

REGULATION AND GROWTH

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Centre for Productivity
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Abstract

The primary objective of the *Centre for Productivity and Prosperity* is to understand why Quebec is lagging behind other jurisdictions in terms of productivity and living standards. Many explanations have been put forth in an effort to explain this gap. The goal of this report is to study the extent to which it can be explained by differences in the level of regulatory activity in Quebec and in other jurisdictions. We focus on characterizing the link that exists between regulation and productivity. Although there has been a period of almost three decades of deregulation in markets throughout the world, in Canada, and in Quebec in particular, many industries are still heavily regulated. Regulation is sometimes essential when there is market failure; however, in many cases regulation exists despite the absence of any obvious market failure. Moreover, regulation, in particular regulation that limits entry of new firms or that controls prices, can severely limit economic growth by lowering competitive pressures faced by incumbent firms or by hindering the introduction or adoption of more efficient new technologies. This may reduce the efficiency with which these firms operate and may limit their incentive for investment, thereby slowing technological progress.

1_ Introduction

Quebec lags behind other jurisdictions in terms of productivity and living standards. In 2008 Quebec's per capita gross domestic product (GDP) was measured at C\$38 898. Meanwhile Ontario's per capita GDP was C\$45,472, while the average across Canada was C\$48,106. An even larger gap exists relative to the United States where per capita GDP was C\$57,642 in 2008. Furthermore the growth rate of per capita GDP in Quebec between 1981 and 2008 (1.42%) was lower than in Canada (1.58%) and than in all other OECD countries save Switzerland (1.03%) and New Zealand (1.31%).¹

Many explanations have been offered in an effort to explain this gap. The goal of this report is to study the extent to which it can be explained by differences in the level and extent of regulatory activity in Quebec and other jurisdictions. We focus on characterizing the link that exists between regulation and productivity. Although there has been a period of almost three decades of deregulation in markets throughout the world, in Canada, and in Quebec in particular, many industries are still heavily regulated. For instance the banking industry, energy markets, the telecommunications industry, and agricultural markets all feature significant government involvement.

Regulation is sometimes essential when there is market failure; however, in many cases regulation exists despite the absence of any obvious market failure. Moreover, regulation, in particular regulation that curbs the entry of new firms or that controls firms' strategic variables such as price, can severely limit economic growth by lowering competitive pressures faced by incumbent firms or by hindering the introduction or adoption of more efficient new technologies. This may reduce the efficiency with which these firms operate and may limit their incentive for investment, thereby slowing technological progress.

The rest of this report is organized as follows. The next section provides an overview of economic regulation. More specifically, it explains why some markets are regulated while others are not, and how governments typically go about controlling markets. Section 3 explains the theoretical work that has been done to explain the link between regulation and growth. Section 4 reviews the empirical studies that have tested for this relationship. Finally, Section 5 concludes and offers suggestions for possible future studies on the link between regulation and growth with a specific focus on understanding this relationship in the context of Quebec.

¹ Calculations extracted from Productivity and prosperity in Quebec, 1981-2008 overview, Center for productivity and prosperity, HEC Montréal, 2009.

2_ Regulation

What is regulation?

Regulation is the use of the government's power to coerce for the purpose of restricting the decisions of economic agents (Viscusi et al., 1995). There are two main forms of regulation: economic regulation and social regulation.

Economic regulation

Economic regulation refers to government control of firms' decisions over price, quantity and other strategic variables, and over entry and exit into markets. For example, when governments intervene to set rates for electricity service or to impose restrictions on entry into airline markets, they are exerting control over firms' decisions and engaging in economic regulation.

Social regulation

Social regulation refers to government control of individual and firm behavior with respect to environmental and health/safety consequences of the production and consumption of goods/services. For example, when governments set quality standards for automobile seat belts, or speed limits for highways, they are controlling individual behavior.

In this report we will be interested in the effect of *Economic regulation*, and on understanding the impact that this form of regulation has on productivity and therefore on economic growth.

Why is there regulation?

Public interest explanation

The most often cited justification for regulation is that it represents the "second best" alternative. That is, in a situation in which there is market failure, the outcome achieved under regulation may be better than the outcome that would arise if the market remained unregulated. More specifically, industries that are characterized by market failure may require government intervention in order to protect the interests of consumers -- in particular if the good or service is deemed essential.

Perhaps the most common form of market failure that leads to government intervention is the existence of a *natural monopoly* situation. A market is said to be a natural monopoly situation if it is more efficient for one firm to serve the entire market than it would be for more than one firm. Usually, natural monopoly is associated with economies of scale -- average costs that are always decreasing in quantity produced. A single large producer with an average cost curve that is always decreasing in output may be in a position to drive competitors out of the market, at which point it can charge the monopoly price. If entry is unrestricted, consumers could face fluctuating prices since competitors will be attracted to the market by the single firm's positive economic profits. Upon entry, the incumbent would again lower price to drive the entrants from the market. Therefore regulation may be necessary to control entry and limit the exercising of market power by the single producer. This is typically the justification for regulation of utilities such as electricity and water, and of rail transport.

More generally, excess market power or lack of competition can be considered market failure in the sense that the market does not clear (supply and demand are not equal). For this reason governments will sometimes intervene in order to prevent the future establishment of a monopoly in a market. The fear of predatory pricing behavior that would drive out (or prevent the entry of) competitors may lead governments to exert control over prices. For instance many provinces and states have adopted 'below-cost sales' laws that prevent firms from selling below either their cost or their competitors' costs. Advocates of these policies typically associate aggressive pricing with predatory behavior and believe that imposing price floors will deter this sort of conduct.

On somewhat the opposite extreme, governments may also intervene in situations of *excess competition*. The worry is that, in immature industries, if too many firms compete, then they will not earn sufficient revenues to cover their costs leading to exit of firms from the industry. This may prevent the growth of particular industries and/or lead to instability and to fluctuating prices. For example, in the early days of the airline industry there were many firms attempting to participate. As a result of the intense competition that resulted many firms failed leading to tremendous price volatility (see Vietor, 1989).

Market failure may also occur when there are *externalities* generated through production or consumption. Externalities are generated when the behavior of one economic agent affects the well-being of another. If the externality generated is positive, since the producing agents fail to take into account the external benefits provided by their behavior, too little of the good is produced from a social perspective. If the externality generated is negative, too much is produced. In this case the purpose of regulation is to force producers to internalize the cost of the externality they generate (Baldwin and Cave, 1999). Positive externalities can also necessitate regulation. The government can intervene in order to make sure that enough of the good or service is produced from a social perspective.

Similarly, *public good* production may also require government intervention. Public goods or services are those that are non-rival and non-excludable. They are non-rival in the sense that consumption by one agent does not preclude consumption by another, and non-excludable in the sense that no agent can be prevented from consuming. Public goods are subject to a free-rider problem in that agents can take advantage of the good or service without having to contribute to its funding. For instance all agents might benefit from better infrastructure (roads, bridges, airports), but, when asked to contribute to its provision, they hope that others contribute in sufficient numbers that the infrastructure is provided without their support. Therefore, the private market may not supply the good or service (or enough of it). If the good or service in question is considered to be essential, government involvement may be necessary.

Another important reason for market failure is *imperfect information*. Markets may fail if there is insufficient or asymmetric information. The uninformed or less informed party may be unwilling to participate in the market for fear of being taken advantage of. For instance firms have greater information regarding the quality of the goods and services that they supply than potential consumers. Since it is very difficult for firms to credibly convince consumers of the quality of their goods and services, the market may fail. Similarly, in financial markets, borrowers may have information that is not available to the lender. The asymmetry that exists between the level of information possessed by the firm or borrower and the consumers or lenders may prevent the proper functioning of the market.

Finally, markets may fail as a result of *coordination problems*. Sometimes the payoff for an economic agent from making different choices depends on the choices made by other agents. As a result a coordination problem arises whereby an agent would choose one particular action if it knew that another agent was making one choice and a different action if it thought the other agent was choosing something else. Such a coordination problem exists for instance with bank deposits. Banks receive deposits from customers and then proceed to use all but a small fraction of these deposits to make loans of various kinds. Customers have two possible actions in this simple example: They can either leave their investment with the bank and earn some positive rate of return, or they can withdraw their investment. If we assume that they have no better opportunity available for their funds, then it is clear that they would prefer to leave their investment with the bank since this provides them with a positive return while withdrawing their investment provides them with no return. However, this is only their preferred action if other agents also leave their money with the bank. If, on the other hand, the majority of other customers begin to withdraw their money from the bank creating a run on the bank, the agent in question would prefer to withdraw. This is true for all agents, and so, a coordination problem exists in which customers prefer to leave their money if others do also, and withdraw if others do. Government interference may help to resolve the coordination problem. In the example above, governments require deposit insurance in order to assure customers that their deposits will not vanish in the event of a run on their bank.

Problems with the Public Interest explanation

The problem with the public interest theory is that there are many instances where regulation exists but where there do not appear to be any sort of market failures. Specifically, there are many markets that are potentially competitive, but in which regulation exists. Moreover, regulation is often supported by firms, which is at odds with the public interest theory.

Capture explanation

An alternative theory is that regulation is supplied in response to the industry's demand for regulation. This theory is known as the *capture theory* of economic regulation (Stigler, 1971). The argument is that regulatory agencies are created by captured legislatures and wind up being controlled by the industry being regulated.

This theory has come about for two reasons. First, there is evidence that in some industries regulation is favorable to firms. An example of this is provided in Viscusi *et al.* (2000). They refer to U.S. regulation that set limits on truck payloads. The limits were for 7,000 pounds on trucks serving two or more railroad stations and 14,000 pounds on trucks serving just one station. These restrictions were favorable to the railroads since the lower limit was placed on trucks serving multiple railroad stations as these were the trucks that were competing with the railroads. Second, there is evidence of pre or post regulatory agency employment of commissioners at U.S. regulators. Specifically, commissioners at U.S. regulators are twice as likely to come from related public sector or regulated employment as related private sector employment. However, they are five times as likely to leave to related private sector employment as to related public-sector.

Problems with the Capture explanation

Of course, there are lots of instances where regulation is not favorable to the firms in the industry being regulated and so is not supported by the industry. Frequently, regulation does result in higher profits for firms. More importantly, this theory provides no explanation as to how regulation comes to be controlled by the industry.

Economic theory

Faced with these two deficient explanations as to when and why industries are regulated, economists have developed models to rationalize the existence of regulation and characterize situations when it might occur.

The models are based on the following assumptions:

- i) The state has the power to coerce;
- ii) Agents are rational (simply put, they want to improve their wellbeing);
- iii) Agents compete to promote their agendas by offering political support to legislators;
- iv) Legislators are interested in staying in office;
- v) Regulation is one way to redistribute wealth.

The models are referred to as “Interest group explanations for regulations” (see Viscusi *et al.* (2000)) and are due to Peltzman (1976), Becker (1983), and Stigler (1971). They explain that regulation is more likely to arise in very competitive markets or in monopoly since in each case there are interest groups that could benefit greatly from government intervention. In competition, firms may engage in lobbying activity since otherwise they earn no economic profits. In monopoly, consumers may push for regulation since they face high prices and limited quantity. More generally, when there is some sort of market failure, some disadvantaged groups will have incentive to engage in lobbying.

Related is the theory that regulation is simply a means to redistribute income from one group to another. The net receivers are those from the group with more political influence than the net givers. Consider for instance the telephone or electricity markets. Regulation of these markets can often involve specifying the same or similar rates for consumers regardless of their home location. Since it is cheaper to serve consumers in more dense markets, the implication is that consumers in less dense markets are subsidized by those in more dense markets. This is often referred to as “Taxation by Regulation” (see for instance Posner, 1971).

Factors Affecting Levels of Regulatory Activity

What is the rationale for deregulation and/or privatization? For a government contemplating liberalization of an industry the critical question is the following: when regulatory controls are removed, what will transpire? The motivation for restructuring is the view that some regulated or privatized markets do not in fact represent market failure –namely, that they do not constitute natural monopoly situation- and so if these industries are restructured and competition is permitted, greater efficiency will arise. The goal of restructuring efforts has been to produce benefits to consumers in the form of the lowest prices possible while guaranteeing continued reliable supply and maintaining or creating incentives to innovate. It is also hoped for that more choices will be offered to consumers.

On the other hand, the typical arguments against liberalization usually make reference to the fact that without regulation or without public ownership some customer classes will not be serviced since cross-subsidization would surely be a casualty in a liberalized market; and to the

fact that many regulated industries although perhaps not natural monopolies, are nonetheless oligopolistic, and so prices will increase drastically with deregulation.

More generally, there are a number of factors that affect the level of regulatory activity. The most important of these are:

- i) The macroeconomic context,
- ii) The political context,
- iii) Regulatory failure,
- iv) Entrepreneurial pressure, and
- v) Technological innovation (see Vietor, 1989).

The historical experience with regulation suggests a pattern whereby markets become more and more liberalized as the economy grows and economic conditions improve. On the other hand, when the economy contracts, there is usually some belief that the contraction is, at least in part, due to the lack of government oversight.² This typically leads to an increase in the extent to which the government is involved in business and the extent to which markets are regulated. The opposite can occur during a period of weak growth when this lack of growth is attributed to too much government involvement or to regulatory failure. Much of this has to do with the current political context.

There are additional pressures on governments to intervene more or less in the economy that stem from technological innovation and increased entrepreneurship. Both innovation and entrepreneurial activity can make the competitive or regulated status quo seem inappropriate (Vietor, 1989). For instance, in the context of the telecommunications industry, regulation imposed early in the twentieth century no longer seemed appropriate towards the end of the century as a result of technological improvements that drastically lowered the fixed costs of providing certain services.

How does the government control economic activity?

There are a variety of ways that governments can control economic activity. The degree to which activity is controlled depends on the mechanism employed. At the extreme, the government can take ownership of the firm in the industry. This is referred to as *public ownership*. Most often this is done in the context of natural monopolies. For natural monopolies, public ownership can achieve efficient pricing. Public ownership can ensure sufficient investment, adequate levels of safety and security, and can reduce the overall regulatory cost. At times, governments use their control to help provide macroeconomic

² For instance the subprime mortgage crisis of 2007-2009 led to immediate calls for more government oversight of the banking industry.

stability. For instance public ownership can permit governments to set really low prices and subsidize any losses out of general taxation. On the other hand, public ownership can lead to agency problems since the objectives of the owners of the firm are not necessarily consistent with those managing.

Alternatively governments can auction off the right to own and/or operate a natural monopoly. This is referred to as *franchise bidding*. The government awards the natural monopoly via some sort of bidding process. In this case the winner of the auction is allowed to operate the firm as an unregulated monopolist and the government could in theory use the proceeds of the auction to compensate anyone disadvantaged by the existence of a monopolist.

More often governments intervene in markets by engaging in regulation; that is by controlling activity. In what follows we discuss the primary mechanisms used by governments to control economic activity.

Instruments of regulation

The main tools that governments employ in order to control economic activity are the following:

- i) Control of price,
- ii) Control of quantity; and
- iii) Control of entry and exit.

Sometimes, governments will exert control over other variables such as product quality, investment, and advertising (Viscusi *et al.*, 2000).

Control of price

Governments can impose price ceilings or price floors, or even require that prices remain in a certain interval. These types of policies are typically implemented in instances where governments are worried about monopoly pricing and/or predatory pricing.

In the case of natural monopoly, regulatory agencies will usually try to address the fact that competition has been limited by restricting prices to a certain level. In terms of efficiency, the agency would ideally restrict prices to be equal to marginal costs, but in practice, since these are not observable, price is often restricted to be equal to average cost. This reflects the typical solution of regulatory agencies: to set prices such that total revenues exceed total costs.

Often this is done by setting prices that allow for a particular rate of return. This is known as *rate of return regulation*. Regulatory agencies hold “rate cases” at which “just and reasonable” prices are determined.

For instance, in Canada prices for patented prescription drugs are strictly regulated. Health Canada introduced a government agency, the Patented Medicine Prices Review Board through amendments to the Patent Act in 1987. This board regulates drugs that are still under patent and which have no generic substitutes establishing the maximum prices that can be charged in Canada for patent drugs (Anis and Wen, 1998; Paris and Docteur, 2007).

Rates in energy markets are also typically regulated. In the Quebec electricity market, in order to protect domestic consumers from possible price increases as a result of restructuring efforts undertaken by Québec's energy provider, Hydro-Québec, the domestic wholesale electricity price was capped through a social compact known as the Heritage Pool. The Heritage Pool requires that Hydro-Québec supply 165 TWh of electricity per year for distribution to Quebec residents at a fixed wholesale price of 2.79 cents per kilowatt hour (kWh). In Ontario following an attempt to deregulate the electricity market, the provincial government enacted the Electricity Pricing, Conservation and Supply Act, 2002, on December 9, 2002. This Act restricted the price of electricity to 4.3 cents per kWh for low volume consumers. It was increased April 1, 2004 to 4.7 cents per kWh for first 750 kWh/month, then 5.5 cents after (Trebilcock and Hrab, 2003).

If, on the other hand, the concern is about predatory pricing that would drive some competitors out of the market resulting in a less competitive environment, regulatory agencies may impose a price floor. A price floor would help to ensure a minimum margin for firms in the industry.

Currently, three Canadian provinces (Quebec, Nova Scotia, and Prince Edward Island) and (as of 2002) thirteen states in the U.S. have some form of below-cost sales statutes in the retail gasoline market (Skidmore *et al.*, 2005). Other goods and services are also sometimes subject to such restrictions. For instance, in Tennessee there are floors in the markets for cigarettes, milk, and frozen desserts. Wal-Mart was charged in Wisconsin for selling milk below cost in 2002. More generally, some states have sales-below-costs laws that apply broadly to all products.

Control of quantity

Governments can limit the amount firms produce. Sometimes in conjunction with price regulation, the government will impose laws requiring firms to sell a specified amount at the regulated price (Viscusi *et al.*, 1995). Also, sometimes when high price supports are imposed (for instance in agricultural markets) large stockpiles are created. In such cases the government may pay firms not to produce certain quantities. Quotas are also employed to limit production (Carlton and Perloff, 2005).

Control of entry and exit

Sometimes, especially in the case of natural monopoly, entry of new firms is banned altogether. Entry can also often be restricted in industries by requiring potential entrants to become

licensed. Sometimes, licenses can be acquired by successfully passing an exam. In other cases, new licenses are sold with the proceeds from the sale of the licenses going back to the original members of the industry. Many occupations such as lawyers, doctors and dentists require licenses in order to practice. The result is typically reduced supply and therefore higher wages (Kleiner, 2000).

Control of other variables (for example advertising)

There are other variables whose control can also influence the entry and exit of firms. For instance, the control of advertising may influence market structure. In particular, advertising restrictions can prevent new firms or products from breaking into markets. This has been shown to be the case in Quebec where restrictions exist that prevent firms from targeting their advertising towards children. Advertising is restricted in a number of other instances, and so similar effects might arise. For instance, direct-to-consumer advertising for prescription drugs is prohibited under Canada's Food and Drugs Act, which is enforced by Health Canada. Despite this prohibition, Health Canada currently allows two forms of advertising:

- (i) Reminder ads, which include only the brand name and no health claims or hints about the product's use; and
- (ii) Disease-oriented or help-seeking ads, which do not mention a specific brand but discuss a condition and suggest consumers ask their doctor about an unspecified treatment (Gardner *et al.*, 2003).

Neither type of advertisement is required to include risk information. Because of the extent of regulation, the pharmaceutical industry in Canada spends much less on direct-to-consumer advertising than in the US where DTCA restriction was relaxed in 1997 (CAD 22 million in 2006 in Canada (Mintzes *et al.*, 2009) compared to USD 4.2 billion in 2005 in the US)³.

³ U.S. Government Accountability Office (<http://www.gao.gov/htext/d0754.html>)

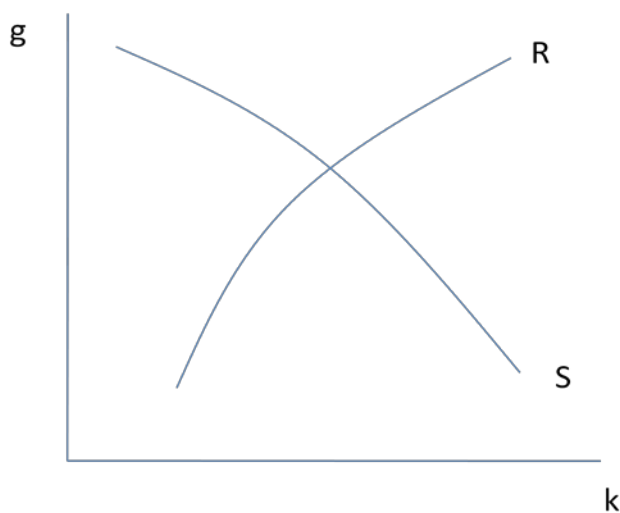
3_ Regulation and growth

What are the channels via which regulation affects growth?

In this section, we describe the channels through which regulation can affect economic growth. The primary mechanism via which regulation affects growth is through its effect on restructuring and factor reallocation. The process whereby restructuring and factor reallocation drives economic growth is known as *creative destruction* – a term coined by Joseph Schumpeter (Schumpeter, 1942). Creative destruction refers to the replacement of old products and technologies by newer and more efficient ones. This process permits economies to adapt to and to exploit new technological innovations and to evolve along with the changing economic environment (Aghion and Howitt, 1992; Caballero and Hammour, 2000).

The process of growth through creative destruction can be understood by studying the relationship between the rate of economic growth and the amount of capital per efficiency unit of labor (Howitt, 2007). Figure 1 plots this relationship with the rate of economic growth (growth rate of GDP per worker) on the y-axis (g) and the stock of capital per efficiency unit of labor on the x-axis (k):

Figure 1: Endogenous growth



The downward-sloping curve denoted by S shows how much capital per efficiency-unit of labor the economy ends up with in the long run, given the rate of economic growth. A higher rate of growth implies a faster rate of technological progress and therefore a faster-growing labor force (in efficiency units). The upward-sloping curve denoted by R shows the incentive to engage in research and development. The level of research and development in the economy determines the rate of technological progress and therefore the long-run rate of economic growth.

The long-run growth rate is determined by the interaction of these two curves. Factors that increase the expected returns to innovation and so influence economic agents to engage in more research and development shift the R curve upwards and cause the long-run growth rate to go up. Similarly, factors that encourage agents to save more shift the S curve up.

Regulation, can act as a disincentive to save if it reduces the value of an investment project. In this case, regulation acts in the same way as a fall in the savings rate. The S curve shifts down and growth falls. Regulation can also have an influence on the R curve by affecting the expected returns to innovation (Crafts, 2006).

The returns to innovation depend on the markup earned from the sale of the product. The markup depends explicitly on the regulatory environment. Restrictions on the entry of new firms will increase expected markups for existing firms since competition will be limited. This may encourage more innovation since the return could be greater. On the other hand, in the absence of entry restrictions existing firms will be motivated to engage in research and development in order to protect their market share. Price ceilings or required rates of return will limit the expected benefits for existing firms, as well as for potential entrants. When markups are lower, firms have less incentive to invest since their return on investment is reduced.

Regulation that imposes a ceiling on the rate of return on capital can also influence the production decisions of firms. In particular, rate ceilings on capital can affect the input mix, namely the demand for capital relative to labour (Averch and Johnson, 1962).

More generally, a proper institutional environment is necessary in order for the creative destruction process to take place efficiently. Weak institutions can slow or halt the creative destruction process. More specifically, regulation can act as a force that slows down restructuring. Caballero and Hammour (2000) propose that one outcome of a disrupted creative destruction process is *sclerosis*, wherein low-productivity units survive longer than they would in an efficient equilibrium.

Sometimes, the fact that low-productivity firms remain in the market is the result of regulation explicitly preventing new firms from entering. Other times, it may be the consequence of less explicitly anti-competitive regulation such as price floors. Carranza *et al.* (2009) show that price floors can deter the entry of high-productivity firms by making it more profitable for low-productivity firms to remain active. When low-productivity firms remain in the market they can act as a deterrent to more productive potential entrants. The latter will expect lower profits should they enter and so instead they stay out of the market (see also Caballero *et al.*, 2008 who study the effect of regulation on entry, exit and productivity in Japanese banking).

At a more minor level, there is another cost of regulation associated with compliance or red tape. Increases in compliance costs can influence the costs firms must incur when expanding their productive capacity.

Finally, regulation and in particular privatization can generate agency problems because of the ownership arrangement. As pointed out by Nicoletti and Scarpetta (2003) incentives for monitoring, cost efficiency, and innovation may be stronger for private firms since owners get the full benefit from each of these actions. In contrast, the benefits from monitoring, cost efficiency and innovation accrue to the tax-payer in the case of public ownership, but tax-payers have no control over firm behavior.

4_ Empirical Evidence

Empirical evidence confirming theoretic results linking product market regulation to economic performance has been rather scarce if not inexistent before the second half of the nineteen nineties. Difficulty surrounding the gathering and collecting of quality and objective data on the levels of regulation and on the competitiveness of the economic environment across countries has explained in part this literature scarcity. However, significant progress has been made in this regard and recent empirical investigations have lead to advancement in the understanding of the impact of product market regulation on growth and productivity. Most of these macroeconomic studies have identified product market regulation as an obstacle to economic and productivity growth, mainly through its effect on market structure, on incentives for firms inside the market, and on the natural process of creative destruction. Results from these studies are summarized in Table 1 in the Appendix.

Another branch of the literature has used a different approach to examine the influence of product market regulation on growth. Rather than studying broadly the effect of regulation on overall growth, this branch of the literature seeks to discover the forces at play that lead regulation to affect growth. By exploiting episodes of regulatory reform in specific industries or differences in regulatory regimes in specific industries, some studies have succeeded in pinpointing more precisely the forces and the channels through which product market regulation affects productivity. We will discuss these microeconomic studies in the second part of this empirical literature review.

Macroeconomic evidence⁴

One of the earliest studies examining the macroeconomic evidence linking regulation to economic performance comes from Koedijk and Kremers (1996). Their paper employs both a statistical analysis and a simple cross-sectional approach and looks at eleven European countries. It finds a negative and significant relationship between GDP per capita and total factor productivity growth and product market regulation. Since their study focuses only on Europe, further investigation has been more comprehensive in an effort to confirm that the results are not specific to a European context.

Subsequent studies have built upon the work of Koedijk and Kremers and have refined the methodology as well as the product market regulation measures employed. More comprehensive studies have also aimed at including developing and developed countries in their

⁴ In this literature review we will focus on the impact of regulation on GDP and productivity growth. However, a lot of studies focus on the influence of regulation on other measures of economic performance. See for example, employment (Berger and Daninger, 2005), recession length (Bergoing *et al.*, 2004) and variance of economic performance (Aghion *et al.*, 2005).

analysis. For example, Djankov *et al.* (2006) use the business regulation database of the World Bank (Doing Business) to construct an aggregate index of business regulation for a sample of 135 countries by taking the simple average of country rankings in each of the seven categories in the database.⁵ Their results demonstrate that the effect of a more business-friendly environment on growth is positive even after controlling for the potential endogeneity of the relationship (that is, there could be unobserved factors that explain growth and that are correlated with having a more business-friendly environment). Concretely, improving from the lowest to the highest quartile in terms of business regulation generates a 2.3 percentage point increase in average annual growth of GDP per capita.

Jalilian, Kirkpatrick and Parker (2007) make use of a World Bank dataset of 117 countries to explore the impact of regulatory structures on growth based on two different techniques of estimation (cross-sectional and panel data methods). Their empirical results from both empirical approaches also strongly suggest a positive link between regulatory quality and economic growth. More precisely, a change of one unit of the aggregate regulatory index is associated with an average increase of 0.6-0.9% in economic growth.

Gorgens *et al.* (2003) model a more complex relationship between economic performance and regulation. They introduce a non-linear fixed effect model to evaluate the relationship between growth and regulation. The results suggest a variable effect of regulation as the level of regulation increases. Indeed, high levels of regulation lower growth, but this effect fades as the level of regulation diminishes. More specifically, a change from high to moderate regulation has a substantial effect on growth (2.5 percentage points). However, the authors find no evidence that further deregulation has any effect on growth. These findings have led research towards investigation of the conditionality of the relation between regulation and economic growth. Focus will be given to the following question: are regulation reforms as efficient in countries with poor quality governance as in countries where the quality of institution is markedly higher? In response to this question, Loayza *et al.* (2004) study the macroeconomic impact of regulation by examining its effect on economic growth and volatility and controlling for the quality of governance and institutions. Making use of six data sources,⁶ they construct a unique state-of-the-art database containing indices to measure the regulatory burden for 76 countries in the following seven areas:

- firm entry,
- labor market,
- fiscal burden,

⁵ The seven areas are: Starting a business, Hiring and firing workers, Registering property, Getting bank credit, Protecting equity investors, Enforcing contracts in the courts, and Closing a business.

⁶ Namely Doing Business (The World Bank Group), Index of Economic Freedom (The Heritage Foundation), Economic Freedom of the World (The Fraser Institute), Labor Market Indicators Database (M. Rama and R. Artecona, 2000), The Corporate Tax Rates Survey (KPMG), and International Country Risk Guide (The PRS Group).

- trade barriers,
- financial markets,
- contract enforcement, and
- bankruptcy regulation.

Their results, based on a cross-sectional approach, confirm the hypothesis that regulation has a harming effect on economic performance. However, when controlling for quality of governance, results indicate that the negative association between economic growth and regulation is mitigated by the quality of the institutional environment.⁷ Moreover, at the maximum level of governance quality, regulation seems to have no impact at all on economic growth. When estimating the importance of regulation on economic performance, they show that if a country's overall index increases by one standard deviation and its level of governance is equal to the world median, then its annual growth rate of GDP per capita would drop by 0.4 percentage point.

In a subsequent study, Loayza *et al.* (2005) examine the effect of regulation on economic growth and on the relative size of the informal sector, again conditional on the quality of governance and institutions. Making use of the same database as Loayza *et al.* (2004), they show that economic growth is negatively and statistically correlated with the overall index of regulation as well as with the labor and product market indices but not with the fiscal regulation index. However, like Loayza *et al.* (2004), they find that these effects were mitigated with the improvement of the overall institutional framework.

One important paper in the assessment of the effect of regulation on productivity is the work of Nicoletti and Scarpetta (2003) who study the link between multifactor productivity and regulation using a panel of 18 OECD countries over the period of 1984-1998. They exploit the heterogeneity of the product market regulatory environments in the OECD to show that a negative and significant relationship exists between economy-wide product market regulation and multifactor productivity. Nicoletti and Scarpetta (2003) also conclude that the detrimental effect of excessive regulation is mainly due to the slowing down of technological catch-up of the least productive country towards the technological frontier. They introduce a concept of convergence by adding that the further the industry or country is from the technological frontier and the reform leader the greater they benefit from liberalization of markets and state retrenchment. By decomposing product market regulations, the authors also identify that the lower the proportion of state control and entry barriers, the faster the process of catch-up takes places in manufacturing industries through the diffusion of technological advancement. Moreover, the results suggest that privatization is associated with productivity gains and technological catch-up by increasing the competitive environment and firms' incentives.

⁷ The authors estimate the quality of governance by averaging the values of indicators measuring the absence of corruption in the political system, the prevalence of law and order, and the level of democratic accountability. These data are taken from the International Country Risk Guide.

Conway *et al.* (2006) use a comparable approach and reach similar conclusions to Nicoletti and Scarpetta (2003). They examine more specifically the relationship between product market regulation and the convergence of labor productivity growth in a sample of 21 OECD countries between 1978 and 2003. They find that the level of product market regulation affects negatively the process by which positive productivity shocks spread from one country to the other and the integration of new technologies in the production. More specifically, an excessive regulatory burden might hinder productivity convergence by two principal channels. First, product market regulation is an important determinant of investments in information and communication technology which in turn is a fundamental driver of productivity convergence. By way of simulation, the authors estimate that the proportion of investment in ICT to total investment would rise, on average, by 2.5 percentage points if the countries would adopt the same regulatory framework of the least restrictive OECD country in each of the industries. Second, restrictive regulation deters the establishment of foreign subsidiaries by multinational enterprises, reducing the international diffusion of technologies and therefore the spread of productivity shocks.

These studies highlight the role that regulation plays in limiting technological diffusion and the consequences for productivity growth. However, while technology is perhaps the main channel by which the regulatory environment affects firms' productivity growth, competition is the main force behind the incentives to invest and to innovate. Empirical evidence is now accumulating towards the positive effects of competition on productivity growth principally by the way of creative destruction predicted by the Schumpeterian model but also by forcing technological leaders to innovate in order to keep their privileged position in the market.

Griffith *et al.* (2006) exploit the reforms carried out under the Single Market Programme (SMP) in the European Union to estimate the effect of regulation on competition, innovation, R&D and ultimately productivity. Using an unbalanced panel of 9 countries between 1987 and 2000, they find that regulation is associated with increased competition and productivity. More specifically, SMP reforms increased substantially product market competition, which in turn increased innovation and productivity growth through augmentation of R&D investment intensity. In fact, the results suggest that an increase of 1 percentage point in R&D is associated with a 0.6 percentage point increase in TFP growth.

Cincera and Galgau (2005) reach similar conclusions while using a two-step procedure to evaluate the effect of product market reform in Europe on macroeconomic performance and more precisely on labor productivity growth. They first estimate the impact of deregulation on firm entry and exit rates while controlling for country and industry specific characteristics such as entry barriers. In the second stage of the estimation, they evaluate the relationship between firm entry and exit rate and different economic measures such as employment, R&D investment and labor productivity growth. Their results suggest a positive relation between firm entry and

exit rates and labor productivity and employment growth. For example, a one percent increase in firm entry and exit rates increases labor productivity growth by 0.6 percent per year.

Indirect effect

Numerous authors have studied the effect of regulation on factors other than productivity or growth. Since the impact of regulation on productivity is often considered to unfold in two steps rather than directly, these studies can give us useful insight on the influence of these intermediate factors on economic performance. For example, Alesina *et al.* (2003) find a negative and statistically significant link between investment and various measures of regulation in the product market. Dawson (2006) finds similar results while focusing on the relation between private investment and regulation indices in the labor market, the credit market and the business environment.

What do we know about regulation and growth in Canada?

Based on the empirical results from Conway *et al.* (2006), Conway and Nicoletti (2007) draw a certain conclusion regarding the specific case of Canada. First, they note that while economic growth has been impressive for the past decade, labor productivity growth has been rather mediocre for the Canadian economy. These disappointing results come from past regulatory reforms that have missed their goals to encourage a competitive environment particularly in certain non manufacturing industries such as electricity, railroad transportation, postal services, etc. In the Canadian context, the non-competitive regulation has hindered adoption in new technologies which in turn impacted negatively productivity growth. In their simulation exercise, Conway and Nicoletti estimate that the proportion of information and communications technology investment in total investments would rise from 19 to 21 % if the Canadian regulatory reforms between 1977 and 2003 in the networking and other services industries would have brought the regulatory environment at the same level as the most liberal countries in the OECD. Consequently, Canada would have experienced a 1 % higher annual productivity growth.

Gu and Lafrance (2008) in a study on the evolution of some regulated industries in Canada find that the sectors where deregulation took place were the ones that experienced the biggest shift in productivity growth. For example, over the 1977-2003 period, productivity growth in the rail transportation, the broadcasting and telecommunications, and the financial intermediation and insurance carriers sectors was higher than the business sector average. Meanwhile, during the same period, the two cultural industries (publishing, data processing and information services; motion pictures and sound recording industries), where there was less deregulation, showed little productivity gain. Finally, while undergoing relatively important deregulation the air transportation industry experienced lower productivity growth, but was affected by the

recession of 1990, the effects of the 9/11 attack on air transportation and the surge in oil prices. In the second part of the study, a comparison between the Canadian industries and their U.S. counterparts exhibit that the industries that went through the most deregulation showed productivity growth higher or comparable than in the United States. This was the case for broadcasting and telecommunications, transportation (except air transportation) and financial services industries. Again, the cultural industries, much more regulated than in the United States, showed little productivity growth compared to their U.S. counterparts.

Microeconomic evidence

Microeconomic studies focusing on specific product market reforms or heterogeneity across legislation to study the impact of regulation on an industry's economic and financial performance seek to uncover the driving forces behind the relationship between regulation and growth. Product market reform and regulation not only affect productivity growth directly, but also modify the incentives to invest in R&D, to innovate, to enter a market, or leave it. Product market regulation literally defines a market structure, its growth, and economic viability. Taken together these effects trace the trend of economic performance and by the same token shape the growth of productivity in a market, a region and a country. Therefore, microeconomic studies give us an insight into the forces at play at the firm and market level and allow researchers to confirm or confront overall macroeconomic evidence.

For example, the work of Olley and Pakes (1996) demonstrates that the deregulation in the telecommunications industry in the United States between the nineteen-seventies and nineteen-eighties created an important surge in productivity growth. The liberalization of the industry provided an opportunity to new firms to enter the industry and modified substantially the number and the size of the incumbents. More precisely, the data show that this productivity growth has materialized through the reallocation of capital from less productive towards more productive establishments. These results show just how regulation can protect less productive firms in an industry, slowing the natural process of creative destruction or simply modifying the incentives to innovate and to stay competitive in a market.

Using a similar approach Jayaratne and Strahan (1998) show that bank performance improved significantly following a major deregulation in the banking sector in the United States, allowing bank expansion and nation-wide branching.⁸ While performance of the banks following the changing regulatory environment has increased the quality of loan management notably by reducing significantly the rates charged to the consumers on the loans, profits of the banks didn't raise. This might be explained by the expansion of the more efficient banks at the expense of their less efficient counterparts, increasing the competitive pressures on banks, therefore

⁸ Jayaratne and Strahan (1998) measure bank performance in a number of different ways such as net income on assets, net income on capital, non-performing loans on total loans, etc.

reducing the profit margin. This means that the reductions of the costs of the loans were almost entirely passed on to the borrowers.

Dick (2006) studying these same regulatory reforms and using a sample of banks in the United States between 1993 and 1999, takes advantage of this major nationwide reform in the banking system to evaluate its effect on market structure, quality and bank performance. Following the Riegle-Neal Act, banks were now authorized to open branches and buy other banking firms across the country. This had an important impact on the competitive environment of the banking industry where non-performing banks were forced to leave the market paving the way to more efficient ones. This caused an increase in the quality of the service offered to consumers by establishing greater networks, free of fees, throughout large geographic regions. Following deregulation, interest rates on loans fell, while the rates on deposit rose and average profit remained unchanged indicating once more the taking over of more productive banks.

De Serres *et al.* (2006) also explore the regulation of the financial and banking system. However, contrary to Dick (2006) and Jayaratne and Strahan (1998) they focus on the effects of financial regulation on the overall economic performance of a country. Their data consist of a panel of 20 countries of the OECD between 1994 and 2003. The results show that regulation in the financial system has a negative and statistically significant impact on output and productivity. This influence is particularly important for sectors relying more heavily on external sources of funding. The results from estimating the impact of financial regulation indicates that if countries with the most restrictive banking regulation would reform to the level of OECD average, annual GDP growth would increase by 1/4 to 1/2 percentage point. Of course their analysis does not cover the financial crises of 2007-2009.

Clark (2007) comes to a similar conclusion, but in a different context. Cereal prices in the Canadian province of Quebec where advertising directed at children is prohibited are systematically higher than in the neighboring province of Ontario where this type of advertising is not restricted. Studying the breakfast cereal industry, Clark shows that the regulation has an unintended influence on competition. The inability to advertise hinders the introduction of new products and therefore allows established brands -- older and better known brands -- to do better than they otherwise would.

Haskel and Sadun (2008) study the impact of regulation in the UK retail industry. They find a significant relationship between firm size and total factor productivity growth. In a two-step approach, they first document the shift towards smaller stores after a regulation reform made it much harder to build large out-of-town stores. In the second step, they show that there exists a positive relationship between total factor productivity for multi-store chains and different measures of store sizes within a chain. Their results suggest that this decrease in productivity

accounts for about 40% of the TFP growth slowdown registered since 1995 in the UK retailing industry.

Finally, Carranza *et al.* (2009) analyse the consequences of a price floor regulation in effect in the Quebec retail gasoline market. They show that the new policy modified the market structure by affecting stations' incentives and hindering competition in the market by discouraging larger and more productive stations from entering. At the same time, smaller and less efficient stations were able to survive and their proportion was significantly higher than in the neighboring province of Ontario where no such regulation was in place. In terms of prices, in the short-run, following the reform Quebec's prices rose relative to those in Ontario. However, in the long-run prices in Quebec were higher as the policy lowered the overall productivity of stations by modifying incentives and therefore market structure, encouraging the survival of many small and inefficient gas stations. The presence of more stations in the regulated market of Quebec generated more intense competition and therefore a tendency for lower prices relative to the unregulated market of Ontario. Again, this paper demonstrates the very close link between regulation and productivity. As seen before, the regulation affects primarily the incentives for the players in the market. Whether it is the incentives to invest or the incentives to enter or exit a market, regulation changes the market organization which in turns influences the level of productivity in the market and eventually in the economy as a whole.

5_ Conclusion

Summing up, we have seen that the level of regulation is an important determinant of productivity growth at the national level through its impact on incentives to invest, innovate or to enter or leave a market. Although, regulation is often a political tool used to serve social goals such as protecting particular groups, in the economy its impact on productivity and on economic growth and well-being can be important. In the micro studies discussed last we can see the way in which regulation disrupts the natural creative destruction taking place in individual markets and the way it therefore hinders productivity growth. This then translates into consequences for the overall macroeconomy. Product market regulation should therefore be (re)examined carefully before reforming a sector or an industry because there are often distortionary effects of regulation.

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Appendix

STUDIES	SOURCES OF REGULATION MEASURES	ESTIMATION	COUNTRIES	PRODUCTIVITY MEASURES	MAIN CONCLUSIONS
MACROECONOMIC EVIDENCE					
KOEDIJK AND KREMERS (1996)	The World Bank, OECD, Netherlands Ministry of Economic Affairs	Cross-sectional analysis	11 European countries	TFP LP CP	<ul style="list-style-type: none"> Productivity growth is negatively correlated with product market regulation.
GORGENS ET AL. (2003)	Economic freedom indicator (The Fraser Institute)	Fixed-effect model (Semi-parametric regression)	Unbalanced panel of 123 countries (1970-2000)	GDP	<ul style="list-style-type: none"> Liberalization from high regulation to moderate increases GDP growth. Further liberalization has no effect on GDP growth.
NICOLETTI AND SCARPETTA (2003)	OECD International Regulation database	Fixed effect model	18 OECD countries (1984-1998)	TFP	<ul style="list-style-type: none"> Negative and significant relation between economy-wide product market regulation and multifactor productivity growth. The further an industry or country is from the technological frontier and/or the reform leader the greater they benefit from liberalization of markets and state retrenchment.
LOAYZA ET AL. (2004)	Aggregate index of 6 data sources	Cross-sectional analysis	76 countries	GDP per capita	<ul style="list-style-type: none"> Regulation has a harming effect on economic performance. The negative association between economic growth and regulation is mitigated by the quality of the institutional environment.
CINCERA AND GALGAU (2005)	OECD Product market regulation database	Two-step fixed-effect estimation	9 OECD countries (1997-2003)	LP Employment	<ul style="list-style-type: none"> Negative relation between regulation and firm entry and exit rates. Positive relation between firm entry and exit rates and economic performance (labor productivity and employment growth).
LOAYZA ET AL. (2005)	Aggregate index of 6 data sources	Cross-sectional analysis	75 countries	GDP per capita	<ul style="list-style-type: none"> Economic growth is negatively and statistically correlated with the overall index of regulation as well as with the labor and product market indices but not with the fiscal regulation index. The negative association between economic growth and regulation is mitigated by the quality of the institutional environment.

STUDIES	SOURCES OF REGULATION MEASURES	ESTIMATION	COUNTRIES	PRODUCTIVITY MEASURES	MAIN CONCLUSIONS
CONWAY ET AL. (2006)	OECD International Regulation database	Fixed effect model	21 OECD countries (1978-2003)	LP	<ul style="list-style-type: none"> Product market regulation affects negatively the process by which positive productivity shocks spread from one country to the other by two channels. <ul style="list-style-type: none"> First channel: product market regulation is an important determinant of investments in information and communication technology. Second channel: restrictive regulation deters the establishment of foreign subsidiaries by multinational enterprises.
DJANKOV ET AL. (2006)	Doing Business database (The World Bank)	Cross-sectional analysis	135 countries	GDP per capita	<ul style="list-style-type: none"> The effect of a more business-friendly environment on growth is positive
GRIFFITH ET AL. (2006)	European commission report	Fixed effect model (Instrumental variable estimator)	Unbalanced panel of 9 countries (1987-2000)	R&D TFP Profitability	<ul style="list-style-type: none"> SMP reforms increased substantially product market competition, which in turn increased innovation and total factor productivity growth through augmentation of R&D investment intensity.
JALILIAN ET AL. (2006)	Doing Business database (The World Bank)	Cross-sectional analysis	117 countries	GDP per capita	<ul style="list-style-type: none"> Positive link between regulatory quality and GDP growth.
CANADIAN EVIDENCE					
CONWAY AND NICOLETTI (2007)	OECD International Regulation database	Fixed effect model	21 OECD countries (1978-2003)	LP	<ul style="list-style-type: none"> Past regulatory reforms have missed their goals to encourage a competitive environment and reduced labor productivity growth particularly in certain non manufacturing industries such as electricity, railroad transportation, postal services
GU AND LAFRANCE (2008)	Statistics Canada	Statistical analysis	Canada vs United States (1977-2003)	LP TFP	<ul style="list-style-type: none"> The sectors where deregulation took place were the ones who created the biggest shift in productivity growth (labor and total factor productivity).

Legend :

GDP : Gross domestic product

LP : Labor productivity

CP : Capital productivity

TFP : Total factor productivity

R&D : Research and development