CAIRN POLICY BRIEF
CANADIAN AGRICULTURAL INNOVATION AND REGULATION NETWORK

REGULATION AND INNOVATION FOR AGRI-FOOD AND RENEWABLE ENERGY

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Issue

Innovation is a key determinant of competitiveness for firms which operate in Canada's agrifood and renewable energy sectors. A great deal has been written about the drivers of innovation, but comparatively little has been written about the interface between regulation and innovation. Regulations are usually various types of restrictions on property rights, land and natural resource use, methods of production, product specification, information disclosure, pricing and an assortment of other economic variables. Regulation promotes innovation by protecting intellectual property rights, lowering uncertainty about future market outcomes and reducing the so-called "lemons" problem, which is associated with asymmetric information. Regulation can also have a negative effect on innovation because of the explicit and implicit costs that result from regulatory delays, different regulatory requirements in different jurisdictions, administrative procedures and uncertainty for firms regarding the criteria for compliance and the expected cost of non-compliance. Regulation will be particularly costly for innovating firms in situations where outdated regulations for existing technologies are slow to change and new regulations for emerging technologies are slow to emerge. Changes to existing regulations or the introduction of new regulations frequently have unintended effects, which can vary in severity from minor to major.

Policy Implications and Conclusions

The interface between innovation and regulation has important policy implications. First,

innovation is often a response to regulatory change, so it is important for policy makers to anticipate this response when regulatory changes are being proposed. Second, innovation may be stifled because different jurisdictions have different regulatory requirements for no apparent reason, and addressing the regulations of multiple jurisdictions may be prohibitively expensive for firms with global supply chains. In such situations governments should continue to strive for greater harmonization of regulations until the marginal social costs and benefits of additional harmonization are equalized. Third, in immature industries such as biotechnology and bioproducts, regulations may be slow to emerge because of the complex nature of the technology and opposing views of stakeholders. Regulatory voids should be addressed in a timely fashion to reduce uncertainty in the regulatory process and to lower the cost of settling stakeholder disputes. Fourth, regulations frequently have unintended effects, so it is important for policy makers to anticipate these unintended impacts, especially in the context of R&D and commercialization decision making. Fifth, grandfathering clauses should be used with caution because they often provide strong disincentives for firms to engage in innovation that might jeopardize the grandfathering provision. Finally, policy makers should be aware that regulations can crowd out private market standards. This crowding out of private standards can negatively impact innovation because the development of new technologies and products often occurs at lower cost in a private standards environment versus a mandatory regulations environment.

The Regulation - Innovation Interface

There are three general ways that regulation and innovation may interface:

1. Regulations affect the incentives for firms to engage in knowledge-generating R&D, and also affect the likelihood that newly created knowledge will eventually be commercialized;
2. Changes in public attitudes and preferences can result in new or revised regulations for existing technologies products, and this change induces firms to innovate to lower the cost of compliance; and
3. New technologies and products and changes in public attitudes and preferences often require new and revised regulations; delays in regulatory approval and a lack of clarity about regulations can slow the rate of innovation and add to the cost of innovation.

Each of these categories of regulation will be discussed in turn

Regulation and Incentives to Innovate: To induce efficient levels of innovation, regulations need to establish well defined intellectual property rights, transparent procedures for compliance, predictable schedules of taxes, subsidies, price ceilings, etc., and stable rules governing a variety of variables such as liability and market access by foreign firms (EuroAbstracts, 2004). For example, a firm developing a wind turbine technology should have knowledge about the level of patent protection it will enjoy in various jurisdictions, a guaranteed schedule of feed-in tariffs for green energy and reasonable information concerning future moratoriums on new wind farms (Walz and Schleich, 2009). Similarly, a firm developing a new food product with functional features requires up-front clarification regarding whether its product will be classified and

regulated as a food or a natural health product (Farrella et al., 2009). In the 1990s Monsanto sunk hundreds of millions into the development of genetically modified (GM) wheat, but eventually placed North American commercialization efforts on hold after substantial commercial concerns about market access induced regulators to withhold approval (Waters Bass 2004). Future R&D initiatives by Monsanto will undoubtedly be influenced by this outcome.

Innovation to Reduce the Cost of Compliance: To remain competitive firms must continually innovate to lower the cost of being in compliance with evolving regulations. In this context, regulations are a major driver of innovation. Indeed, regulations which establish minimum quality standards or maximum pollution levels can be a highly effective means of inducing innovation (EuroAbstracts, 2004). Over the past several decades, much of the innovation in North America's meat packing industry has been in response to regulations which address consumers' concerns over the treatment of livestock in slaughter plants and microbial contamination of meat products (Feller and Sink, 1984). Similarly, recent U.S. regulation that requires country-of-origin labeling for beef products has added substantial costs to the supply chain of Canadian beef being sold in U.S. markets. This cost is sure to hasten the development of gene marker techniques for facilitating full traceability in livestock (Hobbs 2003). Innovation to reduce the cost of complying with trans-fat regulations has been remarkably fast in light of recent legislation that required firms to include trans-fat levels on food labels (Unnevehr and Jagmanaitea, 2008).

Regulation of New Technologies and Products: Regulating new technologies is a complex process that typically strives to achieve a balance across a diverse set of stakeholders. Unfortunately, this balancing act often implies long delays in the formation of regulations for technologies which are complex and uncertain (Zollers, 1989). For example, the emergence of new forms of plant and animal biotechnology has created a high demand for information and assurances by both consumers and investors, which in turn has created long delays in regulatory approval of new technologies and new products (Thomassin and Cloutier, 2001). Technology and new product development is subject to many "gray" areas, so not surprisingly many technologies are in use and products are being marketed with inadequate regulations. Regulatory voids creates an uneven playing surface for firms because some firms will incur extra costs to ensure regulatory compliance whereas other firms will simply ignore existing regulations and argue that the rules are not applicable to their special case. Canada's functional food industry is a good example where there are numerous gray areas. Ambiguous regulations concerning clinical trials for products that straddle the food and natural health products (NHP) categories has created confusion for consumers, an uneven playing field for those firms which have different interpretations of the regulatory requirements and long delays for product approvals when classification confusion is particularly acute (Farrella et al., 2009).

Other Issues

Regulatory Differences across Jurisdictions: Firms that develop products for use in different countries often face very different regulatory requirements in the different jurisdictions. The high cost of satisfying these

requirements can both stifle innovation activities and induce firms to narrow the scope of the distribution of their product. This problem has been particularly acute for agro-chemical companies who develop pesticides and attempt to have them registered in both Canada and the U.S. Since these two countries signed the NAFTA agreement in 1996, Health Canada has participated in harmonization negotiations with the aim to create a common submission database for manufacturers, coordinate approval processes and reduce trade disputes that are attributable to differences in regulatory standards for pesticide residuals (Health Canada Fact Sheet, undated). Pesticide harmonization can create large cost savings but can also generate suboptimal levels of regulation because of differences in climate, plant varieties and prominence of the crop across the different jurisdictions (Ottawa Citizen, 2007). Hence, the marginal social costs and benefits of harmonization must be well understood throughout the negotiations.

Grandfathering: New regulations are often implemented with various degrees of "grandfathering" in order to reduce the financial cost of achieving regulatory compliance for existing firms. Grandfathering is an economically efficient policy in some cases (e.g., not requiring home owners to upgrade their older homes when new building codes are enacted), but in general is enacted on the basis of fairness. Hsu (2006) asserts that grandfathering exemptions have high associated social costs and as such should be used with caution. He argues that grandfathering clauses provide a strong disincentive for existing firms to upgrade capital and engage in innovation over fears of losing grandfathering protection. Grandfathering also deters new firms from entering a market because of the cost advantage enjoyed by incumbent firms. Grandfathering often results in significant lobbying to preserve grandfathering provisions and a sizeable implicit monetary transfer from those without to those with grandfathering protection. Grandfathering is becoming an increasingly important issue in the wind turbine industry. Indeed, firms in this industry have a strong incentive to implement projects sooner rather than later over concerns that zoning regulations may eliminate low-cost location options in the near future.

Unintended Consequences: Regulations often have unintended consequences such as creating price distortions, reducing managerial incentives and, most relevant for this policy brief, reducing innovation (Tan et al. 2009). Unintended consequences often arise when regulators fail to properly account for strategic responses of those being regulated. For example, since 2005 food product labels must report trans fat levels if the level in a product is in excess of 0.2 grams per serving. The unintended innovation of some firms was to simply make the serving size smaller to avoid having to report the presence of trans fat. U.S. legislation unintentionally *requires* (versus *allows*) firms to report zero trans fat if the level is 0.5 grams per serving or less.In another example, feed-in tariffs for green electricity can be effective regulation for inducing farmers to construct anaerobic digesters for converting biogas from manure into electricity. However, once constructed the feed-in tariffs induce farmers to feed their digesters with energy crops well in excess of that which is socially optimal.

Private Standards: Private standards, which impose restrictions on production

processes, product specifications and a variety of social/environmental variables, are increasingly being used by firms and industry associations to add value to agri-food supply chains. Private standards work well for coordinating goods from highly diverse suppliers in global markets and for managing risks associated with quality assurance (Tallontire, 2007). Private standards are effective at lowering costs and achieving premium prices for consumers who value high quality products. However, private standards are also used to pre-empt mandatory government regulations in an attempt to reduce the cost of regulatory compliance (McCluskey and Winfree, forthcoming). Regulatory preemption raises the issue of whether existing regulations and new regulations crowd out private standards and thus reduces the incentive for firms to innovate. Firms are more likely to develop and commercialize new ideas if they can participate in the creation of private standards, which in comparison to legislation are substantially easier to change and customize. As a good example, industry certified animal welfare standards usually go well beyond mandatory regulations. It should therefore not be surprising that innovations such as genetic traceability have largely been driven by private standards versus regulation.

Regulation and Asymmetric Information: Despite the potential crowding out effects of regulation in an industry with emerging private standards, there still exists an important role for regulation. Katz (2007) argues that firms have an incentive to free ride and cheat regardless of whether the industry is governed by private standards or mandatory regulation, but the incidence of this type of behavior is expected to be lower in a regulated environment. Free riding and cheating can take the form of the standard lemons problem where low quality firms mimic the behavior of high quality firms or may take the form of failing to obey testing protocols and falsifying or failing to disclose information. The incentive to innovate is highly diminished in a lemons environment or in an environment prone to cheating, so in this respect regulation may be an important driver of innovation. Regulation which creates barriers to entry for an industry is also likely to give rise to relatively higher rates of innovation. Regulation may be especially important in food processing where food manufacturers have a strong incentive to make claims about the nutritional benefits of a food product in order to raise sales (Hilson, 2005). Eco-claims, which link food production to the environment, are largely in the domain of private standards, presumably because the validity of such claims are less important than nutritional claims (van Amstel, 2008).

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