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Effects of Plant Breeders' Rights (PBRs) on agricultural development: comparative evidence from Tanzania and Canada.

BACKGROUND

The focus of this research project is to examine and compare the effects of introducing Intellectual Property Rights (IPRs), more specifically Plant Breeders Rights (PBRs) on the development of agriculture in Tanzania and Canada.

IPRs encompass a clusters of legal doctrines namely - patent, copyright, trademark and trade secret[1]- which differ in their structure, scope and spheres of application. IPRs grant control-rights over the economic exploitation of an idea or its 'reification' to the entitled party[2] (Metaxas-Maranghidis, 1995; cited according to Ramello, 2005)

The traditional Law-and-Economics' theoretical approach to IPRs focuses on their capacity to incentivize the creation and/or dissemination of new ideas. Recently, Ramello (2005: 2) argued that, "by the very fact of being property rights, they contribute by definition to shaping the market structure, regulating the competitive scenario and determining the rational behaviors of economic agents."

Beyond the well-known types of IPRs i.e. copyright, patent, trade-mark, trade secrets (Metaxas-Maranghidis, 1995) newer varieties include rights in trade-names, industrial designs, microchip topologies, as well as - **Plant Breeders' Rights (PBRs)** (Mackaay, 2008:1). PBRs are used for the protection of plant innovations, which are important for agricultural development. Healthy productive plants are essential for meeting future demands for food, feed, fiber and other plant-based products; minimizing post-harvest losses; and sustaining local, regional and global economies (Flood, 2010). Plant breeding is characterized by continuous innovations and the ongoing development of new varieties that can meet the requirements of producers and consumers more effectively. The driving force behind this type of innovation is the acquisition or increase of market share (Louwaars et al., 2009).

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[1] The reference here concerns the general legal paradigm applying to different countries although, as pointed out elsewhere in the text, intellectual property can be locally declined in a multitude of rights , generating as many variants as the countries that recognise it For a taxonomy of intellectual property rights in Europe see for instance Metaxas-Maranghidis (1995) and in general, among others, Fawcett and Torremans (2001).

[2] i.e. its expression for an individual or group that creates or innovates a tangible or intangible material. (Metaxas-Maranghidis, 1995)

Developed in the first half of the 20th century, PBRs represent the oldest form of protection available to plant breeders. In developing countries, seed supply requirements are met through exchanges between farmers, which operate alongside other more formal mechanisms. Farmers' seed systems are largely based on traditional methods of selection between varieties as well as seed multiplication carried out on farms, but still involve modern varieties. With regards to the relevance of PBRs in plant innovation, Ngwediagi (2008) argued that, 'adequate plant variety protection encourages investment in the plant breeding sector and opens a country's door to overseas' varieties where the protection of law is guaranteed. More often than not, new plant varieties render higher yield and quality product, as well as a greater resistance to disease rendering them a crucial aspect of production. Through these varieties the benefits of plant variety protection therefore extend to farmers, producers and to the national economy.'

In their function of protecting plant innovation, PBRs are, on the one hand, compared to patents[3], and on the other, Farmers' Rights (generic, non-IPR type) (Lesser, 1999, 2000; Louwaars et al., 2005; Trommetter, 2008). Patents are used to supplement PBRs in some countries (such as, the United States, Japan and Australia)[4], some countires rely only on PBRS (such as, **Canada**, France and **Tanzania**) and others completely replace them for patents. PBRs provide weaker protection than patents. PBRs grant the holder the authority to forbid others to reproduce, handle, offer for sale, sell, import and export, or store propagation material of the protected variety[5]. Unlike patents they do not offer protection for the method necessary to obtain this variety, which implies that other producers can use this method in combination with some other to reach a third variety. This means that PBRs are only meant to protect the product in the market (Louwaars et al., 2009), in contrast to patents that allow for the protection of the innovative method (sellable through licencing). Another important way of protecting plant innovation is through more generic Farmers Rights, which do not

[3] Patent entered the sector via plant biotechnology after legal rulings in the USA in the 1980s, and in Europe following the Biotechnology Directive to which the European Patent Convention has been adapted. Numbers, quality and scope of patents create major challenges for the plant breeding sector (3.4).

[4] These are called "utility patents" in the United States and Japan and "standard patents" in Australia. Patenting a seed variety in Australia and Japan is relatively rare due to strong patent requirements. and 45 patents on wheat, and 555 PBRs and 1,543 patents on maize varieties. In cases where both PBRs and patents are allowed for protection of plant innovation bussnisses can go for both. For example, Pioneer Hi-Bred has obtained 116 PBRs and 106 patents on wheat varieties and 765 PBRs and 1946 patents on maize varieties (USPTO and UPOV websites).

[5] Variety is defined as: 'a plant grouping within a single botanical taxon of the lowest known rank, which grouping, irrespective of whether the conditions for the grant of a breeder's right are fully met, can be defined by the expression of the characteristics resulting from a given genotype or combination of genotypes, distinguished from any other plant grouping by the expression of at least one of the said characteristics, and considered as a unit with regard to its suitability for being propagated unchanged' (Louwaars et al., 2009,13).

belong to the specific category of IPRs. The major difference between Farmers' Rights and IPRs is that while the latter offer exclusive rights, the former are geared towards compensation and benefit sharing. Furthermore, Farmers' Rights do not readily define the title-holder or subject matter, which are clearly established in the case of IPRs. Finally, IPRs are also of a limited duration while Farmers' Rights are unlimited.

In the context of previous theoretical discussion on the effects of IPR, the effects of PBR can be expected to fall somewhere between those of patents and those of Farmers Rights. If the acquisition of Farmers Rights completely bar the spread of plant innovation and patents allow for it only through the sale of a license, PBRs allow for free copying of innovative breeding method without compensating the innovator and at the same time, allowing the original innovator to profit from his innovation by selling seeds (that the buyer cannot reproduce for further re-sale).

In 2002, the **Tanzanian** government chose to introduce PBRs for the purpose of protecting plant innovation and encouraging agricultural development.

Tanzania's agricultural sector has still not attained the desired level of development. In Tanzania, over 80 per cent of the population live in rural areas and depend on agriculture for their livelihood. This sector contributes about 26.5 percent to the GDP and comprises 54 percent of the nation's foreign exchange earnings[6] (Ngwediagi, 2008). Agricultural income is the main source of income for the poor, especially in rural areas. Smallholder farmers characterize most of Tanzanian's agriculture. The large majority of the crop area is cultivated by hand, while for the remaining area farmers use ploughs and tractors. The main food crops are maize, rice, wheat, sorghum/millet, cassava and beans and they represent nearly 85 percent of the area cultivated. Bananas are grown mainly in the Kagera and Kilimanjaro area, and like cassava have a low value-to-bulk ratio and are generally retained for home consumption. In recent times, plant breeders are creating new varieties of some of these main food crops and this calls for attention to IPR (Sarris et al , 2006).

In Tanzania, 90 percent of seed management is carried out by farmers and the remaining 10 percent supplied by certified seeds sold on the market (these are generally much more expensive and are not easily available to many farmers in remote areas)[7]. In trying to tackle these problems, the Government of Tanzania has established a legal system for the protection of PBRs in order to put in place a mechanism for rewarding plant breeders and for the purpose of promoting plant breeding

[6] https://www.managingip.com/Article/3580704/Africa-Plant-breeders-rights-in-Tanzania.html?ArticleId=3580704
[7] MAFC Report to the National Variety Release Committee, December 2008

activities to stimulate and promote agricultural development. The system was put in place through the enactment of the Plant Breeders' Rights Act, 2002 which officially became operational in 2004.

In August, 1990 PBR Act was passed in Canada. It was originally based on 1978 Act of the International Convention for the Protection of New Varieties of Plants (UPOV). Canada has had some of ratifications to her PBRs and on 19th June, 2015 ratified the UPOV'91 and that is what currently is in use. The role of PBRs in agricultural development is evident as the Ten-year report (2002) demonstrated that the PBR Act achieved; stimulated investment in Canadian plant breeding, facilitated farmers access to foreign breed varieties and facilitated protection of Canadian breed varieties in other countries (Agriculture and Agri-Food, 2016). It is evident that PBRs has been effective in Canada following the Plant Breeder's Act's introduction, ' The private sector's investment into plant breeding in Canada nearly tripled, from $33.2 million in 1987 to $92.5 million in 2001' (Agriculture and Afric Food Canada, 2004). However, the advantages and disadvantages of a stronger IPR system in Canadian agriculture are currently hotly debated in policy circles (Galushko, 2008).

Indeed, agriculture is one of the founding industries of Canada. All of Canada's major crops originated in other parts of the world – highly dependent on access to genetic resources (Agriculture and Afric Food Canada, 2016). Canada has both natural and accumulated advantages offering an opportunity to become the premier supplier of agricultural and agri-food products to the world. Canada has the third largest endowment of arable land per capita in the world behind Australia and Kazakhstan. A natural advantage for Canada is its access to water. Much of the world faces some degree of fresh water scarcity. In a comparative sense, it is much easier for Canadians to deliver their products to markets than many of our potential competitors (Martin and Stiefelmeyer, 2011).The main food crops are alfalfa, barley, oats, and wheat. Unlike Tanzania, the agricultural sector of Canada has been growing progessively.

In 2016, the agriculture and agri-food system generated $111.9 billion of gross domestic product (GDP) and accounted for 6.7% of Canada's total GDP.It also employed approximately 2.3 million people, representing 12.5% of Canadian employment in 2016. GDP in the agriculture and agri-food system grew by 11% from 2012 to 2016. In comparison, the Canadian economy grew by 7.8% over the same time period.[8]

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http://www.agr.gc.ca/eng/about-us/publications/economic-publications/an-overview-of-the-canadian-agriculture-and-agri-food-system-2017/?id=1510326669269

Some argue that IPRs such as PBRs undermine the Canadian breeding programs and assert that advances in plant breeding can continue to be made only through collaborative efforts and open access to existing technologies (Kuyek, 2004). Others, however, argue that PBRs have been an effective tool for fostering the development of new varieties and open access to foreign technologies.

Based on the experiences and the outcomes of implementing the PBRs, there has been calls from stakeholders for governments to review the law governing the granting of PBRs to make it more compliant with international systems with regard to variety protection for the purpose of increasing local and foreign investment in plant breeding (Ngwediagi, 2008).

PBR is the only intellectual property used to protect new plant varieties in Tanzania and Canada but there has not been any empirical research to examine and compare their effects on **agricultural development** .

To bridge that knowledge gap, this research project employs a comparative institutional analysis using the set of analytical tools from the field generally called **Law and Economics** or New Institutional Economics with the goal of examing and comparing the effects of Plant Breeders' Rights (PBRs) as a tool for agricultural development in Tanzania and Canada.

RESEARCH QUESTION

The following research questions will lead the study;

1. Did PBRs incentivize further innovation?
2. Did PBRs change the structure of the market for agricultural input?

RESEARCH METHODOLOGY

In order to tackle these research questions, I will use an empirical strategy based on **Ordinary Least Squares** regression.

1.

In order to verify if PBRs created incentives for further innovation, I will compare the famers in both countries that formalized their innovation through PBRs and those that did not in terms of the following outcomes:

- Propensity for further innovation by the party / or its collaborators.
- Rents and Revenues from licensing for the innovator.

In order to make my results more robust I will use following control variables:

- Cost structure for production
- Land quality
- Access to funds
- Type of ownership
- Type of farming
- The political policy and instruction
- Educational level of the breeders

2.

In order to account for the market structure change caused by the introduction of PBRs, I will compare Tanzania and Canada in terms of:

- The agricultural input prices.
- The division of money flow between acquisition of licenses and acquisition of other agricultural input across regions.

Besides previously mentioned control variables, here I will also use:

- Soil characteristics in the regions
- Transaction cost

- Institutional impediments such as transportation, communication

Primary source of data will be the national registry for PBRs of Tanzania and Canada which holds information on the parties that formalized the IPR for plant innovation, time of formalization as well as on the specific plants that the innovation involved.

Secondary sources of data will include:

- Living Standard Measurement Survey Repository of World Bank, that holds panel data relevant for my control variables in the periods before and after the PBRs have been introduced (http://microdata.worldbank.org/index.php/catalog/lsms).
- Census data from Tanzanian National Bureau of Statistics and the Statistics Canada that will provide additional characteristics regarding the parties that formalized IPRs to plant innovation (https://www.nbs.go.tz) and (https://www.statcan.gc.ca/eng/start).
- Afrobarometer district level data on soil, climate, precipitation as well as on institutional conditions on the relevant territory (http://www.afrobarometer.org).
- Data from local journals and pre-existing articles that inform on the characteristics of businesses that used PBRs (https://24tanzania.com,…..).

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