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Lexical Bundles in EAP Research Articles of L1 and L2 English Authors: A Contrastive Analysis

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Academic research writing has witnessed an upsurge of interest in the investigation of recurrent word combinations which serve a variety of pragmatic purposes and can differentiate novice authors from professional ones. Reviewing the literature indicates that few studies have investigated lexical bundles such as on the other hand, as a result of, etc. in economic research articles by L1 and L2 authors. Thus, this study intended to investigate the structure, function, and semantic preference of most frequent 4-word lexical bundles in economic research articles written by L1 and L2 authors. The corpora were analyzed and intended lexical bundles were recognized employing a concordance tool, Antconc 3.5.9.0, to identify lexical bundles. The result of this study illustrated that L1 and L2 authors used prepositional phrase bundles more frequently than verb phrase and dependent clause bundles. The results also suggested that L2 authors' limited implementation of lexical bundles might be rooted in their culture, writing rules, and psychological features. In terms of semantic preference, both L1 and L2 authors used lexical bundles with almost the same semantic prosody in the field of economy. Teachers and learners in the field of English for Academic Purposes (EAP) could benefit from the findings of this research to appreciate the role of lexical bundles better.

در نگارش مطالعات تحقیقی آکادمیک، بررسی ترکیب‌های واژه‌ای تکرارشونده علاقه مندان زیادی را جذب کرده است چرا که در خدمت اهداف عمل‌گرایانه‌ای هستند و می‌توانند نویسندگان مبتدی را از نویسندگان حرفه‌ای متمایز کنند. بررسی متون نشان می‌دهد که مطالعات اندکی به بررسی بسته‌های واژگانی از جمله "از سوی دیگر" و "در نتیجه" و غیره در مقالات پژوهشی اقتصادی نویسندگان پرداخته‌اند. بنابراین، این مطالعه با هدف بررسی ساختار، عملکرد و ترجیح معنایی بسته‌های واژگانی در مقالات پژوهشی L2 و L1 بود. پیکره این تحقیق تجزیه و تحلیل شد و بسته‌های واژگانی 4 کلمه‌ای با استفاده از L2 و L1 اقتصادی نوشته‌شده توسط نویسندگان L2 و L1 ، برای شناسایی بسته‌های واژگانی شناسایی شدند. نتیجه این مطالعه نشان داد که نویسندگانAntconc 3.5.9.0ابزار تطابق، از عبارت های شامل حرف اضافه بیشتر از دسته‌های شامل عبارت فعلی و بند وابسته استفاده می‌کنند. نتایج همچنین نشان داد که استفاده از بسته‌های واژگانی ممکن است ریشه در فرهنگ، قوانین نوشتاری و ویژگی‌های روان‌شناختی آنها داشته باشد. L2 محدود نویسندگان از بسته‌های واژگانی با عروض معنایی تقریباً یکسان در حوزه اقتصاد استفاده کردند. L2 و L1 از نظر ترجیح معنایی، هر دو نویسنده می توانند از یافته های این تحقیق برای درک بهتر نقش (EAP) معلمان و زبان آموزان در زمینه زبان انگلیسی برای مقاصد تحصیلی بسته های واژگانی بهره ببرند.

Keywords: Lexical bundles, corpus, structure, function, semantic preference, evaluative prosody

Introduction

Academic research writing has proliferated in the investigation of recurrent word combinations. These lexical bundles, idioms, collocations, etc., which are known with different names such as n-grams, phraseology, fixed expressions, and formulaic language (e.g., Biber et al., 1999; Chen, & Baker, 2010) and clusters (Scott, 2001) are important elements of fluent linguistic production (Wright, 2019). In fluent language production, frequent fixed phrases that serve certain pragmatic purposes are considered to be significant, and they can be seen as indicators of skilled language use in a certain register. These features highlight the importance of continuing to research common word combinations in the creation of various discourse communities. Among these phraseological variations, lexical bundles (LBs) are considered one of the most important and widely occurring word combinations, which help indicate the natural use of language elements (Huang, 2015). Wright (2019) stated some key benefits of LBs, including enabling advanced students to generate sentences in greater pre-made chunks and providing students with a sufficient indication of proficient language learning techniques.

Considering the significance of LBs in academic writing, they have been examined from different views. Several researchers have considered lexical bundles from various disciplinary views (e.g., Candarli, & Jones, 2019; Durrant, 2017; Rahimi Azad & Modarres Khiabani, 2018; Shirazizadeh, & Amirfazlian, 2021). Moreover, variations in LBs between genres have been the subject of certain research (e.g., Hyland, 2008a; Li et al., 2020; Lu & Deng, 2019; Wang, 2017; Wright, 2019). Another area of research has highlighted the use of LBs among L2 learners with various levels of proficiency (e.g., Chen & Baker, 2010; Cortes, 2004; Pan et al., 2016; Shin & Kim, 2017; Zipagan & Lee, 2018). Several studies have also examined how L1 and L2 authors employ LBs in their writing (e.g., Adel & Erman, 2012; Akbulut, 2020; Chen & Baker, 2010; De Cock, 2004; Esfandiari & Barbary, 2017). Although a large number of studies have inspected LBs from various perspectives, contextual functions, the relationship between bundles and semantic domains has not been sufficiently explored yet.

An overview of the related literature indicates that a few studies have addressed LBs in economic research articles. The present study, therefore, aims to contribute the existing knowledge of the diversity of the lexical bundles in EAP research articles by exploring four-word LBs used by L1 and L2 authors in the introduction, methodology, discussion, and conclusion parts of economic research articles, investigating their structure, function, and semantic preference. It is believed that the use of LBs in writing could demonstrate the users' language proficiency; thus, this study contributes to the field of language learning specifically in written discourse. We decided to follow Hyland (2008a) and focus on four-word bundles since he argues that they are significantly more prevalent than 5-word strings and provide a more comprehensive set of structures and functionalities than 3-word bundles. To this end, we developed two corpora of research articles in economics, one by L1 authors and the other by L2 authors, who were from different countries with different first languages. Table 1 represents some 3-word, 4-word and 5-word bundles that occurred frequently in million-word academic corpus.

TABLE 1
Most Frequent 3-Word, 4-Word and 5-Word Bundles in the 3.5 million Word Academic Corpus

3-word	Freq.	4-word	Freq.	5-word	Freq.
in terms of	1203	in the form of	191	on the other hand the	153
in order to	1629	as well as the	253	at the end of the	138
the end of	501	in one of the	209	may be due to the	64
it can be	468	can be used to	148	in the case of the	50
as a result	472	as a result of	175	in the form of a	31

It should be noted that L1 and L2 language users are employed in this study after Cook (1999). This is a radical departure from the classical distinction of native and non-native speaker that has been challenged for a

variety of reasons. It is assumed that the notion of a native speaker is thought to be a misleading, racist, and discriminatory term that conveys inappropriate ideological beliefs (Dewaele, 2018).

Literature Review

According to Biber et al. (1999), LBs could be considered some words that frequently follow each other. According to them, LBs are recurrent formulaic languages which their idiomaticity and structural status are not considered.

Lexical bundles have been studied in several frameworks. The first framework includes various studies about registers (e.g., Biber, 2006; Biber & Barbieri, 2007; Esfandiari & Barbary, 2017; Grabowski, 2015; Herbel-Eisenmann & Wagner, 2010; Mohamad, 2015; Mohammad Hosseinpur et al., 2020; Shirazizadeh, & Amirfazlian, 2021). Esfandiari and Barbary (2017) examined LBs in psychological research articles written by Persian and English authors. They worked on a contrastive corpus-based study to classify the highly frequent 4-, 5-, and 6-word LBs and identify their functions and structures. They suggested that in terms of structural analysis, the largest category involved noun phrase and prepositional phrase bundles. In the case of functional distinction, the study suggested that Persian authors benefit from LBs differently from English authors and may misuse, overuse, or even underuse them.

The analysis of academic genres is another line of inquiry in this area (e.g., Biber et al., 2004; Chen & Baker 2010; Hyland, 2008b; Li et al., 2020; Qin, 2014; Wang, 2017). Biber et al. (2004), for instance, studied LBs in the registers of textbooks and classroom context. They held the view that the oral qualities of the setting, such as conditions of real-time production and an emphasis on personal as well as interpersonal aims, dictate the typical language characteristics of classroom teaching.

The third main line of research done on LBs is concerned with disciplinary variations (e.g., Atai & Tabandeh, 2015; Biber, 2006; Cortes, 2004; Durrant, 2017; Hyland, 2008a; Kashiha & Chan, 2013). As an example in this category, Durrant (2017) identified distinctions between two groups of disciplines including first, humanities and social sciences and second, science and technology in university student writing to highlight disciplinary differences in university student writing. In two disciplines of science and technology, for instance, research-oriented bundles emphasized the physical world and location such as, in the surface of the, and at the beginning of the; in the humanities and social sciences, however, the bundles emphasized complex concepts (research-intangible framing features as of the concept of).

Finally, the last framework refers to contrastive studies between L1 authors and L2 authors (Adel & Erman, 2012; Alipour et al., 2013; Amirian et al., 2013; De Cock, 2004; Esfandiari & Barbary, 2017; Kim, 2009). De Cock (2004) investigated the frequency of 2- to 6-word LBs among L1 language users and L2 language users of French. After removing repetitions (e.g., I I or and and) and hesitation fillers (e.g., em or er), De Cock (2004) noticed that LBs were more frequently used among L1 language users than L2 language users.

Reviewing the literature demonstrated that most studies of LBs have addressed the functions of lexical bundles in discourse without considering types of context referred to as semantic domains. This is remarkable since it can lead to a better comprehension of the functional properties of LBs. To this aim, two concepts of semantic preference and evaluative prosody are worth noting. Some studies have investigated the meaning of words in semantic environment (Bednarek, 2008; Partington, 2004; Phoocharoensil, 2021). Shin (2020) identified LBs in argumentation essays written by L1 and L2 writers. It attempts to explore the meaning of LBs in context by considering semantic preference and evaluative prosody. Hence, the present study intends to raise awareness of LBs in terms of two groups of authors and various parts of a research article in economics.

Structural and Functional Characteristics of Lexical Bundles

Biber et al. (2004) examined LBs structurally as well as functionally. They noted that although LBs are often incomplete structural units, they have significant grammatical correlations, which enable researchers to classify them into different structural sorts. The authors addressed three basic structural types of LBs including, "1) LBs integrating verb phrase fragments, 2) LBs integrating dependent clause fragments, and 3) LBs integrating noun phrase and prepositional fragments." (Biber et al., 2004, p. 381). The first type involves a verb phrase added to a subject pronoun such as, the findings revealed that. Type two includes the main clause followed by a complementizer or a subordinator, for example, I don't know if. Type three of bundles include a prepositional phrase with modifiers, such as at the end of the.

Lexical bundles are classified into numerous subcategories serving a wide range of purposes. In spite of structural categorization, Biber et al. (2004) classified LBs into three classes in terms of their primary functions: "stance expressions, discourse-organizers, and referential expressions." (Biber et al., 2004, p. 384). Stance bundles include the words that communicate sentiments, judgments, and attitudes such as it is important to. Discourse organizing bundles are the connections between preceding and subsequent discourse, like on the other hand. Finally, referential bundles are associated with the expression of specific entity properties like results of this study. However, Hyland (2008a) suggested another functional classification of LBs. He categorized them into three sub-categories: Research-oriented which refers to LBs helping authors to organize their experiences and activities of the real world. Bundles in this group indicate location, quantification, procedure, description, and topic. Text-oriented clusters are concerned with the arrangement of the text and the significance of its components as an argument or message. This category includes transition signals, resultative signals, structuring signals, and framing signals. Finally, participant-oriented clusters focus on the author or reader of the content and include stance features and engagement features.

Length of Lexical Bundles

Despite the fact that different studies have investigated LBs of various lengths, 4-word LBs have received significant attention for the following reasons. First of all, they can be more convenient to analyze both structurally and functionally rather than 3-, 5- or longer word bundles. Chen and Baker (2010) mentioned the reason to the fact that 4-word LBs have been investigated the most can be explained to this point that their size is feasible to work with considering manual classification and concordance checks. Another reason is that 4-word LBs are more frequent than other longer LBs. According to Hyland (2008a), the most commonly occurred 3-, 4 and 5-word bundles in the corpus of 3.5-million-word in academic articles such as, doctoral dissertations, and Master's theses were collected. Based on the final list, 4-word bundles were the most frequent bundles after 3-word bundles, which according to Biber et al. (1999, p. 994), 3-word bundles happened over 60,000 times and 4-word bundles occurred over 5000 times per million words in academic writings. In comparison with longer texts, based on Cortes (2006) who conducted a study of four structurally full 9-word LBs in research article (RA) introductions from various disciplines, 4-word LBs are ten times more frequently used than 5-word LBs. Finally, 4-word LBs are frequently subsumed into 5-word LBs, which also comprise 3-word LBs (Adel & Erman, 2012).

Lexical Bundles, Idioms, Collocations

The meaning of lexical bundles is not considered idiomatic as Hyland (2008a) put forward, that they are both semantically and formally regular. For instance, the meanings of LBs such as it can be seen that, it is possible that the, and it should be noted that can be completely retrieved from the single words that make them up.

Furthermore, since they are found out mostly according to their frequency rather than their structure, LBs are not "perceptually salient" (Biber & Barbieri, 2007). LBs are distinguished from idioms and collocations by Biber et al. (1999). Idioms, based on their classification, are the most consistent sorts of multi-word phrases, which are generally structurally complete units that must be learnt in their whole and can be substituted by other single words with same meaning. For instance, many idiomatic expressions such as phrasal verbs (e.g., hang out, put on, and get along with) and other longer expressions (e.g., beat about/around the bush, tackle a question, and go over one's head) can be replaced with single lexical verbs. Collocations, on the other hand, are connections between two words that are not typically idiomatic in meaning. Collocations could be correlated with a number of different terms, and each word making up the collocation preserve their meaning (Esfandiari & Barbary, 2017).

Semantic Preference and Evaluative Prosody

Two ideas of semantic preference and semantic prosody have recently received much attention in corpus linguistics. Sinclair (2004, as cited in Shin, 2018) defined semantic preference as the limitation of frequent co-occurrence to words that have a shared semantic characteristic. Bednarek (2008) attempted to shed light on the issue by describing them as negative and positive items, which is observable by examining the corpus and considered relatively objective. Like semantic preference, evaluative prosody, also known as semantic prosody, refers to "a consistent aura of meaning with which a word is imbued by its collocates" (Louw, 1993, p. 157, as quoted in Phoocharoensil, 2021). Evaluative prosody spreads beyond the single orthographic word. It explores vocabulary aspects that are not evident such as favorable or unfavorable investigation of an item, which proves that semantic prosody is not part of the in-built meaning of a word (Partington, 2004).

A framework for the Present Study

As briefly reviewed above, prior studies have examined 4-word LBs in English focusing on different registers, genres, and language modes. In recent years, a large number of studies have exclusively concentrated on analyzing LBs between L1 and L2 speakers (e.g., Adel & Erman, 2012; Akbulut, 2020; Chen & Baker, 2010; De Cock, 2004; Esfandiari & Barbary, 2017). This study is an attempt to investigate four-word LBs in economic research articles by L1 authors and L2 authors. Reviewing the literature, we noticed that Choi (2015) examined the most repeated four-word LBs in published economic articles of L1 language users and L2 language speakers of English. The corpus used in Choi's study contained 262,653 words and involved 24 texts collected from the journals representing the American and Korean authors between 2010-2013. Since the study was a pilot study and employed fewer articles, it considered neither frequency nor dispersion criteria to reduce the risk of overgeneralizing the results. Therefore, considering this background, the present study is an attempt to examine a wider range of articles written by various authors from different countries. More exclusively, the current study addressed the following research questions:

1. Which four-word lexical bundles appear most frequently in economic research articles authored by L1 and L2 English authors?
2. What are the similarities and/or differences in the structure and function of lexical bundles utilized in economic research articles written by L1 and L2 English authors?
3. How do L1 and L2 authors use shared bundles in terms of semantic preferences?

Methodology

The Corpus

The corpus for this study contains 210 economic research papers, divided into two sections: research articles written by L1 writers and research articles written by L2 authors, which were collected by a random sampling procedure. To guarantee the representativeness of our corpora, we obtained our articles based on JEL Classification Codes, which is a system that originated with the *Journal of Economic Literature,* and is a standard method of categorizing scholarly literature in the field of economics. These codes include a letter as a subject descriptor and a number, grading sub-categories of a specific subject. To the aim of this study, equal number of articles in two broad subcategories of economics, macroeconomics, representing by E0, E1, E2, etc., and microeconomics, representing by D0, D1, D2, etc., were selected and collected. We benefitted from Google Scholar (https://scholar.google.com/) to identify the articles by codes addressing macroeconomics and microeconomics to download the articles between 2010 and 2020. Articles were downloaded from various journals such as Journal of Macroeconomics (https://www.sciencedirect.com/journal/journal-of-macroeconomics), Journal of Monetary Economics (https://www.sciencedirect.com/journal/journal-of-monetary-economics), International Review of Applied Economics (https://www.tandfonline.com/toc/cira20/current), etc.

TABLE 2
A Profile of the Corpus

Type of Genre	Academic research article
Period (Publication date)	2010 and 2020
Number of words	1,296,322 words from 210 texts
Sources	Electronic databases

In the literature, researchers have used different criteria to identify authors' first language. There is a method after Wood (2001), who operationally defined "L1-English" authors as any authors whose name, both first and last, were recognized L1 English-speakers and those who were affiliated with institutions in a country with English as the official language. According to the definition, in this study, for any author to be assumed as a L1 English author, the person had to be affiliated with an institution in one of the countries with English as the official language, as well as having the first name and the last name being recognized and common to those countries. Likewise, for any author to be regarded as an L2 author, he or she had to be affiliated with an institution in a non-English speaking country, with the first name and the last name regarded as foreign to an English-speaking country.

The corpus was examined to eliminate some parts of texts from the word count. In order to clean research articles, elements such as acknowledgements, prefaces, abstracts, affiliations, literature reviews, numbers, headers, mathematical equations, all illustrations (e.g., graphs, tables, but not their captions), appendices, and references were removed. It was assumed that there are no LBs in these sections or that they are not actually utilized by writers, and therefore examining their structures and functions could not yield exact findings. The texts were gathered in their electronic forms, and all texts were transformed into text documents that computer software tools could read for data analysis. Articles were representative of the various sub-categories in economics written by several authors.

TABLE 3
Subcategories of the ERA Corpus

Subcategory	Number of texts	Running words
Academic articles written by L1 authors	105	747,161
Academic articles written by L2 authors	105	549,161

Data Collection Procedure

Various approaches for developing lists have been used in the literature on LBs. Antconc 3.5.9.0. was preferred in this study over other programs like *MonoConc Pro* and *WordSmith Tools*, which, as a result of filters, are not free and freely available. Antconc version 3.5.9.0. is a concordance tool designed by researchers and enables them to identify LBs through a specific function of recognizing clusters/N-grams to generate word and keyword frequency as well as distribution plots. This corpus analysis tool is an intuitive graphical user interface and has several advantages such as being easy-to-use, offering free access, and empowering small-scale corpora like ours. It is used to create lists of four-word LBs out of the corpora.

Extraction of lexical bundles

For the purpose of the present study, the following criteria were taken into account: range, frequency, and length of LBs. The current study adopted a conventional approach by setting a range of 5, and a cut-off frequency of 20 times in each corpus for our intended length of LBs, 4-word bundles. Following the application of this software, two lists of the most frequent LBs were created from articles by L1 and L2 writers, with the type numbers 175 and 66, respectively. Due to the fact that the software is not able to eliminate disqualified LBs, it was necessary to filter the list manually. Thus, LBs discovered by Antconc were examined for items misapplied by the software. For instance, a statement like “the central bank s” didn’t seem as a 4-word bundle, and we assumed this is misspelled. Following a review of the corpora, 3 and 1 types of bundles were eliminated from the reported bundle lists in articles by L1 and L2 authors, respectively.

There is an exception to LBs thus identified, which is the overlapping LBs. Several cases were identified in which two (or more) bundles overlapped and one of them was subsumed within the other. It is what Chen and Baker (2010) called “complete subsumption”. For example, the 4-word bundle in the case of repeated 247 times in the corpus, and the case of the appeared 56 times in the total corpus. According to the concordance analyses, all occurrences of the case of the are followed by the word it. The higher frequency bundle was involved the lower frequency one: in the case of. Then the lists of bundles were reduced to 153 and 60 in articles written by L1 and L2 authors. Figure 1 illustrates an image of this analysis in the computer software.

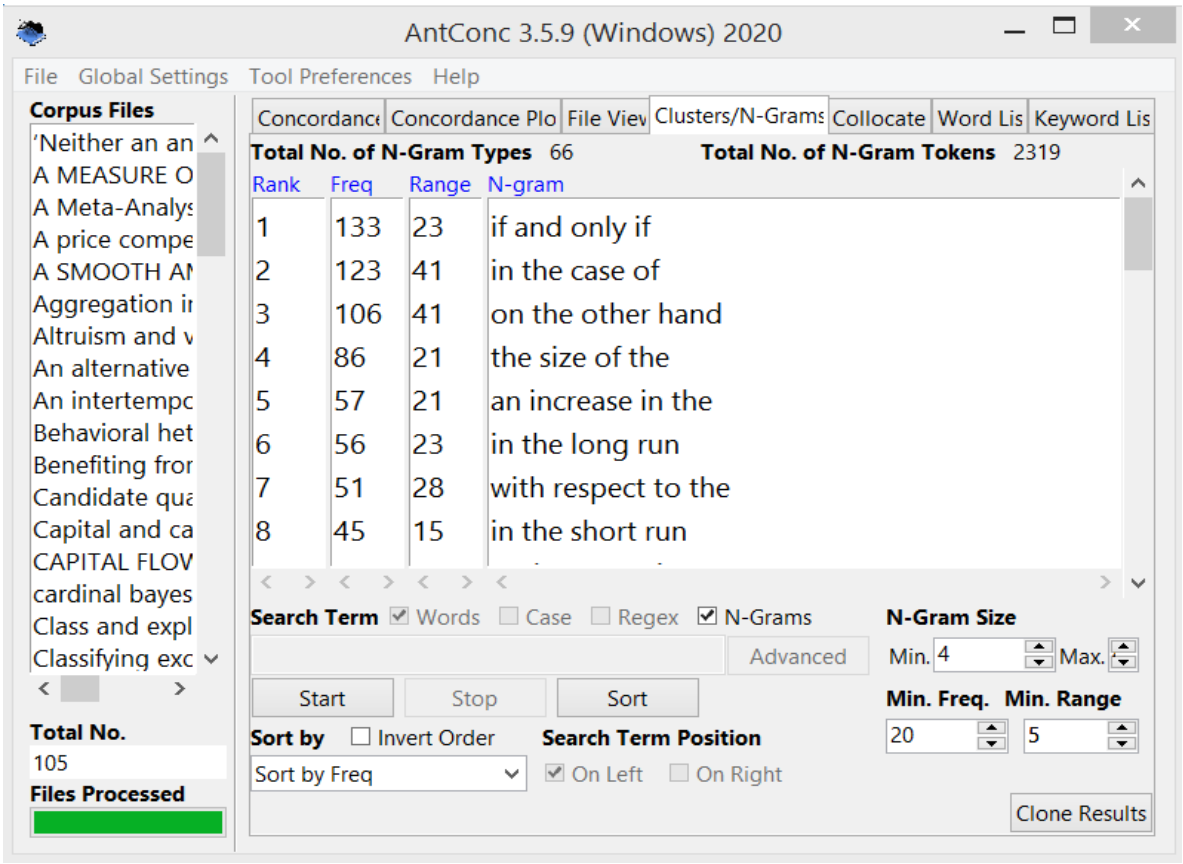

Figure 1. The primary analysis of lexical bundles in articles written by L2 authors.

Classification of lexical bundles

Following the next step, for the structural analysis of bundles, we benefitted from the classification proposed by Biber et al. (2004). It is a classic structural taxonomy of LBs, which many researchers are widely using (e.g., Amirian et al., 2013; Hyland & Jiang, 2018; Kashiha & Chan, 2013). The structural classification involves verb phrase fragments, dependent clause fragments, and noun phrase and prepositional fragments.

In order to analyze LBs functionally, we could adopt it of Biber et al. (2004) or Hyland (2008a). Ultimately, Hyland's taxonomy was assumed to be more appropriate and was preferred over Biber's classification, as our corpus exclusively includes research articles, which is more similar to Hyland's corpus. In Hyland's taxonomy, LBs were grouped into three broad categories: Text-oriented, associating with the organization of the text; research-oriented, representing time, place, and research procedure; and participant-oriented, concentrating on the writer or reader of the content.

Results and Discussion

In the following part, a quantitative comparison between the two classifications will be presented to compare type and token's number. In addition, a comparison regarding structure and function of the LBs in the L1 and

L2 writings will be presented. Finally, the most frequent LBs of L1RAs and L2RAs are presented in appendices A, B, and C.

Most Frequent Four-Word Lexical Bundles Identified in Corpora

Generally, 153 LBs were found in the L1RA and 60 in the L2RA. The number of existence in each corpus is shown in Table 4, with further contrast between type and token.

TABLE 4
The Number of Occurrences of Lexical Bundles

Corpus	No. of Types	No. of Tokens	Type/Token Ratio
L1RA	153	6,093	1/39
L2RA	60	2,317	1/38

The outcome reveals that the articles written by L2 writers contain less types and tokens of LBs than those written by L1 authors. The outcome of this study is in accordance with previous findings which L1 authors tend to use more LBs (e.g., Esfandiari & Barbary 2017; Shin, 2018). The employment of more LBs by L1 authors may indicate a higher language competence than L2 authors. The type/token ratio of L1 authors was higher than L2 ones which shows that more bundles were used in L1 academic writing. L2 authors used less repeated number of LBs, the majority of the bundles were noun phrase-based and preposition phrase-based ones.

Taken into account, we identified 107 bundles classified as specific to L1 texts and 14 to L2 texts, with 46 LBs shared by both groups. It is concluded that L2 authors mostly use noun and preposition-based bundles which are frequent in L1 writing as well. LBs, such as the size of the and on the other hand, are among the high frequent bundles that are used in both corpora. Considering the shared bundles, the frequencies differ between the two groups. For example, L2 authors opt for the size of the less than L1 authors. Moreover, among the non-shared bundles, the most frequent bundle in L1 writing is as a function of; while the most frequent non-shared bundle in L2 writing was in the euro area.

Structural Comparison between Lexical Bundles Identified in L1RAs and L2Ras

In the following section, LBs in the structural subcategories will be compared. Figure 2 indicates the distribution of each subcategory. Considering the most frequent four-word LBs, it is clear that L1 and L2 authors are eager to use prepositional phrase and noun phrase bundles the most. It is proposed that prepositional phrase bundles are repeated in academic writing and clausal bundles are typically for spoken register, which is consistent with the earlier research (e.g., Biber et al., 1999, 2004; 2011; Pan et al., 2016).

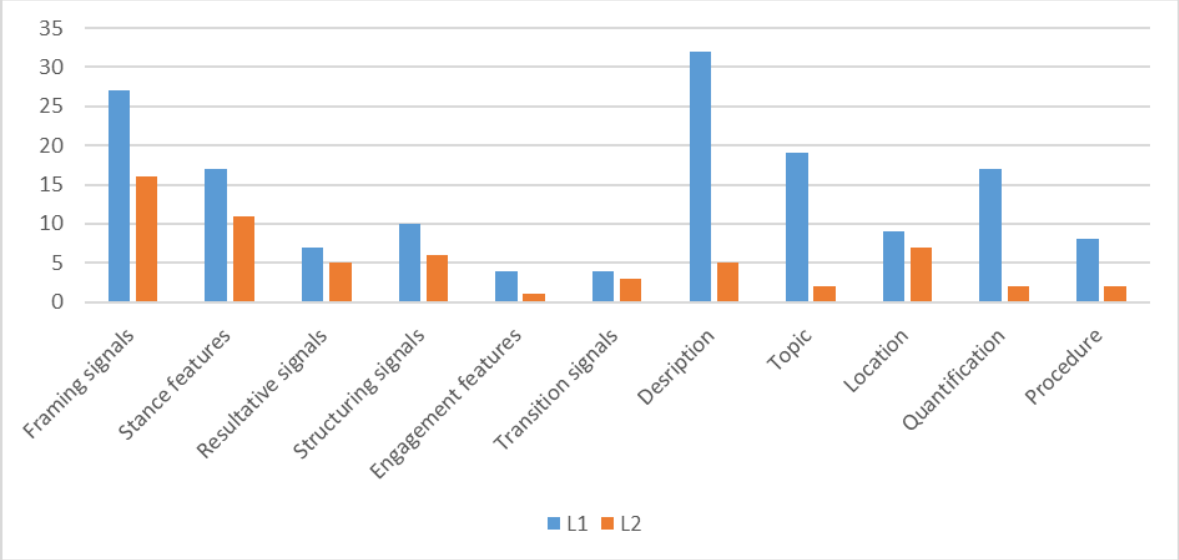

Figure 2. Distribution of structural categories of lexical bundles.

All in all, the verb phrase-based LBs are used less frequent in L2 writing whereas the L1 authors employed it more. L2 authors make use of verb phrase with non-passive verb and verb phrase with passive verb more frequently than the other subcategories of verb phrase fragments in Biber et al.'s taxonomy (2004). Moreover, as this is shown in figure 2, discourse marker+ VP, yes/no question, and Wh-question are the subcategories that L1 and L2 authors did not use. The dependent clause based LBs are the least frequent LBs that are employed by the two groups.

The next section will pinpoint the functional categories of LBs along with their semantic prosody in articles written by L1 and L2 authors.

Functional Comparison between Lexical Bundles Identified in L1RAs and L2Ras

Figure 3 contains the distribution of functional categories of LBs in L1 and L2 corpora. The results show that LBs of different functions are more evident in L1 writing. Framing *signals* and *description* LBs are the most used ones in L1 writing while *framing signals* and *stance features* are frequent in L2 writing.

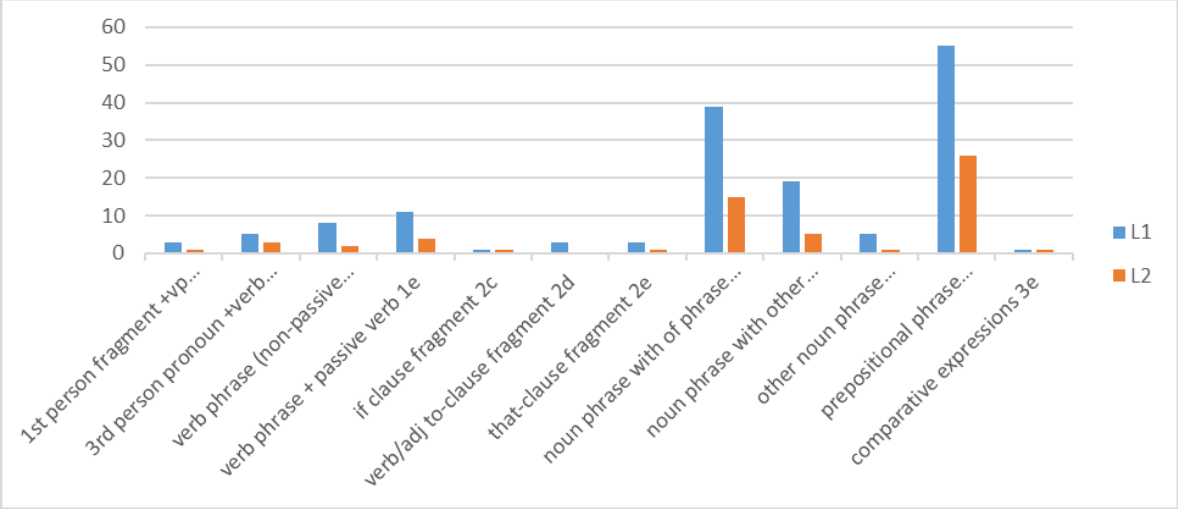

Figure 3. Distribution of functional categories of lexical bundles.

It can be understood that L1 authors tend to use four-word LBs more frequently. According to figure 3, framing signals and *description* LBs are among the most used ones by L1 authors. However, *engagement features* LBs are the least among the other groups. In addition, L2 authors show great interest in employing *stance* features bundles. However, they are less interested in choosing engagement *features* in their articles.

Regarding the similarities and differences between the economic research articles written by L1 and L2 English authors in employing different functional categories, research-oriented LBs can be counted as the biggest in both corpora. As it was explained by Hyland (2008a), research-oriented LBs can empower writers organize their activities and real-world experiences. In this study, L1 authors used descriptive bundles more frequently and L2 ones used framing signal bundles more. Furthermore, considering text-oriented LBs, the L1 authors used transition and resultative signals less frequently. Moreover, the L2 authors also used transition signals the least. The smallest group is participant-oriented bundles in both L1 and L2.

Semantic prosody in ERA

Considering the semantic prosody of the LBs used by L1 and L2 authors, the first ten most frequent bundles which were shared in the articles were investigated. The following section is going to represent the semantic prosody of the most frequent LBs in the sense of positive, negative or neutral meaning they serve alongside their categories.

The most frequent group of text-oriented bundles in L2 writing is considered framing signals. Framing signals are used to make a scaffold for arguments by limiting the conditions. Most of the framing signals in this study are preposition+ of structures, such as in the case of, which is the most used bundle of this category in both groups. The phrase “In the case of” was used 142 times by L1 authors and 162 times by L2 authors.

> Example: Notice that an accommodating monetary policy would have a role, even if less important, also in the case of a demand shock (figures available upon request from the authors). (L1 articles)

> Example: However, in the case of two bidders, this inference could be drawn already after a few rounds of bidding. (L2 articles)

L2 authors use framing signals to mention a source such as a case as an example referring to a wider group. In the case of L1 authors, they use framing signals to put a limitation on a condition. Both groups of authors tend to use *in the case of* for both positive and negative content. Framing signal bundles can make the methodologies and conclusions seem more persuading.

Furthermore, an increase in the was one of the most used bundles which is considered as a framing signal. While L1 authors used it 97 time, L2 authors incorporated it for 66 times. Analyzing the semantic prosody, both groups of authors used *an increase in the positively* according to the topic in which they had.

> Example: In short, the deflation that accompanies a recession represents an increase in the value of money and, therefore, an increase in the profitability of money production. (L1 articles)

> Example: It aims to do so by, on the one hand, an increase in the establishment of bank accounts among the adult population of the Kingdom; and, on the other hand, by ensuring better access to finance for SMEs and Saudi citizens. (L2 articles)

Transitional signals can be used to establish additive or contrastive connections between different text components. The coherence and cohesion of the writing could be maintained by using these bundles. Both groups of L1 and L2 authors relied on these bundles to connect different text parts. *On the other hand, the* second most used shared bundle was repeated 141 times in L1 and 117 times in L2 articles. Based on the examples below, this bundle is used to contrast the ideas in both corpora. The semantic prosody for both L1 and L2 authors is neutral since both groups used it in order to compare things.

> Example: On the other hand, the two remaining zones, the north-west and south-east quadrants, are areas of indifference. (L1 articles)

> Example: Edwards and Edwards, on the other hand, show that trade liberalization affected moderately unemployment and that the marginal effect declined through time. (L2 articles)

The right hand side was another most-used-shared bundle. L1 authors used it nine times, whereas L2 authors incorporated it five times. How *the right hand side* was used in both corpora shows positive semantic prosody in the economic articles.

> Example: To see that the in that solves is positive, we need to show that the right hand side of this inequality equals. (L1 articles)

> Example: Clearly, we know that as the left hand side is the maximum utility over all possible sets and the right hand side is the utility of a specific set. (L2 articles)

The next subcategory is stance features which shows the writer's attitude toward something. If and only if is third most used shared bundles by L1 and L2 authors. It was used 137 times in L1 articles and 146 times in L2 article.

> Example: Condition SOV is satisfied if and only if the expected valuation is increasing, so Condition IEGT and Condition SOV are mutually exclusive. (L1 articles)

Example: A social choice rule f is strategy-proof if and only if there is a function satisfying Proposition and a family {of voting by collections of lA–decisive sets satisfying Propositions to such that for all and all preference profiles. (L2 articles)

This bundle carries positive prosody in both L1 and L2 corpora. It was used to convey how a situation must be following a special condition.

The real exchange rate was the fourth most-used shared bundle in both corpora. It is considered a topic-oriented LB related to the field of research. L1 authors incorporated 106 of this bundle, while L2 authors used it 36 times. Therefore, the evaluation of its semantic prosody will be considered as the following, which is used neutrally:

Example: Even in cases where there is a strong relation between the real exchange rate and the relative price of nontraded goods, however, a large fraction of real exchange rate fluctuations is due to deviations from the law of one price for traded goods. (L1 articles)

Example: This is in line with the empirical literature on currency crises, which finds the real exchange rate appreciation to be an early signal of currency crises. (L2 articles)

Description bundles are considered the fifth most-used shared bundle in both L1 and L2 articles. They fit "noun+ of" structural bundle revealing that this pattern is used in both corpora to indicate abstract functions such as *ideas, quality,* and *context. The size of the* is the bundle used 79 times by L1 and 86 times by L2 authors. The semantic prosody for both groups is neutral since they both use this bundle to talk about their experience in the field of economy.

Example: The proportion of the increase falls relative to the size of the stock of ether as more ether are created. (L1 articles)

Example: For the government's books to balance, the size of the government workforce has to shrink. (L2 authors)

In order to set up inferential or causative relations, resultative signals can be used efficiently. L2 and L1 authors both preferred the bundle *as a function of,* which L1 authors had in for 84 times while L2 authors had it 27 times.

Example: Furthermore, the pattern of welfare gains, as a function of the pre-trade liberalization tariff of each country, are similar for the static and dynamic model that takes the transition into account.

Example: The impulse response for unemployment [which equals can then be written as a function of the impulse response function for inflation [which equals with appropriate leads and lags.

The semantic prosody associated with this bundle in L1 and L2 authors followed by a neutral environment in both corpora.

In the long run, a location bundle can be counted as one of the frequently shared bundles. Location bundles are employed to describe time and place within the sentence. L1 authors had it 59 times, and L2 authors used it 42 times. In the long run carries a positive and negative semantic prosody in L1 and L2 authors according to the area of the economic field discussed.

Example: Of course, this simulative effect is present in the short run, but vanishes in the long run once prices have adjusted. (L1 articles)

Example: Households of the middle generation will only react to changes in the long run which concern themselves. (L2 articles)

The last most frequent shared bundle is *the value of the*, which is a quantification LB. Quantification bundles are important because they are used to show the value of something within an article. While L1 authors used it 79 times, L2 authors used it 51 times in their articles.

Example: The value of the cryptocurrencies used to purchase these tokens is substantively linked to the value of the assets registered on the blockchain. (L1 articles)

Example: The decision is as follows: if the value of the F-stat exceeds the upper limit, then there is cointegration; if it lies between the limits, then we cannot conclude; if it is inferior to the lower bound, then there is no cointegration. (L2 articles)

Considering the semantic prosody of the value of the, both positive and negative aspect can be considered according to the explanation given in a specific area.

Taken together, L1 and L2 authors make use of different types of functional proportions to keep readers engaged, and scaffold the text so readers can be directed to the point that the writer shaped. L1 authors' widespread use of structural bundles makes their articles to be more meaningful in the sense that structural bundles give the text a sense of coherence. This is in line with Hyland (2005) who notes on writing in the soft disciplines and asserts that the L2 groups appear to use attitude markers more frequently than the L1 group to inspire an intelligent reader and a reliable, amicable writer. The limited number of LBs that are used exclusively by L2 authors suggests they rely more on the structural bundles specially in their argumentative writings which has shown some misuses according to some investigations. They are more willing to use prepositional bundles frequently and a narrow amount of verb phrase-based bundles. However, L2 authors' limited implementing of LBs might be rooted in their culture. Blagojević (2009) mentions that the L2 authors may have adhered to the writing skills they gained within their writing culture while writing academically, or they may have been influenced by a range of social, and psychological aspects present in both cultures. Comparing L1 and L2 authors in this study was an attempt to better understand a possible influence of their mother tongue and culture on English speaking.

The findings are in accordance with the previous studies about LBs. They were in line with Esfandiari and Barbary (2017) in the sense that L1 authors tend to use more LBs than L2 authors. Moreover, Shin (2018) had the same findings and confirmed that the use of LBs by L1 authors exceeded L2s authors. Taken the result of our study into consideration, however, our findings are inconsistent with the findings of Hyland (2008a) in a sense that in Hyland's (2008a) research, students with less skill or confidence in writing used more LBs.

In addition, both L1 and L2 authors used LB with almost the same semantic prosody in the field of economy. There was no significant difference between the semantic prosody used in the context by both groups of authors. It is important to consider the fact that using LBs with different semantic prosodies may be related to the cultural practices of different authors. According to Shin (2020), the concept of native-like plays little role in the writers' collocational competence with lexical bundles.

Conclusion

This study analyzed LBs in terms of structural and functional use in economic research articles written by L1 and L2 authors. Also, it considered the semantic prosody served by the ten most-frequent-shared bundles. The two groups of authors represented some similar features in their structural and functional use of LBs. However, the difference in the structural use is more eminent.

The whole number of LBs were 154 for L1 and 60 for L2 authors. Forty-six LBs were shared by both groups of authors. It was found both groups were more willing to incorporate noun and preposition-based phrase LBs into their writing. Considering functional analysis, both groups made use of different types of functional proportions. Moreover, the semantic prosody which was investigated in this research was rather limited in the sense that the first ten shared frequent bundles were considered.

According to the findings of our study, which is in line with Chung and Lee (2020), instructors and teachers are recommended to teach LBs in various contexts so that learners can become acquainted with the exact meaning and appreciate it. They could benefit from this research in the sense that they can focus more on how to raise students' awareness of these LBs and how they are used by various writers in order to facilitate their writing production. To be more specific, L1 writers' uses of LBs would be a great sample for L2 writers to follow and get a better comprehension of LBs uses. As Dahunsi and Ewata (2022) put forward, teaching LBs as a multi-word expression is therefore recommended in ELT as a way of enhancing learners' proficiency and naturalness in English. Moreover, as Huang (2015) asserted, the learner's inability to use LBs in a grammatically correct and semantically appropriate way indicates their lack of competency in the target language. Therefore, material developers and teachers should pay more attention to provide learners with appropriate and accurate ways of presenting LBs in written discourse and help learners to benefit from them as this was suggested by Shahmoradi et al. (2021) that this could help writing instructors to enhance students' academic writing. This could guide learners to be more aware of LBs so they can be more fluent and incorporate them in their writings. In addition, learners can get to know the functions of the LBs more since the LBs are used by different authors.

The present study holds some limitations, including size and the subjects of two corpora. Although the corpus included approximately 1.5 million running words, the analysis may not provide satisfactory results to generalize findings since the size is insufficient. Therefore, further studies considering larger corpora would be required to have a more revealing result. The other limitation is that we selected two subjects in economics. However, further research can be done by focusing on other subjects in economics, such as industrial organization, financial economics, etc., to comprise a larger corpus.

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Appendix A

Most frequent lexical bundles in L1RAs			
Rank	Frequency	Range	
1	150	43	in the case of
2	116	56	on the other hand
3	162	12	the real exchange rate
4	127	38	an increase in the
5	90	24	in the long run
6	85	25	if and only if
7	83	29	the size of the
9	131	34	as a function of
10	72	37	as well as the
11	71	36	the value of the
12	69	7	of the output gap
13	65	28	in the absence of
14	63	7	the relative price of
15	62	9	of the exchange rate
16	61	32	in terms of the
17	60	10	of the central bank
18	59	13	state of the economy
20	54	32	in this case the
21	53	25	at the same time
22	73	33	is consistent with the
23	78	32	the fact that the
24	52	33	in the context of

25	51	40	it is important to
26	74	18	the level of the
27	82	25	the right hand side
28	48	29	in this section we
30	48	19	the ratio of the
31	48	11	the real interest rate
32	47	29	is given by the
33	47	6	the conditional variance of
34	46	27	in the sense that
35	68	10	the state of the
36	45	31	in this paper we
37	43	29	in the presence of
38	71	6	the expected value of
39	43	26	we assume that the
40	81	25	at the end of
41	41	28	in the next section
42	41	15	the nominal interest rate
43	41	25	with respect to the
44	40	6	of the capital stock
45	39	23	as a result the
46	39	25	can be written as
47	39	18	in the short run
50	37	15	in the form of
51	59	19	in the united states
52	37	16	the change in the
53	57	19	the growth rate of
54	37	11	the variance of the

55	36	16	is a vector of
56	36	21	is assumed to be
57	36	25	is based on the
58	36	9	the log of the
59	55	24	a measure of the
60	35	25	is likely to be
61	35	9	of the real exchange
62	35	22	the difference between the
63	35	20	the extent to which
64	35	19	the sum of the
65	34	7	exchange rate and the
66	34	19	on the basis of
67	34	12	the coefficient on the
69	33	26	that there is a
70	33	14	the dynamics of the
72	32	22	as a result of
73	32	5	the terms of trade
74	32	16	to account for the
75	31	19	a change in the
76	31	9	significant at the level
77	30	18	can be interpreted as
78	30	27	of the paper is
79	51	18	the effect of the
80	30	17	the existence of a
81	30	8	the federal funds rate
82	30	8	the impulse response functions
83	30	18	the results of the

84	29	11	in the distribution of
86	29	19	is a function of
87	73	17	is the same as
88	29	15	that an increase in
89	29	10	the increase in the
90	29	21	the nature of the
91	29	13	the response of the
92	29	19	the rest of the
93	29	6	the values of the
94	28	18	are more likely to
95	28	9	as a share of
97	28	21	for each of the
98	28	22	in addition to the
99	28	11	of the long run
100	28	14	the evolution of the
101	28	19	the magnitude of the
102	54	10	the standard deviation of
103	27	12	in response to a
104	27	27	is organized as follows
105	27	21	of this paper is
106	27	11	on the number of
107	27	13	the behavior of the
108	27	17	the structure of the
109	26	14	an important role in
110	26	18	is equal to the
111	26	20	it is possible to
112	26	11	of the interest rate

115	26	6	the consumer price index
116	26	11	the marginal utility of
117	26	12	the null hypothesis of
118	26	17	the relationship between the
119	25	19	a large number of
120	25	19	are assumed to be
121	25	10	as in the case
123	25	17	in line with the
124	25	14	on the right hand
125	45	25	paper is organized as
155	21	20	in the previous section
163	20	17	can be found in
167	20	9	in the sense of
126	25	10	that the central bank
127	25	11	the cost of the
128	25	16	the impact of the
129	25	16	we show that the
130	24	15	at the beginning of
131	24	6	in the real exchange
132	24	13	of changes in the
134	24	14	the parameters of the
136	23	14	are the same as
137	23	13	in the number of
138	23	12	is given by where
139	23	17	it is clear that
140	23	5	of real exchange rates
141	23	16	of the form where

143	23	18	the remainder of the
144	23	16	to changes in the
145	23	5	to the output gap
146	22	13	a model in which
147	22	8	for the united states
148	22	15	it is straightforward to
150	22	11	the difference in the
151	22	6	the two types of
153	21	19	are consistent with the
154	21	15	in other words the
157	21	14	on the level of
158	21	13	the assumption that the
159	21	11	the first order condition
160	21	11	the quality of the
161	21	16	to the extent that
162	21	15	we focus on the
164	20	6	conduct of monetary policy
166	20	13	in the level of
169	20	15	it is assumed that
170	20	14	of the number of
171	20	11	than or equal to
172	20	9	the nominal exchange rate
174	20	8	the set of all

Appendix B

Most frequent lexical bundles in L2RAs			
Rank	Frequency	Range	
1	133	23	if and only if
2	153	41	in the case of
3	128	41	on the other hand
4	86	21	the size of the
5	57	21	an increase in the
6	56	23	in the long run
7	51	28	with respect to the
8	45	15	in the short run
9	43	28	at the same time
10	42	17	the value of the
11	41	9	in the euro area
12	41	19	the results of the
13	40	23	in the presence of
14	38	21	in this case the
15	38	23	it is important to
16	38	19	on the basis of
17	37	23	as well as the
18	37	21	in line with the
19	37	20	in terms of the
20	37	23	in the context of
21	37	9	the real exchange rate
22	37	24	the rest of the
23	36	21	in this section we
24	33	24	in this paper we

25	53	11	the null hypothesis of
26	32	6	the balance of payments
27	32	17	the existence of a
28	31	22	on the one hand
29	31	21	that there is a
30	31	26	the fact that the
31	30	19	it is possible to
33	30	17	we assume that the
34	28	20	is consistent with the
35	28	28	is organized as follows
36	27	14	it is easy to
37	26	11	in the sense of
38	26	7	of the euro area
39	26	17	of this paper is
40	47	26	paper is organized as
41	26	13	the case of a
42	26	8	the expected value of
43	25	15	in the sense that
44	25	17	is based on the
45	25	7	significant at the level
46	25	12	the right hand side
47	24	17	is equal to the
48	24	6	is said to be
49	44	14	the end of the
50	23	19	in the next section
51	23	6	in view of the
52	22	9	as a share of

55	22	8	the probability of a
56	21	16	can be found in
57	21	19	of the paper is
58	21	8	such that for all
60	21	18	the purpose of this
62	20	15	in the form of
64	20	7	of the central bank
65	20	5	states of the world
66	20	12	the case in which

Appendix C

Most frequent lexical bundles shared in L1RAs and L2RAs			
Rank	Frequency	Range	
1	303	84	in the case of
2	222	97	on the other hand
3	218	48	if and only if
4	169	50	the size of the
5	151	59	an increase in the
6	201	21	the real exchange rate
7	146	47	in the long run
8	113	53	the value of the
9	109	60	as well as the
11	98	52	in terms of the
12	96	53	at the same time
13	92	53	in this case the
14	92	53	with respect to the

15	157	46	as a function of
16	89	56	in the context of
17	89	63	it is important to
18	84	33	in the short run
19	84	50	in this section we
20	84	58	the fact that the
21	83	52	in the presence of
22	81	53	is consistent with the
26	80	17	of the central bank
27	78	55	in this paper we
29	126	37	the right hand side
30	73	43	we assume that the
31	72	38	on the basis of
33	71	42	in the sense that
34	71	37	the results of the
37	66	43	the rest of the
38	64	47	in the next section
40	64	47	that there is a
43	62	38	in line with the
45	62	34	the existence of a
46	61	42	is based on the
47	59	23	the null hypothesis of
48	57	30	in the form of
50	56	39	it is possible to
53	56	26	the ratio of the
55	55	55	is organized as follows
57	54	31	the sum of the

58	53	38	of this paper is
64	51	46	of the paper is
65	92	51	paper is organized as
66	51	26	the change in the
69	50	35	is equal to the
73	49	30	a change in the