a) serves as a foundational pattern and cognitive basis. In semantic analysis, the underlying semantic representation corresponding to it should also be identified.

III. FORM OF NON-CORE ARGUMENT MARKER

From the above discussion, it can be observed that there are times when the events emphasized by grammatical forms do not directly correspond to semantic events. This introduces challenges to the research paradigm of utilizing syntax directly for semantic analysis. In the case makers of non-core arguments in Chinese, there are typical structures where prepositional phrases introduce objects as adverbials, as well as other

structures beyond those like “造成A的原因是B(The reason for A is B)”. Therefore, in this study from the perspective of semantic events, we explore formal markers that can introduce non-core arguments aside from prepositions. We particularly focus on analyzing the relationship between propositional non-core arguments and the main event.

A. Form of Case Marker

Starting from a formal perspective and combining observations from corpora, the forms of case markers can be categorized as follows:

(1) “A*B”

This form represents a closed framework, for example, “在*旁边(beside *)”, indicating 处所(location), “因*而(because *)”, indicating 原因(reason), and “与*相比(compared with *)”, indicating 比较(comparison). In addition to this, there is another type of closed-form case marker, for instance, “造成*的原因(the reason for causing *)”, where the intermediate component generally represents a main event. The non-core argument component of this framework typically appears externally, and the differences between these two patterned case markers will be further detailed in the next section.

(2) “A*”

This form has been a primary focus in previous studies on argument case markers. It often involves prepositions introducing related argument components.

(3) “*A”

In previous research, trailing case markers have often been considered as complementary components of the “A*” pattern, with the main element emphasizing argument semantics still determined by the “A” in “A*B”. For example, in “在*上(on*)”, the directional meaning is determined by the “在(on)” element. However, there are differing viewpoints suggesting that postpositions can also independently serve as argument markers. For instance, in the sentence “你没来的时候, 我一直在看书(When you were not here, I was reading)”, “的时候(when)” effectively marks it as the temporal argument of the subsequent event.

(4) “*A*”

This kind of argument marker in the middle has rarely appeared in previous research on argument case markers. It mainly refers to certain verbs that connect two events, indicating causal conditions or other relationships between them.

The verb “造成(to cause)” represents the relationship between the main event and its causal argument. Its typical expression pattern is “原因+ 造成+ 主事件(Reason + result in + main event)”. The causal component can be fulfilled by a predicate element, as seen in the sentence “天气持续湿冷导致我爸爸的肩周炎又加重了。(The prolonged damp and cold weather caused my dad's shoulder inflammation to worsen again)”.

The verb “取决于(depends on)” indicates the relationship between the main event and its causal argument. Its common expression pattern is “主事件+ 取决于+ 原

因(依据)(Main event + depends on + cause/basis)". The causal component is often fulfilled by a predicate element, as seen in the sentence “未来是否能普及取决于技术是否不断进步成熟、用户体验是否不断提高完善(Whether the future can popularize depends on whether technology continues to progress and mature, and whether user experience keeps improving and becoming more refined)".

The verb “旨在(aim at)” indicates the relationship between the main event and its 目的(purpose) argument. Its common expression pattern is “主事件+ 旨在+ 目的(Main event + aims at + purpose)". The purpose component is often fulfilled by a predicate element, as seen in the sentence “贸易商这样做旨在逃避中国的资本管制”(Traders do this aiming to evade China’s capital controls)".

B. Relationship Between Case Markers and Semantic Events

For the case marker “A*B”, the introduced argument often has the potential to form two different patterns with the main event.

Example (2):

- a. 在你考虑清楚之前，你最好不做决定。(It’s better for you not to make a decision until you’ve thought it through.)
- b. 出于为大家考虑的缘故，大家尽量居家不出门。(For the sake of everyone’s well-being, please try to stay home as much as possible.)

Example (3):

- a. 造成观望气氛浓厚的主要原因是银行对房地产相关的贷款额度收紧使得市场预期产生了变化。(The main reason for the strong atmosphere of caution is that the tightening of loans related to real estate by banks has led to a shift in market expectations.)
- b. 为什么我对他们都陷入了倦怠期的原因是因为他们似乎都忘了最初的梦想。(The reason I feel that both of them have entered a period of fatigue is because it seems that they have both forgotten their initial dreams.)

Comparing the examples from the Example (2) group and Example (3) group, it can be observed that in Example (2), the underlined markers of the form “A*B” primarily introduce non-core arguments of the main event, with the semantic core of the main event positioned outside the frame structure. However, in Example (3), the main event is embedded within the formalized markers, and specific non-core arguments are subsequently expressed through judgmental sentences. The relationship diagram between the formalized markers, non-core arguments, and the main event is depicted in Figure 1 and Figure 2.

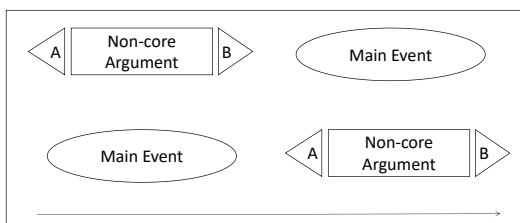


Figure 1: The relationship diagram between non-core arguments and events corresponding to the Example (2) group.

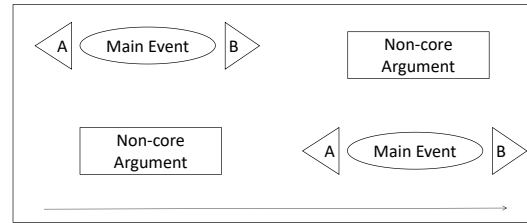


Figure 2: The relationship diagram between non-core arguments and events corresponding to the Example (3) group.

In Figures 1 and 2, the arrows represent relative positional relationships. The upper and lower parts of each figure represent different sets of positional relationships. For instance, in Figure 1, the introduced argument of the case marker can appear before or after the main event. As for the pattern in set (3), fewer scholars have discussed it. In this pattern, non-core argument case markers are often filled by event attribute nouns, attached to the semantic main event. **Therefore, in the subsequent study of case markers, the focus is primarily on this type.**

C. Annotation of Non-core Argument Case Markers

1) *Definition of Non-Core Argument Case Marker:* The non-core argument case markers focused on in this paper mainly refer to specific marking patterns formed when abstract nouns like “原因(reason)” and “工具(tool)” which represent event attributes, are attached to the semantic main event. For example, in the sentence “造成A的原因是B (The reason for A is B)”, the “的原因(the reason)” attaches to the semantic main event A, and the 原因(reason) argument B is presented through the “是(be)” construction. In this example, “造成*的原因(the reason for *)” forms a closed-frame marker. In some cases, only the marker formed by event attribute nouns may appear, such as in “A的原因是B(The reason for A is B)”.

2) *Guidelines for Annotating Non-core Argument Case Markers:*

a) **Case Marker Annotation:** In this paper, we use “<>” to annotate case markers that highlight argument semantics. This primarily includes event attribute nouns attached to the semantic main event, as well as components used in conjunction with event attribute nouns to emphasize argument semantics. For example:

Example (4)

- a. 斯诺登目前“不能飞往拉美”的<原因>(在于)[斯诺登被美国视为“国家敌人”。(The current reason why Snowden is “unable to fly to Latin America” is because he is considered a “national enemy” by the United States.)
- b. <导致>“民反”的<原因>却往往(是)[官僚阶层腐败或社会治理错误]。(The causes leading to “public opposition” often stem from bureaucratic corruption or errors in social governance.)

In example (4a), the marker is “原因(reason)”, attached after the main event. In example (4b), the marker is the “导致*原因” frame structure.

b) **Annotation of Syntactic Core Predicate:** We utilize “()” to annotate the syntactic core predicate that links the semantic main event with the argument component. The core predicate is typically represented by a single verb and occasionally by a phrasal structure formed by a verb and a preposition. For example:

Example (5)

a. 设立人才培养平台互联网大学的<目的>(在于)[培养一支既懂互联网又懂生活服务的队伍]。(The purpose of establishing the talent development platform, Internet University, is to cultivate a workforce that possesses expertise in both Internet technologies and life services.)

b. 吕清海“出事”的<原因>很大程度上被怀疑(和)[“神马集团”暗箱操作](有关)。(The reason behind the incident involving Lv Qinghai is widely suspected to be closely linked to covert maneuvers by the “Shenma Group.”)

In example (5a), the core predicate verb “在于(be attributed to)” serves to link the semantic main event “设立人才培养平台互联网大学(to establish an internet university platform for cultivating talents)” with the purpose argument component “培养一支既懂互联网又懂生活服务的队伍(to cultivate a team that is proficient in both the internet and life services)”. In example (5b), the equivalent core predicate verb “和*有关(be related to)” functions similarly, forming a phrasal structure with a preposition.

c) **Annotation of Non-core Argument Components:**

In this paper, we employ “《》” and “[]” to annotate non-core argument components of semantic main events performed by nominal and predicate elements, respectively. For example:

Example (6)

a. 决定“大体相当”的<依据>(是)《经济社会的发展水平》。(The basis for determining “rough equivalence” lies in the level of economic and social development.)

b. “一言堂”、“一边倒”的<结果>只能(是)[堵塞言路、为权力的腐败埋下祸根]。(The outcomes of “one-man rule” and “unilateralism” inevitably lead to the stifling of discourse and sow the seeds of corruption in power.)

In example (6a), the 依据(basis) argument of the main event is performed by a nominal element. In example (6b), the 结果(result) argument of the main event is performed by a predicate element.

3) *Statistics of Non-core Argument Case Marker Annotations:* From a multigenre corpus comprising encyclopedic content, news, microblogs, and patents, we extracted 19,439 candidate sentences using nine event attribute nouns¹ like “原因(reason)”. Following the definition and annotation guidelines for non-core argument case markers, we annotated a total of 643 sentences containing established non-core argument case markers.

¹These nouns primarily include 原因(reason), 结果(result), 目的(purpose), 依据(basis), 材料(material), 方式(manner), 工具(tool), 时间(time), and 地点(location).

In this paper, we regard the sequence composed of non-core arguments, syntactic predicates, and case markers as a typical sentence pattern for non-core arguments, taking the form “NP/VP*(V)*<>”. Here, “NP/VP” represents non-core arguments as either nominal or predicate, “(V)” represents the core predicate, and “<>” indicates the argument case marker.

Based on the annotated data, the number of labelled sentences for different non-core argument roles and their typical sentence patterns are shown in Table I.

TABLE I
INSTANCES OF THE NEIGHBOR ARGUMENT OF THE VERB “着想(THINK ABOUT)”

non-core argument roles	number	ratio	number of typical sentence patterns
原因(reason)	272	42%	44
目的(purpose)	136	21%	8
依据(basis)	89	14%	9
结果(result)	56	9%	4
工具(tool)	47	7%	9
方式(manner)	43	7%	8
	643	100%	82

As can be seen from Table I, both the number of annotated examples and the number of sentence patterns for “原因(reason)” arguments are the highest. “目的(purpose)” arguments come in second place. Such distributional data provides us with an insight when dealing with non-core arguments of verbs: we should not only focus on the syntactic distributional environment where prepositional arguments function as adverbial modifiers for predicates. It’s also worth noting the syntactic distributional environment where event attribute nouns, as observed in this paper, attach to semantically core events as sentence subjects or objects.

IV. SYNTACTIC AND SEMANTIC ANALYSIS OF NON-CORE ARGUMENT CASE MARKERS

From the above example, it can be observed that the non-core argument roles defined in this paper exhibit systematic distinctions from the traditional syntactic and semantic features of prepositional arguments used as adverbial modifiers when introducing non-core arguments. These distinctions include the syntactic role they play, their positional relationship with the main event, and their selection with respect to the core predicate verb in the sentence.

A. Syntactic Position and Syntactic Relationships

Non-core argument markers primarily appear in the head positions of sentence subjects or objects, while the introduced arguments correspondingly appear in the positions of the respective subjects or objects. In other words, when the non-core argument marker introducing the non-core argument appears in the subject position, the non-core argument itself appears in the object position. Conversely, when the marker appears in the object position, the introduced non-core argument appears in

the subject position, creating a distinct subject-object position contrast characteristic. Its formal description is as follows:

Pattern 1: *Marker + Verb + Non-core Argument

Pattern 2: Non-core Argument + Verb + *Marker

In Patterns 1 and 2, the “*” generally represents the semantically core event to which the non-core argument attaches, typically in a predicative form. In terms of linguistic structure, Pattern 1 treats the “Event + Marker” as the topic, thus emphasizing the non-core argument component. On the other hand, Pattern 2 treats the “Non-core Argument” as the topic, highlighting the “Event + Marker”.

For various non-core arguments, the distribution of Patterns 1 and 2 has been analyzed based on their respective argument roles. Specific details are provided in Table II.

TABLE II
DISTRIBUTION OF SYNTACTIC POSITIONS BETWEEN NON-CORE ARGUMENTS AND MARKERS

non-core argument roles	pattern 1	pattern 2
原因(reason)	77	195
目的(purpose)	4	132
依据(basis)	8	81
结果(result)	5	51
工具(tool)	2	45
方式(manner)	2	41
	98(15%)	545(85%)

The data from Table II clearly demonstrates that Pattern 2 (Non-core Argument + Verb + *Marker), where the marker is attached to the core event and functions as the sentence object, is the preferred syntactic structure across various argument roles. This preference is primarily attributed to the relatively complex expression of the core event. When the representation involving the core event and the marker appears in the sentence subject position, it can result in an imbalanced sentence structure known as “top-heavy” construction.

B. Selection of Core Predicate Verbs

During the analysis of the corpus, it was observed that when non-core argument markers appear in the subject or object position, they impose strong selection restrictions on the core predicate verb. These restrictions are primarily concentrated within the following types:

A category of verbs that signifies *judgment* and *explanation* is the verb “是(be)”. It appears 519 times, accounting for 80.7% of the occurrences. “是(be)” primarily affirms and establishes connections, expressing semantics encompassing *equivalence*, *categorization*, *attributes*, *material*, *existence*, *possession*, *comparison*, *explanation*, *condition*, *time*, *place*, and *acquisition*.

Example (7):

暂停IPO的原因是发行价很不理想，估值太低。(The reason for suspending the IPO is that the issuance price is very unsatisfactory, and the valuation is too low.)

Another category of verbs represents the meaning of judgment and explanation, such as “在于(lie in)”. There are 56 instances of this type, making up 8.7% of the total occurrences.

Example (8):

产业看好HTML的原因很大程度上是在于降低成本。(The reason why the industry is optimistic about HTML is largely because it reduces costs.)

Another category of verbs includes those that signify assuming a role or becoming, using verbs such as “成为(become)”, “作为(be)”, and “变成(become)”. There are 52 instances of this type, accounting for 8.1% of the total occurrences.

Example (9):

跨国兼并已经成为企业迅速占领新市场的最有效的方式。(Cross-border mergers and acquisitions have become the most effective way for companies to capture new markets rapidly.)

Another kind of verb is “include(包括)”, which expresses inclusive meaning. Similar verbs include “有(have)”, etc. There are 4 cases of such verbs, accounting for 0.6%.

Example (10):

这些岗位“零报考”的原因主要包括工作地点位于艰苦边远地区，专业要求相对严格。(The reasons for these positions receiving “zero applications” mainly include the work locations being in remote and challenging areas and the professional requirements being relatively stringent.)

Another category comprises a frame structure, exemplified by phrases like “与*有关(be related to)”, which conveys the meaning of association. This includes variations such as “与*有关联(be related to)” and “与*有联系(be connected to)”. In total, there are 2 instances, accounting for 0.3% of the occurrences. These are primarily found in sentences denoting causal arguments.

Example (11):

吕清海“出事”的原因很大程度上被怀疑和“神马集团”有关。(The reason for Lv Qinghai’s “accident” is largely suspected to be related to “Shenma” Group.)

Table III presents the statistics of core predicate verbs in sentences where non-core argument markers are located.

It can be observed that, in sentences where non-core argument markers introduce corresponding arguments as subjects or objects, the core predicate verbs are typically verbs that belong to the *explanation*, *judgment*, *inclusion*, or *association* categories. Generally, these verbs do not involve specific concrete actions or descriptions of actions, nor do they encompass terms indicating specific actions or states. Let’s illustrate this with a set of examples:

Example (12):

a.造成二月份CPI增长8.7%的原因是多方面的。(The reasons for the 8.7% increase in CPI in February are diverse.)

b.导致这位未婚夫“行为失常”的原因很简单-他恋爱了。(The reason for this fiancé’s “aberrant behavior” is quite simple - he is in love.)

c.雷霆依靠他和威少两个人的单打在西部雄霸的方式就如此简单粗暴。(The Thunder’s dominance in the Western Conference is built on the straightforward and forceful method of relying on him and Westbrook’s one-on-one plays.)

TABLE III
CORE PREDICATE VERB STATISTICS IN SENTENCES CONTAINING
NON-CORE ARGUMENT MARKERS

core predicate verbs	number	ratio
是(be)	519	80.7%
在于(lie in)	56	8.7%
成为(become)	29	4.5%
作为(be)	17	2.6%
系(be)	4	0.6%
为(be)	4	0.6%
包括(include)	2	0.3%
和*有关(be related to)	2	0.3%
有(have)	2	0.3%
使(allow)	2	0.3%
来自于(originate from)	1	0.2%
由*造成(caused by)	1	0.2%
当作(regard as)	1	0.2%
成(become)	1	0.2%
用作(used as)	1	0.2%
达到(reach)	1	0.2%

d.联合国挑选秘书长的方式发生了巨大变化。(There have been significant changes in the way the United Nations selects its Secretary-General.)

As evident from the provided examples, most core predicate verbs are adjectives that convey inherent qualities. These verbs frame the non-core argument of the main event as the focal point, without explicitly detailing the specific content of the argument. Even in the context of example (12d), the emphasis remains on expressing the concept of “change” rather than elucidating the precise nature of the change undergone. In light of this analysis, it can be inferred that when non-core argument markers are situated in subject or object positions to introduce corresponding arguments of the main event, the relationship with the core predicate verb is subject to selectivity. Typically, verbs that encapsulate *explanatory*, *evaluative*, *inclusive*, and *associative connotations* are commonly enlisted for this role.

C. Grammatical Valency of Non-core Arguments

Through the observation and analysis of the corpus, it is feasible to differentiate the linguistic units of non-core arguments based on their nominal or predicative characteristics.

When predicate constituents function as non-core arguments, their argument roles primarily include “原因(reason)” (141 instances, 21.9%), “目的(purpose)” (135 instances, 21.0%), and “方式(manner)” (31 instances, 4.8%). For example:

Example (13):

a.苏轼在黄州三年“不知其久”的原因正在于武昌西山风景好，山里人也好。(The reason for Su

Shi’s three-year stay in Huangzhou without realizing its duration lies in the picturesque scenery of Wuchang Xishan and the amiable locals within the mountains.)

b.促进水产养殖生产的发展，是个体生态学研究的主要目的。(Facilitating the advancement of aquaculture production serves as the primary purpose of individual ecologists’ research.)

c.应对“文明威胁”的方式是放弃普通的商业能源政策，转向实现减少。(The approach to addressing the “threat of civilization” involves forsaking conventional commercial energy policies to transition towards reduction.)

When nominal constituents function as non-core arguments, their argument roles predominantly encompass instrument (45 instances, 7.0%), basis (84 instances, 13.1%), and result (36 instances, 5.6%). For instance:

Example (14):

a.唯一有效地运载核炸弹的工具是远程战略轰炸机。(The sole instrument capable of effectively delivering nuclear bombs is the long-range strategic bomber.)

b.医院进行诊断和治疗方案制定的依据是X光片、CT或者核磁共振。(The basis for the formulation of diagnostic and treatment plans in hospitals relies on X-rays, CT scans, or magnetic resonance imaging (MRI).)

c.伊核问题全面协议的谈判和签署是国际社会共同努力的结果。(The negotiation and signing of the Comprehensive Joint Plan of Action on the Iranian Nuclear Issue is the outcome of collective efforts by the international community.)

At times, to convey the same semantic content, opting for either nominal or verbal constituents is feasible. For instance:

Example (15):

a.医院进行诊断和治疗方案制定的依据是X光片、CT或者核磁共振。(The basis for formulating hospital diagnostic and treatment plans relies on X-rays, CT scans, or magnetic resonance imaging (MRI).)

b.医院进行诊断和治疗方案制定的依据基本只是看X光片、CT或者核磁共振。(The foundation for devising diagnostic and treatment plans in hospitals primarily involves examining X-rays, CT scans, or magnetic resonance imaging (MRI).)

The statistical results for different argument roles of nominal and verbal constituents are presented in Table IV:

TABLE IV
THE STATISTICAL RESULTS FOR DIFFERENT ARGUMENT ROLES OF
NOMINAL AND VERBAL CONSTITUENTS

	原因 (reason)	目的 (purpose)	依据 (basis)	结果 (result)	工具 (tool)	方式 (manner)
NP(309 instances, 48.1%)	131	1	84	36	45	12
VP(334 instances, 51.9%)	141	135	5	20	2	31

D. Dual Identification of Argument Roles

The term “双重赋元(Dual Identification of Argument Roles)” in this context primarily refers to the phenomenon where specific case markers are combined to highlight the semantic of an introduced argument jointly. When separated, each marker can individually contribute to identifying argument semantics.

Based on the differing positions of the primary event occurrence, it can be classified into the following two categories:

(1) The main event is positioned within the subject.

(1a) A+的原因+是+B+所致(The reason for A is attributed to B.)

(1b) A+的目的+是+为了+B(The purpose of A is to achieve B.)

(1c) A+的原因+是+因为+B(The reason for A is because of B.)

(1d) 造成+A+的原因+是+B(The cause of causing A is B.)

(1e) 为什么+A+的原因+是B(The reason for A is B.)

In the context of example 1a, the attachment of “的原因(the cause)” to the main event, followed by the addition of the verb “是(be)”, effectively clarifies that the object portion specifies the specific cause of the preceding event. Simultaneously, by appending “所致(caused by)” after argument B, it further accentuates the non-core argument B as the “原因(cause)”. These two components can independently appear without ambiguity, serving to identify the causal argument unequivocally. Therefore, the construct “A+的原因+是+B+所致(the reason for A is attributed to B)” inherently entails both “A+的原因+是+B(the reason for A is B)” and “A+是+B+所致(A is attributed to B)”.

In the cases of 1b and 1c, the addition of “为了(for)” and “因为(because)” immediately following the verb “是(be)” serves to accentuate the object as the “目的(purpose)” and “原因(reason)” arguments. The construct “A+的目的+是+为了+B” can deduce both “A+的目的+是+B” and “A+是+为了+B”.

The remaining examples, 1d and 1e, mainly use the “A*B” frame structure to highlight the semantic role of non-core arguments. The prepositions in “A*B” are mainly verbs, prepositions or conjunctions.

(2) The main event occurs in the object position.

(2a) B+是+造成+A的原因(B is the cause that leads to A.)

(2b) B+是+为什么+A的原因(B is the reason why A.)

When the main event appears in the object position, the dual marking of the causal argument takes the form of “A*B”. For case 2a, its semantically equivalent expressions include “B+是+A的原因(B is the cause of A)”, with the term “造成(to cause)”, effectively highlighting the causal semantics of the component located in the subject position. In case 2b, “B+是+为什么+A的原因(B is the reason why A)” can imply “B+是+A的原因(B is the cause of A)”. The existence of “为什么(why)” is to accentuate the causal argument further.

V. CONCLUSION

We approach the topic from the perspective of semantic events, conducting empirical analysis based on corpus annotations. We investigate the attachment of event attribute nouns to semantic main events when they function as the subject or object of a sentence, introducing non-core arguments. This analysis focuses on the structure and syntactic-semantic characteristics involved. We have gained the following insights: Firstly, non-core argument case markers primarily appear in the head position of sentence subjects or objects, with the introduced arguments situated in corresponding subject or object positions. The main event and non-core argument distribution exhibit a distinct subject-object contrast. Secondly, the core predicate verb is often a verb denoting explanatory, categorical, inclusive, or relational meanings in sentences where nominal argument case markers connect to the primary event to serve as subjects or objects, therefore introducing appropriate arguments. Typically, terms that have a specific actual action meaning or describe a specific action or state are not used to describe them. Lastly, through corpus observation and analysis, linguistic units expressing non-core arguments can be classified based on their nominal or predicate nature: When predicate components serve as arguments, the primary argument roles encompass 原因(cause), 目的(purpose), and 方式(manner). When nominal components function as arguments, the principal argument roles involve 工具(tool), 依据(basis), and 结果(result).

On the one hand, this study extends the forms of non-core argument case markers, contributing to a comprehensive and systematic investigation of argument case markers in Chinese. On the other hand, the 643 annotated instances generated during the research process can serve as linguistic examples for scholars' further studies.

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