CBB Working Paper No. WP/21/3

EXPANDING THE CENTRAL BANK'S TOOL KIT: CREDIT GUARANTEE SCHEMES IN A SMALL ISLAND DEVELOPING STATE

Shekira Thompson and Winston Moore

December 30, 2021

The authors would welcome any comments on this paper. Citations should refer to a Central Bank of Barbados Working Paper. The views expressed are those of the author(s) and do not necessarily represent those of the Central Bank of Barbados, its Board of Directors, or Central Bank of Barbados management.

Expanding the Central Bank's Tool Kit: Credit Guarantee Schemes in a Small Island Developing State

Shekira Thompson[1] and Winston Moore[2]

Abstract

The COVID-19 pandemic was a negative shock to the real economy which induced both liquidity pressures and operating losses for firms across the world as well as weakened their insolvency. Monetary authorities were left to contend with harmonising the accuracy of their policy measures with the speed of reaching those most affected. Utilising a combined empirical approach of Propensity Score Matching (PSM) and scenario analysis, this study evaluates the impact of credit guarantee schemes as a counter-cyclical tool during a crisis in the small open economy of Barbados. The results suggest that credit guarantee schemes represent a viable monetary policy tool during a crisis to shift persistent liquidity from the banking sectors to the illiquid corporate sector.

JEL Classifications: E30, E52, O54

Keywords: Monetary Policy, Propensity Score Matching, Average Treatment Effects, Small Open Economy

[1] Corresponding Author, Shekira Thompson, Research and Economic Analysis Department, Central Bank of Barbados, Email: shekira.thompson@centralbank.org.bb

[2] Prof. Winston Moore, Department of Economics, University of the West Indies, Cave Hill Campus, Barbados, Email: winston.moore@cavehill.uwi.edu

1. Introduction

In March 2020, the global economy was brought to a halt. The economic and financial crisis that would ensue was unprecedented. Unlike the 2007/2008 crisis, the COVID-19 pandemic could not be contained or restricted to one sector but instead inflicted damage to global production and supply chains, dismantled international trade, foreign direct investment (FDI) flows, international financial markets and international tourism and travel (Sarker, 2020). As businesses were forced to close their doors and individuals confined to their homes, fiscal and monetary authorities were left to determine how to strike the difficult balance between responding promptly to the pandemic and maintaining a sufficient level of prudence (Baudino, 2020).

The pandemic was a negative shock to the real economy that induced both liquidity pressures and operating losses for small and medium-sized enterprises (SMEs) across the world and weakened their solvency. In many countries across the world, SMEs are considered the backbone of the economy and they represent the overwhelming share of companies. In terms of numbers, SMEs typically account for well over half of the employed workforce and slightly less in terms of turnover and investment (Schich et al., 2017). Furthermore, SMEs are often considered a key engine of technological innovation, productivity, growth and employment creation (OECD, 2010).

Numerous governments responded to support SMEs by providing or extending credit guarantees to help limit potential losses. Central bank responses across the world are documented in a number of studies (Brault & Signore, 2020; Cusmano, 2013; Dikau et al., 2020; Kim et al., 2021). The main policy tools deployed in support of SMEs were credit guarantee schemes (CGSs) (Brault & Signore, 2020). By April 2020 the United States (US) had pledged approximately US $560 billion of guaranteed loans and the European Union, 1,600 billion euros, with the European Investment Fund (EIF) pledging another 25 billion euros. Kim et al. (2020), in particular, point out that during the COVID-19 crisis, countries like Hong Kong, China, Malaysia, Philippines, the Republic of Korea, Brazil and Germany increased the coverage ratio for their schemes; while others like Australia, the Republic of Korea and South Africa increased the loan tenure. Additionally, several central banks extended their collateral pools, and included credit claims issued under the guarantee programmes as responses to COVID-19 (Baudino, 2020).

Despite having CGSs at their disposal, the monetary authorities in Barbados did not exploit these schemes as a counter-cyclical tool to stem the sudden onset of illiquidity in the corporate sector. Instead, the securities ratio for banks was lowered and for non-bank deposit taking licensees the securities ratio was eliminated. The only change made to the Enhanced Credit Guarantee Fund was to allow guarantees for short-term loans.

As a small open economy, the banking system operates under paradoxical circumstances as it is usually inundated with persistent liquidity while illiquidity remains within the corporate sector (Chase et al., 2006). Nevertheless, just over a decade prior, CGSs were used as an investment-favouring tool in other countries, especially during the Great Recession. Guaranteed companies' assets grew 5.36% more than those of their non-guaranteed counter-parts during the Great Recession than during economic recovery when the former saw 2% higher growth in assets than the latter (Martin-Garcia & Moran Santor, 2021). In some countries, existing loan guarantee programmes were ramped up during the Great Recession in terms of the total amount of guarantee funds and direct lending available; the percentage of the loans guaranteed; the size of the guaranteed or direct loan and the number of eligible enterprises (Cusmano, 2013). In a crisis, a CGS could shift the liquidity from the banking system to the corporate sectors suffering from credit rationing to potentially dampen the negative impact on the real economy and prevent widespread disruptions.

This paper makes three main contributions to the literature. First, it explores the evolving role of central banks in crisis environments and how credit guarantees could be used to expand the toolkit of a small island developing state. Second, it empirically evaluates how CGSs impact firms during a crisis by simulating what firms could've experienced had it been used as a policy tool in response to COVID-19 pandemic. Third, it contributes to the limited literature by highlighting opportunities for existing capacities to be leveraged in crisis and non-crisis environments.

The rest of the paper is organised as follows: section 2 provides a summary of the literature on how central banks respond in a crisis environment as well as how credit guarantee schemes have been used in the past; section 3 outlines the data and methodology used in the study; section 4 summarises the key findings and a discussion of how SMEs could have benefited from CGSs during the COVID-19 pandemic and section 5 provides an overview of the main findings as well as some recommendations emerging from the study.

2. Literature Review

2.1 The Role of Central Banks in a Crisis Environment

Historically, the role of central banks has evolved in response to crises and an ever-changing financial and economic environment. Goodhart (2011) for example, identified three epochs in relation to central banking: the Victorian Era of the 1840s to 1914; government control from the 1930s to 1960s and the market era from the 1980s to 2007. The end of each era was associated with a period where economists searched for a new framework of how central banks would achieve their objectives. Goodhart (2011) argues that the central bank's control of its balance sheet is its fundamental function, even more so than setting short-term interest rates.

The Great Financial Crisis (GFC) of 2008/2009, coming at the end of the market era, arose from the asset side of commercial banks' balance sheets whereas past crises all occurred on the liability side. Subbarao (2010) contends that preventing an asset price build up should be within the remit of a central bank. Central banks have a role in preventing "bank centred" bubbles, but the instrument for this is not monetary policy but regulatory intervention. The Bank for International Settlements (BIS) has, however, argued that the financial system is inherently procyclical and thus chronically prone to bubble-like behaviour (Nier, 2009).

Buiter (2008) takes a broader definition of the role of the central bank by suggesting that these institutions should be focused on ensuring the absence of asset price bubbles, preventing market illiquidity as well as preventing the insolvency of systemically important financial institutions. These objectives are more extensive than the market era would have conceptualised and would therefore require the central bank to utilise its balance sheet to meet these objectives. During the global financial crisis (2007-2008), for example, the Bank of England created a Special Liquidity Scheme that lent treasury for one year to commercial banks, using collateralised bonds and credit card receivables as collateral. This approach injected significant liquidity into the financial system at a time when it was most needed.

The GFC has also shown that the central bank's role as lender of last resort (LOLR) loses much of its potency in a 'bank run' from the asset side (Subbarao, 2010). During the crisis, central banks pumped enormous amounts of liquidity to stimulate the system through the LOLR function. While this made individual institutions liquid, the market still remained illiquid, thereby exposing the limitation of the LOLR instruments in combating illiquidity. Therefore, in addition to being the Lender of Last Resort, a central bank also has to be the Market Maker of Last Resort (MMLR) (Brault & Signore, 2020; Ojo, 2010; Subbarao, 2010; Nier, 2009). Resultingly, a central bank's *de facto* role as LOLR and as an agent in the resolution of systemically important financial institutions gives them an interest in the regulation and supervision of these institutions.

The central bank also has an important role to play during crises. Corbo (2010), for example, charges that the role of a central bank not only lies in treating crises but preventing them. He says the *ad hoc* manner with which central banks dealt with systematically important institutions during the GFC exacerbated uncertainty and inflicted damage to the system. In the same way, Canova (2015) asserts that central banks had a flawed "trickle-down" response to the crisis, indicative of an inherent bias to austerity. The author notes that the Federal Reserve and other leading central banks provided massive subsidies to financial institutions and markets during the crisis while subjecting other sectors of the economy and society to the pains of austerity.

2.2 Monetary Policy and COVID-19

The COVID-19 crisis once again brought the role of central banks to the forefront as they worked to provide a much needed line of defence against the increasing deterioration of the global economic and

financial systems. While the GFC engendered fear and uncertainty based on an opaque financial relationship, the impact of COVID-19 was a true negative supply and demand shock on the real sector, significantly impacting economic activity and employment (Haas et al., 2020). Where central banks failed in their response to the GFC however, they responded with unusual speed and vigour. Central banks all across the world swiftly lowered interest rates, expanded collateral frameworks, implemented new or scaled-up existing quantitative easing programmes and introduced various targeted and non-targeted additional financing and purchasing facilities (Dikau et al., 2020). For example, the Federal Reserve and the Bank of England (BOE) cut short-term interest rates, while the European Central Bank (ECB) and Bank of Japan (BOJ) maintained rates that were already at or below zero (Echarte Fernández et al., 2021; Haas et al., 2020; Sarker, 2020).

Mayer and Schnabl (2021) criticised this policy response and likened the cutting of interest rates to euthanasia. Fuelled by Austrian Business Cycle Theory, they purport that continued reductions in interest rates will actually contribute to an economic crisis in the long run. The boom is fuelled by credit creation in the banking sector, which raises investment above savings and thus leads to overinvestment. The authors further argue that the boom turns inevitably into a bust when interest rates are raised to contain rising inflation. When interest rates are strongly cut in response to the downswing, distorted economic structures are conserved.

All four central banks also introduced or expanded broad asset purchases, special bank-lending facilities, and narrow asset purchase facilities. For instance, the United States dollar (USD) and the euro play important roles in international financial markets so the Federal Reserve and the ECB expanded swap lines and created repo facilities for international monetary authorities (Domanski et al., 2014). Bahaj and Reis (2020) noted that the Federal Reserve even lowered the rate on the swap lines it had with five other central banks and opened new ones in nine other currencies. The prompt and proportionate response to operations in their own money markets, together with the rapid establishment of a network of currency swap lines buttressed domestic and international liquidity during the initial stages of the COVID-19 crisis (Bingham et al., 2021). Domanski et al. (2014) go further by positing that the latter consideration is proof of another evolution of central banks' role. The provision of liquidity in foreign currencies is now a part of their policy response toolkit.

2.3 Credit Guarantee Schemes

Credit guarantee schemes (CGSs) are mechanisms in which a third party, the guarantor, pledges to repay some or the entire loan amount to the lender in case of borrower default. The guarantor assumes part or all of the credit risk, reducing the risk faced by financial intermediaries and thus making it possible for firms to obtain credit or improve the terms and conditions under which they can borrow (Gozzi & Schmukler, 2016). These arrangements first emerged in Europe in the 19th and early 20th centuries. Currently there are over 2,250 schemes implemented in different forms in almost 100 countries (OECD, 2010). These arrangements are especially popular policy tools in Asia: specifically in Japan, The Republic of Korea and Malaysia (L. N. Dang & Chuc, 2019; Kim et al., 2021).

SMEs account for most businesses worldwide and are important contributors to job creation and global economic development. According to the World Bank, they represent about 90% of businesses and more than 50 percent of employment worldwide (World Bank, n.d.). Cusmano (2013) states that if governments are especially sensitive to the challenges faced by SMEs, then CGSs are usually established to target challenges specific to SMEs within key sectors. Therefore, these programmes are usually justified based on social objectives which Zhu (2020) points out in his research on CGSs in China. The author posits that these schemes are founded in the hopes of increasing employment, tax revenue and foreign exchange earnings through foreign exports. However, Gozzi and Schmukler (2016) argue that

the rationale underlying the choice of credit guarantees instead of other forms of government intervention is usually left unexplained which reduces its credibility as an effective policy tool.

Credit guarantee schemes tend to have a particularly significant impact on micro and young SMEs. Asdrubali and Signore (2015) utilises data on SME beneficiaries to the EU SME Guarantee Facility in Central, Eastern and South-Eastern European (CESEE) countries during the period 2005-2012. The study utilises both propensity scores and difference-in-differences estimation to evaluate the effect of having received a guaranteed loan on firm performance captured by employment, production, profitability and factor productivity against a control group of comparable firms. The results suggest that on average, beneficiaries of guarantees increased the workforce by 17.3% compared to the control group. When the authors disaggregate the data even further, micro and young SMEs also benefited from increased sales as well as a rise in employment.

In addition to the employment effect, the relaxation of credit constraints can also help SMEs to maintain their investment, even during periods of economic downturn. Martin-Garcia and Moran Santor (2021) evaluate the impact of credit guarantees over the period of two economic cycles: downturn (2009-2011) and expansion (2012-2015). Employing propensity score matching based on economic activity and company size, the authors report that guarantees help to relax credit constraints, expand turnover as well as investment over both periods of decline and expansion. Similar to Asdrubali and Signore (2015), the authors reported the greatest gains for small and microenterprises.

Numerous authors mention the advantages that CGSs provide to SMEs (Brault & Signore, 2020; L. N. Dang & Chuc, 2019; T. B. Dang, 2015; Kim et al., 2021; Levitsky, 1997). The three major advantages delineated are the leverage these programmes provide; regulatory capital relief and the ability to be used as a counter-cyclical crisis tool. The main advantage stems from the ability of the schemes to allow investors[3] to guarantee loans multiple times larger than the CGS fund itself. In this way, the higher the leverage ratio, the more loans CGSs mobilise (Kim et al., 2021; Levitsky, 1997).

There was no consensus in the literature regarding the effectiveness of these schemes in contributing to economic growth, unemployment or investment. The reasons put forward in the literature include but are not limited to the lack of rigorous evaluations by authorities as well as a counterfactual. A counter-factual case is needed in empirical analysis to show what would have occurred in the absence of the programme. Also, there is limited appropriate disaggregated data available for estimation (Schich et al., 2017). As a result, the studies that attempt to estimate the effectiveness of CGSs have done so using a variety of methodologies and samples thus producing varying results.

Essentially, the literature has shown that CGSs in a crisis environment are risk transfer and risk diversification tools used to pump liquidity into strained economies (Corredera-Catalán et al., 2021). During COVID-19 where authorities had to be more aggressive to maintain financial stability and support the flow of credit to firms and households amidst unprecedented social protocols, CGSs became an essential policy tool. However, there is a gap in the literature on empirical studies of guarantee schemes in developing countries and even less on schemes in small open economies. This research seeks to fill that gap.

[3] These are usually governments but some privately-backed schemes do exist.

3. Credit Guarantee Schemes Around the World

3.1 Barbados

The Central Bank of Barbados first introduced credit guarantee schemes in September, 1979 in an effort to promote the growth of the small business sector (Levitsky & Prasad, 1989). The scheme's objective was to enable small businesses to obtain finance from commercial banks and other credit institutions without having to provide security from their own sources. To be eligible for the guarantee, the borrower had to meet the criteria of a small business in any of the following sectors: agriculture, manufacturing, retail trade, construction, hospitality, medical, health, educational or professional services. The commercial banks were responsible for evaluating project proposals and submitting the necessary applications to the central bank. The central bank reviewed the applications to ensure that they complied with the terms and conditions of the scheme. Based on interviews with staff of the Central Bank of Barbados' Foreign Exchange and Exports Credit Department, a commercial bank's assessment was in most instances accepted by the central bank without further detailed investigation. Lastly, commercial banks were required to notify the Central Bank on a monthly basis of any applications that were rejected.

The first scheme was known as the Credit Guarantee Scheme for Businesses (CGSB) and faced a number of challenges since its inception primarily due to its design. Levitsky and Prasad (1989) report that despite the central bank's best efforts to simplify the process and procedures, the local commercial banks were not receptive to the scheme. The commercial banks were of the opinion that the scheme was a method to force them to approve very risky small business loans with low profitability. Despite this, the scheme exists today but it is not as active.

Against the backdrop of challenges faced with the initial programme, the Government of Barbados assisted by the Central Bank of Barbados, created a number of schemes under the CGSB umbrella. For example, the Tourism Loan Guarantee Scheme provided guarantees to cover debt service and new short-term loans to hotels and other providers of accommodation to tourists in Barbados. Any business providing accommodation qualified once they had a total loans-to-property value ratio below 75% (Antilles Economics, 2014). However, much like its predecessor, this scheme is no longer active. Instead, the central bank has focussed its efforts on the recently created Enhanced Credit Guarantee Fund (ECGF).

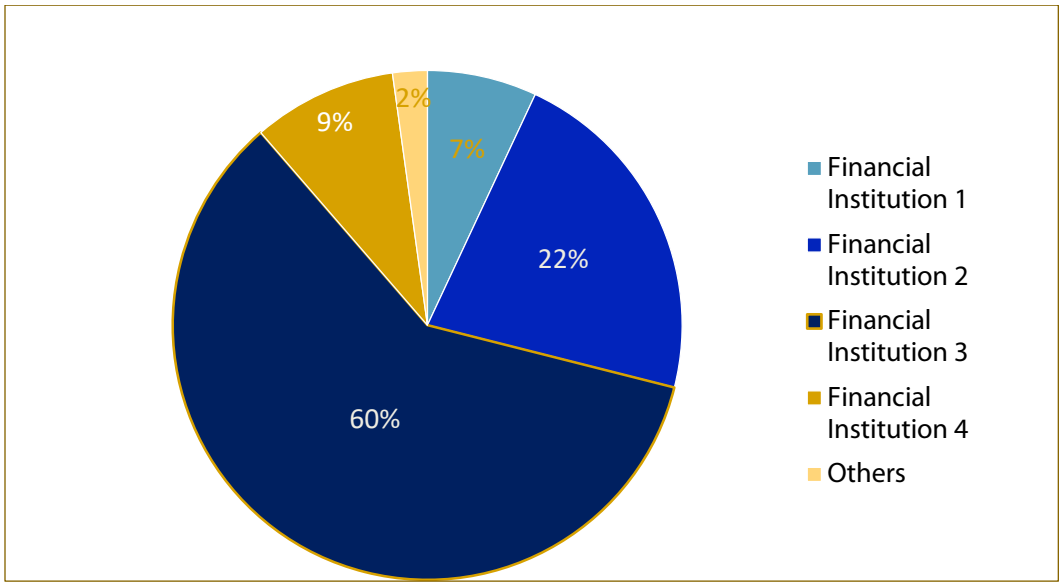
The ECGF is a partial credit guarantee fund, established to assist small and medium-sized enterprises in obtaining medium to long-term financing by providing security to eligible financial institutions for new loans (Central Bank of Barbados, n.d.). By providing additional security for businesses, it reduces the risk to financial institutions. The ECGF was financed by a USD 30 million loan from the Inter-American Development Bank (IDB). Unlike the CGSB, all businesses must be incorporated and registered to operate in Barbados making this scheme more exclusive. All applications are submitted and processed electronically, significantly reducing processing times and guarantees can now be provided in both USD and Barbados Dollars (BBD). Fewer sectors qualify for assistance with this fund: agriculture, commerce, industry and the service sectors. For financial institutions the new fund is more attractive as it ensures they recover at least 80% of the loan in the case of default. They also have more autonomy in the administration of loans and setting of interest rates. During interviews with the Central Bank staff, they pointed out that due to the new features of the ECGF, the fund saw greater participation from commercial banks.

Unlike other countries around the world, the Central Bank of Barbados did not utilise any of their guarantee schemes as counter-cyclical tools during the COVID-19 induced economic crisis. Instead, the central bank deployed macro prudential policies by lowering the securities ratio for banks from 17.5% to 5% and eliminated the 1.5 % securities ratio for non-bank deposit taking licensees. The Central Bank

targeted the securities ratio in their Lender of Last Resort function by allowing banks to access liquidity from their securities if they wished to do so.

This study uses the ECGF in its analysis. Data was sourced from the Central Bank of Barbados' ECGF database. The database is managed by the Foreign Exchange and Export Credits Department in the Central Bank of Barbados. It contains information on the financial intermediary and the associated transactions. Data was provided for all of the guarantees approved by the Central Bank from the Fund's establishment to present, that is from 2016 to 2020. In total the Fund has provided guarantees for 273 loans, benefitting 97 individual firms across a range of industries. Also, a total of 7 financial institutions have signed contracts under the ECGF (not all have used the fund in recent years). Since the Fund's inception, one commercial bank holds 60% of the fund's guarantee portfolio valued at $26,760,693 BBD as shown in Figure 1. For the purposes of this study, "Others" refers to financial institutions who only began accessing the Fund in 2020 and as such represent just 2.2% of the guaranteed portfolio.

Figure 1: Percentage Share of Guarantees by Financial Institution



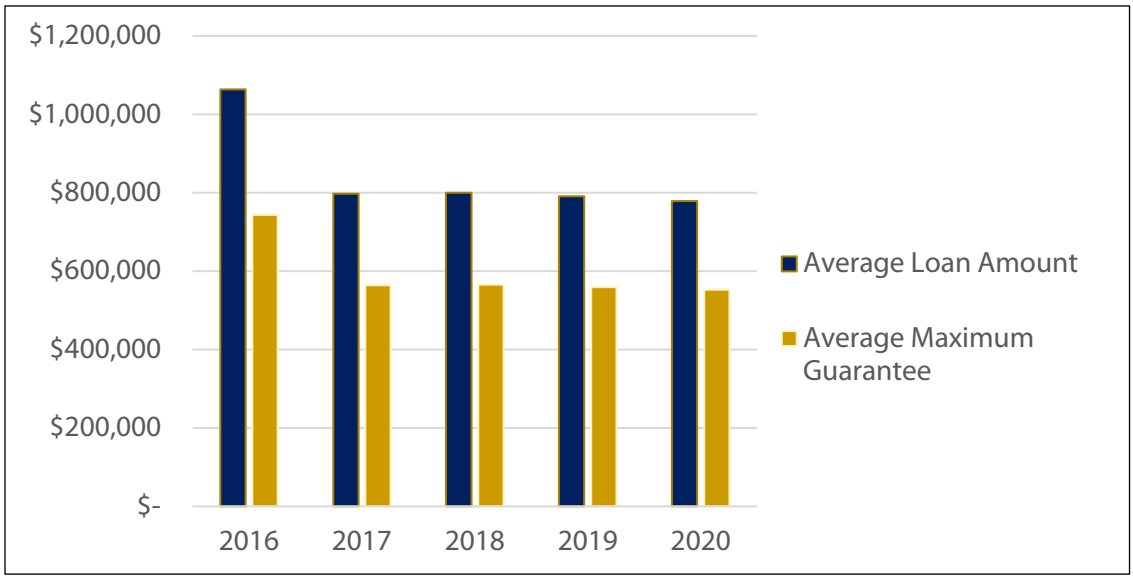
Source: Central Bank of Barbados

For each ECGF guaranteed loan transaction, the database reports a series of characteristics relating to the transaction itself or the beneficiary firm (e.g., maximum guaranteed loan amount, sector, date of loan disbursement, etc.) The average loan amount disbursed for the period under consideration is $846,146.13 BBD while the average maximum guaranteed amount is $597,032.74 BBD which represents about a 71% coverage ratio. Figure 2 depicts the average loan amount by the average maximum guarantee amount annually. In the Fund's first year, loan amounts were at their highest but by the second year onward they averaged around $800,000 BBD annually. It should be noted that the loan applicants still have to meet the various criteria of the commercial banks, which might limit the ability of some institutions to access the Fund.

Individual loans are also guaranteed under ECGF but are much smaller in size and scope. They range between $30,000 BBD to $50,000 BBD. Upon further decomposition over the years, the analysis reveals that the Manufacturing ($9,701,538 BBD) and Heath and Medical industries ($7,523,860 BBD) have benefitted most from the scheme. In 2019, one manufacturing firm was able to secure a $5.8 million

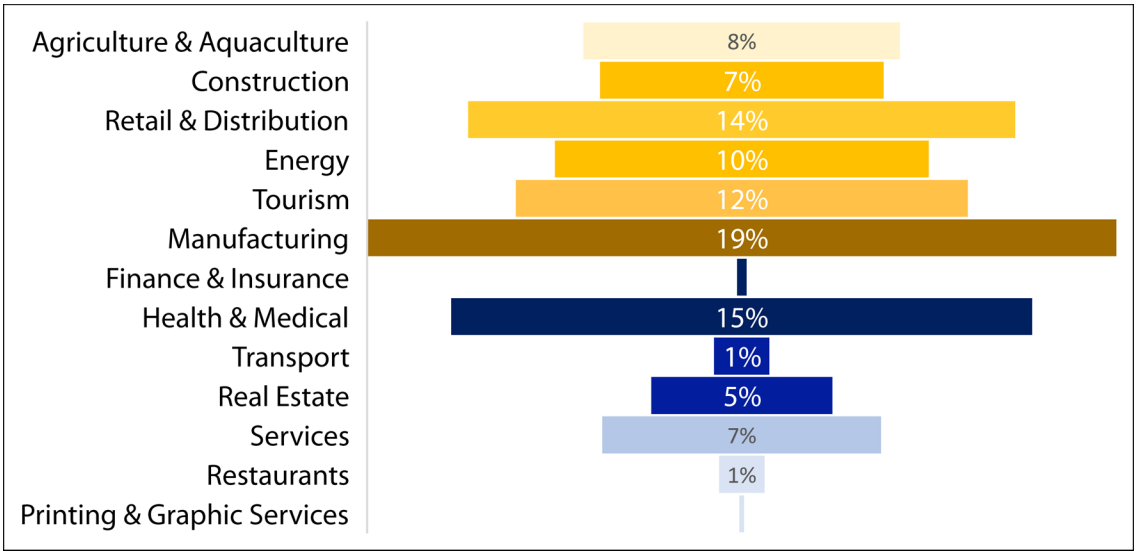
BBD loan, with 34% being guaranteed through the fund. Figure 3 illustrates the maximum guarantee by industry from 2016-2020.

Figure 2: Loan & Guaranteed Amounts (BBD)



Source: Central Bank of Barbados

Figure 3: Maximum Guarantee by Industry from 2016-2019



Source: Central Bank of Barbados

3.2 Chile

In 1980, the Chilean national government in tandem with a large state-owned national bank, Banco Estado established El Fondo de Garantía para Pequeños Empresarios (FOGAPE). FOGAPE was funded by the national government and administered by BancoEstado and provides credit guarantees to financial institutions for loans to microenterprises and small firms. Due to under-utilisation the scheme underwent a review and was relaunched in 1999. One of the significant outcomes of the relaunch was a streamlining of the claim procedures. Within 15 days of a claim being made, guarantees are paid out in full. As at 2015, following much success, the fund raised its total capital to 260 million USD (de la Torre et al., 2017). FOGAPE does not target any particular sector but limits no more than 50% of guarantees going to one sector.

The most unique feature of FOGAPE relates to how it allocates guarantee funds to financial institutions. Auctions are held four to six times a year where the scheme offers a fixed volume of guarantees. Each financial institution submits secret bids requesting guarantees for a certain volume of loans with a given coverage ratio. FOGAPE allocates guarantees to those institutions requesting the lowest coverage ratio until the total amount of guarantees auctioned equals total bids. The bidding process determines how risks are shared among financial intermediaries and FOGAPE. The scheme is also managed to maintain low operating costs by allowing financial institutions to make all lending decisions.

FOGAPE has several design features aimed at mitigating incentive problems. First, the auctioning of guarantees fosters competition among financial institutions on the basis of the coverage ratio, providing additional incentives to screen and monitor borrowers and foster risk discovery. Second, the fee that financial institutions pay for the credit guarantees depends on past default rates of guaranteed loans. This fee, however, is capped at 2% of the guaranteed amount per year. Finally, if claims from a given financial institution are too high, FOGAPE excludes the institution from participating in future bidding processes until loan performance improves. De la Torre et al. (2017) posit FOGAPE's design creates an incentive structure for lenders that limits risk shifting and keeps operating costs low, thereby avoiding adverse selection and moral hazard among borrowers and lenders.

To respond to the sudden economic crisis caused by COVID-19, FOGAPE broadened its scope significantly with guarantees of USD 3 billion to mobilise USD 24 billion in new credits. They also allowed banks to use guarantees to refinance other credit operations with a grace period of six months to prevent system-wide defaults and closures (García, 2021).

3.2 Organisation of Eastern Caribbean States

The governments of the Organisation of Eastern Caribbean States (OECS) in partnership with the World Bank established the Eastern Caribbean Partial Credit Guarantee Corporation (ECPCGC) to increase credit facilitation to micro, small and medium-sized enterprises (MSME's) in 2017. The ECPCGC provides partial guarantees on loans made by financial institutions to MSME borrowers in OECS member states. Unlike the schemes available in Barbados, the ECPCGC considers credit unions among the eligible financial institutions list. By including all financial institutions, they hope to serve a larger number of MSMEs to create jobs and expand local economies. The fund is operated with a minimum number of staff to ensure that the guaranteed fee structure can cover operating expenses and pay loan losses. It is also completely electronic with all applications received and processed through a web portal designed for guaranteed lending. The OECS also uses electronic means of personal communication, including video conferencing and offers tutorials on topics of interest to small business owners and the loans officers who work with them. The maximum guarantee offered is 75 percent on loans, which may not exceed 300,000 Eastern Caribbean Dollars (XCD).

During the COVID-19 crisis, the fund responded by offering additional products to help small businesses. In addition to the fund's Classic Guarantee Programme, they added the Working Capital

Guarantee and the Start-up Guarantee. Of the two new programmes, the Start-up programme is one of interest as it was specifically designed to target small start-up businesses. small businesses in operation for 3-24 months have access to a loan of up to 100,000 XCD where the ECPCGC will guarantee up to 80 percent. To qualify, the small businesses' owners have to register their business, maintain proper records and establish a relationship with a financial institution of their choosing.

3.3 USA

A secure and responsible energy future relies on innovation. "De-risking" new energy technologies is a critical step in bringing innovation to market (Springer, 2018). Financing these new and innovative energy projects is often difficult. Habitually, investors are hesitant to accept risk for projects that rely on unproven technologies. Green CGSs are important for mitigating the risks of green financing to unlock the participation of financial institutions in these projects (Taghizadeh-Hesary & Yoshino, 2020). Even though central banks see the need to respond to crises, not many of them have explicitly considered sustainability in relation to their response. The impending climate crisis will have a potentially disastrous impact on our economies and requires urgent policy action. It is already changing the policy environment in which central banks are operating (Dikau & Volz, 2021). Given the need to meet national emission goals and targets, central banks in some countries have scaled-up their activities to have a broader sustainability mandate (Dikau, Robins, & Volz, 2020). These tools included updating collateral frameworks to address climate change-related and other environmental risks, removing the carbon bias in the financial sector, adjusting prudential measures to minimise climate risks as well as adopting sustainable investment principles.

With this in mind, the US Department of Energy (DOE) has made it easier for American companies to access financing for innovative clean energy projects. Authorised by the Energy Policy Act of 2005, the Title XVII Innovative Energy Projects Loan Guarantee Programme enables the DOE to issue loan guarantees for innovative and novel commercial-scale deployments of advanced fossil, advanced nuclear, renewable energy, energy efficient and distributed energy projects in the United States (US Department of Energy). Technologies which fall within the current solicitations include carbon capture, direct air capture, small modular nuclear reactors, uprates and upgrades for existing nuclear plants, energy storage, efficient end-use technologies, and retrofits of existing renewable facilities. Eligible projects for the Title XVII programme must utilise a new or significantly improved technology; avoid, reduce or sequester greenhouse gases (GHGs); be located in the United States and have a reasonable prospect of repayment. Under Title XVII authority, DOE can guarantee loans for up to 80 percent of total project costs for eligible proposals. Total funding for the programme stood at USD 30 billion to be divided amongst the five sub-programmes managed by the DOE. The five sub-programmes include:

- Advanced Fossil Energy Projects Loan Guarantees
- Advanced Nuclear Energy Projects Loan Guarantees
- Renewable Energy and Efficient Energy Projects Loan Guarantees
- Distributed Energy Projects
- Electric Vehicles and Alternative Fuel Vehicles

The programme also makes provisions for energy projects in tribal communities. This programme is known as the Tribal Energy Loan Guarantee Programme.

A decade after its inception, the programme financed 24 projects, many of which were first-of-a-kind projects in the United States, among the largest in the world or catalytic for domestic industries (Springer, 2018). For example, the first five photovoltaic (PV) solar power projects larger than 100 MW in the United States benefited from the programme.

This section showed how guarantee schemes can be designed to meet policy goals in countries and act as timely and effective tools in a crisis to maintain economic growth and stability. Table 1 below presents a summary of the different CGSs presented in this section.

Table 1: Comparison of CGSs & COVID-19 Response

Country	Barbados	Chile	OECS	USA
Programme Name	Enhanced Credit Guarantee Fund	FOGAPE	Eastern Caribbean Partial Credit Guarantee Corporation (ECPCGC)	Title XVII Innovative Energy Projects Loan Guarantee Programme
Eligibility Criteria	•Must be incorporated and registered to operate in Barbados. • Annual sales should not exceed $20 million BBD. • Total assets should not exceed $20 million BBD. • Number of employees should not exceed 200 persons.	•Total annual sales should be less than USD 750,000 in previous year. •Should have no existing arrears in the financial system. •Should not have expected losses at the time of loan issuance greater than 3%	•Annual or projected revenue if less than XCD 2 million. •Employ or intend to employ less than 50 permanent employees. •Must have a minimum of 25% equity in the transaction. •Maximum loan should not exceed XCD 300,000.	•Must utilise a new or significantly improved technology. •Avoid, reduce or sequester GHGs •Be located in the USA •Have a reasonable prospect of repayment.
Eligible Sectors	SME's involved in one of the following industries: •Agriculture •Industry •Commerce •Services	All sectors	All MSME owners except those on the Exclusion List	
Total Funding	USD 70 million	USD 260 million (As at 2017)	USD 8 million	USD 30 billion
Coverage Ratio	Up to 80%	Not Fixed	Up to 75%	Up to 80%
Interesting Feature	•Completely electronic •Land and building purchases can be guaranteed.	Guarantees allocated through an auction.	Credit unions are allowed to access the guarantees.	•Provide guarantees for novel renewable energy projects. •Has 5 sub-programmes dealing with specific forms of energy.
Crisis Response		Allowed guarantees to refinance loans.	Created a Start-up Guarantee sub-programme.	

Source: Authors' Calculations

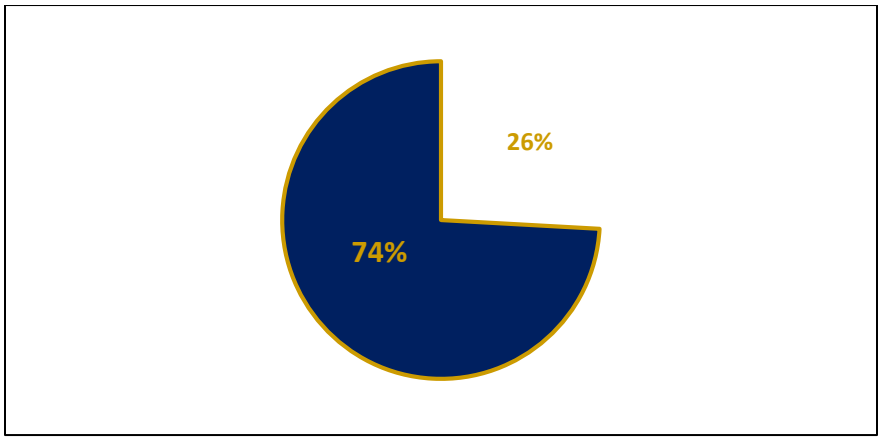
4. Empirical Methodology

4.1 Data

The company-level data used in this study was sourced from a CARICOM wide survey commissioned by the Inter-American Development Bank in 2020 (*Compete Caribbean*, n.d.). Company level information was collected from businesses in 13 countries across the region on issues affecting firm competitiveness. The data also includes general information on the company such as sales and marketing, production, innovation and the impact of COVID-19 on business operations.

For Barbados, a total of 170 companies were interviewed from the extractive, manufacturing and services industries. Of the companies interviewed, 67 were microenterprises, 89 were small and 14 were medium-sized to large enterprises[4]. When asked if access to finance was a major obstacle to their operations, 74% of respondents agreed as depicted on Figure 4. However, when asked if they sought to secure a loan in the past fiscal year, (2018-2019), 91% of respondents reported they had not. A follow-up question was asked to determine the reasons behind the apprehension to getting a loan and 43% of respondents stated that the collateral requirements for loans or lines of credit were too high, while 27% stated that the interest rates were unfavourable. A few respondents lamented that they did not think their applications would have been approved. Respondents were also asked what percentage of collateral was required as a percentage of the loan value by financial institutions. Figure 5 depicts the average percentage of collateral required as a percentage of the loan value for the few firms who applied in terms of firm size. It can be seen that micro and small enterprises require more in collateral to secure a loan than medium-sized firms. However, one small firm reported that 550% of the loan value was required as collateral for a loan which skews the average for the small enterprises upward.

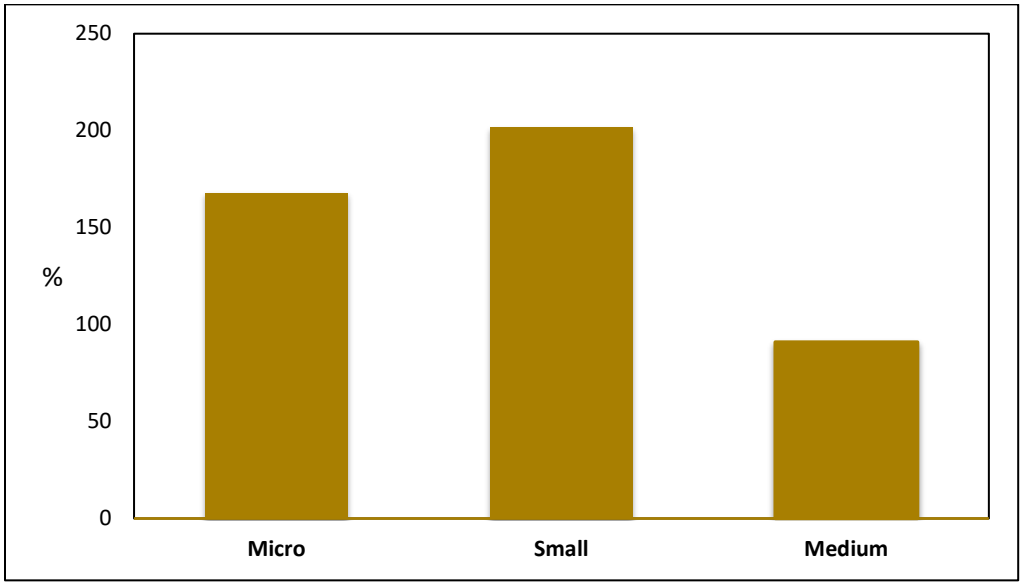
Figure 4: Percentage of Firms with Finance Access Constraints



Source: Compete Caribbean

[4] The definition of micro, small and medium-sized enterprises is taken from the OECD Glossary of Statistical Terms.

Figure 5: Average Collateral Required as a Percentage of Loan Value, by Firm Size



Source: Compete Caribbean

For the econometric analysis, data on overdraft facilities of firms, growth in sales, productivity and innovation were selected. Then a propensity score model was estimated to determine the average treatment effect of financial constraints on these firms.

4.2 Propensity Score Matching

Credit guarantee programmes aim to help overcome market failures and the lack of collateral that some SMEs may encounter when attempting to finance their activities (Schich et al., 2017). Establishing causality between policy inputs and outcomes requires the construction of a valid counterfactual. In other words, would credit constrained SMEs have employed more workers, invested more in plant and machinery or experienced higher sales growth? In the literature, a combination of propensity score matching (PSM) and difference-in-differences (DID) are used to compare beneficiary firms to similar firms which did not receive guarantees- the counterfactual (Bertoni et al., 2018, 2019; Brault & Signore, 2020,; Brown & Earle, 2017; Uesugi et al., 2008). The PSM method creates a statistical comparison group of individuals without treatment that has similar observable characteristics to the individuals with the treatment (Cintina & Love, 2019).

This study employs Rubin's Causal Model (Rosenbaum & Rubin, 1983) based on the concept of potential outcome. The main implication of the potential outcome framework is that, conditional on few specific assumptions, the alternative unobservable outcome of treated enterprises, had they not received the treatment, is replaceable on average, with the outcome of an appropriate control group (Bertoni et al., 2019). The paper attempts to determine for selected outcomes, the average effect if firms did not have financial constraints. In this way, the authors could make informed pronouncements on the potential of a credit guarantee scheme to improve firm performance in Barbados and by extension, recommend whether the scheme should be used in crisis situations to reduce illiquidity in financial markets. In the absence of firm level data for firms which received ECGF support and those which did not, this study

utilises access to an overdraft facility as reported in the IADB survey mentioned above, as a measure for financial constraints. Overdraft facilities are only extended to firms which commercial banks deem as being financially sound. Therefore, if a firm has an overdraft facility the assumption can be made that that firm would be more likely to receive a loan from a bank and not require a credit guarantee (Cowling, 2010).

To estimate the PSM model, the treatment effect must be a dummy variable. A variable was created which takes the value of 1 if a firm indicated they had an overdraft facility and 0 otherwise to measure financing constraints. PSM also requires outcome variables and control variables that are independent of the outcome. A total of 122 firms indicated that they did not have access to an overdraft facility while the remaining 48 said that they did. Moreover, the authors selected eight outcome variables for this study. The literature has established the positive relationship between innovation and firm performance (Atalay et al., 2013). The dataset available, provided data on firm spending on product innovation for three fiscal years. The authors created the variable 'average innovation' by calculating the average of firm spending on product innovation for all three years. It is believed that firms who are able to spend more on research and design are usually less financially constrained (Silva & Carreira, 2017).

Secondly, to capture growth in sales for firms, the paper uses differenced total sales from the two fiscal years found within the database. Firms with higher growth in sales are less likely to be financially constrained because they would represent less risky borrowers by banks.

This study employed five variables related to employment since COVID-19 significantly impacted the real sector through employment of persons. Initially, a crude measure for productivity was created by dividing total sales by the total number of workers in the last fiscal year. It is believed that firms who are less fiscally constrained would be more productive than firms who are not. Then, two proxies were used to capture employment: (1) total number of employees; and, (2) the firms' estimated impact of COVID-19 on employment. Firms who are more financially constrained are more likely to reduce their workforce in the face of downturns in the business cycle. Lastly, variables were included to capture the firms' annual average wage bill for both pre- and post-COVID-19.

In total six control variables were chosen; firm age, if a firm was a subsidiary, firm's legal status, firm size, industry, number of competitors and percentage of sales that are exports. The older a firm, the less financial constraints they should face while firms that are subsidiaries would have limited access to resources since they have to be shared among other subsidiary companies. The firm's legal status refers to the type of firm registered that is, sole partnership, a limited liability company, etc. Firms that are registered as sole partnerships are expected to have greater financial constraints because they represent riskier investments to banks. An industry variable was included because depending on the industry, a firm may be perceived to be a higher risk borrower than a firm in another industry. Firm size controlled for whether the firm was a micro, small or medium-sized enterprise. Lastly, firms in industries with a large number of competitors may have slower growth in sales. As a result, the number of competitors was included as a control variable in the regressions. The results are presented in the subsequent section.

5. Empirical Results

This section illustrates the main results of our analysis. Eight equations were estimated to find the average treatment effect of financing constraints (proxied by access to an overdraft facility) on firms. The results (see Table 2) revealed that on average, sales growth was positively impacted by having an overdraft facility, but it was not significant at either the five or one percent significance levels. This suggests that growth in sales, for firms in our sample having fewer financial constraints, may not necessarily help firms perform better than firms who were more financially constrained. Similar results were found during the COVID-19 crisis; the treatment effect was negative but not statistically significant. The negative sign could be explained by the negative impact of COVID on sales due to the decrease in economic activity while persons were on lockdown.

Our model shows that the average treatment effect (ATE) for innovation was positive and significant at the 1 percent significance level. This implies that firms which had access to an overdraft facility are more likely to spend more on research and innovation. The model also revealed that the treatment effect on firm productivity was positive and significant at the 5 percent level of significance. The results therefore suggest that firms which had an overdraft facility were more likely to have higher levels of productivity than those without.

Lastly, we estimated four equations to capture the impact of treatment on different employment indicators. In terms of annual wages, the ATE was positive and significant at the 5 percent level on pre- and post-COVID wages. This implies that firms which had access to an overdraft facility were able to pay higher annual wages than firms without and would have suffered less of an impact from COVID. In terms of the workforce, however, the ATE was only significant pre-COVID. This suggests that having fewer financial constraints was not significant enough to prevent COVID's impact on the total number of workers employed. Table 2 below illustrates our results.

Table 2: Average Treatment Effect on the Sample

ATE	Outcome Variables				
	Growth of Sales	***Innovation***	***Productivity***	***Wages***	***Workforce***
Overdraft (1 vs 0)	0.0039	2877.87**	372892.9*	4300.76*	16.2411*
	(0.01739)	(1472.296)	(87287.75)	(1630.488)	(3.6008)
ATE	***COVID Sales***	***COVID Wages***	***COVID Workforce***		
Overdraft (1 vs 0)	-0.4549	4.4824*	0.12352		
	(9.250855)	(1.50512)	(0.44938)		

Note: The table reports treatment coefficients of the PSM matched sample, controlling for firm age, industry, legal status, exports, no. of competitors, firm size and if the firm is a subsidiary. Robust standard errors in brackets. * p<0.05, ** p<0.01, *** p<0.1.

Source: Authors' Calculations

After completing the PSM estimation, using treatment coefficients and the mean of outcome variables, the authors conducted a scenario analysis to determine how the firms would have performed if they had access to the treatment. From this analysis the paper is able to make generalisations about the potential of credit guarantee schemes to influence firm performance based on the outcome variables chosen.

When sorted by firm size, 55 micro, 65 small and 2 medium-sized firms, indicated that they did not have access to an overdraft facility. On average, the results suggest that micro and small firms would benefit more substantially from the treatment than larger firms. For instance, micro enterprises spent about $57,000 on innovation without access to an overdraft facility. If those firms had fewer financial constraints, we find that they could have increased their spending to about $297,123. Furthermore, if those results were extrapolated and applied to the population of all firms in Barbados, reducing the financial constraints of firms could have led to $24 million BBD in additional investment.

Moreover, unlike innovation, the ATE's effect on sales growth between groups was not significant. Nonetheless, the analysis showed that if the micro and small enterprises within the sample had received the support of the overdraft facility, sales could have increased from 2.52 to 3.38 percentage points and 2.98 to 4 percentage points, respectively. This finding is not surprising since sales growth could be explained by other factors besides access to finance. However, it could suggest that if firms had access to finance, they might be able to invest in new capital or marketing to drive sales upward. Similar results

were found for COVID-19's impact on sales. It suggests that if firms had more readily available access to finance, the impact of COVID would have reduced by one percentage point on average. In contrast, for larger firms our analysis finds that the impact of COVID-19 would have been the same whether or not they had access to an overdraft facility. This implies that as firms increase in size, the impact of negative shocks like COVID-19 decreases.

Lastly, we considered the ATE on productivity within the sample in units of sales. The removal of financial constraints could result in significant increases in productivity across all firm groups. This could be due to firms having enough to hire more workers, pay for marketing or engage in capital investments to expand and engage in economies of scale. Table 3 presents the results from the scenario analysis.

Table 3: ATE Scenario Analysis by Firm Size

	Micro		Small		Medium	
	Treatment=0	**Treatment=1**	**Treatment=0**	**Treatment=1**	**Treatment=0**	**Treatment=1**
Sales	2.52%	3.38%	2.98%	4%	0.09%	0.12%
Innovation	$57,840.15	$297,123.37	$68,357.54	$351,145.80	$2103.28	$10,804.49
Productivity	19,431,561	48,216,129	22,964,572	56,982,699	706,602	1,753,314
COVID Sales	-6%	-5.9%	-8%	-7.9%	-0.2%	0%

Source: Authors' Calculations

6. Discussion

Financing constraints can be a significant hurdle for firms. However, by utilising credit guarantee schemes, these constraints could be eliminated thereby contributing to growth in the economy. To capture the effects of these constraints, the authors estimated an Average Treatment Effect Propensity Score Matching model and conducted a scenario analysis. The results support the view that CGS can be used in Barbados to inject liquidity into the corporate sector with the effects being immediate. In a crisis situation, for SOE's with limited monetary policy toolkits, this approach could be an effective counter-cyclical tool at the central banks' disposal.

For the most part our results were consistent with the literature. For example, Asdrubali and Signore (2015) estimate the economic impact at a financial beneficiary level of the EU SME Guarantee Facility for Central, Eastern and South-Eastern European countries. The authors reported that the facility on average had a significant and positive effect on firms' employment. Beneficiary firms were able to increase their workforce by 17.3 percent, compared to the control groups within the first five years following the issuance of the guaranteed loan. From our analysis, firms would have been able to increase their workforce by about 84 percent over the long run if they were not financially constrained. This supports the argument for CGSs, particularly during a crisis, to help firms maintain their workforce and avoid significant unemployment increases within the economy. Furthermore the results presented are also consistent with studies by Martin-Garcia and Moran Santor (2021) and Brown and Earle (2017) who found that guarantees have a positive effect on employment with the effect being more positive for smaller and younger firms. Similar results are reported in this study, with micro and small firms benefiting most from the treatment as well. Given that these enterprises employ the greatest number of persons in most countries, there is enough evidence to support policy allowing CGS to target these particular firms to expand their access to finance.

In contrast to Brault and Signore (2020) who found evidence to support the use of guarantees as a policy instrument to promote growth of SMEs, the results presented in this paper are not sufficient enough to draw this conclusion. However, it does leave room for further study in the area once data becomes available.

Instead, the study produced enough evidence to suggest that guarantees would allow for the relaxation of credit constraints, drive turnover and investment with the greatest impact on micro and small enterprises. The results suggest that reducing financial constraints for firms could potentially result in more than $24 million in additional investment in Barbados through expenditure on research and design alone. In small economies which are usually unable to benefit from economies of scale, research into innovation to better design and manufacture products which are more effective and efficient could result in increase competitiveness for firms, particularly those who export goods and services.

In conclusion, this study was limited by the lack of firm level data related to the CGS and as a result proxies were utilised. Even though our results were positive and provide enough support to recommend the use of credit guarantee schemes, it cannot replace an empirical study of firms who actually received support from the ECGF.

7. Conclusion

The COVID-19 pandemic is a generation defining event and its impact will linger for many years to come. It has generated huge losses for firms and households alike. As the role of central banks continue to evolve, continued uncertainty will force them to face difficult trade-offs as they try to return economies to growth. This study implicitly showed that there is room for the Central Bank of Barbados to expand their tool kit to include credit guarantee schemes under certain conditions. CGSs are an effective policy tool in facilitating the flow of funds to the SMEs by diversifying risks to creditors (Kim et al., 2021). For small open economies like Barbados, CGSs can shift persistent liquidity from the banking sector to the credit constrained corporate sectors when needed, to help insulate the economy from negative shocks.

This study recommends that emphasis be placed on the design of the credit guarantee scheme to reduce the central bank's exposure to risk. Best practices established by schemes in other countries. The Chilean guarantee scheme due to its unique design was able to use the scheme to help firms refinance loans during the COVID-19 crisis. By adjusting the criteria, they were able to provide timely assistance to firms without increasing their risk exposure.

Furthermore, there is scope for the inclusion of sustainability objectives to be incorporated into the mandate of the credit guarantee schemes. Small island developing states are likely to be significantly affected by the current climate crisis. Through the incorporation of sustainability into the current mandate and objectives of the ECGF, the Central Bank of Barbados would be better positioned to respond in the future. Relaxing the criteria of the current guarantee scheme to make it easier for firms who intend to invest in projects related to the national environmental and sustainability goals should ensure the continued relevance of the scheme, particularly given the island's goal of using 100% renewable energy by 2030.

This study was limited by the lack of disaggregated firm level data for beneficiary firms of the ECGF, but the results obtained are sufficient to argue that CGSs in Barbados are capable of positively impacting SMEs and by extension the economy. It also highlights areas for further research primarily into the post-performance of CGS beneficiary firms to better inform policy creation and design. As countries look ahead, central banks need to be focused on maintaining macroeconomic stability with targeted and effective policies. By re-imagining and re-engineering existing tools and policies, central banks can expand their toolkits to ready themselves for the challenges and crises yet future.

References

Antilles Economics. (2014). *Technical Note: Access to Credit for Productive Development for the Tourism Strategy,* Bridgetown.

Asdrubali, P., & Signore, S. (2015). *The Economic Impact of EU Guarantees on Credit to SMEs Evidence from CESEE Countries*. European Economy Discussion Papers, 2, 72.

Atalay, M., Anafarta, N., & Sarvan, F. (2013). *The Relationship between Innovation and Firm Performance: An Empirical Evidence from Turkish Automotive Supplier Industry*. Procedia - Social and Behavioral Sciences, 75, 226–235.

Bahaj, S., & Reis, R. (2020). *Central Bank Swap Lines During the Covid-19 Pandemic*. COVID Economics, 2, 12.

Baudino, P. (2020). *Public Guarantees for Bank Lending in Response to the Covid-19 Pandemic* (FSI Briefs No. 5; p. 9). Bank for International Settlements, Brussels.

Bertoni, F., Brault, J., Colombo, M., Quas, A., & Signore, S. (2019). *Econometric Study on the Impact of EU Loan Guarantee Financial Instruments on Growth and Jobs of SMEs* (EIF Working Paper 2019/54). European Investment Fund. https://www.eif.org/news_centre/publications/EIF_Working_Paper_2019_54.pdf

Bertoni, F., Colombo, M., & Quas, A. (2018). *The Effects of EU-Funded Guarantee Instruments on the Performance of Small and Medium Enterprises: Evidence from France* (EIF Working Paper 2018/52). European Investment Fund. https://www.econstor.eu/bitstream/10419/190505/1/1042032890.pdf

Bingham, G., Fisher, P., & Large, A. (2021). *The Covid Crisis, Central Banks and the Future*. Central Banking, 15.

Brault, J., & Signore, S. (2020). *Credit Guarantees in the COVID-19 Crisis – Relevance and Economic Impact*. European International Fund, 176, 9.

Brown, J. D., & Earle, J. S. (2017). *Finance and Growth at the Firm Level: Evidence from SBA Loans*. The Journal of Finance, 72(3), 1039–1080. https://doi.org/10.1111/jofi.12492

Buiter, W. H. (2008). *Central Banks and Financial Crises*. London School of Economics, London.

Canova, T. A. (2015). *The Role of Central Banks in Global Austerity*. Indiana Journal of Global Legal Studies, 22(2), 665–695.

Central Bank of Barbados. (n.d.). *ECGF Summary Sheet*. Retrieved 23 June 2021, from http://www.centralbank.org.bb/Portals/0/Files/Enhanced%20Credit%20Guarantee%20Fund/ECGF%20Summary%20Sheet%20for%20email.pdf

Chase, K., Greenidge, K., Moore, W., & Worrell, D. (2006). *Quantitative Assessment of a Financial System-Barbados*. Social and Economic Studies, 49–68.

Cintina, I., & Love, I. (2019). *Re-Evaluating Microfinance: Evidence from Propensity Score Matching*. The World Bank Economic Review, 33(1), 95–115.

Compete Caribbean. (n.d.). *Compete Caribbean Partnership Facility*. Retrieved 9 December 2021, from https://www.competecaribbean.org/proteqin/

Corbo, V. (2010). *Financial Stability in a Crisis: What is the Role of the Central Bank?* In BIS Papers chapters (Vol. 51, pp. 27–30). Bank for International Settlements. https://ideas.repec.org/h/bis/bisbpc/51-07.html

Corredera-Catalán, F., di Pietro, F., & Trujillo-Ponce, A. (2021). *Post-COVID-19 SME financing constraints and the credit guarantee scheme solution in Spain*. Journal of Banking Regulation.

Cowling, M. (2010). *The Role of Loan Guarantee Schemes in Alleviating Credit Rationing in the UK*. Journal of Financial Stability, 6(1), 36–44.

Cusmano, L. (2013). *SME and Entrepreneurship Financing: The Role of Credit Guarantee Schemes and Mutual Guarantee Societies in Supporting Finance for Small and Medium-Sized Enterprises*. OECD SME and Entrepreneurship Papers, Vol. 1.

Dang, L. N., & Chuc, A. T. (2019). *Challenges in Implementing the Credit Guarantee Scheme for Small and Medium-Sized Enterprises: The Case of Viet Nam*. Viet Nam; Issue 941. Asian Development Bank. https://www.adb.org/publications/challenges-implementing-credit-guarantee-scheme-sme-vietnam

Dang, T. B. (2015). *Study on the Credit Guarantee System: The Case of the V4 Countries*. Challenges in Economic and Technological Development Conference, 24–39. Lillafured, Hungary.

de la Torre, Augusto; Gozzi, Juan Carlos; Schmukler, Sergio L. 2017. *Innovative Experiences in Access to Finance: Market-Friendly Roles for the Visible Hand? Latin American Development Forum*. Washington, DC. World Bank. https://openknowledge.worldbank.org/handle/10986/27529 License: CC BY 3.0 IGO

Dikau, S., Robins, N., & Volz, U. (2020). *A Toolbox of Sustainable Crisis Response Measures for Central Banks and Supervisors* – Second Edition- Lessons from Practice. INSPIRE.

Dikau, S., & Volz, U. (2021). Central Bank Mandates, Sustainability Objectives and the Promotion of Green Finance. *Ecological Economics*, *184*, 107022.

Domanski, D., Moessner, R., & Nelson, W. R. (2014). *Central Banks as Lender of Last Resort: Experiences During the 2007-2010 Crisis and Lessons for the Future*. Federal Reserve Board. http://www.ssrn.com/abstract=2544645

Echarte Fernández, M. Á., Náñez Alonso, S. L., Jorge-Vázquez, J., & Reier Forradellas, R. F. (2021). *Central Banks' Monetary Policy in the Face of the COVID-19 Economic Crisis: Monetary Stimulus and the Emergence of CBDCs*. Sustainability, 13(8), 4242.

García-Silva, P. (2021). *Unconventional Monetary Policy Responses to the COVID-19* Crisis- *The Chilean Experience Lecture*. INS-MCM IMF seminar on "Unconventional Monetary Policy in Emerging Markets". The Central Bank of Chile https://www.bcentral.cl/documents

Goodhart, C. a. E. (2011). The Changing Role of Central Banks. Financial History Review, 18 (2), 135–154.

Gozzi, J. C., & Schmukler, S. (2016). Public Credit Quarantees and Access to Finance. No. 2068-2018-1284. Warwick Economics Research Paper Series. Coventry. UK

Haas, J., Neely, C. J., & Emmons, W. R. (2020). *Responses of International Central Banks to the COVID-19 Crisis*. Federal Reserve Bank of St. Louis Review, Fourth Quarter 2020, pp. 339-84.

Kim, S. S., Kesller, T., Lee, H., & Khan, M. S. (2021). *Policies to Optimise the Performance of Credit Guarantee Schemes During Financial Crises*. [ADB Briefs]. Asian Development Bank. https://www.adb.org/publications/policies-credit-guarantee-schemes-financial-crises

Levitsky, J. (1997). *Credit Guarantee Schemes for SMEs: An International Review*. Small Enterprise Development, 8, 4-17.

Levitsky, J., & Prasad, R. (1989). *Credit Guarantee Schemes for Small and Medium Enterprises*. World Bank, Washington.

Martin-Garcia, R., & Moran Santor, J. (2021). *Public Guarantees: A Countercyclical Instrument for SME Growth: Evidence from the Spanish Region of Madrid*. Small Business Economics, 56(1), 427–449.

Mayer, T., & Schnabl, G. (2021). *Covid-19 and the Euthanasia of Interest Rates: A Critical Assessment of Central Bank Policy in Our Times.* Journal of Policy Modeling. https://linkinghub.elsevier.com/retrieve/pii/S0161893821000491

Nier, E. W. (2009). *Financial Stability Frameworks and the Role of Central Banks: Lessons from the Crisis*. IMF Working Papers, 2009 (070).

OECD. (2010). *Facilitating Access to Finance: Discussion Paper on Credit Guarantee Schemes*. https://www.oecd.org/global-relations/45324327.pdf

OECD Glossary of Statistical Terms. *Small and Medium-Sized Enterprises (SMEs) Definition*. (n.d.). Retrieved 17 July 2021, from https://stats.oecd.org/glossary/detail.asp?ID=3123

Ojo, M. (2010). *Redefining a Role for Central Banks: The Increased Importance of Central Banks' Roles in the Management of Liquidity Risks and Macro Prudential Supervision in the Aftermath of the Financial Crisis. SSRN Electronic Journal*.

Rosenbaum, P. R., & Rubin, D. B. (1983). *The Central Role of the Propensity Score in Observational Studies for Causal Effects.* Biometrika, 70(1), 41–55.

Sarker, Provash Kumer, (2020). *Covid Crisis: Fiscal, Monetary and Macro-Financial Policy Responses*. Theoretical and Applied Economics, 3 / 2020 (624), Autumn. Wuhan China.

Schich, S., Cariboni, J., Naszodi, A., & Maccaferri, S. (2017). *Evaluating Publicly Supported Credit Guarantee Programmes for SMEs*. OECD, 48.

Silva, F., & Carreira, C. (2017). *Financial Constraints: Do They Matter to Allocate R&D Subsidies?* The B.E. Journal of Economic Analysis & Policy, 17 (4).

Springer, N. (2018, June 12). *Loan-Guarantee Programme Fuels Innovative Energy Technology*. Clean Energy Finance Forum. https://www.cleanenergyfinanceforum.com/2018/06/12/loan-guarantee-program-fuels-innovative-energy-technology

Subbarao, D. (2010). Inaugural Address by Dr. Duvvuri Subbarao, Governor, Reserve Bank of India at the International Research Conference on "*Challenges for Central Banks in the Context of the Crisis*". Mumbai: Reserve Bank of India.

Taghizadeh-Hesary, F., & Yoshino, N. (2020). *Sustainable Solutions for Green Financing and Investment in Renewable Energy Projects*. Energies, 13(4), 788.

Uesugi, I., Sakai, K., & Yamashiro, G. M. (2008). *The Effectiveness of Public Credit Guarantees in the Japanese Loan Market*. Journal of the Japanese and International Economies, 24(4), 457–480.

US Department of Energy. (n.d.). *Loan Programmes Office*. Energy.Gov. Retrieved 3 July 2021, from https://www.energy.gov/lpo/loan-programs-office

World Bank. (n.d.). *World Bank SME Finance* [Text/HTML]. World Bank. Retrieved 21 June 2021, from https://www.worldbank.org/en/topic/smefinance

Zhu, Y. (2020). *Research on the Credit Guarantee System of Small and Medium-sized Enterprises in China.* Proceedings of the 3rd International Conference on Economy, Management and Entrepreneurship (ICOEME 2020). Moscow, Russia.