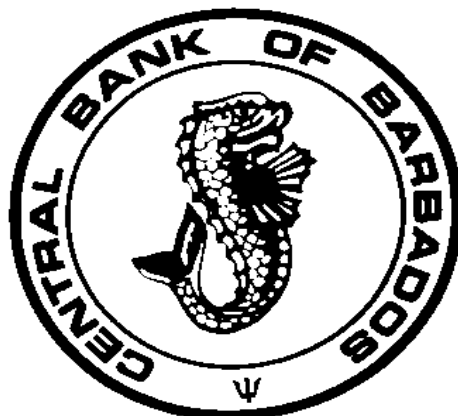


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**AN ASSESSMENT OF THE KNOWLEDGE PRODUCTS  
PRODUCED BY THE CENTRAL BANK OF BARBADOS  
OVER THE PAST FORTY YEARS**

**BY**

**WINSTON MOORE, SHAMIKA WALROND, LARON ALLEYNE,  
DARRIN DOWNES, CRYSTAL DRAKES AND STACIA HOWARD**



**CENTRAL BANK OF BARBADOS**

# **An Assessment of the Knowledge Products Produced by the Central Bank of Barbados over the Past Forty Years**

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## **Abstract**

Since the establishment of the Central Bank of Barbados in May 1972, the focus has been on acquiring a deep understanding of the domestic economic challenges and the broader issues surrounding sustainable development in small states. While most of this research, as should be expected, has examined topics in money and finance, there has also been an active research effort on other key sectoral challenges facing the small state. Utilising thematic analysis, this paper provides an assessment of the knowledge products (i.e., research output) produced by the Central Bank of Barbados over the past forty years, with the objective of identifying the key thematic areas researched. This research aims to assess broadly how the Bank's economic policy advice has been driven by its research, identify any gaps in this research agenda and potential areas for future research.

Keywords: Central Bank of Barbados; Small States; Monetary Policy

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## **1 Introduction**

The Central Bank of Barbados (CBB) was established six years after Independence, with a staff complement of the Governor and five employees. The Research Department, and its fledgling research programme, began the following year. During the early years, the objective was to develop a keen sense of the workings of the domestic economy and pathways to development. Indeed, it was the hope of policymakers at this time that by breaking away from the Eastern Caribbean Currency Authority (ECCA) and establishing its own monetary authority would advance the pace of economic growth and development (Blackman, 1988).

The research programme of the CBB had to be ambitious, as there was only modest research on the development options for Barbados at that time and even less research on central banking in small island states. Because of this desire to focus on development and not just monetary matters, the research touched on a wide variety of areas, as exhibited by its various articles and publications (Worrell, 1982; Codrington, Craigwell, & Haynes, 1997; Codrington, Craigwell, & Downes, 2003).

The Bank's research focus has been influenced by the consensus that many of the economic theories associated with large economies could not be justifiably applied to the fundamentals of small states. For instance, small open economies differ from larger economies in respect to their significant reliance on imports and the associated price inelasticities, as well as their deference to the foreign exchange constraint. In recognition of this, the Bank's research agenda has been consistently geared towards advancing the understanding of the economic rudiments of small open economies, with an overall aim of supporting policy development.

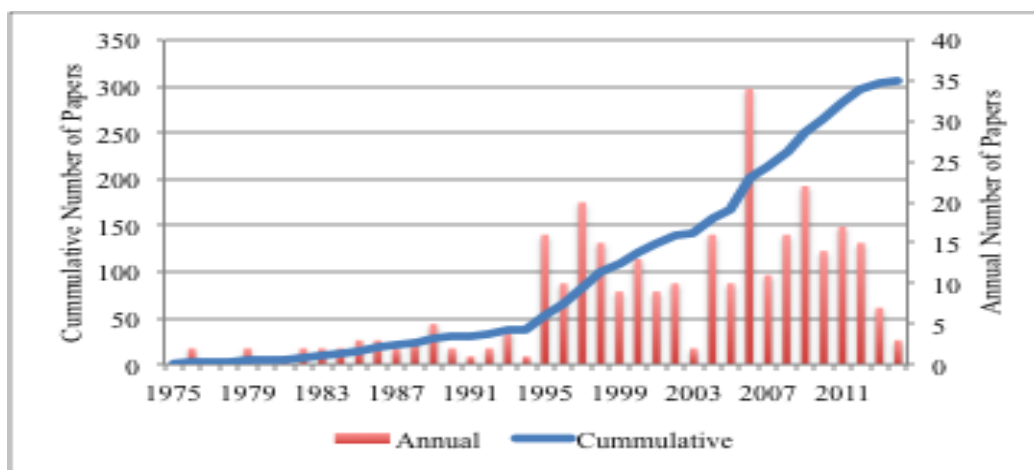
There have been two previous attempts to examine the body of research produced by the CBB. The first effort was in commemoration of its tenth anniversary entitled: *The Economy of Barbados: 1946-1980*, which was an assessment of the domestic economic performance during the post-war period and not an evaluation of the research programme per se. A subsequent analysis was conducted by Codrington (1997), who notes that research has featured prominently at the CBB since its inception and despite its limitations in relation to staff size, was able to produce more than 150 articles, pamphlets and books.

In addition to analysing a more extensive database, this study builds on the analysis conducted by Codrington (1997) by classifying CBB research into various thematic areas or clusters using textual analysis, with the view of understanding how the scope of research has evolved over time. This type of analysis falls within the realm of text mining, which uses 'text' as the data input rather than numbers or numerical information. Text mining techniques have been used in a variety of areas, mainly attempting textual classification, clustering, summarisation and semantic analysis (Meyer, Hornik, & Feinerer, 2008). In economics, text analysis has been used to analyse patent data (Tseng, Lin, & Lin, 2007), financial reports (Kloptchenko, Eklund, Karlsson, Back, Vanharanta, & Visa, 2004) and stock market prediction (Nikfarjam, Emadzadeh, & Muthaiyah, 2010).

The research output of the CBB is significant given its size. It is estimated the cumulative research output (working papers, journal articles, and technical reports) of CBB researchers at the end of 2014 was approximately 307 papers. As illustrated in Figure 1, there was a distinct shift in the research output of the Bank in the early 1990s,

when the average annual output rose from under 5 papers to as high as 20 papers. Since then, the annual research output has remained around this level, reaching as high as 34 papers in 2006.

**Figure 1: Cumulative Research Output of Central Bank Researchers**



Source: Authors' Calculations

Given the tremendous productivity of the Bank's research staff, it is of interest to investigate the research issues and key thematic areas that have been addressed in this research programme over the years. As such, the study uses text analysis tools to not only highlight the main thematic areas, but also identifies the linkages and relationships that would have driven this research programme. This involves not only identifying areas where the Bank's research has made significant contributions to the understanding of the economies of small island states, but also identify under-researched areas and thereby inform the research agenda for the next 40 years.

The remainder of this paper is structured as follows. Following the introduction, Section 2 outlines the approach used to build the database of forty years of research conducted by the Bank's staff, while Section 3 describes the methodological approach

used to analyse this information. Section 4 discusses the main findings from analysing the research output, identifying the main thematic areas, the research clusters that emerged and how this has changed over time. The final section of the paper, Section 5, summarises the research findings and discusses the next steps in the process of analysing the research output of the Central Bank of Barbados.

## **2 Approach to Data Collection**

The CBB has accumulated an extensive history of policy-oriented research since its inception. To date, however, there has not been any comprehensive attempt to catalogue the Bank's collection of research within a metadata framework. To identify the knowledge products of the CBB, a detailed search of the Bank's eLibrary database was conducted, which yielded an initial database of working papers, spanning the years 1984 to 2015. This database was further supplemented with the Economic Review papers (1974-2012) and CBB staff papers (1974-2011).

In recognition of the limited coverage provided by the eLibrary resource, the library's physical resources were also utilised, with respect to the inclusion of unpublished papers (1972-2014) and other research not available electronically, such as, policy papers produced by the Bank's Think Tank<sup>1</sup>. The coverage of the study was extended even further through the inclusion of the Bank's catalogue of memoranda. These memoranda, while not being dedicated to the dissemination of research publicly, offer

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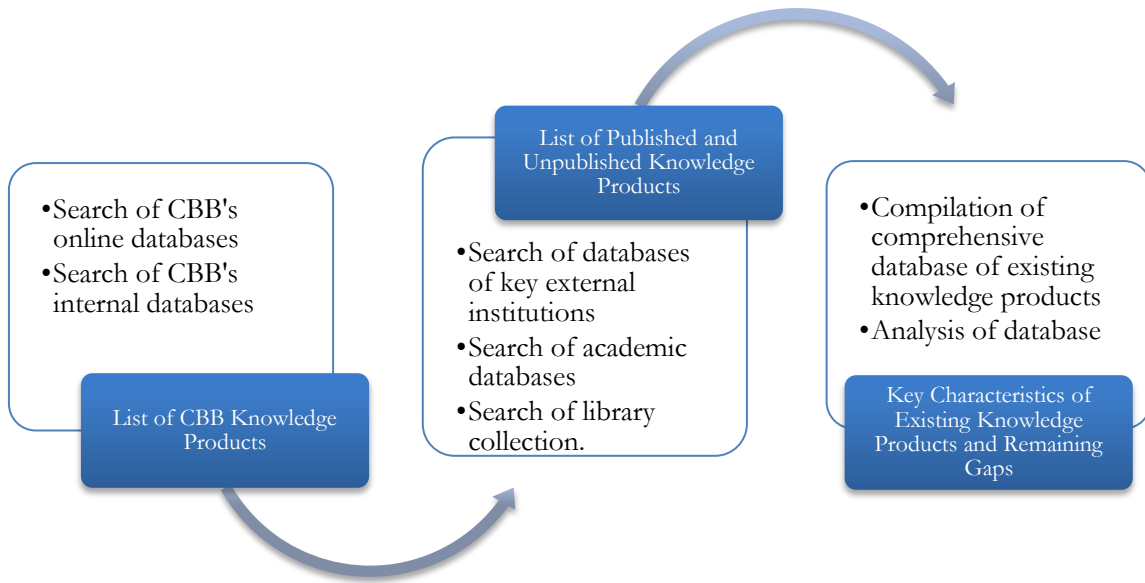
<sup>1</sup> The Bank's Think Tank was established in 2002 and chaired by the then Governor, Dr. Marion Williams. The main objective of the Think Tank was to examine critical economic policy issues using a collaborative, cross-department approach.

unique insights into the early areas of interest to which research would have been directed. The digitization of the library's physical resources relied heavily on collaborative efforts with the library's staff. Indeed, the library staff's intimate knowledge of the scope of the Bank's research, provided much needed direction to the construction of the initial database of research.

A particular challenge encountered in the initial construction of the database was that early documents required conversion from an image file format to the portable document format (PDF) before being converted into text files using PDF-to-text conversion software. It should be noted, however, that the process of converting from image to text on occasion resulted in some degradation of the final text document, especially when the original document is heavily pixelated. Despite this, it is the authors' contention that the final analysis was not unduly affected, due to the infrequent occurrence of such cases.

So as not to be constrained by the limitations of the Bank's online and physical database, the in-house records were merged with databases of the University of the West Indies, Caribbean Centre for Monetary Studies as well as international journal databases. The merger of the two databases partially addresses a crucial limitation of the process thus far, where exclusive use of the online and internal databases would have inadvertently excluded research done by CBB staff, but which have been published in academic journals or via international research institutions (Figure 2).

**Figure 2: Methodological Approach Used for the Project**



In an attempt to ensure the comprehensiveness of the resulting database, both published and unpublished materials were included in the compilation. It was determined for the purpose of this paper that published literature comprised of work produced by an established journal or publishing company. These knowledge products mainly consisted of journal articles and books. Any other knowledge material that was captured was categorised as unpublished work, this largely consisted of working papers, technical reports, PhD theses and the like.

### **3 Empirical Methodology**

The innovation of this study lies in its application of “text mining” software in its initial analysis of the compiled database. Using the “text mining” package available in the R statistical software (Feinerer, 2013), the corpus of papers were processed to achieve a world frequency matrix that was then applied to the development of broad thematic



areas. By employing this approach in concert with the process of thematic analysis described below, issues of bias and time constraints were partially addressed.

The methodological approach adopted also encompasses correlation analysis, as well as hierarchical text clustering to establish the relationship between key words and the existence of broad thematic areas. This approach was applied to the entire catalogue of research, which is segmented in accordance with the year of production. The choice of this disaggregated approach was influenced by the desire of tracking the evolution of research undertaken by the Central Bank, even as the authors provide a broad assessment of the Bank's knowledge products. This disaggregation also supported the identification of under-researched areas.

The analysis of the database of knowledge products was supplemented with thematic analysis, given the exploratory nature of the research. Braun and Clarke (2006) describe thematic analysis as a method for identifying, analysing and reporting patterns within data, usually qualitative data. The particular steps applied in a thematic analysis vary based on the purpose of the research. The steps used in this paper follow the general procedure:

- a) The literature/research material included in the database was identified by explicit words and/or phrases in the title and also by implicit ideas within the body of the work.
- b) Each thematic area was applied or linked to the content in the database.
- c) Analyses, such as comparing thematic frequencies, identifying thematic co-occurrences and non-occurrences, as well as graphical representation of

relationships or lack thereof, between themes were conducted (Guest, MacQueen, & Namey, 2012).

One of the first steps in this process is to extract from the text database a list of the most frequently used terms (thematic areas). From this information frequency tables can be generated to determine how many times a particular thematic area was covered in the papers included in the database. In addition to identifying the frequency of particular terms, the study also attempts to identify term-to-term relations. This would provide information on the likely clustering of thematic areas. For example, how often was “exchange” linked with say “rate” and then at a higher analytical level “exchange rate” and “monetary policy”.

In addition to an analysis of word or phrase frequency, the study also attempts to utilise hierarchical clustering of the research materials published by the CBB. The distance and similarity measures put forward by Meyer (2015) are used to identify the similarities in the various documents. This attempt to cluster the research into particular batches would provide a means of formally classifying the research into batches. This would be useful for identifying trends in research clusters so that future research could be used to compare and contrast the findings from within the cluster as well as identify the key conclusions.

#### **4 Analysis of Knowledge Products During the Past Forty Years**

The scope of each year’s research programme is determined heavily by the topical economic policy issues and the national development agenda. These topics are discussed and included on CBB’s Research Agenda at the beginning of the year. The Research Agenda serves as a useful guide to the targeted areas of research to be



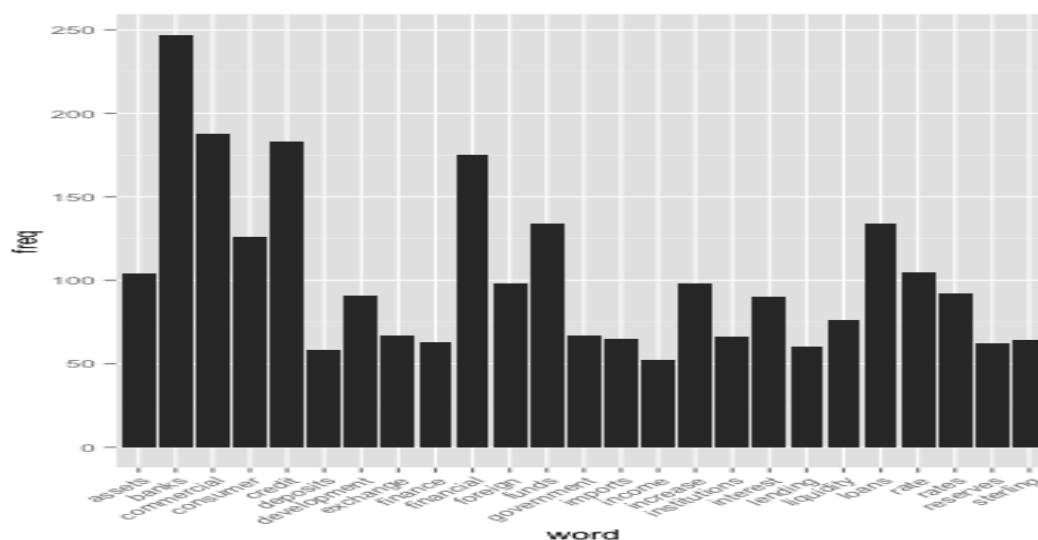
As should be expected, financial terms dominate these word clouds. Terms such as “exchange”, “financial”, (commercial) “banks”, “deposits”, “money”, “monetary”, and “reserves”, to name a few, dominate the word clouds in every period considered. Given the size of the economy, there is a clear focus on the external sector with issues such as “imports”, “foreign”, “exports”, “trade” and “CARICOM” all appear on the list of most frequently used terms. Another key thematic area is the issue of “smallness” and its impact on “development” and “growth”. Indeed, small states face numerous challenges, due to their vulnerability, which impacts on their development (Pelling & Uitto, 2001). It is clear that the frequent use of these terms shows the CBB has made a concerted attempt to address these issues.

In addition to financial issues, the word cloud of Central Bank’s research also indicated that fiscal issues have been an important area of research. Fiscal issues such as “tax”, “debt” and “public expenditure” have been some of the most commonly used terms used by researchers at the CBB. To some extent, this may reflect the ethos of the first Governor who was keenly aware that in small open fixed exchange rate economies fiscal policy is the most important instrument with which to achieve economic growth (Blackman C. , 1991).



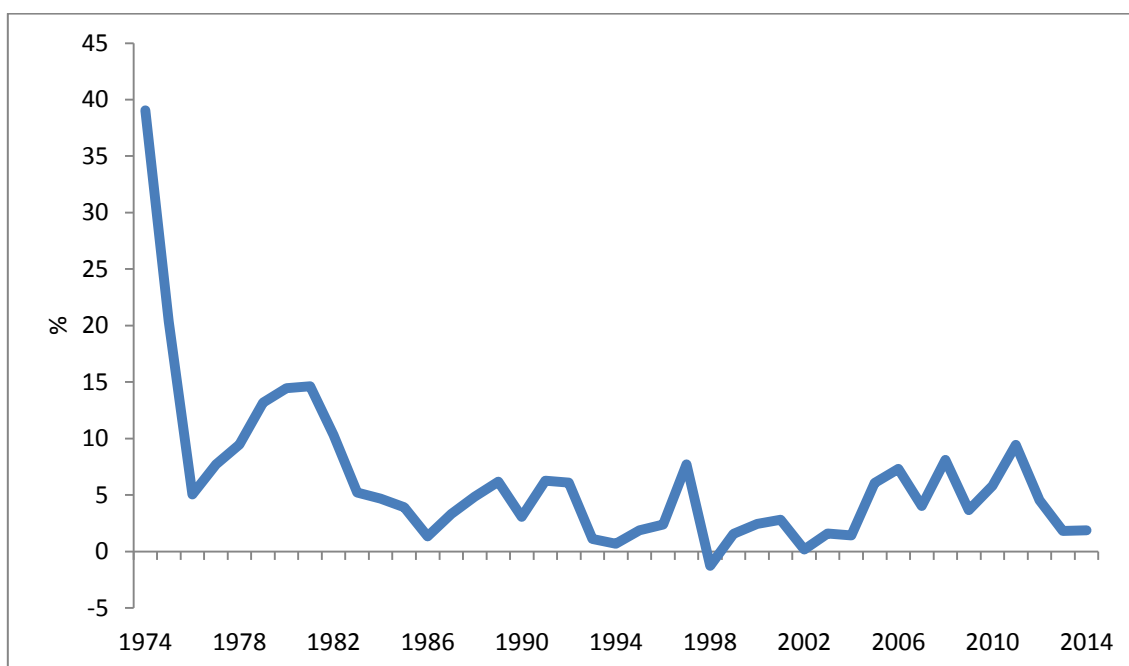
**Figure 4** sorts the key thematic areas by decades, starting with the first decade of CBB research. Even then, terms such as “small”, “fiscal” and “tax” emerged from this era, as key issues that engaged the interests of staff. Indeed, in 1973, the year in which the Research Department was started, of the 15 documents our research found the term “government” was mentioned more than 50 times.

**Figure 5: Frequency of Use for Particular Terms in Central Bank Research (1973)**



One can obtain a fairly clear idea of the issues that attracted the attention of the Bank during the various decades from examining these word clouds shown in **Figure 4**. Driven by the relatively high rates of inflation experienced during the 1970s and 1980s (**Figure 6**), the terms “price” or some variant of the word, were some of the most frequently used terms. During the structural adjustment period of the 1990s, terms such as “investment”, “growth”, “payments”, “policy” and “debt” were most prevalent; during the 2000s, “liberalisation” and “FDI” appeared for the first time in the lists of most frequently cited terms, and finally over the last five years “tourism”, “foreign exchange” and “debt” were the most frequently cited terms.

**Figure 6: Annual Average Rates of Inflation (1974-2014)**



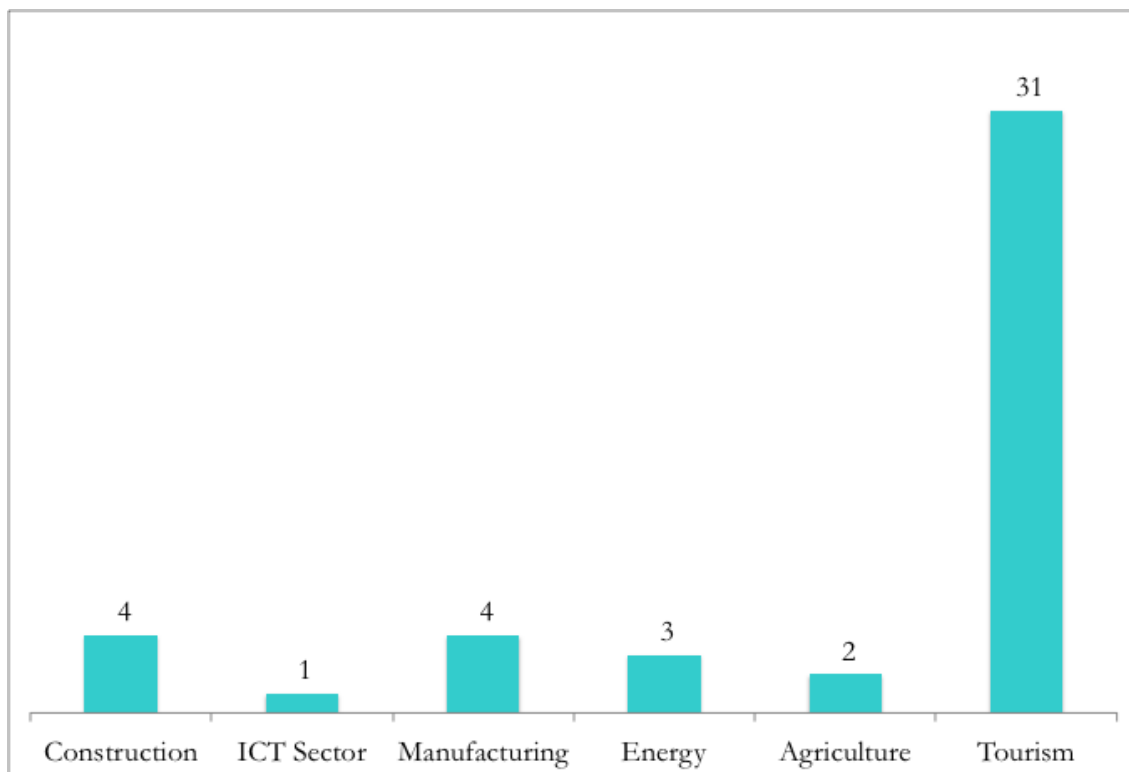
Source: Central Bank of Barbados

The CBB researchers have also published their research in international peer-reviewed journals and presented at numerous regional conferences. To identify the key thematic areas covered by these papers, the authors searched international and regional journal databases as well as conference proceedings. For this section of the report, the authors use thematic rather than text analysis, in order to identify the main themes covered.

Looking across the research programme, one can disaggregate this research by industry, major policy issues and type of markets investigated (*Figure 7* and *Figure 8*). In terms of papers examining industrial issues, most of the working papers and publications of the CBB research staff have focussed on issues related to tourism. Research on other industry-specific issues has, however, been quite modest in comparison. While tourism is a key driver of the domestic economy, the amount of research on tourism is not commensurate with its contribution to the domestic economy. This does not imply that

less emphasis should be placed on tourism related research. However, greater attention should be given to other productive industries.

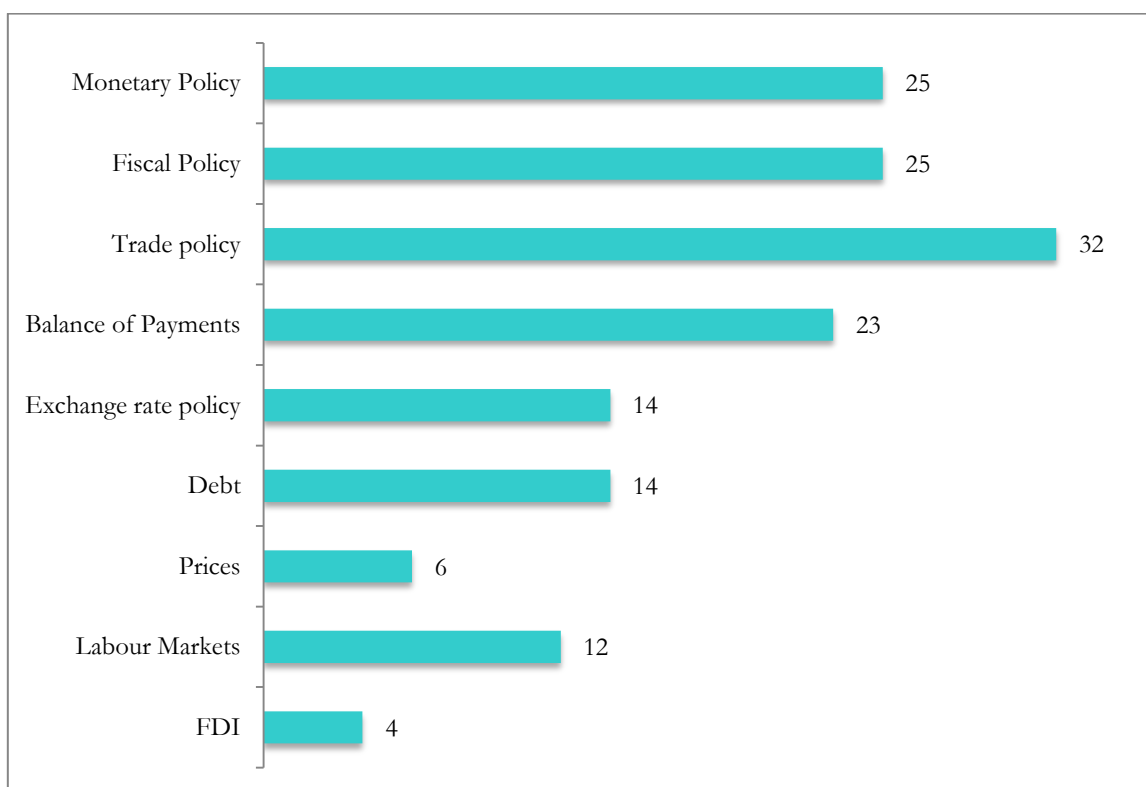
**Figure 7: Research Papers by Industry**



In relation to policy issues, the Bank’s staff has researched a wide array of policy issues. Most of this research has been focused mainly on monetary, fiscal, trade and balance of payments issues (*Figure 8*). In contrast, there has only been a modest research programme examining labour market, FDI and issues related to prices. The lack of focus on price issues may reflect the prevailing wisdom of a price-taking small state (Downes, Holder, & Leon, 1990). However, the limited focus on FDI is a bit more difficult to justify, particularly given the financing constraints normally faced by small states.



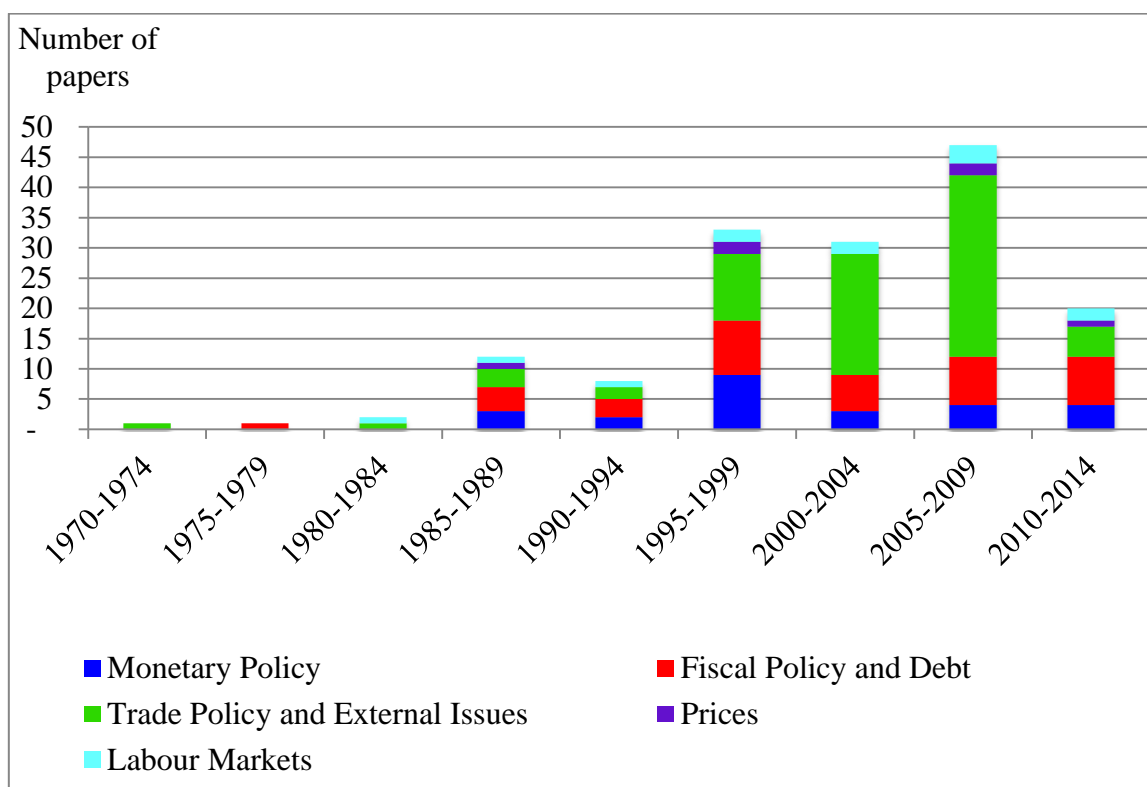
**Figure 8: Research Papers by Major Policy Issue**



Source: Central Bank of Barbados

The focus on trade and other external sector issues largely emerged in the late 1990s, as the island struggled with issues related to trade liberalisation both with the Caribbean and internationally. Between 2000 and 2009, more than half of the research papers on policy-related issues focused on trade policy or other external issues. Since 2010, however, and as debt statistics have deteriorated, the proportion of research related to fiscal policy and debt related issues has increased. In contrast, issues related to prices and labour markets have never really been a significant part of the CBB's research agenda.

**Figure 9: Research Papers by Policy Issue Over Time**

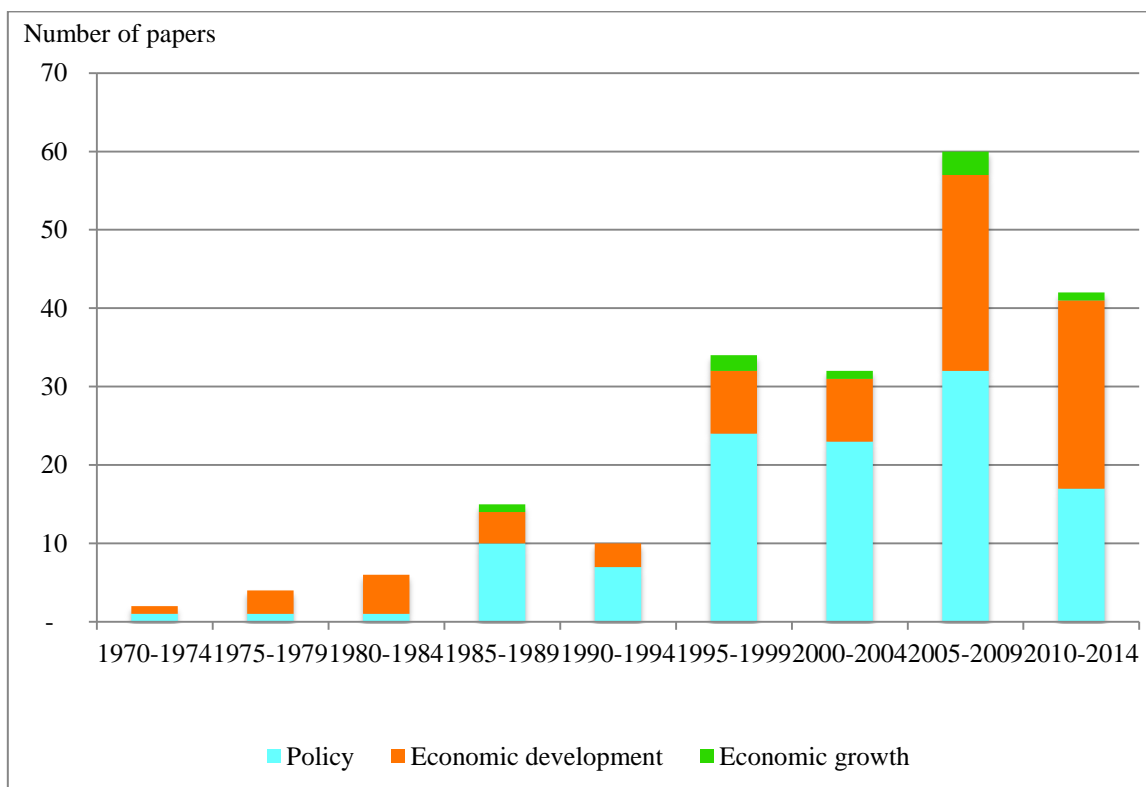


Source: Central Bank of Barbados

Much of the early research of the Bank focused on economic development and related issues. Indeed, more than half of the research papers focused on development. From the mid-1980s onwards, however, this research shifted from development to the issue of economic growth. This shift in research focus seems to have coincided with the significant expansion in Gross National Income (GNI) that occurred during this period. While the island's GNI in 1973 was just US\$1,386, by 1985 it had reached US\$5,563 and by 1990 US\$7,681. This tremendous improvement in the standard of living that occurred during the period, placed greater emphasis on maintain and enhancing this standard of living through supportive policies (see for example (Wood, 1993)). One area that appears to be somewhat under-researched is the issue of economic growth in small states. While there have been papers examining macroeconomic growth

throughout the sample period, this has never been a significant area of research over the period.

**Figure 10: Research Papers on Development Issues**



Source: Central Bank of Barbados

## 5 Conclusions

The Central Bank of Barbados has had a quite active research agenda since its formation in the early 1970s. With a very limited staff the Central Bank of Barbados' researchers have been able to complete more than 300 articles on various economic issues, but with a particular focus on small states. In addition to the anticipated focus on financial issues, a relatively significant proportion of this research has examined fiscal issues, even in the early years of central bank activities.

An assessment focusing on published papers as well as working papers identified a number of research gaps that could inform the research agenda of the Bank going forward. In relation to industrial issues, it was noted that there seemed to have been an over-emphasis on tourism-related issues. While this focus on tourism should remain, it is suggested that industrial issues related to construction, agriculture, and other service-related activities might also be considered for future research themes. In relation to development, while there has been a significant amount of research on broad developmental areas, only a modest amount of this research has focused specifically on economic growth.

Conducting the study also identified a couple of gaps in relation to the Bank's archival activities. It is important that digital copies of all documents be stored and archived. These should not be restricted to research articles, but should be extended to include the many policy papers and reports that the researchers at the Bank produce. Maintaining such a database would be useful not just for future assessments, but would help to build ensure that institutional knowledge and understanding of the economies of small states is effectively passed on from one generation of central bankers to the next.

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