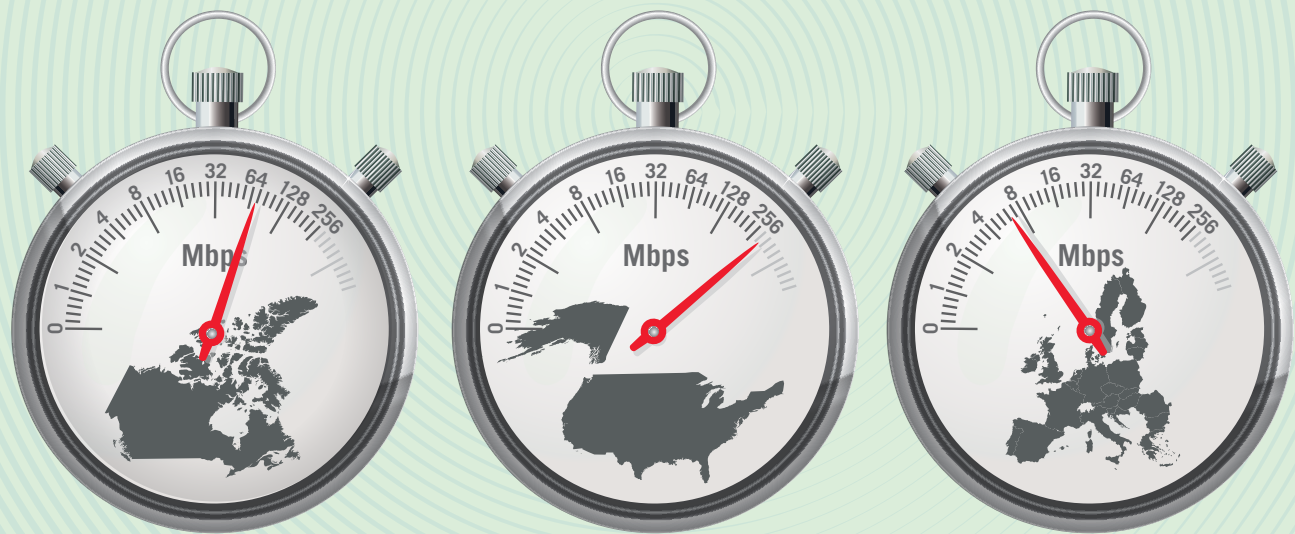


WINNERS AND LOSERS IN THE GLOBAL RACE FOR ULTRA-FAST BROADBAND

A cautionary tale from Europe

Andrea Renda



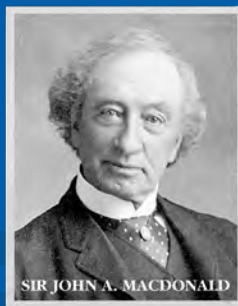
AUGUST 2016



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EXECUTIVE SUMMARY

A world-class Internet infrastructure is vital to economic growth in the 21st century, but frequently the actions taken by government to nurture broadband investment have had the opposite effect. This paper presents such a cautionary tale from Europe, and draws recommendations for Canadian policy-makers.

Canadian federal telecommunications policy under the Harper government was focused on promoting and sustaining more market players in the name of increasing consumer choice and lowering prices. This policy objective manifested itself in a series of government interventions in the marketplace – including requiring incumbent firms to grant new competitors access to their networks (what is known as mandatory network sharing) in order to enter the market and compete. The government’s so-called “fourth player” policy – nurturing a new competitor to the “Big Three” incumbents, Bell, Rogers, and Telus – became the source of considerable controversy. The government contended these interventions were necessary to enhance market competition and benefit consumers. Incumbent

firms insisted that heavy-handed interventions would discourage investment and network improvements, and hurt the broader economy.

“ The government contended these interventions were necessary to enhance market competition and benefit consumers.”

The CRTC’s 2015 decision imposing the unbundling of “fibre-to-the-premises” was another example of Canada taking a heavy-handed regulatory approach to network infrastructure. From an external observer’s viewpoint the decision to impose access (price) regulation on FTTP seems to be hardly in line with the Canadian market conditions, where extensive facilities-

based competition has secured over time sustained investment levels. It seems to basically ignore that previous policy had created the conditions for massive private investment in Canada’s broadband network and that the lessons from elsewhere such as Europe show that these conditions can be eroded.

Now as the Trudeau government determines its own telecommunications policy – particularly with regards to broadband deployment – and how it fits in its broader objectives with regards to innovation, there is growing interest in whether Ottawa charts a new course.

The European experience has been marked by the same types of government interventions reflected in Canadian policy in recent years, and the EU is now trying to close its growing gap with other major economies in terms of fixed-line infrastructure. This paper demonstrates that Europe’s policy of mandatory network sharing has discouraged investment in the continent’s networks and diminished the positive economic benefits that high-quality networks can enable. For example, fibre to the premises coverage is approximately double in the US compared to Europe (23 percent versus 12 percent); and overall next generation access coverage reaches 82 percent in the United States versus 54 percent in Europe. Furthermore, telecommunications revenues are dramatically higher in Australia, the US, Switzerland, Japan, Canada, Iceland, and Norway than in EU nations, which all fall below the OECD average.

Canada could learn from this experience as it currently benefits from a vibrant facilities-based competition despite recent missteps, and thus has no compelling reason to follow the EU approach. Continuing to follow down the European path could lead to a substantial price to pay in terms of growth and jobs. Nobody washes a rental car and so, if the state is going to mandate network access, the incentives for companies to invest in their own networks or to upgrade networks are diminished. Incentives matter.

The Trudeau government finds itself faced with a choice with respect to broadband/wireless policy and its broader goals for innovation, the digital economy, and long-term economic growth. The choices that Ottawa makes in the coming months could therefore have significant, long-term implications for Canada's economy. It is time to choose a new path.

SOMMAIRE

Au XXI^e siècle, une infrastructure Internet de classe mondiale est absolument essentielle à la croissance économique, mais les mesures gouvernementales visant à encourager l'investissement à large bande ont fréquemment produit l'effet contraire. Dans cette étude, on présente l'exemple particulièrement éloquent à ce titre fourni par l'Europe, tout en formulant des recommandations à l'intention des décideurs publics canadiens.

Le gouvernement Harper a orienté la politique du Canada en matière de télécommunications de manière à promouvoir et assurer un accroissement du nombre de fournisseurs au nom de l'élargissement des choix pour les consommateurs et des baisses de prix. Cet objectif de politique s'est concrétisé par le biais d'une suite d'interventions sur le marché, notamment l'imposition d'une mesure obligeant les fournisseurs titulaires à mettre leurs réseaux à la disposition des nouveaux venus (ce qu'on appelle le partage obligatoire des réseaux) pour leur permettre d'accéder au marché et d'être concurrentiels. La politique gouvernementale visant à faire entrer un quatrième joueur dans le secteur pour concurrencer les « trois grands » titulaires (Bell, Rogers et Telus) est devenue la source d'une intense polémique. Le gouvernement a justifié ces interventions en soulignant qu'il fallait renforcer la concurrence et les avantages pour les consommateurs. Les fournisseurs titulaires ont allégué que des interventions trop contraignantes nuiraient à l'investissement et aux projets d'infrastructure ainsi qu'à l'économie en général.

La décision prise par le CRTC en 2015 visant à imposer le dégroupage pour la fourniture d'accès aux réseaux de fibres jusqu'aux locaux de l'abonné (*fibre-to-the-premises* – FTTP) est un autre exemple canadien d'approche réglementaire indûment rigoureuse en matière d'infrastructure de réseau. Vue de l'extérieur, la décision de réglementer l'accès aux réseaux FTTP (prix) semble difficilement conciliable avec la situation du marché canadien, puisque la force de la concurrence fondée sur les installations a favorisé une hausse soutenue des investissements au fil du temps. En somme, la décision ne semble pas avoir tenu compte du fait que les conditions créées par la politique précédente ont mené à d'importants investissements privés dans le réseau canadien à large bande, ni des expériences riches en enseignements réalisées ailleurs, notamment en Europe, qui démontrent que ces conditions pourraient disparaître.

Comme le gouvernement Trudeau élabore en ce moment sa propre politique en matière de télécommunications – en particulier en ce qui concerne le déploiement de large bande – et la manière dont elle peut répondre à ses grands objectifs d'innovation et d'esprit d'entreprise, on cherche de plus en plus à savoir si Ottawa s'engage sur une nouvelle voie.

“ Les fournisseurs titulaires ont allégué que des interventions trop contraignantes nuiraient à l'investissement et aux projets d'infrastructure ainsi qu'à l'économie en général.”

L'Europe a connu les mêmes types d'interventions gouvernementales qu'au Canada au cours des dernières années et tente maintenant de combler le fossé de plus en plus large qui la sépare des autres grandes économies à l'égard de l'infrastructure par ligne fixe. Cette étude démontre que la politique européenne de partage obligatoire des réseaux a découragé l'investissement dans les réseaux du continent et diminué les avantages économiques qui, autrement, sont tributaires des réseaux de haute qualité. Les réseaux de fibres jusqu'aux locaux de l'abonné assurent en gros une couverture deux fois moins grande en Europe qu'aux États-Unis (12 % c. 23 %); pour l'accès de nouvelle génération, la couverture atteint 54 % en Europe contre 82 % aux États-Unis. En outre, les recettes tirées des télécommunications sont considérablement moins élevées dans les pays de l'UE – tous à la traîne de la moyenne de l'OCDE – que dans les pays suivants : Australie, États-Unis, Suisse, Japon, Canada, Islande et Norvège.

Le Canada pourrait s'inspirer de cette expérience, lui qui tire profit actuellement de la forte concurrence fondée sur les installations, malgré les récentes occasions manquées. Rien ne l'oblige donc à adopter l'approche de l'UE. Continuer à suivre le modèle européen pourrait avoir des conséquences négatives sur la croissance et l'emploi. L'adage « *personne ne lave une voiture de location* » rend bien compte de la logique selon laquelle un État qui prescrit l'accès aux réseaux n'incite pas les entreprises à investir dans leurs propres infrastructures ni à les mettre à niveau. Les mesures incitatives importent.

En matière de large bande et de services sans fil, le gouvernement Trudeau se retrouve dans une situation où les choix de politiques qui se posent et ses vastes objectifs à l'égard de l'innovation, de l'économie numérique et de la croissance économique à long terme sont en chassé croisé. Les décisions d'Ottawa au cours des prochains mois pourraient avoir d'importantes retombées à long terme sur l'économie du Canada. Il est temps d'emprunter une nouvelle voie.

INTRODUCTION

The past decade has seen the rise of broadband as a key driver of economic growth and prosperity. This is due, in particular, to the fact that broadband is a general purpose, “enabling” technology, which drives the creation of new, disruptive business models that are radically transforming many sectors of the economy. These include for instance, smart manufacturing, driverless cars, connected homes, FinTech, eHealth, and many more (Hassett and Shapiro 2016). It is increasingly the technological foundation of so much of the economy.

The development of ultra-high-speed broadband networks, and the rapid increase of fourth generation wireless broadband have made the connected society a reality, with hundreds of millions of people constantly using the Internet for a growing variety of services. More network capacity and more speed, in turn, increases the potential to use advanced, bandwidth-hungry applications in our everyday lives.

A world-class Internet infrastructure does not only increase choice for consumers: among other things, it also boosts GDP and productivity, leads domestic companies into global value chains; empowers the elderly and the disabled; and helps the development of whole new ecosystems such as the Internet of Things and the Internet of Value. Not surprisingly, many advanced countries now look at broadband-powered information and communications technologies as the only possible way to remedy the current slowdown in productivity growth, and thus as the only way to boost long-term prosperity (OECD 2016).

This breathtaking development of broadband communications creates challenges and opportunities for policy-makers. How does public policy create the conditions for high-quality broadband infrastructure? How does it ensure market competition and protect consumer interests? And to what extent are these objectives in conflict?

As an example of this tension, the regulation of broadband access – often referred to as “mandated network sharing” whereby the state requires the owner of broadband infrastructure to grant access to its competitors – became widespread government policy, particularly in the “narrowband” era of lower capacity networks.

But today’s ultra-fast broadband has become an information superhighway on which users can find all sorts of products and services that run “on top of” the network (so-called “over-the-top” services such as Netflix). These services are what users want when they connect to the broadband network; having 10 alternative identical ways to reach the same slow Internet is not going to add a lot of value to end users, especially if competition stifles incentives to deploy better networks, or to ultimately create products or services that highly depend on network speed.

“A world-class Internet infrastructure boosts GDP and productivity, leads domestic companies into global value chains, empowers the elderly and the disabled, and helps the development of whole new ecosystems such as the Internet of Things.”

Against this background, industrialized countries and emerging economies have adopted gradually more ambitious digital agendas, which often include dedicated measures to promote broadband deployment (with public and/or private funding), *ad hoc* targets for geographic penetration speeds, and overall uptake goals. Governments have tended to couple these strategies with complementary actions in the field of education, aimed at increasing the digital literacy of individuals and businesses; adjusting their legal frameworks with respect to Internet access, copyright, data protection, and net neutrality to ensure the smooth development of the Internet; and adopting specific research and innovation platforms to promote the development of new industrial platforms such as the Internet of Things, smart manufacturing (or Industry 4.0), applications powered by artificial intelligence, smart cities, and so forth.

Who is going to win the race for global leadership in the age of ultra-broadband connectivity? That is in part the subject of this study. More specifically, the analysis investigates what policies are most likely to create the conditions for a jurisdiction to win this global race with significant economic implications.

Examples of these policy trends are numerous and widespread, but with several important differences that allow for a meaningful international comparison, which is useful as Canadian policy-makers deliberate on the right model for this country.

The United States (US), for example, developed a comprehensive policy for the information superhighway in the late 1990s, which eventually led to lifting network sharing obligations for broadband networks beginning in 2003. This was accompanied by a remarkable increase in per capita investment in telecommunications infrastructure: the market today is relatively concentrated, but the availability of both fixed and wireless ultra-fast broadband is very high, and while these high speed connections are expensive, lower speed tiers are relatively cheap (Yoo 2014).

More generally, evidence from global practice in telecommunications regulation suggests that South Korea and Japan, world leaders in ultra-fast networks (such as fibre-to-the-home), have not heavily regulated the deployment of broadband by imposing network sharing obligations on investors (Yoo 2014; Crandall 2014; Wallsten 2014).

The experience from these jurisdictions suggests that a light regulatory touch can create the conditions for private investment in broadband networks and in turn help to produce the digital networks that can serve as the foundation for innovation, digital adoption, and economic growth.

The European Union (EU), by contrast, has largely applied to broadband the same access policy regime – marked by heavy-handed regulation – it had crafted for legacy copper networks, and the experience has been quite different.

This paper discusses the impact of the EU regulatory approach on competition, innovation, and investment. It does so with exclusive reference to wireline telecommunications, although many of the findings apply also to wireless. Section 1 below discusses the overall regulatory and policy

thinking reflected in Europe's current regulatory framework. Section 2 describes the experience of selected EU member states, and illustrates the current evolution of the European broadband market. Section 3 discusses potential lessons for Canada.

“Europe's policy of mandatory network sharing discouraged investment in the continent's networks.”

The main takeaway is that Europe's policy of mandatory network sharing has discouraged investment in the continent's networks and diminished the positive economic benefits that high-quality networks can enable. The lesson for

the Trudeau government is that heavy-handed telecommunications regulations such as mandatory network sharing can lead to underinvestment in digital networks and in turn undermine its broader goals with regard to innovation and entrepreneurship.

THE EU APPROACH TO THE REGULATION OF FIXED-LINE ELECTRONIC COMMUNICATIONS

Liberalizing the fixed-line telecommunications sector was not an easy task for the EU. Until the 1990s, member states largely relied on their state-owned monopolies to offer the service to citizens, with prices that were often subsidized and averaged out to allow for universal service provision. Later, when the broadband era started to become a reasonable prospect, it became clear that the absence of well-deployed cable networks in most EU member states could limit the ability of regulators to rely on facilities-based competition to create the right environment for investment and dynamic efficiency: in other words, the broadband era in most EU countries would have to rely on copper and its evolutions (xDSL), and so did.

The multi-level governance structure of the EU made it difficult to adopt pan-European decisions that would apply in the same way in every member state: as a matter of fact, since the early days, the European Commission's (EC) attempts to create a truly integrated market for electronic communications has met with the opposition of national governments wishing to preserve their prerogatives in key policy domains such as infrastructure, spectrum, and copyright (Cave and Larouche 2004; Renda 2009).

With these constraints in mind, it is easier to understand why the EU regulatory framework for electronic communications emerged as a compromise between national and EU interests, and between what

would have been ideal in theory and what was indeed practically feasible. The liberalization began in 1998 with the “First Telecoms Package”; it was later thoroughly revised with the “Second Telecoms Package” in 2002; and was then further amended through a series of regulatory measures that are commonly termed the “Third Telecoms Package” in 2009.¹

The lack of well-developed cable was one of the main reasons for adopting, since the very beginning, an approach based on the idea that fixed-line telecommunications were to be treated like “essential facilities” such as electricity or water, and as such could not be technically or economically replicated by potential competitors (Renda 2010).² This, in turn, led to the decision to mandate that all legacy networks be subject to an obligation to provide access to new entrants at regulated prices.

Common criteria for imposing access and determining the related conditions were developed by the EC, in cooperation with the national regulatory authorities, initially coordinated by a European Regulators’ Group, which later evolved into the current Bureau of European Regulators on Electronic Communications (BEREC). Simply put: mandatory network sharing has become an essentially universal policy across EU member states and thus provides a useful case study for the implications of such a policy for a Canadian audience.

In terms of overall governance, the regulatory framework features a multi-level structure:

- EU institutions define the basic rules, definitions, principles, and goals for the framework in a set of directives and related documents;³
- the EC defines a list of relevant markets that might warrant *ex ante* regulation in a Recommendation (a piece of soft law), which is sent to national regulatory authorities (NRAs) and contains a reference list of markets that potentially satisfy the criteria for regulation;
- and NRAs apply these rules in their domestic territories, by performing market analyses, identifying operators that have significant market power (SMP), and selecting appropriate remedies from a menu contained already in the EU legislation.

NRAs notify the EC of their market analyses, SMP decisions, and remedies. The Commission can reject the market analysis and the finding of SMP, but can only “express concerns” about the remedies chosen by the NRA, not veto them.⁴ In this respect, the EU framework borrows extensively from EU competition law, especially in implementing concepts such as “relevant market” and “significant market power”, which equates to dominance under Article 102 of the Treaty on the Functioning of the European Union.⁵

“Mandatory network sharing has become an essentially universal policy across EU member states.”

Regulatory obligations were implemented in a relatively sophisticated way: after the limited success of the first package (the Open Network Provisions), which largely relied on local loop unbundling or LLU (allowing multiple telecommunications operators to use connections from the telephone exchange to the customer’s premises), the implementation of the 2002 framework was accompanied by the pre-selection of markets that, in the opinion of the EC, warranted *ex ante* regulation since they potentially met three basic criteria (described in the 2003 and 2007 Recommendations on relevant markets):

- 1) the presence of high and non-transitory barriers to entry;
- 2) a market structure that does not tend toward effective competition within the relevant time horizon; and
- 3) the insufficiency of competition law alone to adequately address the market failure(s) concerned.

NRAs were free to define relevant markets that differed from the ones included in the list. If they did so, however, they faced the burden of proving that the three criteria were indeed met for the newly defined market. In practice, and as a consequence, NRAs have been reluctant to deviate from the list.

In addition, the need to secure some consistency in the application of the framework has led the Commission to often reject NRAs' proposals to define relevant markets that are different from the ones included in the list. In any event, over time the list has been gradually shortened, with the elimination of retail markets, but the three criteria test has remained marginal in the overall implementation of the regulatory framework.

What remained as perhaps the most prominent reference for national regulators is the so-called “ladder of investment” model, which aimed at fostering gradual, step-by-step infrastructure deployment by new entrants by securing initial access to the whole incumbent-owned legacy network. The assumption was that granting new market entrants mandated access to incumbents' networks would lower the barrier to entry and create the conditions for new firms to grow and eventually invest in their own networks. This model is described in the next section.

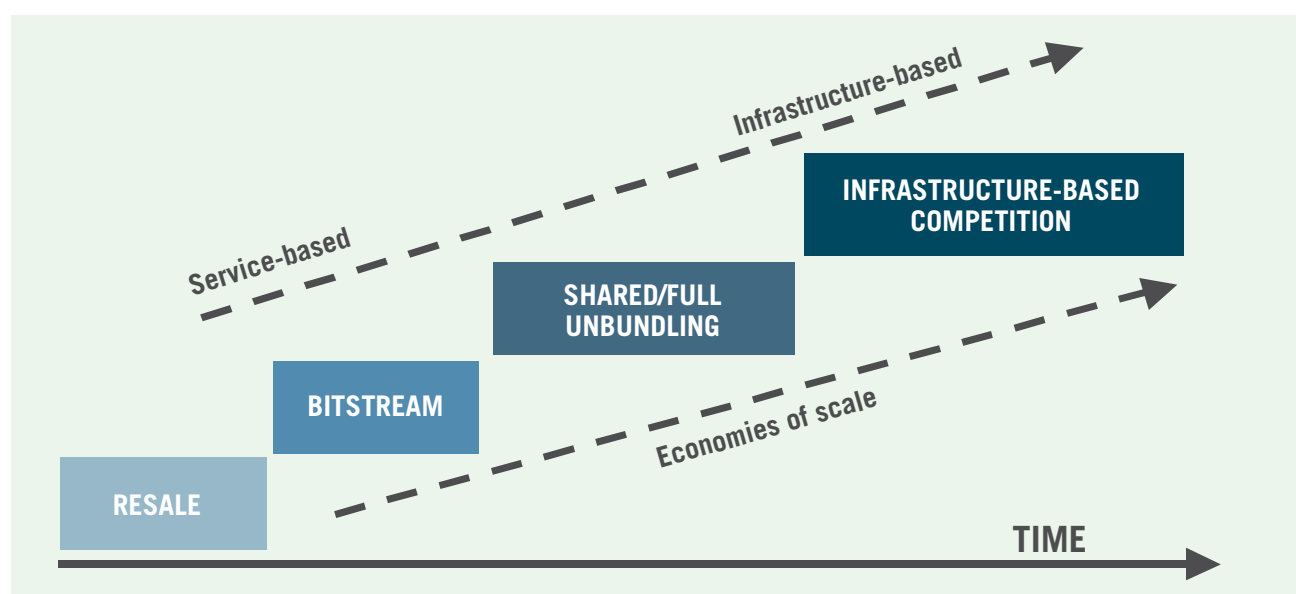
THE “LADDER OF INVESTMENT” MODEL

The “ladder of investment” model, which echoed the “stepping stones” model already used (with limited success) in the US 1996 *Telecommunications Act*, was developed and proposed for Europe by British economist Martin Cave (Cave and Majumdar 2002; Cave 2006). The model was aimed at encouraging new entrants to move toward full-fledged facility-based competition without having to incur significant upfront investment when entering the market.⁶

This way, the model sought to stimulate service-based competition (competition from new entrants that do not own any infrastructure, and accordingly merely resell the same service provided by the incumbent, possibly at lower retail prices) in the short term, but gradually move to competition between players each owning their own separate infrastructure in the longer run.

The approach became the dominant regulatory model adopted by NRAs in regulating wholesale fixed-line telecommunications markets (see chart 1 for an example of the ladder of investment).

CHART 1: The ladder of investment



Source: ERG 2005.

The ladder of investment model has been subject to extensive research from a theoretical and empirical perspective. To make the ladder approach effective, national regulators were supposed to follow several steps (Cave 2005), including:

- 1) Determine which network elements are clearly non-replicable;
- 2) rank network elements according to whether they are replicable;
- 3) locate entrants on the ladder;
- 4) determine how, and how fast, entrants should climb the ladder;⁷
- 5) choose the particular form of intervention. This means that intervention can take place “either based upon rising access prices (relative to costs), subject to a short transition period where necessary, or upon the projected withdrawal of mandatory access” (Cave 2007);
- 6) specify a date on which mandatory access ceases; and
- 7) make a credible commitment to the policy.

The ladder of investment approach has been subject to several critiques. Oldale and Padilla (2004) point out that the approach requires regulators to have the information, time, and competence to govern the transition from service-based to facilities-based competition, and that this is unlikely to be the case.⁸ Bourreau et al. (2010) note that, for the ladder of investment to work, it is necessary for short-term service-based profits to be constrained by the regulator. This can be done by including sunset clauses in access regulation or by increasing access prices.

More generally, the empirical evidence with respect to the ladder of investment is that the theory is largely a failure, as regulators have often been unable to create a regulatory environment that encourages substantial investment by new entrants. The large empirical literature that discusses the economic effects of telecommunications access regulation strongly supports the hypothesis that access regulation does not promote, and indeed can hamper, telecommunications investment and broadband penetration.⁹

A number of authoritative papers (Distaso et al. 2006, Denni and Gruber 2007) show that it is facilities-based competition, rather than service-based competition, that really drives broadband investment and penetration. Other papers, including Hoeffler (2008), Friederiszick et al. (2008), Wallsten (2006), and Wallsten and Hausladen (2009) confirm that access policy has generally not been able to promote investment in fully owned facilities.¹⁰

This makes intuitive sense: nobody washes a rental car and so, if the state is going to mandate network access, the incentives for companies to invest in their own networks or to upgrade networks is diminished. Incentives matter.

The ladder of investment has not helped the emergence of facilities-based competition, as new entrants have stopped short of the “last rung”.

Over time, it has become clear that the ladder of investment produced mixed effects on competition and investment in the narrowband telecommunications sector in Europe. On one hand, it promoted massive entry and an overall increase in price competition, with consequent lower prices throughout the continent. It also promoted investment in portions of networks, as some players found it convenient to climb the ladder up to the “shared/full unbundling” rung, obtaining access to the local loop.

“ The ladder of investment has not helped the emergence of facilities-based competition, as new entrants have stopped short of the ‘last rung’.”

However, the model has not helped the emergence of facilities-based competition, as new entrants have stopped short of the “last rung” of the ladder – that is, investing in their own networks and shedding their dependence on mandated access to their competitors’ infrastructure (Briglauer, Ecker, and Gugler 2012; Bacache, Bourreau, and Gaudin 2013; Briglauer 2014).

Other papers broadly confirm this finding: Bouckaert et al. (2010) find that inter-platform competition had a positive and significant effect on broadband penetration; full and shared LLU have no significant effects; while service-based intra-platform competition has a negative and significant effect.¹¹

The risk, then, is that modest price savings for consumers are matched with weak broadband penetration, poorer quality services, and diminished opportunities for innovation and entrepreneurship enabled by high-quality networks, as incumbents begin to underinvest in the core network. This risk became especially clear when Europe extended the policy to broadband.

THE DOWNFALL OF THE “NEW LADDER”

While the ladder of investment model produced mixed results during the narrowband era, the advent of the broadband age created a new set of problems for EU policy-makers.

Three important problems emerged. First, the broadband infrastructure was not yet in place: accordingly, adopting an essential facilities approach with respect to facilities that had not yet been built was tantamount to a leap of faith for policy-makers, and the risk of creating chilling effects on network deployment was enormous. As a matter of fact, the essential facilities doctrine (already

“ Modest price savings for consumers are matched with weak broadband penetration, poorer quality services, and diminished opportunities for innovation and entrepreneurship enabled by high-quality networks.”

controversial in antitrust, to the extent that the US Supreme Court, for example, never fully endorsed it) emerged with reference to existing infrastructures such as ports, legacy utilities, and copper networks; this approach represented a compromise between the need to protect property rights and investment, and the goal of promoting welfare-enhancing entry without requiring excessive upfront exposure to new entrants. But this trade-off is way more hazardous when the investment in the prospective essential facility has not yet been made (Renda 2010).

Second, the case for incentivizing investment in new networks by incumbent players became even more compelling since these players were facing the prospect of new sources of competitive pressure, due to enhanced competition by wireless carriers and by over-the-top (OTT) players such as Skype, and also due to uncertainties related to network neutrality rules. The situation of incumbent fixed-line players in Europe was potentially very risky, and conflicted: investing in high-speed broadband would mean having to share the new network at regulated prices, and creating even stronger competition by OTTs. Hence, something had to be done to avoid paralysing the whole telecoms market, at least in terms of incumbents’ investment.

Third, from a more technical standpoint, the broadband age created problems also for all those players that had started to climb the “narrowband ladder” (Cave 2010). New networks had a different configuration and different technical constraints, which made a “jump” from one ladder to another very complicated and costly. The situation of these players had to be addressed to avoid undermining the effectiveness of the regulatory framework in terms of promoting entry and competition.

The challenge was apparent also in countries like the US, South Korea, and Japan. However, as already mentioned, the reaction of these countries was very different compared to what occurred in the EU.

The US decided in 2003 to lift regulatory obligations by establishing regulatory forbearance for broadband networks already in; similarly, in South Korea the government lifted regulatory obligations on all fibre networks deployed after 2004; in Japan, only soft obligations were imposed on the incumbent player NTT, and competition emerged as largely facilities-based, thanks also to the rise of utilities as new facilities-based entrants.

Against this background, the EU decided to preserve its access-based policy also for the broadband age. The EC, in particular, was aware of the potential risks this would entail, but the need to preserve a common approach in member states led to resistance against proposed deregulation. For example, the Commission had a fierce legal battle with Germany, as the latter's government was determined to lift regulatory obligations on Deutsche Telekom, limited to its high speed broadband investments (European Commission 2007). Eventually, it became clear that access policy would remain the dominant paradigm for the broadband era.¹²

The academic literature has extensively studied what happened during those years. Among others, Briglauer et al. (2013; 2015) try to investigate the impact of access regulation on investment in high-speed broadband networks (so-called next generation networks or NGN). Their results suggest that the number of wholesale lines in an incumbent's network has a significant and negative effect on the deployment of NGN; in contrast, inter-platform competition, measured as fixed-to-mobile substitution, availability of legacy technologies, and cable penetration, had a positive and significant effect.

“If you combine Japan, South Korea and the USA, it is the same population as Europe. But they have over 8 times more fixed fibre broadband, and almost 15 times more 4G. And the gap is growing.”

NEELIE KROES, PAST COMMISSIONER FOR
DIGITAL ECONOMY AND SOCIETY (2013)

Grajek and Roeller (2012) perform an empirical analysis on a comprehensive data set covering 180 fixed-line and mobile operators in 25 European countries over 10 years using a new measure of regulatory intensity.¹³ They explore the relationship between regulation and investment and find that wholesale access regulation reduces incentives for the regulated firm and for entrants to invest.

Nardotto et al. (2012) analyse a uniquely disaggregated dataset released by the British telecommunications regulator, and find that the number of LLU lines has a significant negative impact on broadband penetration, but increases average speed; in addition, LLU lines have a negative and significant impact over other forms of competition, which require little or no own infrastructure, such as bitstream and resale.¹⁴ Finally, even Martin Cave (2014) acknowledged that while the ladder of investment might have had overall positive effects in the narrowband era, its viability in the broadband age is more disputable.

All in all, this literature leads to three main conclusions:

- First, for legacy copper networks, access policy seems to have produced mixed results.
- Second, reliance on access regulation seems to have had a negative impact on investment in new broadband networks.
- Third, based on available data and the most recent empirical literature, it is reasonable to conclude that access policy has not sufficiently encouraged investments in alternative infrastructure in Europe and actually has contributed to underinvestment.

FACING THE CHALLENGE

The EC has gradually acknowledged the investment problem in a number of statements. For example, the then-Commissioner for Digital Economy and Society Neelie Kroes (2013) observes:

If you combine Japan, South Korea and the USA it is the same population as Europe. But they have over 8 times more fixed fibre broadband, and almost 15 times more 4G. And the gap is growing. . . . Current trends are unsustainable for the sector, and unsustainable for our whole economy. Without the infrastructure to compete, we aren't going anywhere – in any sector. We hurt consumers, we hurt the economy, we hurt our strategic future if we do not act.

During the same year, the EC (2013a) described the state of the EU telecoms sector as follows:

There has been massive growth in demand (especially data), however, since last reform of EU telecoms rules . . . this growth has not been monetized. Revenue is declining in real terms (-2.2% in 2011 and -1.1% in 2012) and relative to US & Asian & other markets. Market capitalization is down 22% since 2011. Moreover, Europe's former telecoms monopolies have a net investment rate of virtually zero, lagging behind competitors (source: HSBC). Wireless investment is half the rate of US/Canada since 2002.

This sense of urgency has led the EC and some member states to propose a number of reforms of the existing regulatory framework, which are aimed at encouraging investment in fixed and mobile broadband infrastructure. For example, in 2010 the Commission proposed to increase wholesale access prices in order to account for a "risk premium" associated with investment in NGNs (European Commission 2010). In the UK, the regulator Ofcom decided not to impose upon the incumbent the obligation to offer virtual access merely at cost, provided that prices are fair and non-discriminatory.¹⁵ This has reportedly led to encouraging outcomes in terms of accelerating fibre deployment in the UK, even if coverage levels are still disappointing (Plum 2013).

In 2013, the EC (2013b) presented a proposed reform of the regulatory framework (the so-called "Connected Continent" proposal) that placed more emphasis on stimulating investments in high-speed broadband infrastructure. Measures include rules aimed at reducing permitting costs, harmonizing conditions for wholesale access, and a new proposal that could allow network providers to charge for offering customers a better quality of service.

At the same time, the Commission (2013c) adopted a new Recommendation on costing methodologies and non-discrimination obligations, which advocates the removal of wholesale access price regulation for fibre networks, subject to non-discrimination requirements and provided that there is sufficient competitive pressure from legacy networks or at least one alternative infrastructure with comparable reach.¹⁶ These recent documents also showed that the EC was increasingly aware that, absent a change of direction in the approach to wholesale access regulation, it was unlikely that Europe would catch up with its international competitors in terms of ultra-fast broadband availability.¹⁷

A new Recommendation on relevant markets placed greater emphasis on issues related to dynamic efficiency (such as getting the investment incentives right and promoting innovation) and less of a focus on static efficiency (securing the highest possible number of players and the lowest prices at any given moment of time). Also, it encouraged national regulators to consider all sources of competitive pressure (including wireless operators and OTT companies such as Skype) in defining the relevant market and in assessing whether a given fixed-line operator could be said to have significant market power. The Recommendation also included an explicit statement on the negative effects that over-regulation may exert on investment, as the Commission (2014a) observes that "Regulation must be targeted and balanced in a way that addresses the true obstacles to effective competition in the sector: an excessive regulatory burden on operators would stifle investment and innovation".¹⁸

The Connected Continent package advanced slowly in the EU, and was eventually adopted with rules that mostly focused on roaming and network neutrality. No specific additional measure was adopted to

modify the regulatory approach to e-communications, although the EU institutions have tried to adapt state aids rules and the “Juncker plan” to accommodate more investment in broadband infrastructure (Stupp 2016). Meanwhile, since 2010 the Digital Agenda for Europe set what initially appeared as ambitious connectivity targets in terms of speed and availability (100MB/sec available to 50 percent of the population, 30MB/sec to 100 percent of the population): these targets have proven to be at once insufficient and distortionary, since some member states ended up prioritizing investment in existing networks (such as vectoring of copper networks) rather than migrating to more future-proof investment in optical fibre.

Eventually, in June 2015, the EC launched an ambitious plan to complete the Digital Single Market, which acknowledged that existing rules had not reached the desired results in terms of investment and had actually made them worse. The Communication on the Digital Single Market contained an explicit acknowledgement that the existing framework was not apt to incentivize a “generalized roll-out of new networks in accordance with public-policy objectives” (European Commission 2015).

What is more, the Commission also acknowledged that access policy can reduce alternative operators’ incentives to invest in their own facilities. This is deplorable, since there is wide consensus among economists and policy-makers that the only sustainable form of competition in the long run is infrastructure-based, not access-based competition. And for the past 15 years, EU policy-makers stressed the importance of stimulating facilities-based competition in the long run.

The key point for a Canadian audience is that not only has Europe gradually come to the realization that mandatory network sharing has been a failure with regards to network investment, it is now scrambling to experiment with different policies – including considerable liberalization – to reverse its underinvestment problem.

“Telecommunications investment, customer satisfaction, and measures of the United Kingdom’s global competitiveness in telecommunications have fallen.”

THE NATIONAL DIMENSION: WHAT CAN BE LEARNED FROM THE EXPERIENCE OF INDIVIDUAL MEMBER STATES?

A complete analysis of the EU experience with broadband deployment cannot ignore the variety of experiences that have emerged at the member state level, where pre-existing conditions were significantly different. These differences, which became even more evident after the enlargement of the Union in 2004 and 2007 (from 15 to 27 members) have generated a variety of policy approaches, solutions, and outcomes, which can provide useful elements for external observers such as Canadian authorities.

Without pretending to be fully exhaustive, this section looks for some of the most representative experiences that emerged over the past decade in the EU, with specific respect to investments in high-speed fixed broadband.

By 2012, all EU countries had some form of access regulation for the fixed-line broadband market. However, countries had relied on different policy mixes to stimulate the deployment of infrastructure and the development of competition in their markets. In the United Kingdom, the decision was made as early as 2005 to impose the functional separation of British Telecom's infrastructure, and the consequent introduction of access regulation for new entrants on an "equivalence of input" basis.

This approach promoted the entry of many new players in the market, but unfortunately created a remarkable technological and regulatory lock-in, with many players using BT's network and few considering the deployment of their own infrastructure. Meanwhile, unregulated cable operators took the lead in high-speed broadband deployment. A recent econometric analysis by Sidak and Vassallo (2015) showed that the approach generated short-run consumer benefits in the form of lower prices but also led to negative long-run effects, which outweighed the short-term price reduction; in addition, the analysis indicated that prices for broadband and residential fixed-line telephone services are lower than one would expect based on prices in comparable countries.

“As of today, Italy ranks 27th out of 28 EU member states in terms of next generation access coverage.”

However, telecommunications investment, customer satisfaction, and measures of the United Kingdom's global competitiveness in telecommunications have also fallen. In particular, the United Kingdom's investment in next-generation networks is lagging compared with the rest of the world (Sidak and Vassallo 2015). Today, fibre networks are remarkably under-developed, whereas cable broadband is more widespread. Yoo (2014) reported that the

United Kingdom was still at close to 0 percent penetration of optical fibre in rural areas, whereas the penetration of cable broadband was much higher. In particular, FTTP services are only available to 2 percent of UK premises.¹⁹

Another interesting example is Italy. There, cable was (and is) completely absent, and as such the regulatory authority extensively relied on access obligations imposed on Telecom Italia, who had a widespread network throughout the country. However, notwithstanding the entry of a number of new players and early attempts to deploy fibre in densely populated areas such as Milan (Metroweb), the promise of infrastructure-based competition never fully materialized.

As of today, Italy ranks 27th out of 28 EU member states in terms of next generation access (NGA) coverage (European Commission). The government has finally decided to abandon its exclusive reliance on Telecom Italia's network and launched a digital agenda based on the deployment of a new infrastructure by the country's electricity incumbent, Enel, with a good deal of public funding.

The development of the domestic market over the past decade has shown all the challenges of implementing access policy, including repeated allegations of non-price discrimination on the side of the incumbent, and a rare case of a facilities-based new entrant that prefers to revert to the incumbent's network given favourable regulatory conditions (Fastweb), and thus falls down the ladder of investment instead of continuing to engage in facilities-based competition, at least in some portions of the Italian territory (Luchetta et al. 2014).

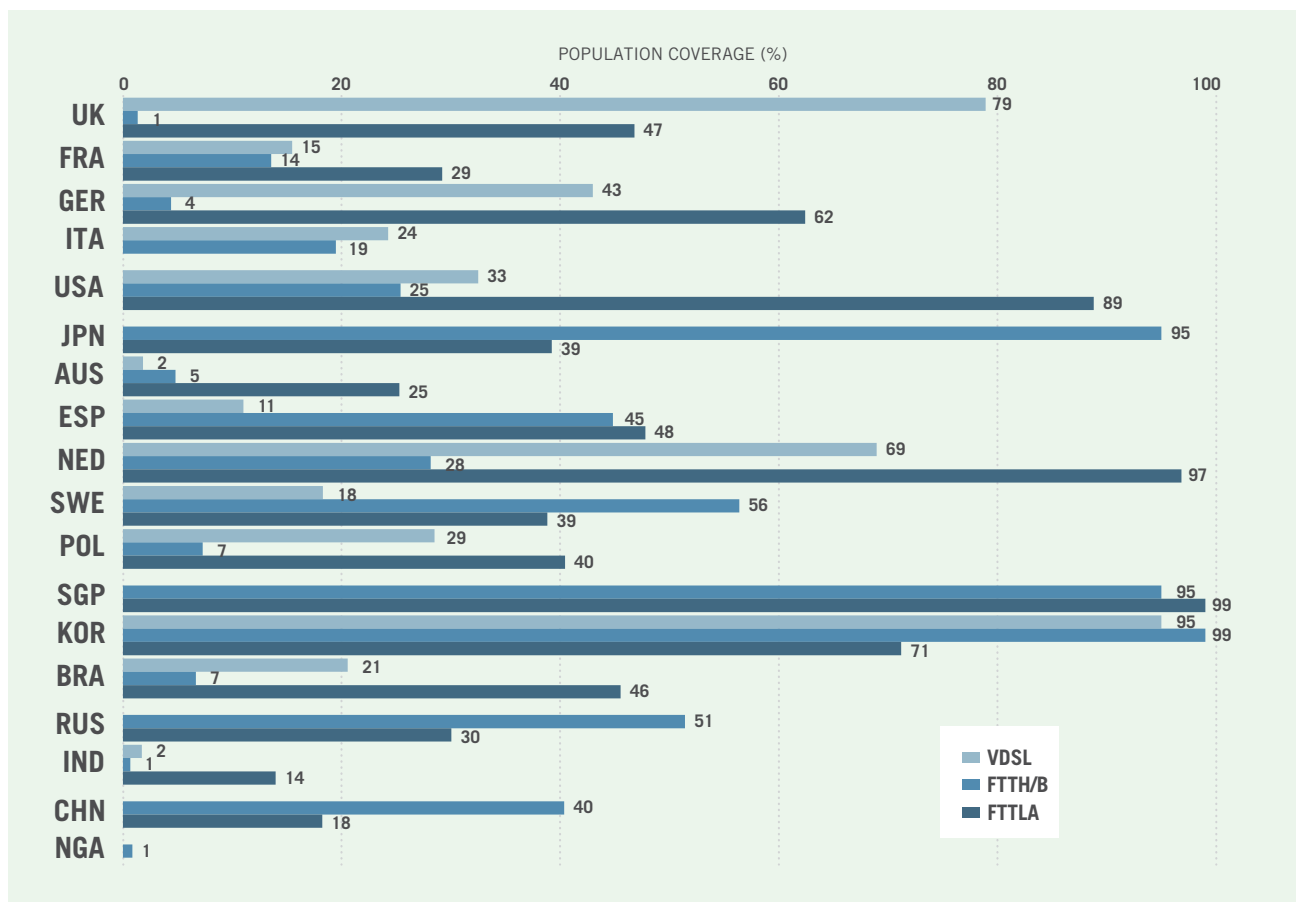
The Italian story is usefully compared with Spain. There, the government managed to create an alternative infrastructure to Telefonica's copper network by first inviting offers for local connectivity through public procurement, and then allowing many smaller cable operators to merge into one single cable provider, ONO, later acquired by Vodafone and currently the largest player in terms of NGA coverage in the country. There too, real competition and investment was spurred more by industrial policy than by access regulation, but at least such industrial policy had the fortunate outcome of creating the conditions for long-term rivalry between alternative infrastructures.

In many other European countries, where cable was available, cable operators took the lead in ultra-high-speed broadband. These include Germany, where Deutsche Telekom sold its cable operations, which later were aggregated in two main companies (Unity Media Kabel BW and Kabel Deutschland, now owned by Vodafone); and also France, Belgium, the Netherlands, Portugal, and Scandinavian countries. Some of these countries have also made extensive use of local public procurement to empower municipalities in broadband projects (such as the Netherlands); or mobilized utilities such as regional energy companies (as happened in Denmark).

THE STATE OF THE EUROPEAN FIXED BROADBAND MARKET TODAY

Today, the overall situation of fixed-line broadband in the EU member states appears to be slowly progressing, especially if one looks at the development of NGA coverage as a whole, including fibre and cable connections. However, this story hides more interesting findings, especially for what concerns the inability of access policy to really deliver infrastructure-based competition. Europe is playing catch-up when it comes to network quality as a result of its access-based regulatory model. See chart 2 for population coverage by country and technology.

CHART 2: Population availability of NGA networks, by country and technology, 2014



* FTTLA networks are hybrid-fibre solutions (Fibre To The Last Amplifier)
Source: Ofcom 2015, 208.

All in all, Europe is believed to have moved more slowly than other regions in providing coverage for fast and ultra-fast broadband.²⁰ For example, the EC (2016) observes that “FTTH (fibre to the home) and FTTB (fibre to the building) together represent 9% of EU broadband subscriptions up from 7% a year ago. In these technologies, Europe is still significantly lagging behind South Korea and Japan”.

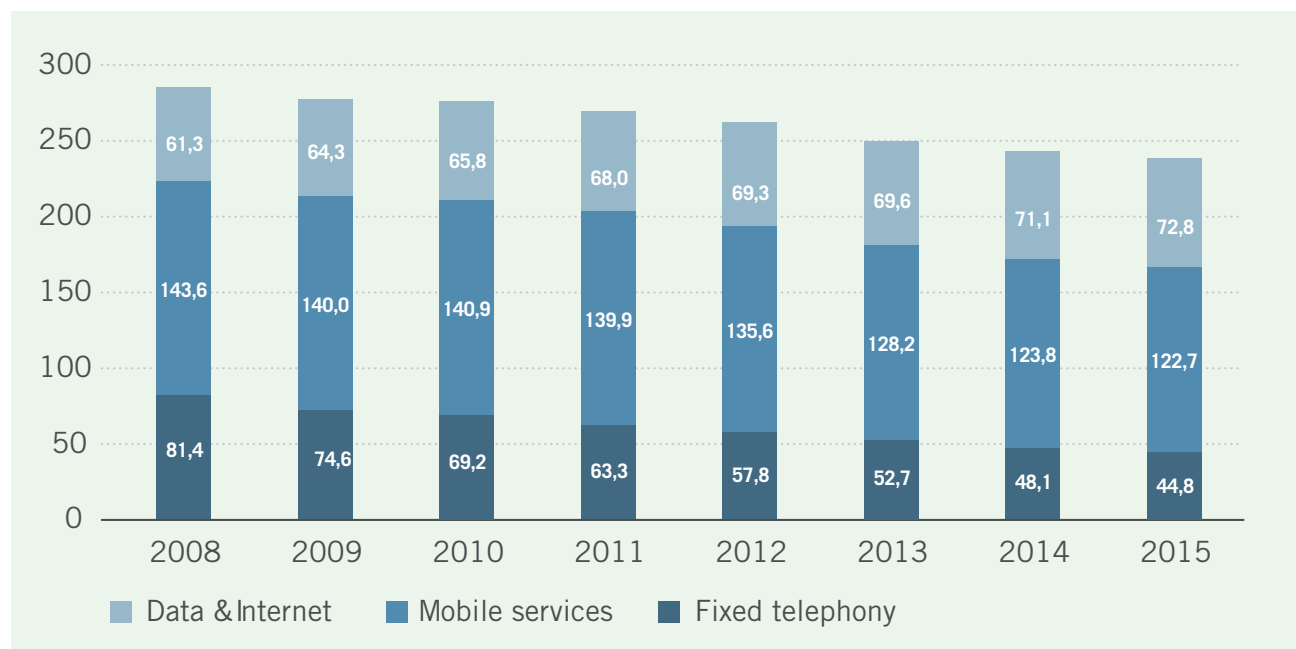
Also in comparison with the US, despite overall greater population density, Europe seems to lag behind: in the US FTTP (fibre to the premises) coverage is around 25 percent, with uneven distribution in the individual states: while small, rich, and densely populated states like Rhode Island have almost ubiquitous FTTP (97.9 percent), other states like Montana only have 3.4 percent coverage (BroadbandNow 2016). But overall, there are several states of the US that are ahead of similarly sized EU member states. Yoo (2014) reports that FTTP coverage is approximately double in the US compared to Europe (23 percent v. 12 percent); and overall NGA coverage reaches 82 percent in the US versus 54 percent in Europe.

This discrepancy hides a number of important differences between the US and Europe. First, as mentioned, the population density is completely different in the two areas: in Europe it reaches 116 people per square km, whereas in the US it is only 34 (Canada has 4). This also means that the level of investment needed to bring NGA connectivity to all areas of the country is greater in the US, and the case for protecting and promoting investment through public policy and regulation even stronger.

That said, the level of investment in telecommunications infrastructure has been significantly greater in the US compared to Europe in the past decade, to the extent that it reached USD\$562 per household in 2013, compared to a mere USD\$244 per household in Europe, demonstrating once again that incentives matter. Despite the challenges created by lower population density, the US has significantly greater high-speed broadband coverage than Europe.

There are also other dimensions along which comparison between Europe and the US can provide interesting insights. First, in terms of operators’ revenues, Europe has been seeing constant decreases over the past decade: while the Internet ecosystem flourishes on top of the fixed and mobile telecom infrastructure, the latter’s owners and operators are allocated a shrinking portion of the pie (see chart 3).

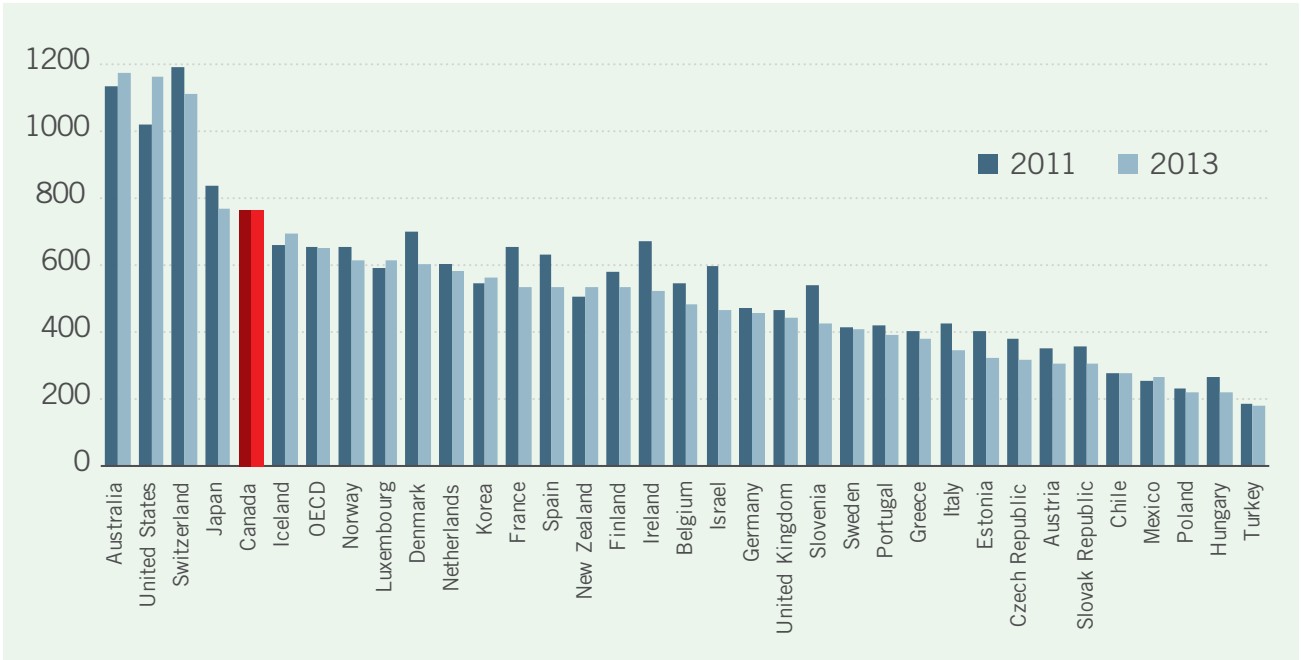
CHART 3: Telecom service revenues in Europe (incl. Turkey, excl. Georgia, Russia, Ukraine, EUR bn)



Source: ETNO 2016.

Similarly, the OECD data on telecommunications revenues per access path, which typically corresponds to revenues per subscription or per fixed line, show diverging conditions between EU member states and other parts of the world.²¹ Chart 4 shows data for 2011 and 2013, which confirm that leading countries in broadband have relatively high revenues per access path (note that Switzerland, Iceland, and Norway are non-EU members).

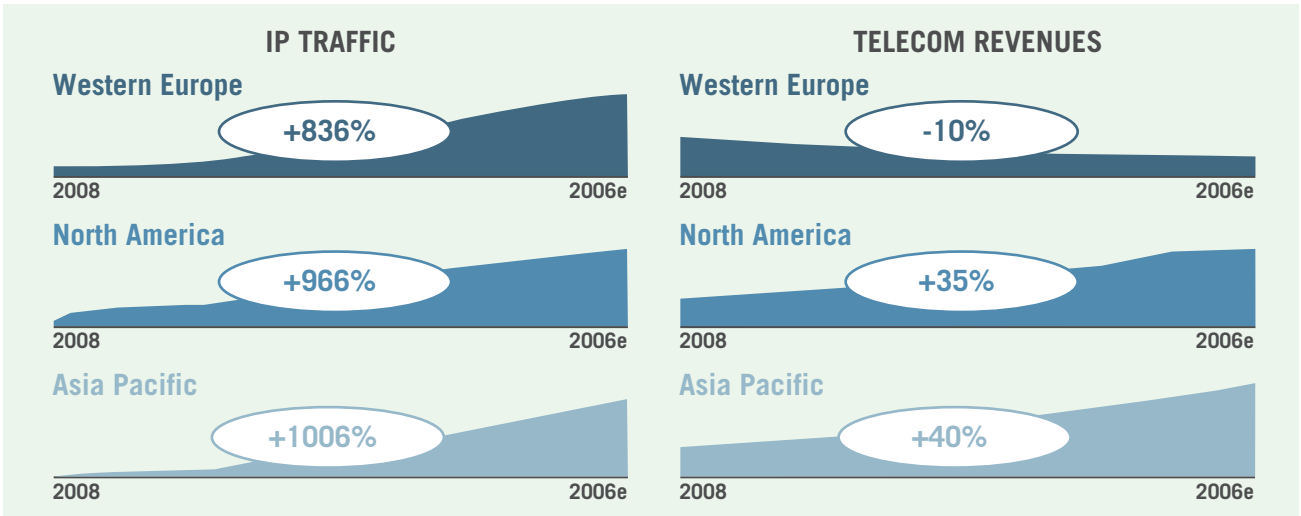
CHART 4: Revenues per communication access path, 2011 and 2013 (USD)



Source: OECD 2015.

The EC acknowledged the deteriorating conditions for investment and growth in the e-communications sector in 2013, when launching the Connected Continent Package. As shown in chart 5 below, shrinking revenues were compared to trends in North America and Asia, which saw a parallel increase of both UP traffic and prospective revenues for telecom operators. It is a powerful illustration of the anti-investment consequences of Europe’s access-based policy.

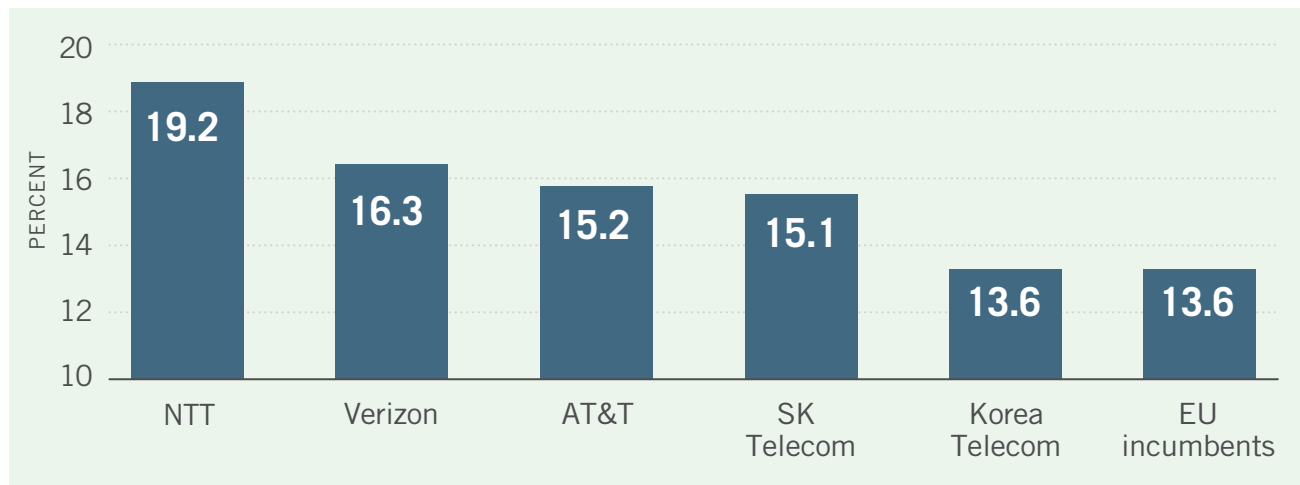
CHART 5: IP traffic and prospective telecom revenues, Western Europe, North America, and Asia-Pacific



Source: European Commission 2013a.

Chart 6 below provides another perspective on why EU policy-makers are concerned about investment. The figure shows that EU incumbents have not invested as much as operators in other countries per unit of sales for the period 2006–2012.

CHART 6: Domestic CAPEX/sales of EU incumbents vs. international, 2006–2012



Source: European Commission 2013d.

In summary, the national experience in EU member states suggests that broadband deployment is relatively strong only in countries that adopted pro-investment, facilities-based competition, or that have managed to create such competition through industrial policy over time. And even in these countries, reliance on unbundling of incumbents' networks has slowed down investment, with new entrants taking the lead in the deployment of brand new ultra-high-speed infrastructure. This was made possible also by the fact that, far from being an essential facility, fibre networks (in particular, FTTP/FTTH) are indeed largely a new infrastructure, which requires massive investment and is not a mere upgrade of previous pipelines. Much in the same vein, investment has also taken place in countries where no widespread fixed-line infrastructure was in place, such as Baltic states and Romania.

For what concerns more specifically fixed-line ultra-high-speed broadband, especially after Brexit, the future of the EU market seems likely to feature an increased reliance on industrial policy measures (state aids, the Juncker plan, cohesion funds, smart cities projects, and so on), and a weaker role for regulation. An inflow of public and private money, orchestrated by the EU institutions (in particular the European Investment Bank) is now needed to avoid Europe irremediably missing the digital economy train. This is mostly due to mistakes made in the regulatory approach over the past two decades, which will require additional burdens on European taxpayers. It is striking example of the risks of an access-based agenda.

WHAT LESSONS CAN CANADA LEARN FROM THE EU EXPERIENCE?

Europe's experience with access-based competition is highly relevant for the new government in Ottawa. Its predecessor shifted Canada's broadband and wireless policy in 2008 from the US/Japan/Korea model to the European one as part of a goal to encourage more competition in the market. This policy change generated considerable controversy, to the say the least. The government

contended that asymmetrical access to spectrum and capital and mandated network and tower sharing was essential to create the conditions for new market entrants to succeed. Incumbent firms cautioned that these policies would eventually cause them to slow or reorient capital investments in their networks and ultimately the price would be paid in less innovation, digital adoption, and economic activity.

The new government has largely refrained from setting a vision for broadband policy though it has ambitious goals with respect to innovation and entrepreneurship. As the government considers how to deliver on these goals, it ought to consider the experience in Europe. A new broadband policy that learns the lessons of Europe's failed experience with access-based competition should be a key part of Ottawa's broader Innovation Agenda.

There are many lessons that Canada could learn from Europe's experience. Despite its vast territory, slightly lower urbanization, and much less numerous population, Canada has had a vibrant development of its broadband infrastructure over time. This is mostly due to the fact that the country could rely on widespread cable infrastructure, which motivated incumbent telecommunications companies to invest in DSL and then, gradually, fibre networks to catch up with their well established, facilities-based rivals.

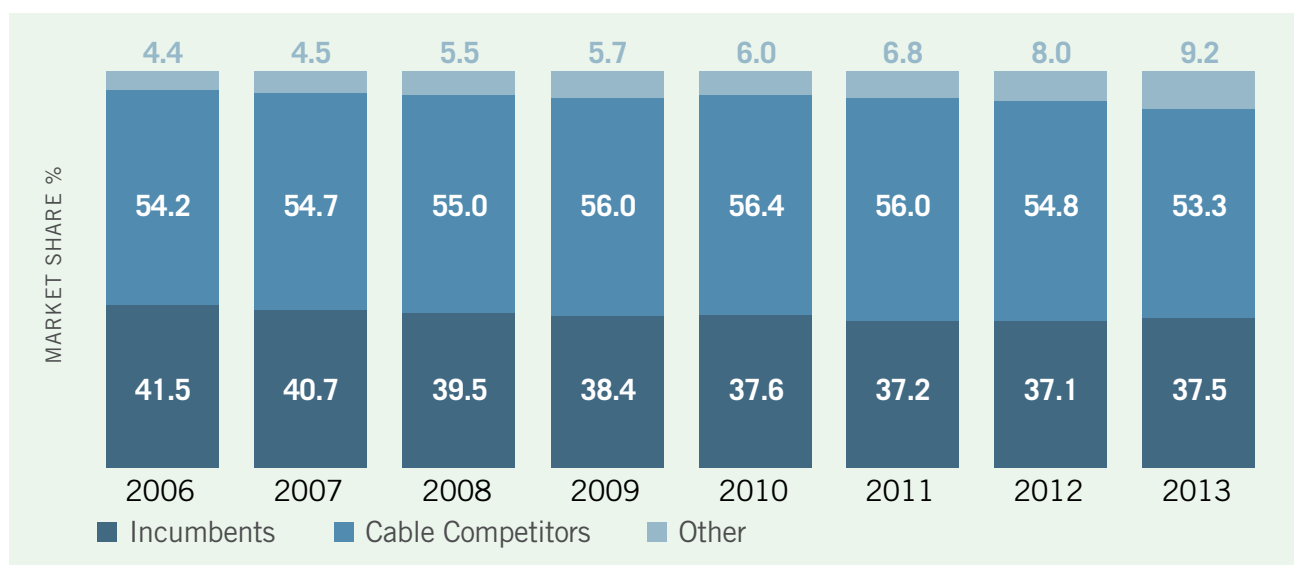
“An inflow of public and private money, orchestrated by EU institutions, is now needed to avoid Europe irremediably missing the digital economy train.”

The competitive success of cable companies and incumbent telephone providers in attracting broadband subscribers has varied dramatically over time. As shown by NERA (2015), this indicates a high degree of rivalry and demonstrates that the market is indeed dynamically competitive.

Consistently, Canada has performed better than the US in broadband penetration over the past decade, with high revenues for operators coupled with high investment levels. High-quality broadband infrastructure is a competitive advantage and it has been mostly financed by private capital.

As shown in chart 7 below, the degree of facilities-based competition in Canada is self-evident, with cable operators maintaining their market share over the 2006–2013 period, and incumbent telecom operators seeing their market share eroded by other players.

CHART 7: Residential fixed broadband subscriptions by type of provider, 2006–2013



Source: Church and Wilkins 2015.

The Harper government began to adjust Canada’s broadband policy beginning with the 2008 AWS auction in which new entrants were given preferential access to spectrum and eventually granted mandated access to incumbent networks. The government did not tend to describe its policy in the terms of the “ladder of investment” theory but at its core it is these ideas that drove federal policy with the stated goal of achieving a “fourth player” in the market.

This new path for federal policy reinforced in a recent decision issued in July 2015 by the Canadian Radio-television and Telecommunications Commission (CRTC) expanding its unbundling obligations to cover fibre-to-the-premises (FTTP) networks. This controversial decision, which was ultimately the subject of a Cabinet appeal, fails to account for the EU experience described in the previous sections.

From an external observer’s viewpoint the decision to impose access (price) regulation on FTTP seems to be hardly in line with the Canadian market conditions, where extensive facilities-based competition has secured over time sustained investment levels. It seems to basically ignore that previous policy had created the conditions for massive private investment in Canada’s broadband network and that the lessons from elsewhere such as Europe show that these conditions can be eroded.

Moreover, and relatedly, even if the European regulatory framework were applied in Canada, many of the incumbent operators currently deploying FTTP would not be subject to regulatory obligations, as they would lack significant market power: as a matter of fact, in EU antitrust law and telecom regulation SMP is considered to be consistent with market shares of at least 40 percent.

In addition, there seems to be little evidence that the market needs such intervention to strengthen retail competition: as shown in chart 8 below, Canadian prices per speed tier are comparable to prices in other countries.

CHART 8: International comparison of wireline broadband prices (PPP-adjusted \$CAN, 2015)

	Canada	U.S.	U.K.	France	Australia	Japan	Germany	Italy	Average
Level 1	48	55				58			53
Level 2	57	68		68	54	61	29	54	56
Level 3	68	92	41	52	70	65	47	52	61
Level 4	81	106	51	58	73	65	59	60	69

Source: Eisenach 2015. Data from Wall Communications Inc. 2015.

Where prices are comparatively lower, for example in the UK, this comes at a high cost to society: the lack of fibre investment. As Beaudry and Speer (2016) put it: “Would Canadians rather have the newest iPhone or marginally lower prices? The point is that a race to the bottom on pricing is incompatible with the government’s own innovation goals”.

Finally, as was the case in Europe, here too the application of the “essentiality test” to not-yet-fully-deployed networks seems to betray the original intentions and scope of the essential facilities doctrine: the boundaries between property rights and competition have been carved out carefully by economists, and failing to apply a thorough, sound replicability and essentiality test can prove detrimental for the future of the fixed-line e-communications infrastructure in Canada. The basic risk is that it leads to the type of underinvestment witnessed in Europe.

An analysis of the EU experience can thus be useful in thinking about the future development of broadband regulation in Canada, even if international comparisons are never perfect, and one should resist the temptation to export ready-made recipes from one legal system to another. To be sure, a number of lessons can be drawn, which could inspire future policy initiatives in Canada.

First, access policy was implemented in Europe as a consequence of the lack of facilities-based competition, with a view to generating such competition. This has always been very clear in Europe: access regulation was implemented only to promote the entry of new players, and gradually transform them into facilities-based operators. This is what the “ladder of investment” model seeks to achieve in the long term, even if the model has not been fully successful, especially in the broadband age.

In Canada, the recent CRTC decision does not seem to explicitly aim towards this goal, and even to the extent it did the EU experiences challenge the underlying assumptions of the so-called ladder. The risk, then, is that the new firms now with mandated access never actually become major investors in networks. Canada has solid facilities-based competition. There is no need for regulatory policy to try to prompt it.

Second, mandating a slightly higher wholesale access charge in the case of FTTP does not necessarily imply the same as the absence of regulation, when it comes to promoting investment. The CRTC seems to think that there does not need to be a trade-off between service-based competition and investment in new high-speed networks. In particular, it would suffice to add a “risk premium” to wholesale charges for access to FTTP networks to encourage ongoing investment by incumbent firms.

“Canada has high-quality networks with limited public investment, mostly as a result of its pro-investment policy framework.”

But it is simply not the case. As already explained in Section 1 above, the EC introduced a similar measure in 2010, and published guidance for the implementation of this measure by a national regulator. The Commission (2010) in particular argued that regulators “should ensure that access prices reflect the costs effectively borne by the SMP operator, including, where appropriate, a higher risk premium to reflect any additional and quantifiable risk incurred by the SMP operator”. However, results were disappointing, as demonstrated by the low levels of investment in fibre observed in Europe; in addition, significant difficulties were experienced by regulators in setting the additional risk premium, as confirmed by BEREC (2011).²² Widely quoted papers such as Nitsche and Wiethaus (2011) confirm this overall finding.

Third, failure to generate sufficient incentives to invest in new infrastructure eventually leads governments to seek more costly remedies to secure the advancement of electronic communications networks. In Europe, the use of public funds to support broadband development is now widespread and acknowledged as one of the only possibilities to ensure timely deployment. Incumbent players have largely left the initiative to much smaller cable operators and municipalities due to insufficient regulatory incentives. And the whole net neutrality debate was heavily influenced by this lack of incentives to invest.

Canada has managed to achieve high-quality networks with limited public investment mostly as a result of its pro-investment policy framework. Why, then, would we move in the opposite direction, only to have government ultimately become responsible for the necessary investments as evidenced in Europe?

Fourth, the far-from-satisfactory results achieved by the EU regulatory framework for e-communications mirror the problems faced by structuralist approaches to competition policy, which some attribute to the original influence of the Ordoliberal school in the formation and implementation of EU antitrust

rules (Gerber 1984; Akman 2014). According to this view, the relative preference for short-term static efficiency gains leads often to EU antitrust authorities sacrificing long-run dynamic efficiency and investment incentives on the altar of securing the highest possible number of players in the market at any given moment of time.

In contemporary ICT markets, including at the infrastructure level, this view appears less in line with the peculiar features of competition (Renda and Yoo 2015). This can also become an element of reflection in other legal systems, such as Canada: the temptation to protect competitors instead of consumers can lead to significant costs for society in the long term. Put differently: artificial, state-induced competition more often than not leads to more and more government interventions often at some expense to consumers. Canada's experience with the so-called "fourth player" policy is illustrative. It started with the 2008 "set aside" and continues to this day in the form of multiple interventions, including further preferential access to spectrum in 2014 and 2015.

Finally, the European experience can also teach a more general lesson on the regulatory approach to markets with high fixed costs, and overall high stakes: regulation should always be crafted in full awareness of the likely impact that individual provisions will have on incentives for market players.²³ More generally, good regulatory practice implies that regulators take a proportionate and adaptive

approach to regulation, and justify regulatory intervention on the basis of a clearly identified regulatory or market failure.

“Ottawa is set to announce an ambitious Innovation Agenda that will require high-quality digital networks to sustain it.”

Despite Canada's overall attitude towards evidence-based policy-making, the proceedings on wholesale access to wirelines networks have not featured high degrees of transparency and economic analysis supporting the final decision. Hal Singer (2015), who provided testimony on behalf of the Fiber to the Home Council in the CRTC's proceeding, later estimated that the CRTC's 2015 decision could discourage between

\$72 and \$384 million in FTTP investment per year in Ontario and Quebec, leading to between 2880 and 15,360 lost jobs, and between \$225 million and \$1.2 billion in lost economic output per year; and noted that the CRTC has offered no estimate of offsetting benefits to its FTTP unbundling plan.

The decision seemed more motivated by a pre-existing goal – that is, the "fourth player" policy – than empirical considerations such as the impact on investment, network quality, or broader economic considerations, such as innovation, digital adoption, or entrepreneurship.

Independently of the accuracy of Singer's estimates, it is likely that the decision will slow down investment in new fibre networks in Canada: even a delay in a few investment projects can prove costly for Canadian citizens, compared with the limited benefit additional service-based competition might confer, particularly as Ottawa is set to announce an ambitious Innovation Agenda that will require high-quality digital networks to sustain it.

A recent MLI study (Beaudry and Speer 2016) warned against an access-based regulatory policy based in part on Europe's failed experiment and instead put forward recommendations for a new pro-investment regulatory policy regime. This more detailed examination of Europe's broadband policy and the broader economic results reinforce that this is the wrong path for Canada.

CONCLUSION

A world-class Internet infrastructure is vital to economic growth in the 21st century, but frequently the actions taken by government to nurture broadband investment have had the opposite effect. Europe's experience in the past decades offers a salutary lesson of the risks of heavy-handed government regulation of digital networks.

It is a lesson that comes at a critical juncture for Canadian broadband policy. The Trudeau government has largely refrained from expressing a vision for broadband and wireless but it inherits from its predecessor a policy regime that resembles some of the negative aspects of European policy. The Harper government's so-called "fourth player" policy caused it to experiment with access-based competition in the name of adding new market players and lowering consumer prices.

The CRTC's 2015 decision imposing the unbundling of fibre-to-the-premises further reinforces this trend towards heavy-handed regulation in Canada. That the Trudeau government sustained the decision suggests that it prepared to maintain its predecessor's policy. This would be a mistake.

The lessons from Europe show where this path ultimately leads – in the direction of underinvestment, poor network quality, and a barrier to broader economic goals such as innovation, digital adoption, and entrepreneurship.

The Trudeau government thus finds itself faced with a choice with respect to broadband/wireless policy and its broader policy agenda. It is time to chart a new path that encourages investment and creates the condition for world-leading digital infrastructure.

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ENDNOTES

- 1 See European Commission (2013), at page 17, Box 1.
- 2 The different availability of cable TV infrastructure also has historical policy causes. In North America cable development was the result of the choice of a pay/advertising model, which facilitated the growth of content, whereas the European model relied on licence fees for TV. In addition, the US and Canada had more suburban dwellings which were difficult to serve with over the air broadcast, so underground cable was a more practical solution. In contrast, in the EU populations were more concentrated in cities.
- 3 At the EU level, the EC has the right of initiative, but Commission proposals are subject to a co-decision procedure that involves the European Parliament and the Council of the EU.
- 4 This possibility was introduced only in 2009 with the so-called “Third Telecoms Package”. The EC had long sought to extend its veto power to the remedies selected by NRAs, but eventually did not achieve this result due to the opposition of member states.
- 5 SMP is equivalent to the concept of “dominance” applied in antitrust law (Art. 102 of the Treaty on the Functioning of the EU). However, there are key differences between the application of those concepts in competition law and their application within the framework (e.g., the notion of essential facilities, see Renda 2010).
- 6 This approach was preceded by the “stepping stones” approach adopted in the US during the 1990s. See Farrell (1997).
- 7 The ERG (2005) clarifies what could happen if rungs are too close, or too distant.
- 8 Facilities-based competition occurs whenever at least some of the operators competing in the market possess their own network, and thus do not rely on another operator’s network.
- 9 Broadband penetration is the most commonly used dependent variable for two reasons. A theoretical reason is that access regulation by definition reduces new entrants’ investment, and it may do so by cutting inefficient duplicative investment, and compensates for it with higher consumer’s welfare (Crandall et al. 2013). A practical reason is that investment data series that are comparable across countries and specific for broadband infrastructure deployment are almost nonexistent.

- 10 At least two papers find a positive correlation between LLU and broadband penetration: Garcia-Murillo (2005) and Gruber and Koutroumpis (2011). The latter estimate a positive correlation across 167 countries, hence the sample is not limited to the OECD peers; however, this effect plays a role only in the first years of broadband deployment. Earlier work by de Ridder (2006) finds a positive correlation between LLU and broadband penetration; however, a later refinement to the model by Boyle et al. (2008) yielded a negative correlation.
- 11 Several other papers found similar results, especially for the US. Hausman and Sidak (2004) found no transition from service-based competition to facilities-based competition. Crandall et al. (2007) found that entrants stay on lower rungs of the ladder and want government to subsidize them and do not invest in a new network. Thomas W. Hazlett and Anil Caliskan (2008) found that subscribership increased 65 percent once LOI mandates were lifted.
- 12 More recently, a new controversy emerged as the EC authorized the German government to allow Deutsche Telekom to rely on vectoring of its copper-based VDSL networks rather than stepping up its investment to fibre. A group of Members of the European Parliament wrote a letter to the EC to express the concern that this would limit the possibility for new entrants to rely on the unbundling of the VDSL network, as vectoring is a technique that by itself makes it impossible to physically share the network with other operators.
- 13 The regulatory intensity indicator for the fixed-line segment refers to the existence of regulated vertical separation and an accounting separation obligation, as well as the existence of regulation regarding the full unbundling, line sharing, bitstream access, and subloop unbundling of the fixed-line incumbent's local loop.
- 14 Bitstream access refers to the situation where a wireline incumbent installs a high-speed access link to the customer's premises and then makes this access link available to third parties, to enable them to provide high-speed services to customers. Resale simply entails the provision of retail services to end customers, where new entrants use the incumbent's network in its entirety.
- 15 See, among other things, Ofcom's (2013) review of the wholesale broadband access market.
- 16 See also the Impact Assessment document attached to the recommendation, EC (2013) 329.
- 17 See the Impact Assessment of the recommendation on costing methodology and non-discrimination obligations, EC (2013) 329, Section 2.3, pages 15-17.
- 18 See also the related explanatory note (European Commission 2014b).
- 19 Dynamic competition is now reportedly being spurred by cable: in May 2016 BT announced a £6bn investment in broadband and mobile by 2020, which will include two million FTTP lines to homes and 10 million using G.fast, which offers speeds of up to 300 megabits using old copper lines. The announcement responded to Virgin's plan to build one million ultrafast fibre-optic broadband lines in the next three years. At the same time, rural broadband player Gigaclear plans to bring FTTP to 1.5 million rural homes and businesses.
- 20 Fast broadband represents fixed-line network technologies capable of delivering broadband at a downstream speed of at least 30 Mbps. Ultra-fast broadband represents fixed-line network technologies capable of delivering broadband at a downstream speed of at least 100 Mbps.
- 21 In OECD broadband statistics, *access path* includes analogue + ISDN, DSL, cable modem, fibre, and mobile subscriptions.
- 22 See also DotCon, 2012, *Regulatory Policy and the Roll-out of Fibre-to-the-Home Networks*.
- 23 In a previous article, I referred to this issue as the so-called "Galileo syndrome", since the famous "European GPS" project Galileo saw the withdrawal of all private funds after the EU institutions had announced a moratorium on commercial services (Renda 2015).



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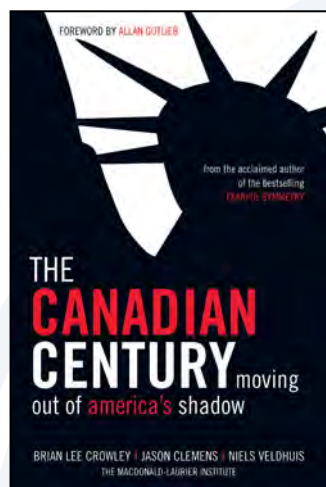
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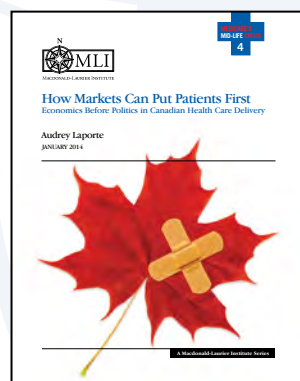
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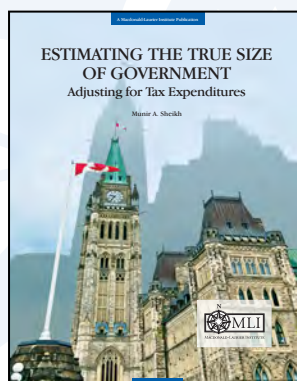
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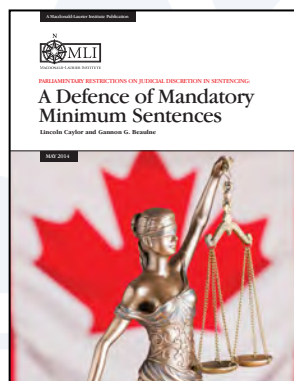
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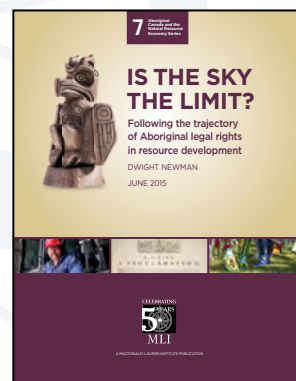
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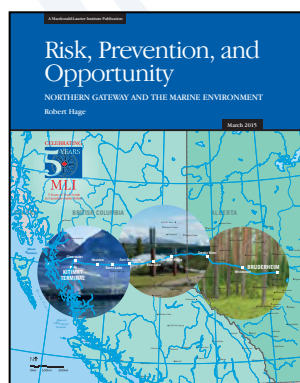
Estimating the True Size of Government
Munir A. Sheikh



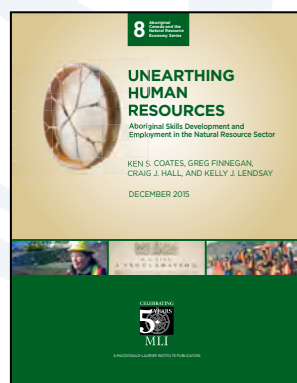
A Defence of Mandatory Minimum Sentences
Lincoln Caylor and
Gannon G. Beaulne



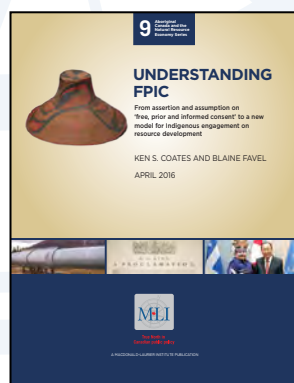
Is the Sky the Limit
Dwight Newman



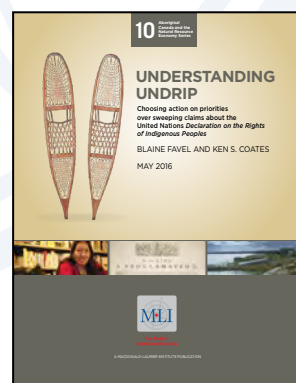
Risk, Prevention and Opportunity
Robert Hage



Unearthing Human Resources
Ken S. Coates,
Greg Finnegan, Craig J. Hall,
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Understanding FPIC
Ken S. Coates and
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THE RIGHT HONOURABLE STEPHEN HARPER

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