

Environmental Determinants of Public Sector Innovation: A study of innovation awards in Canada

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Abstract

In this article, we conduct an empirical study of administrative innovation in the Canadian public sector by examining applications to the Innovative Management Award of the Institute of Public Administration of Canada (IPAC). After a review of the literature on innovation in the public sector and of the history of this award, we come to the conclusion that the relationship between innovation and environment has been studied only sparingly, which explains the focus of our research and our hypotheses. Through an analysis of award applications over 21 years, and of award finalists and winners, we demonstrate that such environmental variables as strength of the economy, size of the civil service, deficits, unemployment rate, investment in R&D, and type of government have important consequences for administrative innovation in the public sector. We also suggest some implications of our findings for future research on this subject.

Key words

Innovation, environment, public sector, awards

ENVIRONMENTAL DETERMINANTS OF PUBLIC SECTOR INNOVATION

A study of innovation awards in Canada

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INTRODUCTION

In the early 1980s, the new public management era was born and neoliberalism became the dominant ideology. Politicians were then elected advocating reductions in the number of civil servants, budgets, and so on. Other voices argued that the state still played an important role and should be reinvented. The need for innovation, in particular, the kind leading to administrative improvements, was much discussed, followed soon by the conviction that a way should be found to acknowledge it. The result, at the end of the decade, was the emergence of the idea of awards for innovation in the public sector.

The first message of these awards was that great things were happening in the public sector and, by winning, one could earn recognition for a job well done. At the same time, the award served the purpose of publicizing behaviour that deserved to be emulated (Hartley and Downe 2007). There was, as a consequence, more innovation by imitation than by invention (Gow 1994: 4). Some of the initiators of these awards also hoped that morale among civil servants could be improved during difficult times (Borins 2000). They expected the public sector image to benefit as well from publicizing its best practices (Galimberti 2003; Moore 2005) and its performance (Kapucu *et al.* 2011). This emphasis on innovation had other important implications, suggesting that, in a turbulent era, public organizations had to be transformed and change should be valued (Kernaghan *et al.* 2000).

Innovation awards were first launched in the United States. Canada, and later other Commonwealth countries, followed soon after. Funded by the Ford Foundation (Moore 2005: 44), the first programme was created in 1985 at the Harvard Kennedy School's Ash Institute. It offered a multi-category award with monetary prizes. Upon its twentieth anniversary, a volume, *Innovations in Government* (Borins 2008), was published to synthesize emerging patterns. The usefulness of the award in stimulating innovation has been apparent as other such programmes have proliferated around the globe (Borins and Walker 2012).

The applications for these awards, in and of themselves, provide a good sample with which to study best practices in public administration (Borins 2008). Recently, the innovations that have garnered recognition have been focused on administration rather than policy, and can be characterized as mostly incremental rather than major or radical. This has given impetus and legitimacy to small innovations as a means to improve public administration services by prompting imitation and more innovation (Walker 2007: 594). It has been said that, because applications must generally be authorized by a senior official and/or a politician (Osborne and Brown 2011: 1340), real innovation may be thwarted. But, since the innovation drive was stimulated by the urgent need to 'do more with less', we see the authorization process as an institutionalization of the innovation spirit, lending it legitimacy and recognition.

In the 1990s, secretariats were established in Canadian public administration to manage applications and coordinators have been appointed in some departments (Borins

2000: 322) to help with the process. In this article, we use a data set, which we developed for an empirical study on public sector innovative management in Canada, to do two things. First, we study who applies for recognition, and why. With regard to the latter, our emphasis is on the environmental determinants of innovation. We use the applications, finalists, and winners of the award as a sample of innovation, and therefore make the important assumption that the applications for these awards involve innovations as promoted by the Institute of Public Administration of Canada (IPAC).

INNOVATION IN THE PUBLIC SECTOR: A BRIEF OVERVIEW OF THE LITERATURE

The literature on innovation in the public sector has been generally about the internal workings of governments (see Albury 2005; Crossan and Apaydin 2010; Fernandez and Wise 2010). It focuses on leadership (Currie et al. 2008), entrepreneurship (Bernier and Hafsi 2007), group dynamics (Mohamed 2002), or the idiosyncratic characteristics of innovative employees (Janssen et al. 2004; Landau 1993) or managers (Damanpour and Schneider 2008).

Borins (2001) found that most innovations come from organizational staff. This is more the case in the United Kingdom and Australia (82 per cent) than in the United States (51 per cent). Types and processes of innovation have also been scrutinized (Walker 2003, 2007). Innovation is often the result of craft work or 'organizational bricolage' (Anderson 1998). In his recent review of the literature on innovation in local government, Walker (2012: 23) finds that 'internal antecedents matter more than the external ones'. Sometimes, innovation is inscribed in organizational routines (Bartunek et al. 2007).

Damanpour and Schneider (2008) have examined the relationship between innovation characteristics, manager characteristics, and innovation adoption in public organizations, drawing on surveys of local government officials. They document our hypothesis development. Innovations are intended to improve services (Albury 2005; Walker 2007). They are often initiated by an intermediate manager, but they also come through networks of professionals and managers. In such a case, they need adaptation (Considine and Lewis 2007; Hartley 2005). Some scholars have observed that some organizations generate innovations, while others adopt them (Damanpour and Wischnevsky 2006). Others do not innovate at all (Hartley 2005).

When studies were conducted on networked innovation, they were generally based on case studies (see Arnaboldi et al. 2010; Denis et al. 2002; Swan and Scarbrough 2005) and so, while insightful, had limited generalization possibilities. Crossan and Apaydin's (2010) meta-analysis links leadership, innovation as a process, and innovation as an outcome after reviewing hundreds of papers published on the topic. Their review concludes that it is hard to draw clear conclusions. A large variety of variables are considered, but many theoretical perspectives are considered but not reconciled. Only

lately has the focus begun to return to the environment (Osborne and Brown 2011: 1342).

In studies that look at the impact of the environment on innovation, there appears to be a U-shaped relation between slack and innovation in the public sector (Nohria and Gulati 1996). Innovation occurs in a particular type of institutional space (Considine and Lewis 2007) or in open systems (Osborne and Brown 2011: 1343). Damanpour and Schneider (2006) have underlined the importance of urbanization and population growth. Boyne *et al.* (2005) have conducted an empirical analysis of innovation adoption, considering the impact of internal and external constraints on the utilization of a programme of management innovation. But the core of their argument is again about the importance of internal organizational variables.

Dougherty and Dunne (2011) propose a preliminary model for organizing ecologies of complex innovations, but in the private sector. For them, innovation comes from ecologies of multiple organizations, institutions, and other agents in both the private and public sectors, where knowledge is created, combined, and recombined. There is an interesting 'configurational' view (Miller 1998) of how environments can foster innovation. Innovation in the public sector may flow not only from the organization but also from environmental changes such as rising expectations of citizens and their changing configuration (Albury 2005; Lekhi 2007; Walker 2012: 3). Borins (1995b) looked at the impact of financial constraints on government, the availability of information technology, and the diversification of the workforce in a study of eighteen cases. Environmental factors still need to be included in more research on the topic (Damanpour and Schneider 2008: 514–15).

In conclusion, a lot of the research to date on innovation in the public sector has to do with the internal dynamics of organizations rather than with the environment, and the goal in this article is to explore further the effect of the latter. In this respect, applications to an innovation award programme provide an interesting inside look at public sector management.

INNOVATION IN CANADIAN PUBLIC ADMINISTRATION: THE IPAC AWARD PROGRAMME AND THE LITERATURE

Leaving aside its ideological element (Metcalf 1993), the new public management movement was intended to achieve greater efficiency in the public sector (Borins 1995a, 1995b). Although its success in attaining that objective has been acknowledged, the limitations of the movement are now recognized (Bernier and Angers 2010; Dunleavy *et al.* 2006). One benefit of the advent of the new public management, however, is that it has prompted debate on possible innovations in the public sector. Borins (2008) has expanded on *Reinventing Government's* proposition (Osborne and Gaebler 1993) that, in a turbulent public sector environment, innovation is essential and the state must be

reinvented. This was true in Canada where, during the 1980s and 1990s, civil servants' morale needed a boost. Awards were one way of achieving that goal (Borins 2000).

The Canadian political system is an interesting laboratory for this study. The federal government and the ten provinces operate under the same political system inherited from the British Westminster tradition but have developed different political cultures (Bernier et al. 2005). The federal system was built to take into account the existence of two important linguistic groups and adapt to geography. Canadians have a stable political system; the current constitution was adopted in 1867. In 1982, the Canadian constitution was repatriated, and Canada was formally separated from Westminster constitutional arrangements. Over the last 20 years, there has been turnover of the parties in power everywhere, except in Alberta, with conservative, liberal (centre-right), and centre-left parties alternating in office. Outside the realm of politics, demographic growth and change has been considerable, and, as elsewhere in the developed world, the socio-economic context has been challenging to say the least, with deficits to manage and the necessity of adapting to a rapidly changing world economy. Empirical research in the public sector in Canada has generally provided in-depth studies, such as Glor's (2002), an interesting exploration of the Blakeney government's strategy in Saskatchewan providing valuable theoretical insights.

In 1990, IPAC created the IPAC Innovative Management Award, modelled after the Harvard-Ford Foundation Innovations in Government awards, to publicize examples of creative problem-solving and to encourage replication of the best new practices in the public sector (Borins 2000: 326). All public administrations in Canada are eligible to apply for these innovation awards. Every year since 1990, 60 to 100 organizations or offices in the federal government and all of the municipalities, provinces, and territories have applied. One can say that, in large-sample research, they are reasonable proxies for innovations, since they are both promoted and endorsed as such by officials in public organizations. For the IPAC award, the applications have usually been presented at regional competitions or more specialized forums. So, although sometimes questioned, we still think that they are the best general indication available of how innovative a government is. Moreover, in this research, we also consider a tighter selection, one involving finalists and winners only.

There have been a few studies on public sector innovation in Canada. In particular, there is not only the work by Borins, cited earlier, but also that by Gow (1992) and Glor (1998a, 1998b). Gow (1992, 1994), besides reviewing the earlier Canadian literature, studied fifteen interesting cases of innovation in Canada by various governments, using survey and interviews of various groups to develop a theoretical framework for public sector innovation. He generally was more interested in the process of innovation than in determinants (1994: 14), with a focus much broader than ours. His cases, moreover, covered the period from the late 1960s to the early 1980s, an era in Canadian public administration distinct from that analysed here.

Glor, is particularly active in the field, serving as the editor of *The Innovation Journal* and organizing conferences and workshops. Her (2002) exploration of the Saskatchewan Government's innovation process in the 1971–1982 period is especially interesting, given that Saskatchewan is the province in which Canadian health insurance and other important reforms originated.

Glor (2002: 155) studied the 1990–1999 nominations for the IPAC award, looking at both medalists and finalists, and concluded that will and determination were powerful forces in driving innovation (172, 178). Saskatchewan, the focus of her book, applied only twenty-five times during the decade and ended up with a second prize and one finalist. As we will see later, our results are consistent with Glor's.

In this study, we look at the entire body of applications for the innovation award over 20 years. Our systematic search for relations, with the introduction of original variables, not available through IPAC, has not been done in Canada before. We provide a broad picture that can perhaps be supplemented with case studies to facilitate generalization and the crafting of a convincing theoretical framework.

STUDY OVERVIEW

Specifically, this study uses as a database all the applications for the IPAC Innovative Management Award submitted by Canada's federal and provincial government organizations since the award's inception in 1990 (the applications are available electronically for the 2000s). Because the database is large and covers a long period, it enables us to study all aspects of public sector innovation as well as patterns over time.

The database can be divided into three sections: the 1,941 applications submitted between 1990 and 2011; the annual short list of six to ten finalists (a total of 162 applications); and the three winners chosen every year to present their projects at the Institute's annual conference. Not only the three winners but all the shortlisted finalists are recognized as successful innovators by a jury made up mostly of senior practitioners and including, in some years, an academic (Galimberti 2003). What is important about the applications is that they suggest the development of an innovation culture in the Canadian public sector. Individual public servants seem to value innovation, consider applying, and sometimes win. This IPAC competition is the ultimate step of a selection process in which organizations apply after winning local or specialized contests. For example, Revenu Québec applied (and won Gold) in 2009 after winning in both a specialized contest and a provincial contest for its 'Wealth Indicators' innovation.¹ Similarly, WelcomeBC.ca was awarded two B.C. Public Sector Information Technology Awards and a Silver Vancouver Island Regional Premier's Award, and was a finalist in the province-wide Premier's Award for Service Excellence, before earning Bronze at the IPAC Innovation Awards. Other examples include the Newfoundland 'Find Yourself Here' Tourism Marketing Campaign and Ontario

French-Language Services, which both won other contests before succeeding in the IPAC competition.²

Of the 1,941 applications submitted from the award’s inception in 1990 until 2011, 351 were from municipalities, and some were from partnerships of organizations belonging to different governments. None of these are considered here. The municipal level is well covered, however, in other studies of innovation (Hartley and Downe 2007; Walker et al. 2011). For our analysis, the three northern territories (the smallest governments) have also been excluded, for two reasons: (a) not enough innovation applications have been submitted by any of the territories (together, a total of only twenty-seven submissions over two decades); and (b) the Nunavut Act (1 April 1999), which separated Nunavut from the Northwest Territories, interferes with a meaningful historical data analysis. With these considerations in mind, we are left with eleven governments, the federal government and ten provincial ones, which together account for a total of 1,563 applications and 135 finalists. We begin our analysis with a quick description of some trends in the data, followed by a more elaborate regression analysis.

DESCRIPTIVE STATISTICS

Figure 1 illustrates the distribution of the applications among the different governments. The federal government has been the most active participant in the IPAC Innovative Management Award, followed closely by Ontario, the province with the largest administration. The other largest provinces, Quebec, Alberta, and British Columbia, had fewer applications over the same period.

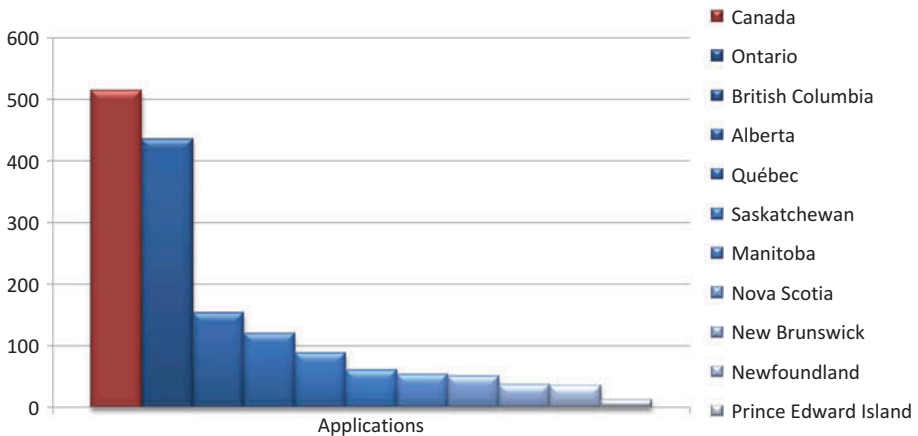


Figure 1: Distribution of applications by source

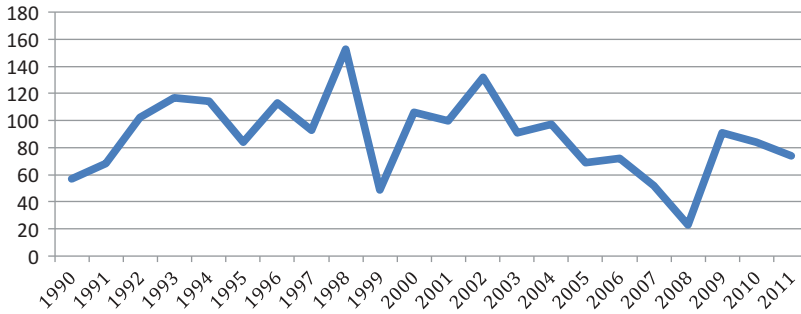


Figure 2: Applications by year

Until 2010, a general theme was chosen each year for the IPAC award, and organizations may have been more interested in some themes than in others (see also Glor 2002: 159). Annual themes were abolished in 2011. Figure 2 shows the total number of applications for every year since 1990. Overall, there is a relative decline in the number of applications over the last decade.

Figure 3 is a compilation of the number of applications versus the number of finalists and winners. To use a baseball metaphor, in comparison with the other governments, Alberta has a high batting average, winning a little less than 20 per cent of the awards with only 6 per cent of the applications. Although relatively fewer in number, Quebec applicants often end up among the finalists and often win. British Columbia also wins disproportionately more than Ontario and the federal government.

Figure 4, which compares finalists’ scores versus applications and winners versus applications, offers another look at the same phenomenon. If a province has the same percentage of winners and applications, its score would be 1. This confirms that there are important variations from one government to the next among the Canadian provinces.

The next section offers more detailed statistical analyses and a model to explain innovative behaviour.

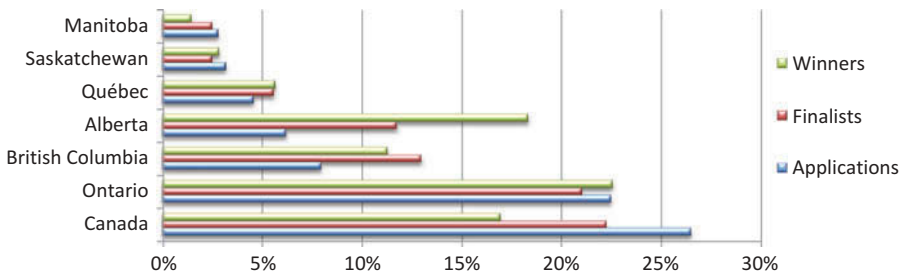


Figure 3: Ratio of applications, finalists, and winners by source

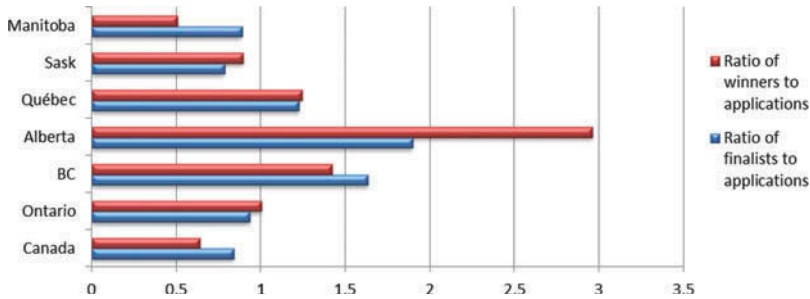


Figure 4: Efficacy by source

ENVIRONMENTAL FACTORS AND PUBLIC SERVICE INNOVATION IN CANADA: HYPOTHESIS DEVELOPMENT

In this section, we intend to identify the environmental determinants of such innovation fluctuations. Comparison among governments of widely different sizes being problematic, we used an approach to compensate for certain shortcomings of an ordinary least square (OLS) regression.

Accepting the assumption that IPAC applications describe real innovations, we built our model by considering the number of innovations submitted to the IPAC award as our *dependent variable*. Submissions in any given year are assumed to have been implemented in the previous year, an assumption that is used to represent the delay between adoption of innovation, implementation, and recognition seeking. This assumption is based on one of the author's informal interviews with both preliminary and final jurors. Our choice of time lag is deliberately short to keep things simple and to avoid choosing an arbitrary lag that could skew the result. It is based on the assumption that people choose to have their contribution as innovators recognized as soon as possible. Some studies suggest that there is often a lag between the idea and its implementation. For example, Fichman and Kemerer (1999) showed that some innovations remain unused for many years. Therefore, we decided to conduct our tests with longer lags, 2–5 years, but the results were not statistically significant.

In this study, we focus on innovation in the Canadian public sector in response to environmental factors. Such factors as regulation, political priorities, information restrictions, and new technologies and partnerships may change for better or worse. Innovation can be seen as an adaptive response to such changes. Environment is often seen as the primary stimulus behind an innovation (Pierce and Delbeck 1977; Tornatzky and Fleisher 1990).

First and foremost, public organizations have to meet the population's needs (Walker 2007). Thus, as the population and its needs increase, public organizations are more likely to face added challenges, to develop and innovate in order to respond

effectively, and to maintain or improve services (Boyne *et al.* 2005; Damanpour and Schneider 2006). Moreover, there is evidence that population growth increases the availability of skilled and enterprising workers, thereby expanding the diversity of the workforce and providing scope and opportunity for innovation (Armstrong and Taylor 2000; Damanpour and Schneider 2006; Williams 2003).

Correspondingly, the size of organization (here, government) is believed to affect innovative behaviour. The larger the organization, the more likely it is to innovate (Damanpour *et al.* 2005; Rogers 1995). The availability of slack resources has been proposed as another reason to explain the relationship between the size of an organization and its ability to innovate (Borins 1998; Light 1998; Walker 2003). This leads to our first hypothesis:

H1: Government size is positively related to innovation.

Economic factors are also seen as a driving force behind innovation. The greater the financial health of an organization, the better it is able to invest in innovative programmes, eventually absorbing the cost of failure if unsuccessful (Aiken and Hage 1971; Nystrom *et al.* 2002).

Furthermore, a lack of financial resources is a major impediment for organizations trying to implement innovative processes (Goes and Park 1997). Although poorer communities may have a greater need for innovations, particularly for those innovations that can ensure a more efficient use of resources, some programmes require upfront spending and cannot be undertaken without sufficient financial and technical resources.

In general, the ability to acquire knowledge, technical resources, and sufficient funding promotes the capacity to innovate in both the private and public sectors, just as a lack of resources inhibits it (Damanpour 1991; Nohria and Gulati 1996). In addition, Damanpour and Schneider (2006) have found that community wealth affects innovation in public administration as much as organizational wealth does. These considerations lead to our second and third hypotheses:

H2: Strength of the economy is positively related to innovation.

H3: Government slack resources are positively related to innovation.

Another way to measure the importance of innovation in a given province is to use an indicator called gross expenditures in research and development (GERD) (Anderson 1998). Expenditures in R&D reflect a government's push for innovation, in both the public and private sectors. The GERD/GDP ratio is often used when dealing with intergovernmental comparisons (Anderson 1998). It is a common indicator of spending on innovation for a given state (Anderson 1998). We expect that governments spending a larger part of their budget on R&D should see results later in the form of innovative

processes and services. Creating programmes to finance and encourage R&D is a common way to promote innovation hence, our fourth hypothesis:

H4: Investments in R&D are positively related to innovation.

Another economic factor that can influence the adoption of innovation by governments is the unemployment rate. Past studies have looked at unemployment rate either as a constraint on local government, limiting the resources available for innovative programmes (Damanpour and Schneider 2006), or as a socio-economic force driving the need for innovation, thus enhancing innovation adoption (Boyne et al. 2005). Scholars have looked at the unemployment rate as a short-term gauge of the economic health of a community, which is known to affect innovation (Damanpour and Schneider 2006). Thus, a higher level of socio-economic difficulty will push government administration towards developing new ways of meeting the needs of their citizens through administrative innovation. This leads to our fifth hypothesis:

H5: Unemployment rate is positively related to innovation.

Other environmental factors have been considered, particularly with regard to political climate and leadership, but methodological constraints prevent us from integrating them in our model. Indeed, independent categorical variables are difficult or impossible to fit in pooled time series data. One variable that we can test in this research is linked to political stability. Minority governments have less freedom to implement new policies and have to form a consensus with the opposition on every bill they wish to pass. A majority government in the Westminster parliamentary tradition, on the other hand, has greater freedom to allocate resources and invest in new and innovative programmes. Yet, in relation to the argument of necessity (Boyne et al. 2005), one could argue that minority governments are under more pressure to be creative and innovate. Therefore, the relation could go both ways. We would like to test both possibilities.

Our hypotheses are:

H6A: Public service innovation occurs more frequently under a majority government than under a minority government.

H6B: Public service innovation occurs more frequently under a minority government than under a majority government.

Political factors are also likely to influence the amount of innovation done in any given year by elements of the public administration (Gow 1994). In this research, we test for 'political ideology', referring to where, on the left-centre-right axis, the party in power sits. Although ideology may affect the content of the innovation, there is no reason to

believe that the degree of innovation would be affected. Circumstantial evidence on the Thatcher (United Kingdom) or Reagan (United States) Governments, on the right, or the Clinton and Mitterand (France) Governments, on the left, confirm that all respond to needs through innovative practices. This leads to our last hypothesis:

H7: Public service innovation is not influenced by the political ideology of the party in power.

There are of course many other variables that are likely to influence public service innovation. In particular, in the immediate environment of organizations, political figures, government orientation or strategy, senior public administration positions, and the political climate can be mentioned (Gow 1994). There are also variables such as organizational culture, leadership, and knowledge that influence innovation (Glor 1998b). All these variables could not be handled with the pooled time series used here.

DATA AND METHOD

Our *independent environmental variables* were taken from the E-STAT interactive tool of Statistics Canada. E-STAT gives researchers and students access to Canadian socio-economic database (CANSIM) time series, tracking trends in many aspects of the Canadian economy and public administration. We had access to large data series covering sociological and macroeconomic variables such as population, GDP, and employment, and to data related to the public service, such as revenues, expenses, number of employees, total payroll, and the like.

The operational definitions, labels, expected directions of relationship, and data sources are detailed in Table 1. Organizational size is measured by the number of employees working for the public administration. We use a logarithm in order to reduce the disparity in size among governments and ensure regression requirements of normality in data distribution. Economic strength is represented by the logarithm of the GDP per capita. For slack resources, we use the financial results of the public administration, specifically surplus or deficit at year's end. In order to apply a logarithm to this variable, we first had to remove all negative values by adding a constant equal to the lowest value plus one to all data points. Additional analyses have been performed with different operational definitions for slack resources, such as using the surplus and deficits without any log transformation, or using surplus and deficits as a percentage of GDP. Those specifications gave very similar results, but the log transformation was kept because it improved the normality of the variable.

Investments in R&D are represented by the GERD/GDP ratio. GDP is unavailable for the last year of the statistical analysis, which means that models using either

Table 1: Independent variables

<i>Independent variables</i>	<i>Operational definition</i>	<i>Label</i>	<i>Direction</i>	<i>Source of data</i>
Organizational size	Log of the number of public service employees within authority area	LogEMPL	Positive	Statistics Canada. Table 183-0002
Economic strength	Log of the GDP per capita within authority area	LogGDPperCap	Positive	Statistics Canada. Table 384-0002
Slack resources	Log of the surplus (or deficit) of public administration	LogSURPLUS	Positive	Statistics Canada. Table 385-0001
Investments in R&D	GERD/GDP within authority area	GERDtoGDP	Positive	Statistics Canada. Table 358-0001
Unemployment rate	Unemployment rate within authority area	UFERATE	Positive	Statistics Canada. Table 282-0055
Majority government	Dichotomous variable: 1 for majority government, 0 for minority government	TYPEGOV	Positive or negative	Elections directories
Political ideology	Categorical variable: 0 for centre, -1 or -2 for centre-left and left, 1 or 2 for centre-right and right	IDEO	N/S	Université de Sherbrooke – École de politique appliquée (2010)

Table 2: Correlations between independent variables

	<i>LogEMPL</i>	<i>LogGDPperCap</i>	<i>LogSURPLUS</i>	<i>GERDtoGDP</i>	<i>UERATE</i>	<i>TYPEGOV</i>
LogEMPL	1.0000					
LogGDPperCap	0.4958	1.0000				
LogSURPLUS	-0.2343	0.0363	1.0000			
GERDtoGDP	0.7227	0.2945	-0.0848	1.0000		
UERATE	-0.4598	-0.7511	-0.0579	-0.2459	1.0000	
TYPEGOV	-0.1285	-0.0937	-0.0522	-0.1484	0.1776	1.0000

LogGDPperCap or GERDtoGDP as variables will be limited to 220 observations (20 years \times 11 governments) instead of 231 (21 years \times 11 governments).

The unemployment rate in the jurisdiction is straightforward. The political power variable is dichotomous and was assigned a value of 1 for majority governments and 0 for minority governments. As such, a significant positive relationship (as per our hypothesis) would indicate that majority governments innovate more than minority governments. A non-significant relationship would reject both hypotheses. Finally, ideology is a categorical variable with 0 for centre ideology; -1 and -2 for centre-left and left, respectively, and 1 and 2 for centre-right and right, respectively. Measures come from the *École de politique appliquée* of the Université de Sherbrooke.

In order to avoid multicollinearity, some variables (e.g., Population) were omitted because of high intercorrelations (see Table 2).

The pairwise correlation matrix indicates in particular that multicollinearity might be a problem with the pairs LogEMPL–LogGDPperCap and LogGDPperCap–UERATE. We therefore tested for multicollinearity, using the variance inflation factor (VIF), which shows that multicollinearity was not an issue in our model.

Models and results

The impact of the environmental variables on the quantity of innovation in an administration was tested using a pooled OLS multiple-regression model with Driscoll–Kraay standard errors (Driscoll and Kraay 1998). Driscoll–Kraay standard errors are robust against disturbances that are heteroscedastic, autocorrelated, and cross-sectionally dependent (Hoechle 2007). Presence of heteroscedasticity was confirmed by White's test (White 1980), which was significant at $p < 0.001$. This is a common problem in econometrics and heteroscedasticity was reduced, but not eliminated, using logarithms on our independent variables.

Autocorrelation is a common phenomenon in time series, and a quick analysis using the Wooldridge test for autocorrelation in panel data (Wooldridge 2002) demonstrates that our data presents first-order autocorrelation ($F(1,10) = 5.739$; $p = 0.0376$).

The main factor causing cross-sectional dependence in our data is the fact that IPAC awards had an annual theme. This made applicants more or less likely to participate in any given year, depending on the current theme. Driscoll–Kraay standard errors are robust against this common form of disturbance (Hoechle 2007).

All our analyses were conducted using the statistical software Stata 12.1. The first results from the regression showed that LogGDPperCap, GERDtoGDP, and IDEO were not significant. After removing non-significant variables, the model included the following variables: LogEMPL, LogSURPLUS, UERATE, and TYPEGOV. The final model is shown in Table 3.

This model shows an R^2 value of 0.5849, which is high considering that we limit our analysis to environmental variables. It means that the better part of the variance can be explained using only these four factors.

As mentioned earlier, multicollinearity is not a problem with this model. The mean VIF is 1.22, and the highest VIF is 1.39 for LogEMPL, well below the Neter and Wasserman (1974) suggested cut-off point of 10.

As expected, LogEMPL is positively correlated with the number of submissions for the IPAC awards, as are UERATE and TYPEGOV. However, LogSURPLUS has a significant relation with innovation, but in direction opposite to that of our hypothesis. This might be because administrations willing to incur deficits are keen to innovate. These innovations are born of necessity. For example, the federal government's export support programmes operate as a 'virtual agency' because, after budget cuts, the various organizations involved no longer have enough resources to operate separately.

Table 3: Regression results (random-effect model; entity- and time-related variance)

Regression with Driscoll–Kraay standard errors						Number of obs = 231	
Method: pooled OLS						Number of groups = 11	
Maximum lag: 2						$F(4, 10) = 149.70$	
						Prob > $F = 0.0000$	
						$R^2 = 0.5849$	
						Root MSE = 5.8330	
<i>SUBMISSIONS</i>	<i>Coef.</i>	<i>Disc/Kraay Std. Err.</i>	<i>t</i>	<i>P > t </i>	<i>[95% Conf. Interval]</i>		
LogEMPL	10.11466	0.8380513	12.07	0.000	8.366512	11.8628	
LogSURPLUS	-7.0838	0.7090233	-9.99	0.000	-8.562796	-5.604803	
UERATE	24.45051	7.619756	3.21	0.004	8.555982	40.34505	
TYPEGOV	3.754113	0.6790801	5.53	0.000	2.337576	5.170649	
Cons.	-18.85928	6.167875	-3.06	0.006	-31.72524	-5.993315	

LogGDPperCap, GERDtoGDP, and IDEO did not have a significant relationship with innovation in our model, thus confirming our seventh hypothesis. The amount spent on R&D by an administration might be more of a long-term incentive for innovation than a short-term boost to innovative programmes. As for economic strength, the absence of relationship might be an indication that, while wealthier economies have more resources to innovate, their external environment puts no pressure on them to make changes, which leads to the status quo.

The previous models used a method generally known as random-effects modelling. For our data structure, random-effects models focus on differences among governments rather than differences in time. In other words, the previous models were good at explaining variance among entities (in our case, the governments of ten provinces and the federation), but reflect poorly the temporal variance in any single entity (say, the difference between innovation in 1990 in Alberta and innovation in that same province 10 years later). We call the former ‘between-effect’ variance (between entities) and the latter ‘within-effect’ variance (within entities, i.e., time-related).

To look at the evolution of innovation through time, the next model we propose is a fixed-effect one, which tries to find a common coefficient for every entity-related variable without pooling the data. This way, entity-specific effects are neutralized and only time-related effects are considered.

We built this model in exactly the same way as the first model, starting with five variables and eliminating non-significant coefficients one by one. The final model, shown in Table 4, is a three-variable model using LogSURPLUS, UERATE, and TYPEGOV as independent variables. The value of within- R^2 , representing the fraction of the time-related variance explained by the model, is 0.2198. This model accounts for approximately 22 per cent of the variance attributed to different time periods in a given government.

Comparing Table 4 (fixed-effect regression) with Table 3 (random-effect regression), we notice that only one variable is missing, LogEMPL. The other three variables are significant and have a very similar coefficient in both models. The variable LogEMPL is significant only when comparing governments with one another. Hence, the three other variables represent the factors that influence innovation in a government from year to year, whereas LogEMPL variable represents the fact that bigger governments can and do innovate more than smaller ones.

To complete this analysis, we used a least-square dummy variables (LSDV) model (Table 5) to show the different intersections (constants) of every entity. This model has exactly the same coefficients as the previous model, but the standard errors are less reliable than the Driscoll–Kraay standard errors shown before (our software analysis package could not provide Driscoll–Kraay standard errors for an LSDV model). The only difference is that, instead of giving the mean constant, this model displays the individual constants of each entity. These constants are the reason why LogEMPL is no

Table 4: Regression using a fixed-effect model (time-related variance only)

Regression with Driscoll–Kraay standard errors					Number of obs = 231	
Method: fixed-effects regression					Number of groups = 11	
Maximum lag: 2					$F(3, 10) = 21.99$	
					Prob > $F = 0.0001$	
					Within $R^2 = 0.2198$	
<i>SUBMISSIONS</i>	<i>Coef.</i>	<i>Drisc/Kraay Std. Err.</i>	<i>t</i>	<i>P > t </i>	<i>[95% Conf. Interval]</i>	
LogSURPLUS	-5.422034	0.8484603	-6.39	0.000	-7.191891	-3.652177
UERATE	35.81678	14.5448	2.46	0.023	5.476862	66.15669
TYPEGOV	3.730943	1.463115	2.55	0.019	.6789392	6.782947
Cons.	25.64007	4.292397	5.97	0.000	16.68629	34.59386

Table 5: Least-square dummy variable model (time-related variance only)

Linear regression					Number of obs = 231	
					$F(13, 217) = 45.42$	
					Prob > $F = 0.0000$	
					$R^2 = 0.7491$	
					Root MSE = 4.6278	
<i>SUBMISSIONS</i>	<i>Coef.</i>	<i>Robust Std. Err.</i>	<i>t</i>	<i>P > t </i>	<i>[95% Conf. Interval]</i>	
LogSURPLUS	-5.422034	0.8146946	-6.66	0.000	-7.027761	-3.816306
UERATE	35.81678	14.30905	2.50	0.013	7.614255	64.0193
TYPEGOV	3.730943	1.365402	2.73	0.007	1.039795	6.422091
Entities						
Canada	15.99008	2.575909	6.21	0.000	10.91308	21.06709
British Columbia	1.151245	1.182502	0.97	0.331	-1.179414	3.481905
Manitoba	-2.676036	0.6678801	-4.01	0.000	-3.992398	-1.359673
New Brunswick	-5.571314	0.9427332	-5.91	0.000	-7.4294	-3.713228
Nova Scotia	-3.549997	1.097655	-3.23	0.001	-5.713428	-1.386567
Ontario	13.18559	2.043901	6.45	0.000	9.157152	17.21403
Quebec	-2.512523	0.9365836	-2.68	0.008	-4.358489	-0.6665578
Saskatchewan	-2.084165	0.805717	-2.59	0.010	-3.672198	-0.496132
Newfoundland	-7.712444	1.660279	-4.65	0.000	-10.98478	-4.440106
PEI	-7.597049	1.200829	-6.33	0.000	-9.963831	-5.230266
Cons.	25.76522	4.562265	5.65	0.000	16.77319	34.75725

longer significant: they represent the variance among governments that was previously encompassed by the size of the administrations. The reported R^2 value is 0.7491.

DISCUSSION OF THE RESULTS AND CONCLUSION

Using the literature as a guide, we have hypothesized that public sector innovation, as measured by applications to the IPAC award programme, is explained by size of the organizations concerned, strength of the economy, government slack resources, public investments in R&D, unemployment, and type of government (majority and minority). Hypotheses 2 (strength of the economy) and 4 (R&D spending) have been rejected. H1 (size drives innovation) has been confirmed, H5 (rate of unemployment drives innovation) has been confirmed, H6A (majority government more innovative) has been confirmed, and H7 (no effect of ideology) has been confirmed. H3 stated that slack resources were positively related to innovation. Our results show that surplus (proxy for slack) is significant, but the direction is the opposite of what was expected. The hypothesis is rejected. Yet, the results indicate that governments with surpluses are less

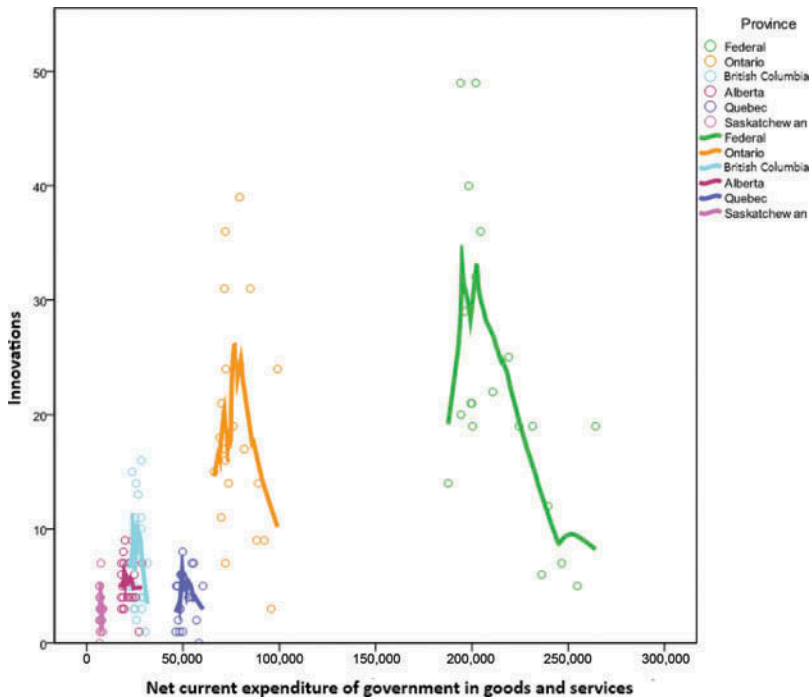


Figure 5: Relationship between government expenditures and innovation

innovative. This was a surprise that required further investigation. As shown in Figure 5, we looked at regression curves broken down by provinces using Epanechnikov's (1969) estimation model. Comparing the number of applications with government spending shows a more complex non-linear relationship. It is an inverted V relationship between government spending and applications. Indeed, there is first a positive relationship that then reverses, after a certain point. This suggests that governments innovate when they have a surplus, but that too much surplus destroys the need for innovation, which makes sense. These are only preliminary conclusions. Further research is required to confirm such findings. We believe that the relationship between a government's economic context and its efforts to innovate merits further attention. Now that the IPAC database is made public, others researchers can take up the challenge, especially by adding relevant variables and looking at moderation and mediation effects. The minority/majority government variable is interesting and could mediate the relationship.

Damanpour and Schneider (2006) conclude that environmental factors have a weaker influence on innovation than organizational characteristics and top managers' attitude. Our analysis shows the more specific impact of environmental factors. According to our data, at least in the public sector, environment matters. Using two models to ensure validity, we believe that these results are convincing, if one accepts that the IPAC award applications are reasonable proxies for innovation.

Applications come from organizations in governments faced with harsh times. Limited resources may have forced them to find new ways to deliver services or operate. And data confirm that it is easier to innovate under a majority government, perhaps because decisions can be made faster. Other political variables were tested in our study but were not statistically significant. We plan to test them again, as Glor (1998a: 309) did. We were limited by the information available on the Canadian form that applicants had to fill out (1995b, see Borins 2001). There is very little information on the organizations that apply or on the public entrepreneurs behind the applications. Despite these limitations, the findings point clearly to the important role of environmental factors. It is possible that organizations and individuals driving innovations take these factors into consideration, which would then provide the link between Damanpour et al. (2005) emphasis on internal factors and the role of external factors. An in-depth study similar to what Glor (1998a) did in Saskatchewan would probably provide a clearer view on these interactions. Further research could also test them.

Applying for prizes such as the Innovation Management Award is a way to give credit to the work of government organizations at a time of budget cutting, retirements, and a certain cynicism about the public sector. Administrative innovations can be exploited to enhance the reputation and image of a government (Lekhi 2007; Moore 2005). They can also improve public value as the dissemination of innovation becomes an important element in award programmes (Moore 2005), where of course innovation is presented

as normatively good (Osborne and Brown 2011). Networks can be important in this regard (Albury 2005; Hartley and Bennington 2006; Swan and Scarbrough 2005). Innovations in governance (Moore and Hartley 2008) may also be seen as an extension of the network idea. These awards are a way

to publicize examples of creative problem-solving and accomplishment in the public service as a means of changing public attitudes towards the public service; and to disseminate information about, and thus encourage replication of, the best practices in the public service. (Borins 2000: 326)

The purpose of this article is also to highlight the value of the IPAC award applications. The awards were initially introduced during the reforms of the new public management and can be seen as part of them (Borins 2000: 322–3). They are now more than that. For Moore and Hartley (2008: 4), ‘innovation is seen as a key means to go beyond the quality improvement approaches of the 1980s and 1990s into a step change in the overall efficiency, effectiveness and responsiveness of government and public services organizations’. Further research should also be done on the link with public policy (Osborne and Brown 2011).

The proper way to understand innovation in the public sector may be to move back and forth from a database to case studies. What becomes of these innovations 5 or 10 years after the award is received? Little attention has been given to issues related to reconciling innovation and traditional control concerns. How do innovations developed within the public sector become institutionalized? Case studies could help us to understand the difficulties involved in the innovation process and come up with convincing prescriptions. This research at least confirms that the environment matters. In addition to government size, the unemployment rate as an indicator of the state of the economy, the presence of a budgetary deficit or surplus, and the presence of majority governments are important predictors of innovative behaviour.

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NOTES

- 1 Revenu Québec was the recipient of an OCTAS award in the ‘information technology (IT) project management’ category and also received an award from l’Institut d’administration publique de Québec in the ‘public service’ category for its ‘Wealth Indicators’ project.
- 2 The ‘Find Yourself Here’ Campaign won a gold CASSIE Award (a marketing award) and multiple Adrian Awards (a travel and tourism award) before applying and being selected as a finalist by IPAC. Ontario French-Language Services received a Certificate of Excellence at the Public Sector Quality Fair and an Amethyst Award prior to earning recognition as a finalist in the IPAC Innovation Award.

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