Performance-based budgeting in Canada: Assessing the association between past performance and subsequent resource allocation

by

Curtis Brett Whittla
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Supervisory Committee

Dr. Ekaterina Rhodes, School of Public Administration, University of Victoria
Supervisor

Dr. Tamara Krawchenko, School of Public Administration, University of Victoria
Second Reader

Abstract

Performance-based budgeting (PBB) is a common performance management practice throughout OECD countries where performance information is directly or indirectly linked to resource allocations in the budgetary process. Canada has had various systems of PBB in place since at least 1969, with the most recent changes being implemented in 2016. Despite these recent changes, few studies have examined the allocative efficiency of Canada's PBB system, which purports to allocate resources in a way that optimizes performance (TBS, 2016). Using panel data spanning eight fiscal years from 2014-15 to 2021-22, this study aims to measure the correlation between past performance and subsequent resource allocation at the organizational level and provide recommendations to improve PBB processes. The analysis found that for every one percentage point increase in average organizational performance, an additional 0.23 percentage points of spending was allocated in the subsequent budget, demonstrating a modest but statistically significant level of allocative efficiency. This result was not found for staffing allocations. These analyses provide some preliminary findings in the Canadian government context which support theories about the allocative efficiency of PBB. These findings differ from the results of an earlier study of PBB in Canada conducted by the Office of the Parliamentary Budget Officer (PBO) in 2014, which found no statistically significant correlation between performance and resource allocation at the organizational level. This study concludes by providing some recommendations to strengthen Canada's PBB systems, including recommending Canada's approach to PBB as an example of creating allocative efficiency, promoting the use of performance information in budgetary decision-making and politics, providing consistent and full public data to scholars and budgetary oversight bodies like the PBO for better analysis, and maintaining more consistent indicators across multiple fiscal years.

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Chapter 1. Introduction

For as long as centralized governments have existed, there has been a longstanding goal of creating policy and programs which are effective, efficient, and make the best use of taxpayer money. Performance-based budgeting (PBB) is a performance management and budgetary system employed by national and sub-national governments worldwide which aims incorporate performance information into budgetary decisions with various levels of alignment and integration (Raudla, 2016).

Proponents of PBB often point to the two types of efficiencies which this system of budgeting asserts to increase: productive efficiency and allocative efficiency (Robinson & Brumby, 2005). Productive efficiency refers to the rate at which inputs—resources such as budgets and staff—are turned into direct outputs and longer-run outcomes. PBB aims to increase productive efficiency by squarely focusing on performance, represented in most cases by the achievement of predetermined output and outcome performance indicators. Under PBB, public servants and politicians can be held to account for under- and over-performance, thus aligning their goals with those of the electorate. Public servants in a well-implemented PBB system are more likely to focus on activities which improve performance measurements and deprioritize activities which do not contribute to better performance.

Allocative efficiency, in contrast, refers to the reallocation of resources from lower-performing policies and programs to ones which are better at achieving their performance objectives. Allocative efficiency is a broader system-wide feature of PBB often implemented at the program, organizational, or government level. In the Canadian PBB system, the Treasury Board promotes allocative efficiency through its *Policy on Results*. This policy mandates organizations to reallocate their resources to optimize results internally. Additionally, it enforces centrally mandated resource alignment reviews and directs reallocations through Treasury Board submissions (Treasury Board Secretariat of Canada (TBS), 2016). However, given the changing priorities of government from year-to-year or government-to-government, this concept can be difficult to observe in practice. An earlier study from the Office of the Parliamentary Budget Officer (PBO) (2014) found no statistically significant evidence of allocative efficiency in the Canadian federal government for the three fiscal years studied.

PBB has been implemented, to various degrees, by every Organization for Economic Cooperation and Development (OECD) member state. In studying its member states, the OECD (2019) identifies four levels of PBB systems on an increasing scale, each with more budgetary control and alignment with performance information than the last. The lowest level, presentational performance budgeting, merely presents performance information alongside budgets but makes no claims about linkages between them. The next level, performance-informed budgeting, is the most common among OECD countries (OECD, 2019). This system involves re-organizing budgetary processes and documents around

performance metrics and presenting budgets at a program level. It also seeks to devolve more budgetary authority to public managers by reducing line-item budgeting.

The third level identified by the OECD is managerial performance budgeting, which is what the OECD classifies Canada's PBB as. In these systems, the focus is on the managerial impacts of PBB and associated changes in organizational behaviour. The government's goal in managerial performance budgeting is to create a results-oriented culture where public servants are empowered to achieve performance targets. The final form of PBB is direct performance budgeting, which does not exist in any country at the national level. This level of PBB implementation establishes a direct link between results and resources, using formulaic approaches to establish budgetary responses to over or underachievement of performance indicators. This approach is used in some specific circumstances, such as payments to health providers (OECD, 2019) and is being experimented with in some jurisdictions for funding post-secondary educational institutions (St-Onge, 2020).

Despite PBB's widespread implementation, detailed empirical analyses of PBB systems are rare and often focused on larger governments such as the United States of America (US). Some studies in the US have found that performance evaluation scores were not significantly associated with program resource allocations (Ryu, 2013), a finding that's echoed by a similar study by the Parliamentary Budget Officer in Canada (PBO, 2014). However, others have noted in state-by-state assessments that states which implemented PBB systems earlier experience lower variation in their spending from year-to-year (Klase & Dougherty, 2008), perhaps indicating PBB's effectiveness in reducing volatility and uncertainty in the budgeting process. Additionally, some studies of OECD countries found that those with stricter PBB mechanisms, where performance targets are more closely linked to budgetary consequences, were correlated with decreased government deficits and increased economic growth (Deyneli, 2019; Kwon, 2018), perhaps revealing PBB's effectiveness at the macroeconomic level instead of the organizational- or program-level.

Concerns that practitioners and scholars have about PBB are often attributed to several factors, many of them associated with improper implementation. Scholars point to the lack of involvement of budgetary actors in the PBB system development process (Hijal-Moghrabi, 2019), the difficulty in selecting and measuring quality performance indicators (Bischoff & Blaeschke, 2016; Sterck, 2007), and the lack of performance data use by politicians in legislatures (A. T.-K. Ho, 2018; Sterck, 2007; Ward, 2015), as major reasons for PBB's failures as a managerial and performance management tool. Additionally, there are problems with the ongoing management of PBB systems. It can be difficult to rationalize the links of some outputs and outcomes to the actions of public organizations (Bischoff & Blaeschke, 2016; Ryu, 2013) particularly those with non-economic goals, and public programs which change their targeted measurements too often can confuse budgetary decision-makers (Ryu, 2013).

Additionally, there are concerns with scale. PBB can and has been implemented at the national, provincial, and municipal levels in Canada, and these PBB systems can be applied to the entire government, individual organizations or departments, and individual programs. PBB has been implemented most fully by the government of Canada across its departments, regulatory bodies, and crown corporations; however, governments with fewer resources or less capacity can find a successful implementation of PBB challenging, leading to performance data which has little influence on decision-making processes (OECD, 2007).

When it comes to governance and impact of the federal government on Canadians' daily lives, many Canadians have an increasingly strained relationship with politicians and the federal government, and this relationship has only become more fraught in recent years with the resurgence of populism and political polarization. A recent public opinion poll found that 50% of Canadian respondents were dissatisfied with the way that Canada's government is being managed, although this varied widely by region, with respondents being much more dissatisfied with the government's approach to improving healthcare and addressing affordability in western provinces such as Alberta than in Ontario, Quebec, or Atlantic Canada (Leger, 2023).

Although not an all-encompassing solution for government effectiveness and accountability, proper implementation of performance management systems such as PBB can help to align the public interests of Canadians with the management of the public organizations. If it is properly implemented, PBB can help bridge the gap between politicians, public servants, and the citizens of Canada which they serve.

The first objective (Objective 1) of this research study is to examine the trends in performance and resource allocation in the federal Canadian government over time, specifically between the 2014-15 and 2021-22 fiscal years. These years include the transition from the end of Prime Minister Stephen Harper's Conservative government to Prime Minister Justin Trudeau's Liberal government, which has won three elections since 2015. This timeframe also includes the start of the COVID-19 pandemic, which heavily impacted government spending both directly through economic recovery programs but also indirectly through low unemployment and rising inflation.

The second objective (Objective 2) of this research is to examine the allocative efficiency of PBB in Canada, by identifying and measuring any association between organizational performance and subsequent resource allocation. A previous study from the Office of the Parliamentary Budget Officer (2014) that examined this linkage found no statistically significant results for the three separate fiscal years which were examined, however, updates to the Treasury Board's approach to PBB have since been implemented and are included in this study.

This thesis is organized as follows. Chapter 2 is a literature review which starts with a thematic overview of performance-based budgeting followed by a description of the performance-budgeting systems and tools in the federal Canadian government. Chapter 3

covers the theoretical framework used in this analysis—the allocative efficiency theory of PBB. Chapter 4 explains data sourcing and collection techniques and outlines the methods used to analyze this data. Chapter 5 explores the summary statistics and results of the regression analyses of the performance and resource allocation data. Chapter 6 provides some discussion and analysis of the results. Chapter 7 concludes the thesis and provides some recommendations and implications for public managers and decision-makers who practise performance-based budgeting and its associated processes, including areas for future research.

Chapter 2. Literature Review

2.1 Defining performance-based budgeting

At its most basic level, performance-based budgeting (PBB) "refers to a budgeting system that takes into account performance information in budgetary decisions" (Raudla, 2016, p. 1). There are many names which describe the practice of linking performance information and the budget-making process, including performance-based budgeting (which will be the term used throughout this study) but also performance budgeting, results-based budgeting, and performance-oriented budgeting, among others. This shift towards performance is rooted in the principles of New Public Management (NPM), a management philosophy that emphasizes efficiency, accountability, and results-driven practices in the public sector (Badie et al., 2011; Bevir, 2009). Emerging in the late 20th century, NPM advocates for public sector organizations to adopt approaches from the private sector and prioritize output-based performance measures, among other initiatives.

Behn (2003) notes that PBB can mean different things in different contexts; it can be as simple as reporting historical performance alongside annual budget requests. Optionally, it could mean that budgets are not structured by line-item but rather as program performance targets—with line-items left to managers to allocate. However, it could also mean rewarding programs which perform well with extra funds and cutting the budgets of those which do not. These various PBB systems are expanded on in later OECD research, which examines the application of PBB in OECD member nations.

Overall, PBB fits into broader performance measurement and management systems and helps to achieve some of the purposes of performance measurement for managers in public organizations, including budgeting and controlling functions, and contributes indirectly to others such as learning and improvement, evaluation, and promotion to stakeholders (Behn, 2003). PBB, however, is not developed 'in a vacuum' and is thus subject to the same limitations and constraints that afflict other performance measurement systems and processes.

In public sector organizations, the use of a performance measurement system is a common approach for developing a comprehensive view of organizational effectiveness. Such systems track variables that contribute to performance, incorporating elements from a logic model that connects inputs, activities, outputs, and outcomes (Smith, 2019; van Dooren et al., 2012, 2015). This method enables organizations to analyze the relationships among different performance components systematically and gain a better understanding of the factors driving the success or failure of a program or organization.

The logic model is particularly useful as it delineates the processes and resources that contribute to overall organizational performance. In the logic model, inputs refer to the resources allocated to an organization, including funding, human resources, and materials. Activities encompass the initiatives, tasks, or programs an organization undertakes using these inputs. Outputs represent the tangible products or services generated by the organization's activities, and outcomes describe the intended, and often long-term, effects

of these outputs on the target population or issue (van Dooren et al., 2015). By tracking and evaluating these components, public organizations can identify areas for improvement and allocate resources more effectively.

Proper implementation of PBB relies on a solid foundation of performance measures that enable organizations to make informed decisions about resource allocation (de Vries et al., 2019; Smith, 2019). By employing a logic model within a performance measurement system, public organizations can ensure that they have the necessary data to support the successful implementation of PBB. This leads to improved strategic planning, better resource allocation, and enhanced overall performance.

Behn (2003), notes that no single performance measurement is good for every purpose, and that public managers should not seek a single magic performance indicator. Further, Behn (2003) states that there are different stakeholders for each type of performance measure, and they might differ for public managers, legislators and politicians, or journalists and the broader public. Instead, public managers need to evaluate carefully the goals of their performance measurement systems—including PBB—and choose performance indicators that can best support those goals. Recognizing the complexities and varying purposes of performance measurement systems, it is essential to consider the diverse approaches to PBB utilized by different countries. By examining the various degrees of PBB adoption, public managers can better align their performance measurement systems with their intended goals and cater to the needs of different stakeholders.

PBB has been adopted to varying degrees across all member states of the Organization for Economic Cooperation and Development (OECD). The OECD (2019) categorizes PBB systems into four ascending levels, each demonstrating an increased integration of budgetary control and performance information. Understanding these levels is crucial for assessing the effectiveness of PBB implementation and the implications for public sector management and resource allocation.

At the first level, *presentational performance budgeting* simply presents performance information alongside budgets without establishing explicit connections between them. This approach may enhance transparency, however, it does not necessarily lead to significant changes in budgetary decision-making or organizational behavior (OECD, 2019). In Italy, for example, PBB has evolved in tandem with the strengthening of overall performance measurement systems (de Vries et al., 2019). Under the influence of NPM, Italy overhauled its budget process to bolster public sector financial management. An official report from 2009 emphasized the need to revise Italy's public spending processes and strengthen performance measurement practices, drawing from international experiences. However, the implementation of these reforms has been fragmented, with several conflicting legislative actions introduced to modify the budget process and structure. Despite the significant strides, Italy faces challenges in fully integrating these

reforms and ensuring their effectiveness in the public sector, making it a notable example of the weakness of presentational performance budgeting (de Vries et al., 2019).

The second level, *performance-informed budgeting*, is the most common among OECD countries (OECD, 2019). In this system, budgetary processes and documents are restructured around performance metrics, and budgets are presented at the program level. This approach aims to delegate greater budgetary authority to public managers by reducing line item budgeting and allowing a more flexible and responsive resource allocation process (OECD, 2019). In the Netherlands, the adoption of its performance-informed budgeting was also significantly influenced by the NPM movement (de Vries et al., 2019). Unlike some nations that took a more radical stance in embracing NPM reforms early, the Netherlands adopted a balanced approach. A consistent theme in Dutch governance has been the continuous monitoring of performance which, by 1998, had led to a higher emphasis being placed on non-financial policy information, leading to noteworthy government reports in the late 1990s which underscored the importance of performance-based budgeting and accountability. Research suggests, however, that while the Netherlands has made improvements in integrating performance measures into its budgeting process, the effectiveness of these reforms in terms of achieving desired outcomes and their impact on governance remains a subject of ongoing evaluation (de Vries et al., 2019).

The third level, *managerial performance budgeting*, is demonstrated by the Government of Canada's modern PBB system, which is explained further later in this chapter. This approach focuses on the managerial implications of PBB and the subsequent changes in organizational behavior and culture. The primary objective of managerial performance budgeting is to create a results-oriented organizational culture in which public servants are empowered to achieve performance targets. By emphasizing the importance of achieving performance indicators, this system encourages a more strategic use of resources and a greater alignment between organizational goals and resource allocation (OECD, 2019). Aside from Canada, the United Kingdom, Norway, and Mexico are among the few countries which practice managerial performance budgeting in the OECD (OECD, 2019). In Mexico, the country's move towards performance budgeting occurred early and was largely influenced by economic challenges faced in the early 1980s, particularly due to the drop in oil prices (A. T. Ho et al., 2019). This economic strain, combined with the government's continued irresponsible spending, led to significant debt problems. In response, Mexico began promoting budgetary reforms that legally integrated performance measurement and evaluation with budgetary practices, aiming to encourage continuous improvement of public management. Despite these reforms, the Mexican system still faces challenges. Studies suggest that while the Mexico's approach to PBB has generated benefits within the executive branch of the government, it has not significantly impacted other areas of governance, such as communication of performance results to the Congress

or the public (A. T. Ho et al., 2019). This perhaps indicates that while there are managerial benefits, broader transparency and accountability objectives are yet to be fully realized.

Lastly, the highest level of PBB implementation, *direct performance budgeting*, has yet to be adopted by any country at the national level. This approach establishes a direct link between results and resources, using formulaic methods to determine budgetary responses to the over- or underachievement of performance indicators. While not adopted in any OECD national governments, direct performance budgeting has been applied in specific contexts, such as payments to healthcare providers (OECD, 2019) and in experiments with funding post-secondary educational institutions by sub-national governments (St-Onge, 2020). As public organizations continue to explore ways to enhance performance management, it is essential to monitor the evolution and potential impact of PBB systems on resource allocation and overall performance.

2.2 Productive and allocative efficiency

In attempts to improve the achievement of performance goals through the various levels of implementation outlined above, PBB has been promoted by OECD member governments for its potential to increase efficiency in public organizations by focusing on results and outcomes. Proponents of PBB allege that this budgetary approach can enhance two types of efficiencies: productive efficiency and allocative efficiency (Robinson & Brumby, 2005). By better understanding these efficiencies and their implications for public sector management, it is possible to gain a better understanding of the potential benefits and challenges associated with PBB implementation.

Productive efficiency is concerned with the rate at which inputs, such as budgets and staff, are converted into direct outputs and longer-term outcomes. PBB aims to improve productive efficiency by placing a strong emphasis on performance, typically defined by the achievement of predetermined outputs and outcomes. By doing so, PBB seeks to hold public servants and politicians accountable for under- and over-performance relative to the priorities and expectations of elected representatives (OECD, 2019). In a well-implemented PBB system, public servants are more likely to prioritize activities that contribute to improved performance results and deprioritize those that do not.

One of the main drivers of productive efficiency in a PBB system is the increased transparency and accountability it brings to public sector organizations. Unfortunately, these improvements do not necessarily elevate the public's trust and confidence in governments by themselves, and may in fact lead to increased political debate and discontent (Schick, 2014). By measuring performance and holding public servants responsible for their results, however, PBB fosters a culture of continuous improvement and encourages the pursuit of best practices, both of which are essential to the effective implementation of PBB (Lu & Willoughby, 2019; Moynihan & Beazley, 2016; OECD, 2019). This focus on performance also leads to the identification of inefficiencies, enabling

organizations to address and correct areas where resources may be underutilized or misallocated.

Alternatively, *allocative efficiency* refers to the reallocation of resources from lower-performing organizations, policies, and programs to those that are more effective in achieving their performance objectives. Allocative efficiency is a broader, system-wide feature of PBB that is often implemented at the whole-of-government or organization level (OECD, 2007; Robinson, 2007). In the Canadian PBB system, for example, allocative efficiency is promoted primarily by the Treasury Board through its *Policy on Results*, which mandates that organizations reallocate their resources to optimize results internally (TBS, 2016). Allocative efficiency is also facilitated centrally through mandated resource alignment reviews and Treasury Board submissions.

However, achieving allocative efficiency in practice can be challenging due to the shifting priorities of governments over time or between administrations. For instance, a study conducted by the Office of the Parliamentary Budget Officer (2014) found no statistically significant evidence of allocative efficiency in the Canadian federal government for the three fiscal years analyzed. This highlights the potential difficulties in effectively implementing and maintaining allocative efficiency within PBB systems.

Overall, PBB offers the potential to improve both productive and allocative efficiencies in public organizations, although there are few empirical studies which support these assertions (A. T. Ho et al., 2019). Still, achieving these efficiencies requires careful implementation, ongoing monitoring, and adjustments as necessary to account for changing priorities and circumstances (A. T.-K. Ho, 2018). By understanding the intricacies of PBB and its implications for public sector organizations, policymakers and public managers can make more informed decisions about its adoption and implementation, ultimately leading to better use of public resources and improved outcomes for citizens (Lu & Willoughby, 2019).

2.3 The Canadian government context

Over the past five decades, in attempts to improve performance and accountability, the federal government has aimed to implement and improve its reporting on results, often in conjunction with changes in expenditure decision-making processes (Smith, 2019). In 1969, the *Program, Planning and Budgeting System* was adopted to focus on program objectives and effectiveness through regular assessments, while presenting expenditures on a program basis with accompanying statements of performance objectives. Following this initial approach, other systems were introduced, such as the *Policy and Expenditure Management System* in 1979 and Part III of the budget estimates in 1982 (Smith, 2019). These budgetary and performance measurement approaches continued to evolve, with Cabinet committees setting priorities within expenditure categories. Additionally, departments began to develop multi-year operational plans that outlined expected expenditures for ongoing programs.

In 1995, the government revised the expenditure management system to promote ongoing reviews of existing programs and services, reallocating existing resources to fund new initiatives. This is the earliest example of systematic approaches used in the federal government to improve allocative efficiency. This revised expenditure management system led to the *Improved Reporting to Parliament Project* in 1996, which split Part III of the estimates into two components: reports on plans and priorities, and departmental performance report, early versions of the reports that are still produced to this day (TBS, 2016). These changes provided the basis for the PBB system that currently exists in Canada and aimed to provide a more comprehensive view of the government's performance and resource allocation.

In 2000, the government released "Results for Canadians: A Management Framework for the Government of Canada," committing to a results-based management approach for all major activities and functions (Smith, 2019). This framework sought to establish a productive cycle of planning, measuring, evaluating, and reporting results to citizens and Parliament, ultimately fostering a culture of continuous learning and adjustment. As public sector organizations continue to adapt and refine their performance measurement systems, understanding the historical context and evolution of these approaches is essential for effective policy development and implementation, and for understanding the current PBB systems at play in Canada.

In recent years, efforts to improve reporting on results have been ongoing, with the federal government in its 2016 Budget emphasizing a shift towards a culture of measurement and impact (Smith, 2019). This approach was led by Trudeau as part of his philosophy of "deliverology", which sought to emphasize the achievement of results in the federal government (May, 2019). As part of this approach, a Results Delivery Unit was established within the Privy Council Office to monitor government commitments, address implementation obstacles, and report progress to the Prime Minister.

In July 2016, the Treasury Board released its *Policy on Results*, which replaced previous policies and required federal departments to prepare departmental results frameworks, develop program inventories, define results indicators, maintain performance measurement functions, and establish neutral evaluation functions with five-year evaluation plans (Smith, 2019). In October 2016, the government published the discussion paper "Empowering parliamentarians through better information," which outlined changes to departmental reports resulting from the Policy on Results. Departments would now report on results frameworks based on core responsibilities and inventories of programs.

Furthermore, the discussion paper described additional reporting to be included in GC InfoBase, an interactive data-visualization tool created in 2013 that offers infographics and data on federal finances, people management, and results (TBS, 2023a). GC InfoBase sources its information from federal publications, such as estimates documents, departmental plans and results reports, and public accounts, presenting it in an accessible,

online format. The open-sourcing and publication of these reports, and the datasets that come from Canada's Open Data hub, provide the data used in this study.

2.4 Challenges in PBB implementation

Canada, and many other OECD countries which have implemented various levels of PBB, have all identified significant challenges in their PBB approaches. Although measuring the impact of these shortfalls was beyond the scope of this thesis, they are important to understand and contextualize any findings related to allocative efficiency. The effectiveness of reporting on results faces several systemic challenges that merit further examination. For instance, the political nature of government budgetary systems may discourage governments from engaging in balanced reporting due to a desire to avoid criticism (Curristine, 2006; A. T. Ho et al., 2019; Raudla, 2022; Saliterer et al., 2019). This aversion to scrutiny can lead to an overly positive representation of results, which may not accurately reflect the true progress made by government programs. Studies have found, however, that politicians from both the government and opposition benches use performance information for four distinct purposes: de-legitimizing (using performance information to attack policies and programs), legitimizing (using performance information to support policies and programs), improving and understanding (using performance information to draw attention) and deflecting (using performance information as to divert attention), perhaps indicating a usefulness for performance data in the political sphere (Saliterer et al., 2019).

Additionally, the complexity and diversity of government programs and objectives can hinder results-based reporting. Some programs, like international diplomacy, do not easily conform to results-based objectives, as their outcomes are often intangible or difficult to quantify (Clark & Swain, 2005; de Vries et al., 2019; OECD, 2019). Additionally, governments often juggle multiple, conflicting objectives, which can complicate the reporting process and make it challenging to prioritize and allocate resources effectively (Smith, 2019).

Another challenge lies in the time-consuming, expensive, and complex nature of collecting and analyzing relevant data for performance reporting (de Vries et al., 2019; Smith, 2019). These constraints may result in poor data quality, ultimately impacting the accuracy and reliability of reported results.

Attributing the impact of government programs on societal issues with multiple causes and factors can also be problematic. For instance, crime rates are influenced by various factors and involve numerous stakeholders, making it difficult to demonstrate a direct link between government interventions and specific outcomes (de Vries et al., 2019; A. T. Ho et al., 2019). In public administration, this would be referred to as a "wicked problem"; an issue which does not have a straightforward solution.

Organizations may also prefer to focus on inputs and activities that are within their control, rather than pursuing long-term outcome objectives (de Vries et al., 2019)—

something that can be observed by the variation in indicators selected by federal government organizations in Canada. This tendency can lead to a misalignment between reported performance indicators and the actual achievement of long-term strategic goals. In some cases, organizations may even adjust program delivery to perform well on selected performance indicators at the expense of long-term strategic objectives (Clark & Swain, 2005; de Vries et al., 2019).

A key challenge as it relates to allocative efficiency is the limited integration of performance information in decision-making and resource allocation (PBO, 2014; Sterck, 2007). When performance data is not considered during these processes, it reduces the usefulness of the information within the government, potentially hindering the improvement of public sector outcomes. This lack of integration also calls into question the effectiveness of PBB in achieving allocative efficiency, as the alignment of resources with high-performing programs and activities becomes less feasible without comprehensive performance data informing decision-making. Some studies have pointed to many internal variables which seem to be associated with higher data use, such as leadership support, the maturity of the performance measurement system, and an organizational culture of innovation, while eschewing other potentially noteworthy variables like financial distress and political competition, which do not seem to have a significant association with performance information use in decision-making (Kroll, 2015).

Canada, like many other OECD countries, grapples with these, and other, considerable challenges in implementing PBB. It is crucial to understand these difficulties and consider the implications for PBB's effectiveness and the pursuit of allocative efficiency in the public sector. Addressing these challenges through further research could provide valuable insights for the ongoing development and refinement of PBB systems, ultimately contributing to better public sector outcomes and resource allocation.

Chapter 3. State of Knowledge

This study will provide a quantitative assessment of PBB's allocative efficiency in the federal Canadian government, applying methods similar to previous quantitative studies in other jurisdictions and timeframes. One of PBB's major theoretical advantages is allocative efficiency, whereby resources are transferred between departments and programs based on performance to maximize their intended outputs and outcomes (Robinson & Brumby, 2005). The federal government references allocative efficiency in their *Policy on Results*, where the Treasury Board states "[r]esources are allocated based on performance to optimize results, including through Treasury Board submissions, through resource alignment reviews, and internally by departments themselves" (TBS, 2016).

To evaluate allocative efficiency, we can examine the correlation between performance and resources, as conducted previously in the USA context by Ho (2011) and Ryu (2013), and in Canada by the Office of the Parliamentary Budget Officer (PBO) (2014). This study will adapt those models to be applied to recent data from the Canadian government's spending, full-time equivalents[1] (FTEs), and performance data at the organization level.

Ho (2011), in an early empirical study on allocative efficiency, analyzed the effects of the number of performance indicators on the variability of program budgets in local government departments. They found that budgetary decision-makers below the department level were able to make cost-efficient budgetary allocations across their programs. Ho (2011) credited this to program-level staff having better understandings of how to deliver their services in efficient ways and that the local governments studied seemed to have public managers which were able to effectively link strategic planning, performance management, and program budgeting together.

At a larger scale, Ryu (2013) used the US' *Government Performance and Results Act* (GPRA) performance scores and budgetary data from the US Department of Commerce to empirically test whether performance evaluations scores are incorporated into agency budgets. GPRA data is available at a few levels—strategic goal, strategic objective, and performance outcome—with each level become more specific and granular. Budgetary data was then matched with each level for analysis; however, budgetary data was insufficient at the performance objective level (the lowest) to conduct panel analysis and was thus excluded from the analysis. The budgetary data was also transformed into propensity change scores, which is based on earlier research which attempts to account for budgetary fluctuations across fiscal years.

Additionally, Ryu (2013) included some control variables. One, based on Ho's (2011) findings, was the number of performance indicators for each budget entity. Another was the overall budget authority—effectively the size of the budget entity in terms of its

[1] A standardized approach to measuring staffing levels, to account for full-time and part-time staff appropriately.

total budget. Ryu (2013) also included one-year lagged variables under the assumption that the best indicator of current-year budgets will be the previous year's budget. Finally, they included a year variable which was used as the time field in the panel analysis.

With the budgetary changes as the dependent variable, Ryu's (2013) results supported earlier findings by Ho (2011) that the number of indicators has a positive association with budgetary allocations, but this result was not statistically significant at all levels, likely because Ryu (2013) was not able to distinguish between output and outcome performance information. Ryu's key finding, however, was that GPRA scores were not significantly associated with budgetary allocations at any levels of analysis, which conflicts with the theoretical basis of PBB improving allocative efficiency.

Ryu's (2013) findings are further supported by analysis conducted by the PBO in 2014 using Canadian data. In this report the PBO analyzes federal financial estimates and performance data for three fiscal years between 2010-2011 and 2012-2013 to determine whether organizational performance is a good indicator of budgetary changes in subsequent years. The PBO's main finding was that no consistent, statistically significant correlation exists between department performance and department budget changes, and additionally that the performance data from 108 organizations does not indicate that financial resources are being moved from low-performing to high-performing programs.

Broadly, this theoretical framework has drawn upon existing literature and empirical studies, such as those conducted by Ho (2011), Ryu (2013), and the PBO (2014), to establish a foundation for the quantitative assessment of PBB's allocative efficiency in the federal Canadian government. The application of methods from these studies to the Canadian context will enable a comprehensive examination of the association between performance and resource allocation, providing insight into whether the theoretical advantages of PBB, particularly allocative efficiency, are being realized in practice. By measuring the factors influencing allocative efficiency, such as the integration of performance information in budgetary decision-making and the number of performance indicators, this study will contribute to the ongoing discourse surrounding PBB and its potential to enhance public sector outcomes through improving allocative efficiency.

Chapter 4. Data Collection and Analysis

4.1 Data collection

Data for this thesis has been collated from two main sources using two different methods. The first method includes complete datasets for fiscal years 2016-17 to 2021-2022 which were acquired through the federal government's Open Government program, through the Open Data portal (TBS, 2017, 2019, 2023b). These datasets were created for the GC Infobase program, developed by the Expenditure Analysis team at the Treasury Board of Canada Secretariat, which aims to provide researchers and policymakers with access to accurate, high-quality, and detailed data on government finances, people, and results (TBS, 2023a). The Expenditure Analysis team consolidates data from various governmental reports, such as Public Accounts, Estimates, Departmental Plans, and Departmental Results Reports, enabling users to gain a comprehensive view of government-wide data and drill down to individual departments and specific programs as needed. The multidisciplinary team, which consists of policy analysts, economists, data analysts, and web developers, aims to effectively manage and analyze the expenditure data from the past five years.

A notable aspect of the GC Infobase program is its focus on data quality, accuracy, and reliability (TBS, 2023a). The Expenditure Analysis team has designed and implemented technology for capturing critical data from government departments and has established mechanisms for maintaining data quality standards. Given its commitment to data accuracy, quality, and comprehensiveness, the GC Infobase serves as a useful resource for researchers aiming to understand government operations and policy decisions, ultimately contributing to evidence-based decision-making and improved public sector outcomes.

Thus, the datasets used in this study for fiscal years 2016-17 to 2021-22 come from the source data of the GC Infobase program and includes variables on performance, expenditures, and staffing, both planned and actual. It is worth noting, however, that in during cleaning and merging of the datasets, fiscal years 2016-17 and 2017-18 were noticeably less complete than 2018-19 and onwards. 2017-18, the first year that many organizations were required to report data until the new *Policy on Results*, was particularly incomplete, with many organizations not reporting sufficient data for analysis and many others only reporting data in this single year without having reported for prior and subsequent years. For these reasons, some panel analysis in later sections of this report excludes data from 2017 in an attempt to present a more balanced panel, despite the gap in the time series.

The second collation method covers fiscal years 2014-15 and 2015-16 and attempts to extend the government-created datasets published through GC Infobase and extend the

time series data of this study closer to where the PBO's analysis ended in 2012-13[2]. Although not an ideal collection method, this data was collated manually into Excel from department Reports on Plans and Priorities[3] and Departmental Performance Reports[4]. More sophisticated methods of automated/digital collation were explored, but the data was reported in different formats for various organizations and fiscal years, and although time-consuming, manual scraping likely led to a more complete and useable dataset for these two fiscal years. Data was collected in the same structure as the fiscal year 2018-19 and onwards data was, allowing it to easily be joined with the data from GC Infobase.

From here, the datasets were merged using STATA 17 BE, combining performance data tables with the resource allocation data tables, and then joined, creating one dataset with performance and resource allocation data for eight fiscal years from 2014-15 to 2021-22. This data was cleaned and transformed into a new dataset as outlined in Table 1.

Table 1 shows the variables used in the Organization Performance Model. In this dataset, each observation is a federal department/agency in a given fiscal year. The dataset (n=657) is designed to be tested with two dependent variables: Percent Change in Spending and Percent Change in FTEs. The main independent variable is the Organizational Performance—the average result of all of an organization's completed performance indicators in the previous year.

Performance indicators are self-selected by an organization are vary widely in measurement and organizational alignment. Some are more outcomes-focused, looking at environmental impacts or economic statistics, while others are related to an organization's outputs or activities, such as the number of phone calls answered within a certain time, or the amount of funding distributed as grants. These performance indicators, and thus the Organizational Performance variable, are only as good as their selection and measurement, which can vary by organization.

Table 1 - Organization Performance Model Variables

Variable	**Status**	**Description**	**Variable type**	**Hypothesized Correlation**
Percent Change in Spending	Dependent	The percent change in allocated spending (actual to planned) from year 1 to year 2	Continuous	
Percent Change in FTEs	Dependent	The percent change in allocated FTEs (actual to planned) from year 1 to year 2	Continuous	
Organizational Performance	Independent (Main)	Average performance of all indicators for an organization in year 1	Discrete (0%-100%)	Positive (A. T.-K. Ho, 2011; Ryu, 2013)

[2] Data for fiscal year 2013-2014, the year after the PBO's analysis ended, was not readily available online for many federal organizations and was thus excluded from collection.

[3] Precursor to modern Departmental Plans

[4] Precursor to modern Departmental Results Reports

Variable	Status	Description	Variable type	Hypothesized Correlation
Organization ID	Independent (Panel)	Identification for each unique organization (government department or agency)	Categorical	Unknown
Fiscal Year	Independent (Panel)	Identification for each fiscal year	Categorical	Unknown
Number of Indicators	Independent (Control)	Total number of performance indicators in an organization in year 1	Discrete	Unknown[5] (A. T.-K. Ho, 2011; Ryu, 2013)
Organizational Size Quintile (Spending)	Independent (Control)	Organizational size based on spending in year 1, ranked by quintile	Ordinal (1-5)	Negative[6]
Organizational Size Quintile (FTEs)	Independent (Control)	Organizational size based on FTEs in year 1, ranked by quintile	Ordinal (1-5)	Negative
Organizational Performance Quintile	Independent (Control)	Organizational performance in year 1, ranked by quintile	Ordinal (1-5)	Positive[7] (A. T.-K. Ho, 2011; Ryu, 2013)

Organization ID and Fiscal Year are included as control variables and to allow for panel analysis. Each observation is an organization in a given fiscal year. Organizations can have different structures but are made up of federal agencies and departments with a variety of functions. A list of these organizations for fiscal year 2018-19 can be found in Appendix A. These organizations represent all different aspects of government activities and operate in various sectors of the economy, society, and environment. They vary widely in size by number of FTEs, with the Canada Revenue Agency, Employment and Social Development Canada, and the Department of National Defense being the largest, and RCMP External Review Committee, Copyright Board Canada, and Military Police Complaints Commission of Canada being the smallest. The distribution of organizations by size for fiscal year 2018-29 can be found in Appendix B.

Four additional independent variables are included as control variables. The Indicators Count is a measure of the number of performance indicators for an organization in a given fiscal year. As explained earlier, research from Ho (2011) and Ryu (2013) shows

[5] The impact of this variable, according to previous research, depends on the composition of the underlying performance indicators. Previous studies have indicated that the number of output indictors has a positive association with resource allocation while the number of outcome indicators has a negative association (A. T.-K. Ho, 2011). The categorization of indicators as output/outcome, however, is beyond the scope of this study and available data.

[6] Size controls are included because the dependent variables are expressed as a percent change, thus, a larger organization is likely to experience smaller percent change in their spending from year-to-year, because a similar percent change in a large organization versus a small one would be much larger in absolute terms.

[7] Compared with the Organizational Performance variable, this variable will instead allow for comparing high performing and low performing organizations separately as well as evaluating any differences between absolute and relative performance.

that the number and types of indicators can influence allocative efficiency, although identifying the types of indicators (activities, outputs, outcomes) in this dataset is beyond the scope of this research. Another two control variables are measures of the Organizational Size, either by spending or FTEs, ranked relative to all other organizations in quintiles (reported on a scale of 1-5, with 5 representing the largest 20% of organizations in a given fiscal year). The idea behind this measurement is that there may be variation in the level of managerial budgetary and performance control based on the size of an organization, which should be controlled for in this model. The final control variable is the Organizational Performance Quintile, which ranks organizations based on their annual performance relative to other organizations in a given fiscal year. This variable allows the regression models to differentiate between absolute performance (the Organizational Performance variable) and relative performance, which may prove to be more important overall.

A major issue in this new dataset is the completeness of the panel, as noted earlier. Reporting for many departments, particularly smaller organizations, or those with highly specific or time-limited mandates, is not consistent over the entire timeframe. Given the nature of politics and cabinet shuffles, departments are often changing with new ones being created, some being dissolved, and others being formed with units from multiple existing organizations. Even within organizations, performance indicators are often changing from year to year, and performance is not always reported on before its target date, especially for long-term indicators—some of which are dropped by the ministry before their intended reporting date.

Another common issue is the misreporting of data by departments. Before cleaning the data, one organization saw a spending increase of 31053% in one fiscal year—an impossible amount. Upon investigation, this organization did not report its program-level spending in every fiscal year, resulting in this massive increase which then is continued in the subsequent year. To help mitigate most extreme outliers like this, this study will use two methods to normalize these extreme outliers, which will also help to address issues of heteroskedasticity and skewness. The first is to trim the high- and low-ends of the data using STATA's *winsor2* package. This package was used to remove the top and bottom one percent of the Percent Change in Spending and Percent Change in FTEs (10-20 observations removed from approximately 560 usable observations which contained all necessary data). This still results in some outliers in the dataset, but the impacts of these will be mitigated with a second method, 'robust' regressions, that is further explained in 4.2 Data Analysis.

Under these constraints, this dataset only examines previous-year performance in aggregate for a given organization or program. Performance results were only taken into consideration if they were reported past their goal year (most indicators have annual goals reported on every year) and were only considered in the dataset as "Met" or not "Not Met". These indicators are used to calculate an average performance of the organization or

program on a scale of 0% to 100% of performance indicators achieved. For example, an organization which receives "Met" on three of its performance indicators and "Not Met" on another two, would receive an Organizational Performance value of 60% for that fiscal year.

4.2 Data analysis

The dataset was examined in STATA to first analyze trends in performance and resource allocation (see Chapter 5.1). Then, using multiple linear regression, models were developed based on the methods outlined in the theoretical framework and pairwise correlations conducted in this chapter. Multiple regression is a statistical technique that allows researchers to investigate the correlation between one dependent variable and two or more independent variables. By including multiple predictors, this analysis provides a more comprehensive understanding of how different variables collectively influence the outcome or response variable (Makhlouf, 2022).

Three main multiple regression models were explored: two related to spending (Chapter 5.2) and one related to FTE allocations (Chapter 5.3). From the three models, each is also applied to a subset of the data to compare different groupings of organizations, such as the largest and smallest 40% of organizations. Additionally, panel analysis was conducted with each dependent variable to complement the linear regression models. There were 15 linear and panel regression models explored in total. Given that the dependent variable used in each model was continuous, the analysis focused on interpreting broader trends and patterns within the data, rather than on the differences between individual values within the dependent variable.

The seven key variables—excluding those which were used to create the panel—were first analyzed for their pairwise correlations. These associations help to create the most informative regression models for data analysis. The goal of the regression models is not necessarily to have a high R^2—these models are not intended to be predictive—but rather to demonstrate whether there is, in fact, a statistically significant association between performance and resource allocation. Table 2 shows the results of the pairwise correlations.

Table 2 - Pairwise Correlations for Dependent and Independent Variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Percent Change in Spending	1.00						
(2) Percent Change in FTEs	0.63*	1.00					
	(0.00)						
(3) Organizational Performance	0.09*	0.10*	1.00				
	(0.04)	(0.02)					
(4) Number of Indicators	-0.00	-0.11*	-0.08	1.00			
	(0.98)	(0.01)	(0.05)				
(5) Organizational Size Quintile	-0.12*	-0.16*	-0.09*	0.66*	1.00		
(Spending)	(0.01)	(0.00)	(0.04)	(0.00)			
(6) Organizational Size Quintile (FTEs)	-0.06	-0.12*	-0.06	0.70*	0.76*	1.00	
	(0.19)	(0.01)	(0.16)	(0.00)	(0.00)		
(7) Organizational Performance Quintile	0.09*	0.12*	0.88*	-0.17*	-0.16*	-0.15*	1.00
	(0.04)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	

*Notes: Values in parenthesis indicate the standard errors. Significance is indicated by * at p<0.05 level.*

Organizational Performance had a significant positive association with percent changes in both spending and FTEs ($p<0.05$), as hypothesized. This confirms that this variable, which was the focus of Objective 2, should be included in the regression models. The Number of Indicators variable had a significant negative correlation ($p<0.05$), but only for Percent Change in FTEs. This is not unexpected—previous literature which studied the number of indicators did so by sorting them into output and outcome indicators, a factor which is not included in the datasets provided by the Government of Canada and is thus beyond the scope of this study. However, including this variable will still likely strengthen the models and provide some insights for future research.

Both organizational size quintiles had significant negative correlations with percent changes in spending and FTEs ($p<0.05$). This is to be expected—as an organization gets larger, percent changes to spending and FTEs are larger in absolute terms, meaning that large percent increases are less likely. Size by spending also had a significant negative association with Organizational Performance ($p<0.05$), perhaps indicating that smaller organizations have better performance—this is explored further in the trends examined in Chapter 5.1. The Organizational Performance Quintile's correlations mirror that of Organizational Performance, however, it had a significant association with all other variables ($p<0.05$), possibly indicating that relative performance (compared to other organizations in the same fiscal year) may yield different insights than absolute performance.

To avoid obvious multicollinearity, there are some variable pairings where only one of two variables was used in a model at a time. Only one organizational size quintile was used (either based on spending or on FTEs) and only either Organizational Performance or the Organizational Performance Quintile were used (given that the latter is derived from the former).

To check for any less-obvious issues, Variance Inflation Factor (VIF) tests were conducted for each model to measure multicollinearity. For each of the models included in this study, multicollinearity was determined to not be problematic, as all VIF values were less than 3 and tolerances were greater than 0.3. Multicollinearity may be an issue when VIF values are greater than 10 and when tolerances are less than 0.1 (Lewis-Beck & Lewis-Beck, 2016; University of California, Los Angeles, n.d.).

'Robust' regression, a function in STATA, was used in each model to help account for likely heteroscedasticity in the data. While the reported coefficients remain consistent with those from a standard linear regression, the 'robust' option adjusts the standard errors, ensuring more reliable significance tests (University of California, Los Angeles, n.d.-b; Verardi & Croux, 2009). This is particularly valuable when we notice a high variation in the data which isn't normally distributed, and could otherwise risk the violation of the homoscedasticity assumption.

Moreover, applying 'robust' regression is important for managing outliers when there is a lack of detailed information beyond what is provided in the Government of

Canada datasets. It is difficult to know which of the less-extreme outliers to exclude without a full understanding of the department beyond what is included in the public reports and plans. For instance, some organizations may have irregular annual funding based on the non-cyclical programs and services they provide. COVID 19-related programs may have temporarily, substantially increased the funding that some organizations received by extreme amounts, depending on the initial size of the organization. For extreme negatives, these could be due to the sunsetting (retirement) of programs and services, or the transfer of some of one department's programs to another. So, rather than examining each observation and deciding whether to include or exclude them, a middle-ground of conducting robust regressions was used.

Included below is the regression specification for the model that will be examined in Chapter 5. This model was also applied to paired subsets of the data to compare different samples of the overall population of reporting organizations from the smallest to the largest organizations, and from the highest to the lowest performing organizations. It was also used in various panel analyses. There are 15 models included in this study overall, each one being a variation of this regression model:

$$Y_{s,t} = \alpha_0 + \alpha_1 P_{s,t-1} + \boldsymbol{X}'\boldsymbol{\beta} + \tau_t + u_{st}$$

In the specification above, the outcome variable ($Y_{s,t}$) represents either the Percent Change in Spending or Percent Change in FTEs. The explanatory variable of interest ($P_{s,t-1}$) represents either the Organizational Performance or Organizational Performance Quintile, which ranks relative performance from 1 to 5, in the previous year. Controls for other factors are included (***X***): the Organization's Size either in terms of overall spending or FTEs and the Number of Indicators in an organization. Country-wide shocks are controlled for using fiscal year fixed effects (τ_t) and an error term is included (u_{st}).

Chapter 5. Results

5.1 Trends in performance and resource allocation

Using 657 observations, 82 separate organizations were identified as reporting data for at least one of the eight fiscal years. Of all the observations, only approximately 85% included all the required variables needed in each model for analysis (Table 3), but this amount varied depending on the model. The dependent and independent variables are summarized in Table 3.

Table 3 - Summary Statistics for Dependent and Independent Variables (2014-15 to 2021-22)

Variable	Obs	Mean	Std. Dev.	Min	Max
Percent Change in Spending	557	10.76	53.97	-92.64	438.98
Percent Change in FTEs	558	8.70	41.67	-73.04	300.00
Organizational Performance	594	72.52	21.26	0.00	100.00
Number of Indicators	657	29.85	30.62	1	162

Across each variable, there were a wide range of values reported. Organizational Performance averaged 72.5% with a relatively low standard deviation of 21.2%. The percent changes in planned spending and FTEs averaged 10.8% and 8.7% respectively; however, the large standard deviations demonstrated substantial variance. The Number of Indicators reported by each organization in a given fiscal year ranged from 1 to 162, but the average was 30. This too had a large standard deviation of 31. The distribution of these variables is demonstrated in Figures 1 to 4.

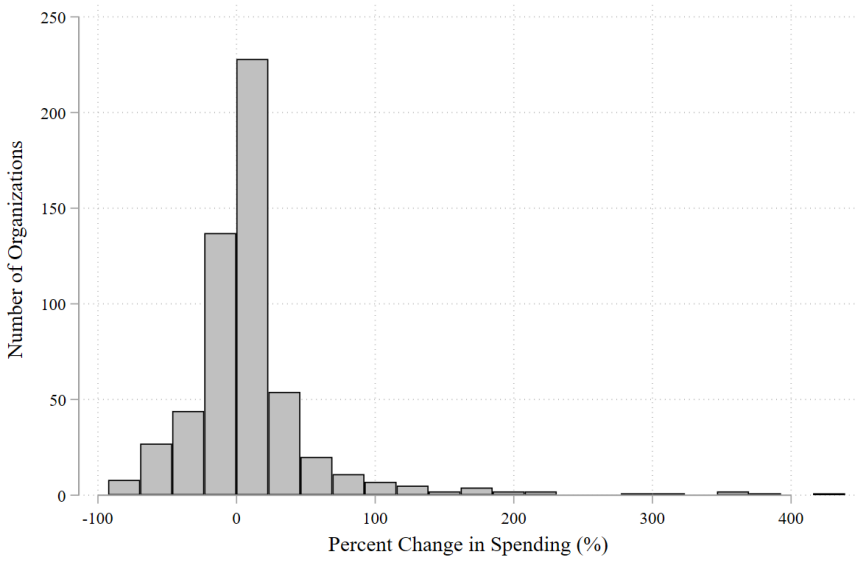

Figure 1 - Distribution of Percent Change in Spending (2014-15 to 2021-22)

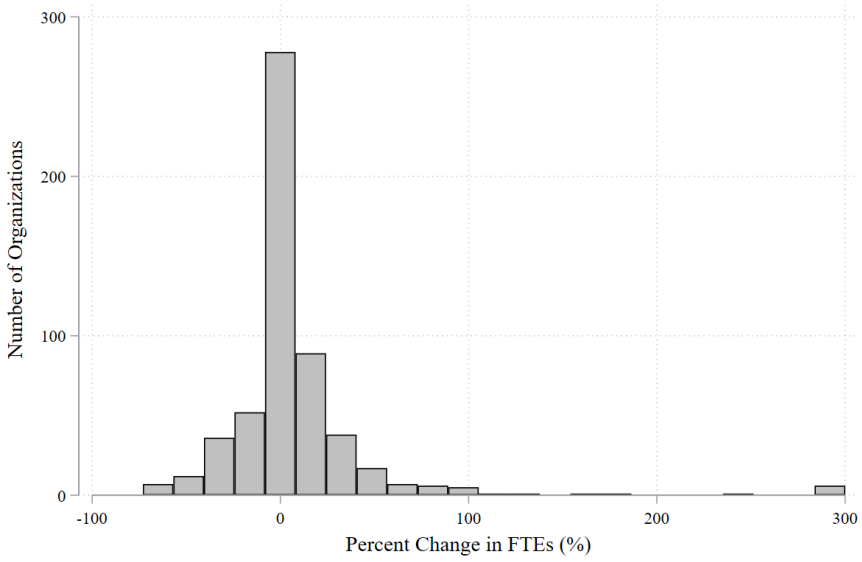

Figure 2 - Distribution of Percent Change in FTEs (2014-15 to 2021-22)

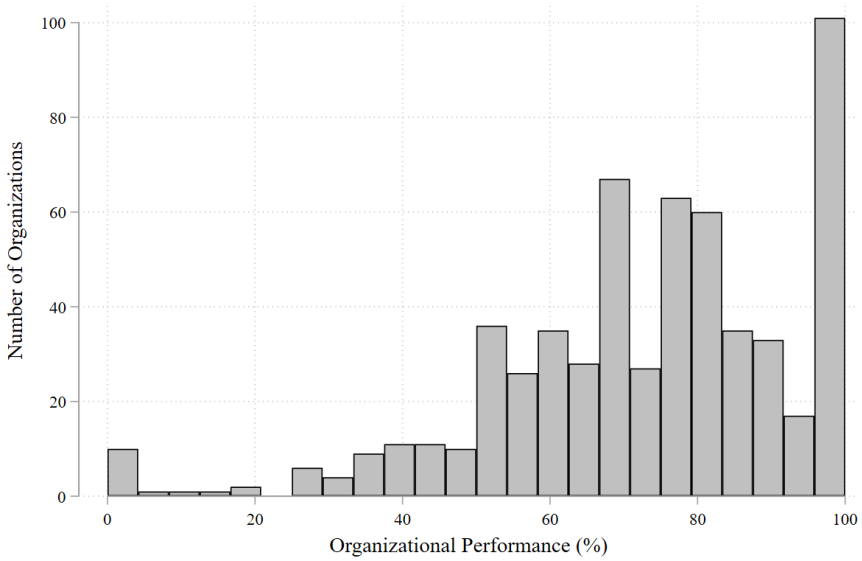

Figure 3 - Distribution of Organizational Performance (2014-15 to 2021-22)

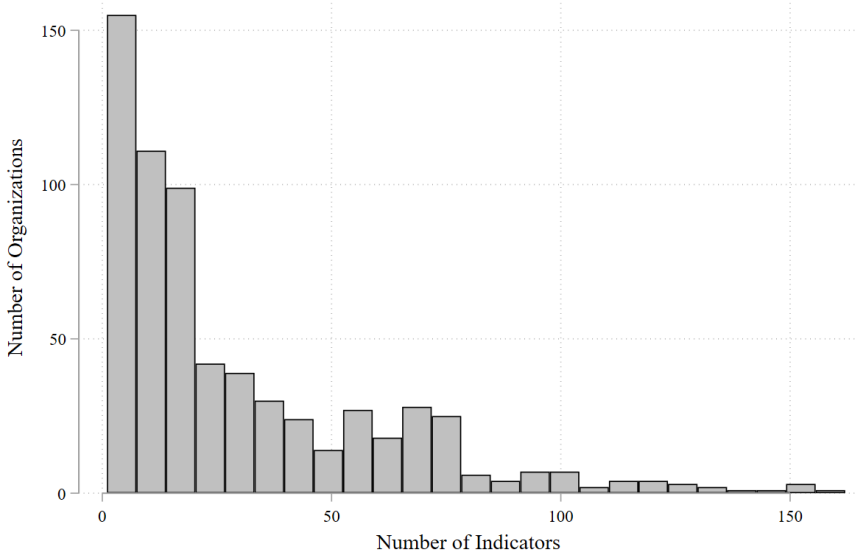

Figure 4 - Distribution of Number of Indicators (2014-15 to 2021-22)

The distribution of these variables was varied, with both Percent Change in Spending and Percent Change in FTEs having a somewhat normal distribution centered around zero, and some outliers reporting extreme increases and decreases. Organizational Performance is negatively skewed, with two peaks—one around 75 to 80 and the other at 100. This is likely a result of the underlying formula ("met" indicators divided by total indicators) meaning that 50, 75, 80, and 100 are often observed. The Number of Indicators is positively skewed, with most organizations reporting whole numbers just above zero but some reporting as many as 150 indicators in a given fiscal year. Understanding these nuances in distributions is important to understanding the underlying trends in performance and resource allocation. For instance, most organizations experience changes in resource allocations relatively close to zero—there are significant outliers in the data which contribute to the higher averages.

The trends in Organizational Performance show some interesting patterns. Figure 5 shows that the average Organizational Performance fluctuates slightly from year to year, but the overall trend for the eight fiscal years in downward with a slight peak in 2016-17, the first year of the new *Policy on Results*. This could perhaps indicate that a more rigorous approach to performance reporting has led to worse, but potentially more accurate, results over time.

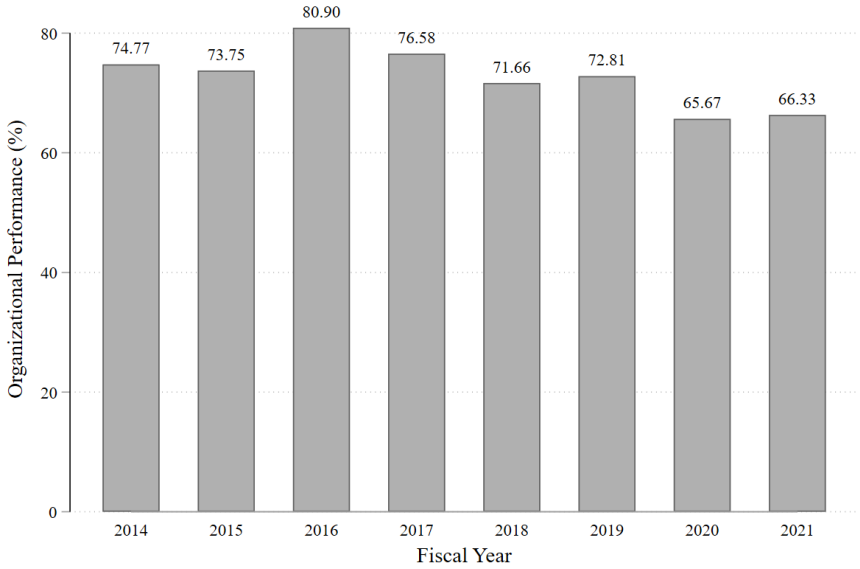

Figure 5 - Mean Organizational Performance over Time (2014-15 to 2021-22)

Figure 6 shows the average Organizational Performance broken down by Organizational Size Quintile based on overall spending. On average, the smallest organizations seem to perform better than larger organizations, although there is a slight uptick in performance among organizations in the 60th to 80th percentile. There could be many reasons why smaller organizations perform better. They may have mandates which are more specific and easier to achieve; they may only exist for shorter periods or have very routine functions; or they could be selecting a small amount of more easily achievable performance indicators when compared to other, larger organizations. An analysis of these organization-specific traits is beyond the scope of this study; however, it could be an avenue for future research.

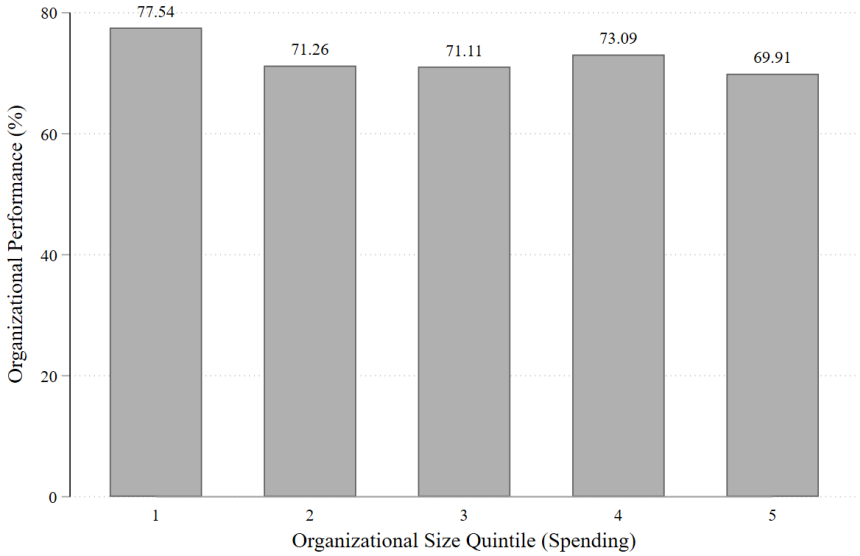

Figure 6 - Mean Organizational Performance by Organizational Size Quintile (Spending) (2014-15 to 2021-22)

Figure 7 shows the average Percent Change in Spending over time across all organizations. Interestingly, every fiscal year except for one (2017-18) showed positive percent change, although these amounts fluctuate dramatically in some fiscal years. The recent trend, however, shows relatively stable growth in the average organization's spending of roughly 10 to 15 percent.

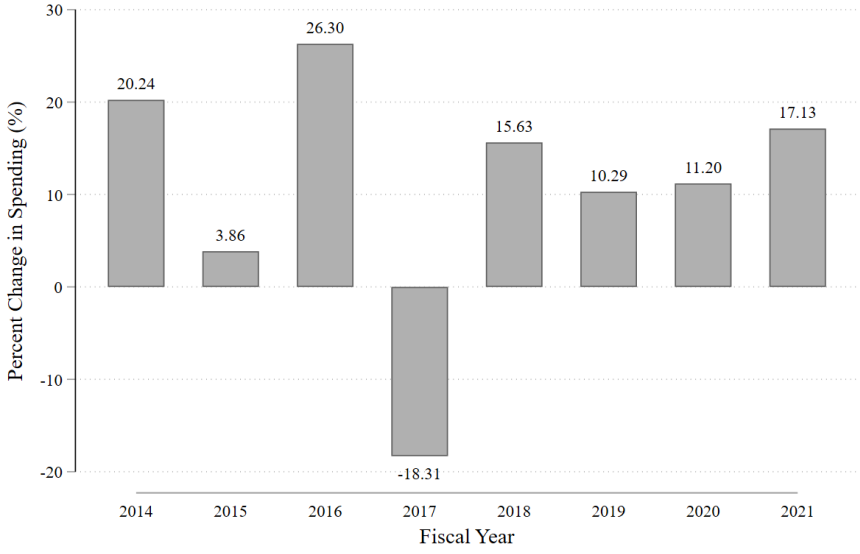

Figure 7 - Mean Percent Change in Spending over Time (2014-15 to 2021-22)

Figure 8 expands on this analysis and shows a breakdown of average Percent Change in Spending by Organizational Size Quintile. Unsurprisingly, the smallest organizations have the largest average Percent Change in Spending at over 30%. From the 20th to 80th percentile, the change is relatively flat at around eight percent and drops to below five percent among the largest organizations.

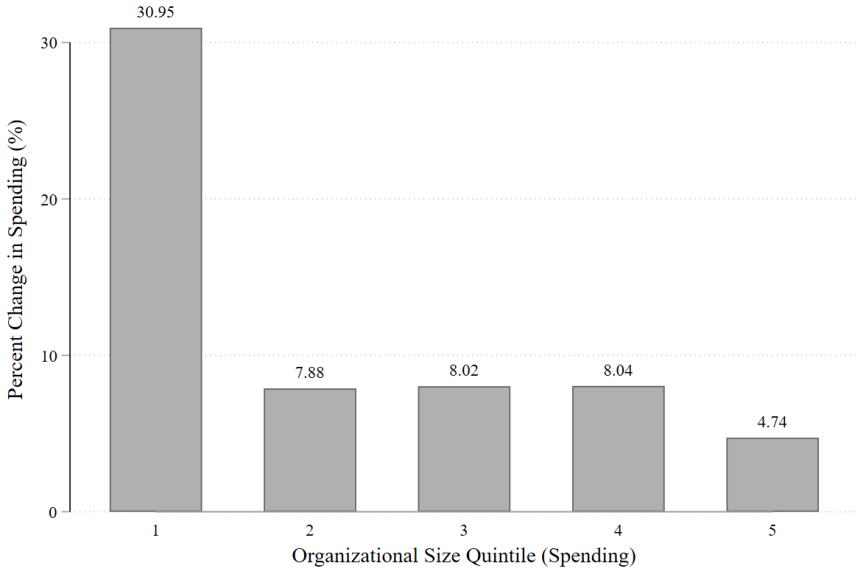

Figure 8 - Mean Percent Change in Spending by Organizational Size Quintile (Spending) (2014-15 to 2021-22)

The average Percent Change in FTEs over time (Figure 9) shows similar fluctuations to the Percent Change in Spending as in Figure 7, although the changes from year to year are much less dramatic. Once again, the average change is positive in every fiscal year except for 2017-18, although this time the largest change is observed in 2015 rather than 2016.

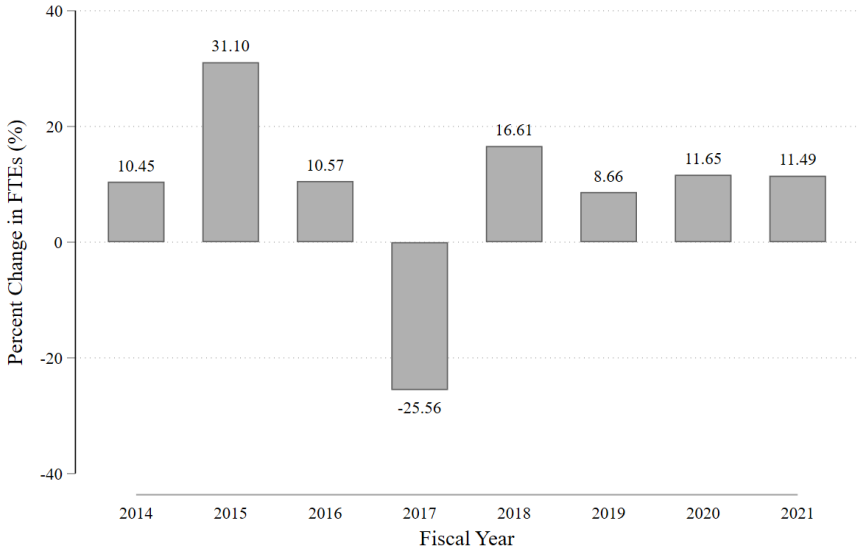

Figure 9 - Mean Percent Change in FTEs over Time (2014-15 to 2021-22)

Figure 10 shows the breakdown by Organizational Size Quintile. Similarly to spending, the smallest organizations have the largest average increases in Percent Change in FTEs although this time there are also peaks from the 20th to 40th percentiles and the 60th to 80th percentiles. This could be a result of changes to government priorities and reallocating staff to different types of organizations in response to the transition in government or the COVID-19 pandemic.

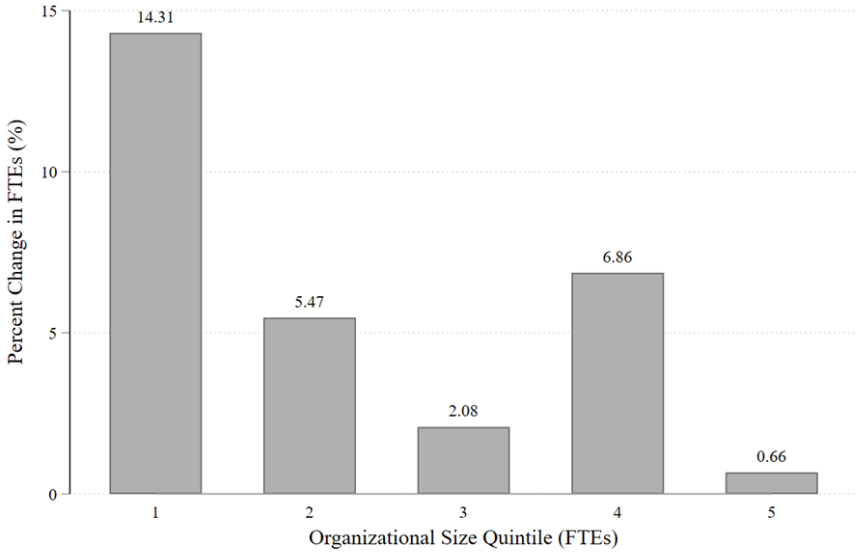

Figure 10 - Mean Percent Change in FTEs by Organizational Size Quintile (FTEs) (2014-15 to 2021-22)

5.2 Analysis of performance and spending allocation

The first multiple linear regression model in Table 4 explores whether the Percent Change in Spending is associated with Organizational Performance, Organizational Size Quintile (Spending), and the Number of Indicators. It also includes dummy variables for each fiscal year. This regression shows that for every one percentage point increase in an organization's performance, the organization receives, on average, a 0.23 percentage point increase in spending in the subsequent year ($p<0.05$). As expected, the organization's size based on spending has a large, significant ($p<0.01$), and negative association with Percent Change in Spending. Interestingly, the Number of Indicators also has a small, significant ($p<0.05$), positive association with subsequent spending, perhaps indicating that tracking more performance indicators leads to higher resource allocation—perhaps linked with Organizational Performance or maybe as a result for a culture that supports performance measurement.

Table 4 - Linear Regression Model for Changes to Planned Spending

Percent Change in Spending		Coef.	Robust Std. Err.
Organizational Performance		0.23**	0.09
Organizational Size Quintile (Spending)		-9.27***	2.60
Number of Indicators		0.33**	0.15
2015		-22.35*	13.06
2016		5.29	12.34
2017		-40.73***	10.99
2018		-2.4	11.24
2019		-8.54	10.97
2020		-8.76	10.65
2021		-2.5	10.46
Constant		22.2**	11.06
R^2	0.11	Number of obs	544
F-test	7.10	Prob > F	0.00

*Notes: *** p<0.01, ** p<0.05, * p<0.1*

It is worth noting too that the yearly dummy variables, representing specific years for 2015 to 2021, seem to reflect distinct influences on the Percent Changes in Spending, perhaps related to the budgetary direction of that fiscal year. Some of these, such as the coefficient for 2017, are particularly significant ($p<0.01$), suggesting specific annual factors that impacted spending in those years. Although, as noted previously, 2017 has data quality issues and many organizations only reported on their performance and resource allocations for this one year.

Despite these interesting results, the model only explains roughly 11% of variance in the changes to spending allocations according to its R^2 value. This likely means that there are other explanatory variables not included in the model, or that the association is not entirely linear. However, as previously mentioned, a low R^2 is not a poor result for the purposes of this study. The focus of this research is on quantifying the association between

Organizational Performance and Percent Change in Spending/FTEs—thus exploring the allocative efficiency of PBB. A significant F-test value ($p<0.01$) also indicates that the independent variables used in the model collectively have a statistically significant association with the dependent variable, reinforcing the rationale behind their selection for this model.

From this initial model, Table 5 and 6 provide further insight into the association between Organizational Performance and the Percent Change in Spending. Each replicates the model from Table 4 on a subset of the overall dataset, the first relating to low-/high-performing organizations and the latter to the size of the organizations. In Table 5, the first model examines the association between Organizational Performance and the Percent Change in Spending in the lowest performing organizations (bottom 40%) while the second model examines the correlation in the highest performing organizations (top 40%). The difference between the models is striking—none of the three main independent variables have a statistically significant association to Percent Change in Spending for the lowest performing organizations, dramatically different from the overall model in Table 4. For the highest performing organizations, the coefficient of Organizational Performance and Percent Change in Spending is nearly five times higher than it was in the original model while maintaining significance ($p<0.05$). The coefficients of the Organizational Size and Number of Indicators are higher and significant as well ($p<0.01$ and $p<0.1$, respectively). The results of these two models may indicate that the Government of Canada is indeed re-allocating resources; however, it is only 'rewarding' high-performing organizations while not 'penalizing' low-performing ones—one half of what PBB is theorized to do.

Table 5 - Linear Regression Model for Changes to Planned Spending, Lowest and Highest Performing Organizations (2014-15 to 2021-22)

	(1) Lowest Performing Organizations	(2) Highest Performing Organizations
Variables	Percent Change in Spending	Percent Change in Spending
Organizational Performance	0.03	1.03**
	(0.14)	(0.46)
Organizational Size Quintile (Spending)	-1.59	-19.65***
	(2.49)	(5.95)
Number of Indicators	0.22	0.72*
	(0.21)	(0.41)
2015	-34.06**	-16.11
	(14.13)	(27.22)
2016	25.79	-38.73*
	(15.99)	(22.61)
2017	-33.04***	-56.83**
	(8.84)	(24.83)
2018	3.26	-12.48
	(9.13)	(27.37)

	(1) Lowest Performing Organizations	(2) Highest Performing Organizations
2019	-3.04	-23.87
	(8.91)	(25.02)
2020	-0.99	-15.03
	(11.09)	(22.27)
2021	8.67	-10.5
	(10.45)	(23.27)
Constant	5.24	-19.17
	(11.38)	(47.88)
Observations	216	214
F-test	6.08	3.13
Prob > F	0.00	0.00
R^2	0.17	0.16

*Notes: Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table 6 compares the smallest 40% of organizations and the largest 40% of organizations. In the smallest organizations, the strength of the association between Organizational Performance and Percent Change in Spending is double that of the base model in Table 4, at an even higher significance level (p<0.01). Among large organizations, the association between these two variables is not significant. Overall, this may indicate that smaller organizations are more likely to receive higher funding based on their previous performance than larger organizations, even when the relative scale of percent changes is accounted for. It is also interesting that for smaller organizations, the significant association between the Number of Indicators and the Percent Change in Spending (p<0.1) is negative, while for large organizations it is positive. This is not unusual as larger organizations may have broader mandates that would require more performance measurement, while smaller organizations with too many performance indicators might struggle to achieve them all, or it may show an unwillingness to focus their program goals.

Table 6 - Linear Regression Model for Changes to Planned Spending, Smallest and Largest Organizations (by Spending) (2014-15 to 2021-22)

	(1) Smallest Organizations	(2) Largest Organizations
Variables	Percent Change in Spending	Percent Change in Spending
Organizational Performance	0.47***	-0.09
	(0.14)	(0.19)
Number of Indicators	-0.49*	0.29*
	(0.26)	(0.17)
2015	46.74**	-68.85***
	(19.73)	(20.96)
2016	-7.08	20.53
	(7.88)	(25.97)
2017	-22.48*	-41.87*
	(13.3)	(22.08)
2018	27.59	-16.36

	(1) Smallest Organizations	(2) Largest Organizations
	(19.85)	(21.07)
2019	22.29	-20.97
	(17.34)	(20.97)
2020	16.93*	-17.35
	(9.91)	(21.87)
2021	24.38**	-13.76
	(10.39)	(21.14)
Constant	-24.5**	15.36
	(10.97)	(17.47)
Observations	188	239
F-test	2.89	9.59
Prob > F	0.00	0.00
R^2	0.16	0.22

*Notes: Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

The next model in Table 7 examines the association between relative performance (using the Organizational Performance Quintile) and Percent Change in Spending. The rationale behind this model is that it may not be absolute performance that drives allocative efficiency, but rather an organization's performance compared to that of other organizations it is compared with when funding decisions are made. If there is a difference between absolute and relative performance's association with resource allocation, this could have implications for Objective 2 of this study.

The findings of this model are similar to those in Table 4—for every one step increase in an organization's quintile ranking, the organization receives 3.65 percentage points higher funding allocations in a subsequent year on average (p<0.05). The coefficients for Organizational Size Quintile (Spending) and Number of Indicators are comparable to the previous model, and the R^2 is similar at 11%.

Table 7 - Linear Regression Model for Changes to Planned Spending using Relative Performance (Quintiles) (2014-15 to 2021-22)

Percent Change in Spending		Coef.	Robust Std. Err.
Organizational Performance Quintile		3.65**	1.54
Organizational Size Quintile (Spending)		-9.14***	2.55
Number of Indicators		0.34**	0.15
2015		-23.08*	13.00
2016		7.10	12.18
2017		-40.86***	10.96
2018		-3.51	11.14
2019		-9.36	10.91
2020		-11.20	10.65
2021		-4.69	10.50
Constant		27.82	10.06
R^2	0.11	Number of obs	544
F-test	7.09	Prob > F	0.00

*Notes: *** p<0.01, ** p<0.05, * p<0.1*

In Table 8, this analysis is taken a step further by disaggregating the organizations—once again applying the model smallest 40% of organizations and the largest 40% of organizations. The findings are similar to those earlier—relative performance has a stronger, significant association to Percent Change in Spending among the smallest organizations ($p<0.01$), while the effect is small and not significant among the largest ones.

Table 8 - Linear Regression Model for Changes to Planned Spending using Relative Performance (Quintiles), Smallest and Largest Organizations (2014-15 to 2021-22)

	(1) Smallest Organizations	(2) Largest Organizations
Variables	Percent Change in Spending	Percent Change in Spending
Organizational Performance Quintile	7.64***	0.21
	(2.61)	(2.53)
Number of Indicators	-0.46*	0.29*
	(0.26)	(0.17)
2015	44.66**	-68.6***
	(19.57)	(21.14)
2016	-2.12	20.45
	(7.54)	(25.58)
2017	-22.81*	-41.87*
	(13.06)	(21.98)
2018	26.82	-16.39
	(19.65)	(21.48)
2019	21.22	-20.83
	(17.13)	(21.10)
2020	13.54	-16.67
	(9.78)	(22.72)
2021	20.46**	-13.43
	(10.00)	(22.18)
Constant	-13.15	8.28
	(8.52)	(14.65)
Observations	188	239
F-test	2.78	9.67
Prob > F	0.00	0.00
R^2	0.16	0.22

*Notes: Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

The next step in this analysis of impacts on Percent Change in Spending was to conduct panel analysis, using the organization as the identifier and the fiscal year as the time series. It is important to note that this panel is unbalanced, for many of the same reasons that there are gaps and outliers in the data. Few federal departments report on their performance and resource allocation in every year for the eight years covered by the panel, and some smaller organizations only report in a single year or every few years. In 2016 and 2017, the number of organizations that report performance and resource allocations increased, particularly in the latter year when the new *Policy on Results* was first fully implemented. After 2017, however, many organizations stopped reporting, perhaps receiving exemptions, thus leaving 2017 as a substantial outlier in the panel, with many

organizations only reporting for that year. For this reason, the same model has been applied in Table 9 and Table 10, with the latter excluding 2017.

Unfortunately, it was challenging to choose between a fixed effects or random effects model based on an understanding of this dataset alone. It is likely that there are organization-specific effects which influence the dependent variable that are not captured in this model (e.g., minister or delegated authority in charge, the organization's management and leadership, its culture of performance measurement, budgetary policies and control, level of political influence, etc.). Some of these effects would likely be constant across all or most of the panel, such as the political leanings of the governing party, but some are likely to change as the organization changes, such as during a cabinet shuffle. On the other hand, a random effects model would assume that individual-specific effects are not correlated with the independent variables, which is also likely not the case.

However, given that this study is quantifying the allocative efficiency of Canada's PBB system, and not attempting to create a model for predicting resource allocation, using the results of a Hausman test should be sufficient. A Hausman test is a statistical procedure that determines whether a fixed effects model or a random effects model is more appropriate for analyzing panel data. Essentially, if the test is significant, a fixed effects model is suitable; if not, a random effects model is preferred. In this case, the p-value is 0.12, above the 0.05 threshold which fails to reject the null hypothesis and indicates the model should use random effects.

Table 9 demonstrates that, in a panel analysis, Organizational Performance is not a significant variable. Organizational Size and the Number of Indicators, however, are both significant (p<0.01 and p<0.05, respectively) and have coefficients which are close to that of the original model in Table 4. The Overall R^2 is low, at just 4%, likely because of how unbalanced the panel is, particularly because of 2017. The overall model is significant (p<0.05), but at a lower level than the model in Table 4.

Table 9 - Panel, Random Effects Model for Changes to Planned Spending (2014-15 to 2021-22)

Percent Change in Spending		Coef.	Robust Std. Err.
Organizational Performance		0.18	0.11
Organizational Size Quintile (Spending)		-9.09***	3.22
Number of Indicators		0.29**	0.13
Constant		17.03**	7.28
Overall R^2	0.04	Number of obs	544
Chi-square	8.20	Prob > chi2	0.04

*Notes: *** p<0.01, ** p<0.05, * p<0.1*

Table 10, which does not include the year 2017, had clearer results. Each of the three independent variables was significant (p<0.1, p<0.01, and p<0.01 respectively) and the coefficients were similar to those in the original model in Table 4. In fact, for Organizational Performance, the coefficients were identical. The Overall R^2 was slightly

higher, at 0.05, and the model was significant at a higher threshold than the model in Table 9 (p<0.01), potentially indicating that this model, excluding 2017, is stronger, assuming that 2017's poor data quality merits its exclusion.

Table 10 - Panel, Random Effects Model for Changes to Planned Spending (2014-15 to 2021-22, excluding 2017-18)

Percent Change in Spending		Coef.	Robust Std. Err.
Organizational Performance		0.23*	0.12
Organizational Size Quintile (Spending)		-10.81***	3.43
Number of Indicators		0.39***	0.15
Constant		19.52**	7.93
Overall R^2	0.05	Number of obs	473.00
Chi-square	10.62	Prob > chi2	0.01

*Notes: *** p<0.01, ** p<0.05, * p<0.1*

Overall, the results from the panel analysis confirm and echo much of what is included in the linear regression models, which control for just fiscal year, but the results are less clear mostly due to the unbalanced nature of the panel is and short time series, meaning that organizations are only observed in the model eight times at most. For this reason, the remainder of the study focuses on the results of the earlier linear regressions in Table 4.

5.3 Analysis of performance and staffing allocation

As previously defined, Full-Time Equivalents (FTEs) refer to the staffing levels of each organization. The overall Percent Change in FTEs variation, both between organizations and in the same organization from year-to-year, is lower than spending (Table 3).

Table 11 presents the linear regression results for Changes in Planned FTEs from 2014-15 to 2021-22. The main dependent variable, Organizational Performance, is not associated with Percent Change in FTEs in this model. Conversely, the Organizational Size Quintile, measured in FTEs, has a negative and statistically significant association with the Percent Change in FTEs (coefficient of -4.12, p<0.01). This suggests that as the size of the organization (in terms of FTEs) increases, the Percent Change in FTEs tends to decrease, as expected. The Number of Indicators variable is also not significant in this model. The model's fit is relatively strong compared to the models in Chapter 5.2 (R^2 = 0.22) suggesting that approximately 22% of the variation in the percent change of FTEs can be explained by the independent variables in this model. The F-test result is significant (p<0.01), indicating that the model as a whole is statistically meaningful in explaining variations in the dependent variable.

Table 11 - Linear Regression Model for Changes to Planned FTEs (2014-15 to 2021-22)

Percent Change in FTEs		Coef.	Robust Std. Err.
Organizational Performance		0.07	0.05
Organizational Size Quintile (FTEs)		-4.12***	1.33
Number of Indicators		0.11*	0.06
2015		19.78***	6.50
2016		-1.52	6.00
2017		-36.61***	4.96
2018		3.34	5.09
2019		-5.22	4.23
2020		-2.14	4.49
2021		-1.03	5.65
Constant		13.53	5.21
R^2	0.22	Number of obs	514
F-test	20.05	Prob > F	0.00

*Notes: *** p<0.01, ** p<0.05, * p<0.1*

Table 12 offers a comparison of two linear regression models focusing on the Percent Change in FTEs spanning from 2014-15 to 2021-22, separated into the lowest and highest performing organizations (lowest 40% and highest 40%). A key takeaway from this comparison is that unlike the model shown in Table 11, for the lowest performing organizations, Organizational Performance seems to have a small association with Percent Change in FTEs. For every percentage point increase in Organizational Performance, these low-performing organizations show a 0.20 percentage point increase in FTEs (p<0.01). In contrast, the highest performing organizations showcase a negligible association between performance and FTE changes and are not significant. This is contrasted with the associations observed for Percent Change in Spending in Table 5, where high-performing organizations saw a significant association between performance and resource allocation while low-performing organizations did not. This finding might indicate that improved performance among relatively low-performing organizations is 'rewarded' with higher FTE allocations—which possibly contributes to further increasing Organizational Performance in the future.

Table 12 - Linear Regression Model for Changes to Planned FTEs, Lowest and Highest Performing Organizations (2014-15 to 2021-22)

	Lowest Performing Organizations	Highest Performing Organizations
Variables	Percent Change in FTEs	Percent Change in FTEs
Organizational Performance	0.20***	0.01
	(0.08)	(0.28)
Organizational Size Quintile (FTEs)	-5.00***	-6.17***
	(1.69)	(2.05)
Number of Indicators	0.13	0.21
	(0.08)	(0.14)

	Lowest Performing Organizations	Highest Performing Organizations
2015	18.04**	22.47*
	(7.59)	(12.93)
2016	-1.97	-16.10*
	(5.49)	(9.68)
2017	-33.63***	-41.41***
	(4.77)	(11.16)
2018	13.42*	-9.31
	(7.43)	(9.92)
2019	-2.57	-12.13
	(3.88)	(9.42)
2020	5.46	-6.19
	(5.11)	(9.80)
2021	-2.13	-0.05
	(5.54)	(12.26)
Constant	6.40	26.30
	(5.88)	(28.85)
Observations	204	200
F-test	13.01	6.37
Prob > F	0.00	0.00
R^2	0.32	0.26

*Notes: Robust standard errors are in parentheses. *** p<0.01, **p<0.05, *p<0.1*

When examining the influence of Organizational Size, there is a significant negative impact on Percent Changes to FTEs in both categories of organizational performance. However, the effect is stronger among the higher performing organizations, with a coefficient of -6.17 (p<0.01) compared to -5 (p<0.01) in the lowest performing ones. This suggests that as these organizations grow in size, there is a stronger tendency to decrease FTEs, possibly hinting at increased efficiencies or restructuring. The explanatory power of the two models, represented by the R^2 values, reveals that 32% of the variation in FTE changes can be explained for the lowest performing organizations, and slightly lower, at 26%, for the highest performing ones. This explanatory power is among the highest demonstrated by models in this study.

In Table 13, the panel regression model examines the Percent Change in FTEs from 2014-15 to 2021-22 using organization as the identifier. For this dependent variable, Percent Change in FTEs, a fixed effects model was chosen as a result of the Hausman test, and the fiscal year dummy variables were used to control for annual fluctuations in FTE allocations. In this model, the variables Organizational Performance, Organizational Size Quintile, and Number of Indicators do not show significant associations with changes to FTEs during this period, given their high respective p-values, in contrast with what was observed in the linear model in Table 11. The most interesting findings from this first

model are in the year 2015 and 2017. In 2015, there was a substantial increase in FTEs, indicated by the significant coefficient value of 22.560 (p<0.01). In contrast, 2017 witnessed a considerable decrease in FTEs with a coefficient of -32.78 (p<0.01), however this finding may not be accurate because of the data quality issues with the 2017-18 fiscal year. This model, overall, explains approximately 24% of the variance in FTE changes (p<0.01).

Table 13 - Panel, Fixed Effects Model for Changes to FTEs (2014-15 to 2021-22)

Percent Change in FTEs		Coef.	Robust Std. Err.
Organizational Performance		0.06	0.07
Organizational Size Quintile (FTEs)		-10.27	13.44
Number of Indicators		0.20	0.12
2015		22.56***	6.80
2016		2.94	7.89
2017		-32.78***	7.33
2018		6.21	7.56
2019		-2.74	6.36
2020		0.83	6.68
2021		2.05	6.96
Constant		26.97	35.66
Overall R^2	0.24	Number of obs	514
F-test	18.26	Prob > F	0.00

*Notes: *** p<0.01, ** p<0.05, * p<0.1*

Table 14 displays a similar model, but omits the year 2017-18 in an attempt to mitigate the data quality issues associated with this year. Despite this exclusion, the results for the year 2015 remain consistent, with a notable increase in FTEs. The primary variables, including Organizational Performance, Organizational Size Quintile, and Number of Indicators, still do not demonstrate correlations with Percent Change in FTEs. This model has a lower explanatory power than the previous one, capturing only 8.7% of the variance in FTE changes, indicating that much of the explanatory power came from the 2017 dummy variable.

Table 14 - Panel, Fixed Effects Model for Changes to FTEs (2014-15 to 2021-22, excluding 2017-18)

Percent Change in FTEs		Coef.	Robust Std. Err.
Organizational Performance		0.03	0.08
Organizational Size Quintile (FTEs)		-13.55	15.99
Number of Indicators		0.23	0.16
2015		22.68***	6.89
2016		3.25	8.27
2018		6.52	7.93
2019		-2.57	6.70
2020		1.02	7.16
2021		2.49	7.50
Constant		37.95	42.06
Overall R^2	0.09	Number of obs	447
F-test	4.22	Prob > F	0.00

*Notes: *** p<0.01, ** p<0.05, * p<0.1*

Unlike the previous panel regression models used for Percent Changes in Spending, these models which examine Percent Changes in FTEs are strikingly different from what is observed in the linear models in Tables 11 and 12. Even when excluding 2017-18, Organizational Performance, Organizational Size Quintile, and the Number of Indicators all do not have any significant association with the Percent Change in FTEs, despite displaying at least a weak association in one of the previous models. There may be several reasons for this. The most likely cause is once again due to the unbalanced nature of the panel where not all organizations report all the required variables for the entire timeframe of the model. Additionally, it could just be the fact that there is not much organization-specific variation in FTE allocations over this time period, which might explain why the results of these two panel models vary so dramatically from the linear model in Table 11, which only controls for the fiscal year and not both the fiscal year and organization as in the panels.

Chapter 6. Discussion

Overall, the results of this study align with most of the body of literature on PBB, specifically those that examine the theory allocative efficiency, and expands on the Canada-specific research first conducted by the Office of the Parliamentary Budget Officer. Objective 1 of this research was to examine the trends in performance and resource allocation within the Canadian federal government over the span of eight fiscal years, from 2014-15 to 2021-22. Objective 2 of the study was to assess the allocative efficiency of PBB in Canada by measuring any associations between performance and resource allocation, particularly in light of recent changes to the Treasury Board's approach to PBB through 2016's *Policy on Results*.

The trends in performance and resource allocation provide some insights into PBB in Canada (Objective 1). Organizational Performance, on average across the seven fiscal years examined, was 72.5%. Performance fluctuated over the years studied but displayed a general downward trend with a minor peak in 2016-17, although this may have been due to data quality issues. This downward trend could potentially indicate that a more thorough approach to performance reporting brought in by the Trudeau government may have resulted in seemingly lower, but perhaps more accurate, outcomes over time. Smaller organizations generally seemed to outperform their larger counterparts, potentially due to more focused mandates or the selection of more easily attainable performance indicators.

Percent Changes in Spending and FTEs averaging around 10.8% and 8.7% respectively, though each with substantial variances. There were observed fluctuations in these variables' averages over the years, with smaller organizations showing the most significant changes. These performance and resource allocation trends are not unexpected. Canada has a long history of PBB, and NPM more broadly, beginning as early as 1969 (Smith, 2019). During the period under study, Canada witnessed a significant political transition from Harper's longtime Conservative government to Trudeau's Liberal government. This transition brought about shifts in policy direction, budgetary approaches, and managerial focus that no doubt affected the Canadian government's approach to performance measurement and resource allocation. The initial and ongoing socioeconomic impacts of the COVID-19 pandemic beginning in early 2020 had also significant implications for government spending, both in terms of direct pandemic response and broader economic stabilization efforts.

The regression results of this study are illuminating and provide some empirical evidence of PBB's allocative efficiency in Canada (Objective 2). Broadly, they reveal a modest yet statistically significant level of allocative efficiency in Canada's PBB system, at least at the organizational level when it comes to changes in spending. The key takeaway of this study being that for the period of 2014-15 to 2021-22, each additional percentage point of Organizational Performance was associated with an increase of 0.23 percentage points of spending in the subsequent year, demonstrating a modest but significant ($p<0.05$) level of allocative efficiency at the government-wide level.

The association between performance and subsequent resource allocation, as observed in this study, is a demonstration of the concept of allocative efficiency of PBB discussed in literature (Robinson & Brumby, 2005). This association suggests that while Canada's PBB system has its imperfections and challenges, it does contribute in a small way to the more efficient use of government fiscal resources. The findings are particularly relevant given the challenges highlighted in the literature, such as the difficulty in selecting and measuring quality performance indicators (Behn, 2003; Bischoff & Blaeschke, 2016) and the ever-changing priorities of governments (Curristine, 2006; Raudla, 2022).

However, the absence of a similar association for FTE allocations presents a mystery that may be explained by the difference of elasticity between spending and FTEs. Changes to FTEs may require layoffs or restructuring and are subject to labour laws and union contracts. Spending, in contrast, if not legislated, can be relatively elastic from year-to-year and is subject to change alongside government priorities in each annual budget. This discrepancy between performance's effects on spending and FTE allocation, when analyzed through the lens of existing literature, underscores the challenges inherent in PBB implementation. As highlighted in the literature, the selection, measurement, and quality of performance indicators, coupled with the dynamic priorities of governments, can lead to such inconsistencies in PBB outcomes (Behn, 2003; Bischoff & Blaeschke, 2016; Curristine, 2006). Future research can provide insights into these internal dynamics within government, hopefully highlighting what specific functions within Canada's managerial approach to PBB stimulate allocative efficiency.

The results of this study are made even more striking by the findings of the 2014 study by the Parliamentary Budget Officer, which found no significant association between performance and resource allocation at the organizational level in each of the individual fiscal years analyzed separately (PBO, 2014). Some of this discrepancy may be due to differences in the underlying methods. The PBO looked at three fiscal years separately, so each of their models had a smaller sample size that may not have been large enough to reveal any underlying patterns. It may also have been the case that these three years were particularly poor representatives for PBB's effectiveness in Canada, perhaps a mistake in the Conservative government's era of fiscal consolidation in the early 2010s (PBO, 2014) or due to external factors such as the long recovery from the Great Financial Crisis of 2007-08.

The contrast between this study's findings and the 2014 study by the Parliamentary Budget Officer may also suggest that the recent changes in Canada's PBB approach, coupled with the broader global and national context, such as the transition in government and changes to performance and spending priorities during the COVID-19 pandemic, have influenced the PBB's outcomes. Perhaps there was a renewed focus on the managerial and cultural aspects of PBB under the Liberal government, one that was emphasized from the Prime Minister to government ministers down to public servants. This could point to the impact of "deliverology", a key tenant of the Trudeau government's approach to results

that highlighted transparency and accountability, and made the achievement of government results a major focus of government ministers early in his administration (May, 2019). This approach was heavily emphasized when the Trudeau government first took power, only to be eased away from in later years (May, 2019).

The evolution of PBB in Canada, as it responds to internal and external pressures, is evidence of the dynamic nature of performance management systems that allows them to be adapted to fit changing conditions. It also underscores the importance of continuous evaluation and learning, a sentiment echoed in recent literature (Hijal-Moghrabi, 2019; A. T.-K. Ho, 2018).

Moreover, the wider implications of these findings provide some insights for scholars and public servants, while also revealing avenues for future research. The Canadian government's approach to PBB, especially during political transitions and global events like the COVID-19 pandemic, offers valuable insights into the adaptability and resilience of such systems. The fact that a correlation, albeit modest, between performance and resource allocation was observed, indicates that Canada's approach to PBB, while not perfect, is responsive to performance metrics. It points to the fact that performance information is, to at least some small degree, integrated into management and budgetary processes and used by politicians and public managers either explicitly or implicitly. This is a significant observation, especially when considering the challenges and complexity of modern governance.

Chapter 7. Conclusion and Policy Recommendations

7.1 Conclusion

This study of the allocative efficiency of PBB in Canada provided a detailed examination of the association between performance and resource allocation from 2014-15 to 2021-22. This period, marked by significant political and socioeconomic events, offers a unique lens to understand some of the dynamics of PBB in the Canadian federal government context. The main findings are that organizational performance fluctuated with a slight downward trend over time for the years studied; resource allocation varies widely by year but is more drastic for smaller organizations; and performance and subsequent resource allocation—allocative efficiency—have a small, significant association for spending but not for FTEs.

There are, however, several limitations to this research, some of which have been highlighted previously. First, the data comes from the government of Canada and is at least somewhat subject to bias in what is reported. Performance indicators are only as good as the selection and measurement principles which are applied to them. The quality of the underlying indicators varies by organization, limiting the applicability of these findings. Additionally, many performance indicators which were previously committed to, were abandoned before they were due to be reported on and this absence likely affected the data analysis. Second, the data used in this study was at the organizational-level and examined whole-of-government spending. Thus, it is challenging to draw conclusions about PBB's implementation at the managerial, sub-organizational level, which is presumably where Canada PBB system is most successfully adopted, based on the OECD's classification of Canada's approach as managerial performance budgeting. There is likely variance in PBB implementation between and within organizations, and this level of analysis would be a rich area for future research.

Third, variables included in the models were limited to those reported and included in previous literature. Given the relatively low R^2 values reported in the results, there are likely other independent variables which might have associations with resource allocation, such as organization-specific characteristics like the minister or delegated authority in charge, the organization's management and leadership, its culture of performance measurement, budgetary policies and control, and level of political influence. A robust, predictive model wasn't a goal of this study, but could be an interesting area for future research. Fourth, the types of regression models used in this study were relatively simple linear multiple regressions and panel analysis. Non-linear regression techniques may yield more interesting results. The associations measured in this study do not demonstrate causation, but they present a starting point for others to expand on this research. There are other, more sophisticated methods of analysis that may build on this study such as difference-in-difference, randomized control trials, comparing Canada with other nations which have not implemented PBB, or using econometric approaches to analyzing Canada's PBB data.

Despite these limitations, the study has important academic and policy-making implications (Section 7.2). The significant findings of this study, that there is at least a modest level of allocative efficiency at the government-wide level, contribute to the broader discourse on the applicability and implications of PBB in public administration. The findings provide some early empirical evidence that PBB in Canada is modestly effective in at least one of its aims: creating allocative efficiency.

7.2 Policy Recommendations

The study offers several policy recommendations, though they should be considered with caution given the macro, whole-of-government analysis of Canada's PBB system conducted in this study.

Recommendation 1 - Other national and sub-national governments looking to improve allocative efficiency should look at Canada's managerial PBB approach for best practices.

The most significant takeaway from this study is that PBB in Canada is modestly effective at creating allocative efficiency at a macro government level. The exact mechanisms with which PBB creates this efficiency were not within the scope of this study and the data used, but given that this is a recent trend that was not observed in the PBO's 2014 study, it may be a result of Trudeau's approach to "deliverology". The OECD and other scholars may have specific insights into Canada's PBB approaches and their best practices (OECD, 2019).

Broadly, governments should emphasize the importance of achieving results at every level of their organizations, creating a transparent and accountable culture of performance that begins at the ministerial level and is devolved to all members of the public service. The continued evaluation and culture of learning and improving is important as well—the Government of Canada has drawn on learnings from decades of PBB and broader NPM approaches (Smith, 2019).

Recommendation 2 - Political decision-makers should incorporate more performance information into their budgetary decision-making, and use PBB's allocative efficiency to promote organizations, policies, and programs which achieve higher performance and efficient resource allocation.

The underuse of performance information in budgetary decision-making is highlighted in the literature on PBB (Saliterer et al., 2019; Sterck, 2007). The results of this study provide some insights into how considering performance information may stimulate allocative efficiency by redirecting funds towards organizations which are more effective in achieving their performance indicators. Using PBB, government ministers can be held accountable for the results their organizations achieve and the resources with which they achieve these results.

Savvy politicians may also benefit from considering performance information in the political sphere, where PBB and allocative efficiency can be used to make arguments that promote implementing more efficient government policies and programs. PBB's allocative efficiency can be used to make arguments in favour of programs which more efficiently use government resources or to argue against those which do not and can provide evidence that perhaps even unpopular programs may be efficient in achieving their goals.

Recommendation 3 - The Government of Canada should strengthen performance and resource data collection and ensure consistent reporting.

To address the challenges encountered in this study related to the variation in data quality, the federal government needs to reinforce the mechanisms for performance and resource data collection, ensuring consistency both within and between organizations across different fiscal years. This enhancement is critical, especially considering the discrepancies observed during the 2017-18 fiscal year. It is important that organizations adhere strictly to reporting all required data (performance targets and results, planned and actual resource allocations) that facilitate aggregate analysis similar to the approach employed in this study. Any gaps in the reporting would require the exclusion of some organizations, impacting the overall integrity and comprehensiveness of future studies.

Continuity in reporting is equally crucial, as the lack thereof impacts the reliability and validity of the data. Organizations should be required to report their data over time, with no one-offs or exceptions for specific years. There has been an improvement from the 2018-19 fiscal year onwards, with data being merged and presented consistently each year. However, constant efforts are required to ensure that the quality of data is uniform across all reporting entities, and outliers are addressed to portray a true reflection of the performance and resource allocation within the organizations. This would aid in eliminating the uncertainties that arose due to the lack of data and would enhance the overall reliability and precision of future research on PBB in Canada.

Recommendation 4 - The Government of Canada should enhance their policy on performance reporting and strengthen sub-organizational reporting.

It is important for organizations to commit to reporting on selected indicators, and to honour the reporting timelines, fostering an environment of accountability and transparency. This is especially critical for indicators set for complex, multifaceted issues which often targeted over multiple years. Abandoning performance indicators prematurely undermines the accountability and transparency mechanisms of PBB, creating complications in the completeness of datasets. These complications may lead to inaccuracies in variables such as Organizational Performance, which are calculated using only indicators that had reached their reporting date, potentially obscuring the true performance characteristics of an organization.

Moreover, there is a need for the Treasury Board to create policies focusing on the classification of performance indicators as activity, output, or outcome based. Making distinctions among various types of indicators is crucial as they influence resource allocation (A. T.-K. Ho, 2011; Ryu, 2013). Standardizing these classifications and incorporating them into published datasets will not only facilitate detailed cross-sectional analysis but will also reveal their distinct associations with resource allocation and organizational performance as understood in Ho (2011).

Finally, to allow for more organization-specific analyses, consistent reporting on sub-organizational performance and resource allocation is critical. Rather than looking at allocative efficiency between organizations, this level of analysis could examine the allocative efficiency within organizations, perhaps over time, and perhaps provide better insight into the managerial influence of PBB, a key focus of Canada's approach according to the OECD (2019).

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Appendices

Appendix A – List of Federal Organizations (2018-19 Fiscal Year)

1. Administrative Tribunals Support Service of Canada
2. Agriculture and Agri-Food Canada
3. Atlantic Canada Opportunities Agency
4. Canada Border Services Agency
5. Canada Economic Development for Quebec Regions
6. Canada Revenue Agency
7. Canada School of Public Service
8. Canadian Centre for Occupational Health and Safety
9. Canadian Energy Regulator
10. Canadian Food Inspection Agency
11. Canadian Grain Commission
12. Canadian Heritage
13. Canadian Human Rights Commission
14. Canadian Institutes of Health Research
15. Canadian Intergovernmental Conference Secretariat
16. Canadian Northern Economic Development Agency
17. Canadian Nuclear Safety Commission
18. Canadian Radio-television and Telecommunications Commission
19. Canadian Space Agency
20. Canadian Transportation Agency
21. Civilian Review and Complaints Commission for the RCMP
22. Copyright Board Canada
23. Correctional Service Canada
24. Courts Administration Service
25. Crown-Indigenous Relations and Northern Affairs Canada
26. Department of Finance Canada
27. Department of Indigenous Services Canada
28. Department of Justice Canada
29. Elections Canada
30. Employment and Social Development Canada
31. Environment and Climate Change Canada
32. Federal Economic Development Agency for Southern Ontario
33. Financial Consumer Agency of Canada
34. Financial Transactions and Reports Analysis Centre of Canada
35. Fisheries and Oceans Canada
36. Global Affairs Canada
37. Health Canada

38. Immigration and Refugee Board of Canada
39. Immigration, Refugees and Citizenship Canada
40. Impact Assessment Agency of Canada
41. Infrastructure Canada
42. Innovation, Science and Economic Development Canada
43. Library and Archives Canada
44. Military Grievances External Review Committee
45. Military Police Complaints Commission of Canada
46. National Battlefields Commission
47. National Defence
48. National Film Board
49. National Research Council Canada
50. National Security and Intelligence Review Agency Secretariat
51. Natural Resources Canada
52. Natural Sciences and Engineering Research Canada
53. Northern Pipeline Agency
54. Office of the Auditor General of Canada
55. Office of the Commissioner for Federal Judicial Affairs Canada
56. Office of the Commissioner of Lobbying of Canada
57. Office of the Commissioner of Official Languages
58. Office of the Intelligence Commissioner
59. Office of the Public Sector Integrity Commissioner of Canada
60. Office of the Superintendent of Financial Institutions Canada
61. Offices of the Information and Privacy Commissioners of Canada
62. Parks Canada
63. Parole Board of Canada
64. Patented Medicine Prices Review Board Canada
65. Polar Knowledge Canada
66. Privy Council Office
67. Public Health Agency of Canada
68. Public Prosecution Service of Canada
69. Public Safety Canada
70. Public Service Commission of Canada
71. Public Services and Procurement Canada
72. RCMP External Review Committee
73. Registrar of the Supreme Court of Canada
74. Royal Canadian Mounted Police (Civilian Staff)
75. Shared Services Canada
76. Social Sciences and Humanities Research Council of Canada
77. Statistics Canada

78. The Correctional Investigator Canada
79. Transport Canada
80. Transportation Safety Board of Canada
81. Treasury Board of Canada Secretariat
82. Veterans Affairs Canada
83. Veterans Review and Appeal Board
84. Western Economic Diversification Canada
85. Women and Gender Equality Canada

Appendix B – Graph of Federal Organizations by Number of FTEs (2018-19 Fiscal Year)