Bio-based and Applied Economics 8(3): 325-334, 2019
DOI: 10.13128/bae-9748

Short Communication

Competitiveness of cattle breeding in Switzerland: the value of policies enabling informed decisions

Stefan Mann

Agroscope

Abstract. Using the case of of Swiss Brown Cattle breeding, this paper develops the hypothesis that a two-angle strategy of fostering competition and providing maximum access to information is promising for states to attain high competitiveness on a national level. Abandoning the monopoly on bull sperm while subsidising classifications of animals in order to provide a maximum base of knowledge helped to increase Switzerland's self-sufficiency in Brown Cattle sperm from under 50 to almost 100 per cent.

Keywords. Switzerland, cattle, breeding, information economics.

JEL Code. Q13.

1. Introduction

The debate about appropriate policies for attaining competitiveness by sectors and nations has long been centred around traditional lines between hands-off liberalists and interventionists. The aspect of how governments should deal with information management is gaining importance in this respect. In Section 2, the literature of the role of the state in handling information is reviewed and arguments about why and how governments should facilitate sufficient access to information to increase sector competitiveness are provided.

Cattle breeding in Switzerland is a sector in which information plays a crucial role in becoming competitive and therefore is a well suited case study to illustrate the effect of information policy on competitiveness. In the Swiss Brown Cattle market in Switzerland, domestic sperm has increased its market share considerably over the last decades from under 50 to almost 100 per cent. Changes in the political regime were an important driver in this process. On the one hand, the government abandoned the monopoly on bull sperm, on the other it provided incentives to generate and use genetic information . In Section 3, the effect of this policy is described. Section 4 focuses on the limitations of this case and offers some conclusions.

Corresponding author: stefan.mann@agroscope.admin.ch

ISSN 2280-6180 (print)
ISSN 2280-6172 (online)

2. Theoretical Framework

While information has been defined in general as a reduction of uncertainty (Sivak, 1996), its use in economic science is ambiguous. On the one hand, institutional economists have shown that the functioning of all markets is strongly dependent on the scale and scope of available information On the other hand, information is a tradable good, and market research companies, consultancies, publishers and many other enterprises owe one of their main justifications to the existence of the market for information.

The latter perspective is needed when exploring reasons why the state might want to interfere in the market for information. One of them is distributional justice (Craig *et al.*, 2008). This is a factor that mostly justifies state intervention in the case of information asymmetries (Mann and Wüstemann, 2010; Mann, 2017). Beyond that, however, the character of information as a public good or as a merit good must be reviewed in some depth in order to arrive at tangible conclusions with regard to the rationale for state intervention.

2.1 The public good aspect of information

When Samuelson (1954) determined nonexcludability and nonrivalry as criteria for public goods, no one expected his brief text to reshape the way economists thought about the distinction between private and public goods (Nordhaus, 2005). Samuelson himself was rather clear that information qualified as a public good (Samuelson, 1958), mainly with respect to media, such as radio and television, where the dissemination of information would nether be excludable nor create problems like rivalry.

Subsequent scholars have shown that the actual state of affairs is more complex. Bates (1990), for example, demonstrated circumstances in which information has private good properties, and others in which it does not. At the same time, Allen (1990) emphasised circumstances under which information generates a price, thereby qualifying it as a private good. Complicating matters further, Antle (1999) suggested that information, though non-competitive, is excludable, such that it would qualify as a club good.

The least that can be concluded from this debate is that information can be treated in extremely different ways. Suppliers of information, like advertisers, may attempt to spread information as widely as possible. In other cases, both in business and private affairs, information may be sealed and never disclosed, or it may be carefully sold to a single person. Similar choices are made on the demand side. Some buyers of information are eager to share it (such as educational bodies), whereas others seek to conceal it.

Public entities create increasing pressure to make information public. Lewis (2012) argued that Gold Open Access, which grants access to all articles at all times, is a disruptive innovation, but one which is likely to cover a major share of the journal market. Governmental bodies, including the European Commission, have pushed for the accessibility of research results, not only technically in terms of open access, but also in terms of transfers of knowledge through the use of simple language and popular media (Olff, 2014). It is indeed plausible that spreading information, or at least making it available on demand, increases its potential benefits much more than its potential costs.

This leads to an often neglected opposition of interests: Limiting access is strongly in the interest of those who want to gain benefits from either selling information or concealing it

(Nisbet and Lewenstein, 2002), whereas the public has an interest in making information as widely accessible as possible. The conflict around patent law, with its struggle to find a 'balance between commercial profitability and public-interest concerns' (Maskus and Reichman, 2004, 283) is an exemplary illustration of this unavoidable clash of interests.

2.2 The merit good aspect of information

When Musgrave (1957, 1959) suggested that the state, in some cases, should impose the consumption of certain goods in spite of the absence of demand among consumers, the concept attracted little support from mainstream economists. Forty years later, Thaler and Sunstein (2008), based on their expertise in behavioural economics, introduced the concept of libertarian paternalism. It has been shown (Mann and Gairing, 2012) how strongly related their preference for 'nudging' people into making rational choices was to the 'merit good' concept. The Nobel Prize awarded to Richard Thaler in 2017 confirms how clear it is today that our decisions are occasionally irrational, and that it would benefit us if the state was more involved in our decision making.

One classical example of such a case is our demand for education. Even before Musgrave (1957, 341) first mused about 'the apparent willingness of the public to provide for a second car and a third icebox prior to ensuring adequate education for their children', it has become common for the public to finance the bulk of primary, and often secondary, education. Poutvaara (2008) even named a number of countries that finance 100 per cent of tertiary education. It would be technically possible to trade education on the free market; parents would buy kindergarten and school programmes as they would food and clothing. As such, there is little trust among policy makers that this would lead to the sufficient education of children, and probably rightly so.

The necessary process of consuming food generates pleasure, which is probably the reason why paying for food is condoned. As we all know, however, obtaining new knowledge and learning about methodologies do not always generate the same feelings of satisfaction and pleasure. This is likely the reason why the state not only pays for but also encourages or even forces us to receive an education. Only from around the age of 20-30, when we have sufficient knowledge to participate in the labour market, do states leave the decision to continue education to market forces.

2.3 Institutional options for intervening

Leaving the availability of information solely to market forces is neither recommended by economists nor considered a good practice in many countries. This leads to the question of how to institutionalise interventions into markets for information.

When discussing the failure of real-world socialism, most political economists (e.g., Elson, 1988; Prybyla, 1991; Li, 2013) agree that both an incentive and an information problem were the main causes for the failure of the system. The information problem's underlying mechanism was that competition generates information (Tang, 2018). Both the success and failure of actors on the market, as indicated by overdemand and lack of demand, are important signals for the preference functions of consumers in a given region, country or even worldwide.

The incentive and information problems are interlinked: When facing increased competition, the incentive to collect sound information on consumer preferences rises, i.e., part of the more intense information flows is fostered by incentives for successful performance on the market.

However, the main advantage of competition in terms of information is that outsiders have a fair chance. In administered markets, the 'usual suspects' are often in charge, whereas it has often been shown (Timmons, 1994; Faltin, 1999; Henoch, 2006) how entrepreneurship introduces new approaches and ideas to tackle problems. Translating this phenomenon into information economics, outsiders may sometimes have better ways of covering demands than actors from within the system, which is important information that should be spread.

2.4 An approach for enabling informed decision making

The complex functions and characteristics of information in contemporary markets reject simple solutions with respect to the classic dichotomy between interventionists and non-interventionists. Scholars who are in general supportive of governmental interventions into markets will find it difficult to accept that all limitations set on competition should be avoided. Any attempts by governments to steer markets in special directions by excluding either players or options are counterproductive, as they decrease the amount of accessible information.

Government interventions, however, are highly appropriate when it comes to the accessibility of information. There is a tendency among information providers to disclose their findings to the non-paying public, and there is also a tendency among information consumers to underinvest in this crucial commodity. This creates likely gains if governments take care to provide data which the public can access at a low cost.

Combining these two elements leads to a strategy for maximising the accessibility of information that will become increasingly important in the Information Age.

3. Empirical methodology

Information is not equally important in each sector. For competitiveness, for example, in the energy or transport sector, infrastructure will be more important than the availability of information (Kljajic *et al.*, 2016; Dolinavova *et al.*, 2017). In other sectors like finance, trust is probably the most important resource (Namahoot and Lavichien, 2015). It is therefore useful to focus on a sector where the role of information is rather above average.

This applies to the market for genetic material in agriculture. Breeding activities require a vast amount of information to be successful. Habier *et al.* (2007), for example, emphasised the importance of genetic relationship information for the breeding values of Holstein cattle. Iezoni *et al.* (2010) illustrated the advantages of an integrated framework of marker-assisted breeding in Rosaceae fruits. Yates *et al.* (2018) demonstrated the need for professional data management for successful crop breeding programmes. The targeted selection of valuable attributes of a species requires much information about the available material.

This also applies to cattle breeding where the largest database internationally, being situated in the United States, has been documented to markedly improve the quality of breeding

(Weigel *et al.*, 2017). While smaller nations attempt to catch up (Lidauer *et al.*, 2006; Fürst *et al.*, 2011), it seems questionable if smaller nation with their lower level of centralization are capable of staying competitive.

Switzerland appears as an ideal test case, as Swiss actors had at one time lost any market power over breeds originating from Switzerland, but regained this power through a series of political adaptations. This development may therefore serve as a case in point to test the theoretical points made above. Both a thorough analysis of the agricultural press in the time between 1996 and the present and in-depth talk with core actors and trade data were used. This included the use of descriptive statistics, but also of content analysis of recorded and transcribed interviews.

The case of Swiss Brown Cattle is also economically relevant as it still constitutes the majority of all dairy cows in Switzerland. This economic dimension, the high dependency on information in animal breeding and the strong dynamics in the breeding of Swiss Brown Cattle make the case worthwhile to find out more about the role of governments in information management of a sector.

4. The case of breeding swiss brown cattle

4.1 Trade development

As in large parts of the contemporary developing world (Vasconcelos Dantas *et al.*, 2018), in Switzerland until the 1970s, local bulls were in charge of inseminating most cows. Then, artificial insemination was introduced, which allowed the selection of the genetic material with the best performance on an international scale. Figure 1 indicates that the option of sperm imports was readily taken up around the turn of the century, even for Brown Cattle, for which the genetic centre is situated in Switzerland, where there are around 200,000 Brown Cattle animals, more than in any other country. While import values of the sperm of Brown Cattle have peaked at around 10 million USD per year, the degrees of self-sufficiency in sperm for other breeds were even lower at that time.

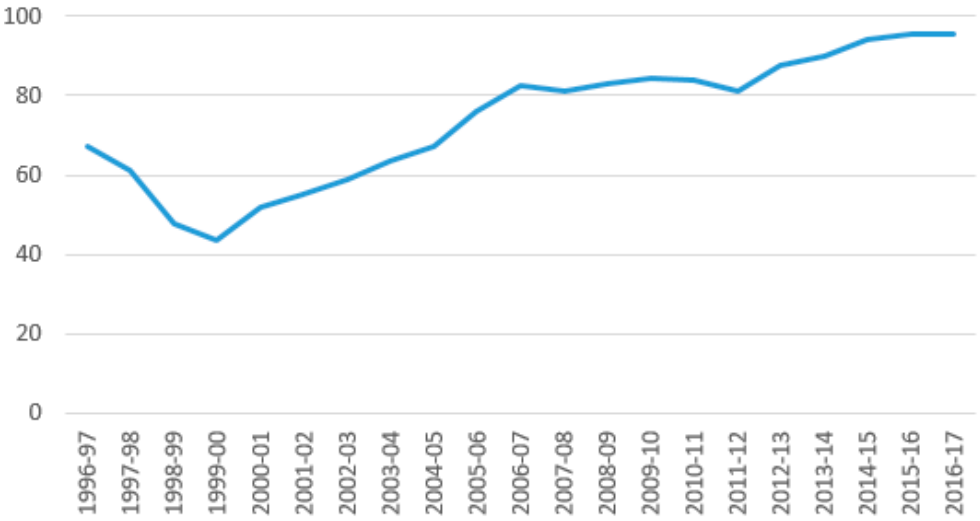
Figure 1 shows the market dynamics of the last 20 years. While the degree of self-sufficiency approached values close to 100 per cent, export figures also rose, mostly to adjacent countries like Austria, Germany and Italy. With such a development, sperm is a clear exception to the rule of Switzerland's generally very low competitiveness in the farming sector (Mann *et al.*, 2011) and agricultural factor markets, in which the country is a net importer of almost everything from machinery to feed to fertilizer.

Switzerland's currently strong position not only translates into market figures. At the last European Brown Cattle contest, Swiss animals won all champion titles as well as the national cup. Italy and France took second and third positions, respectively.

4.2 National monopoly and American expansion

In order to steer the development of this technological innovation, the Swiss Association for Artificial Insemination was founded in 1961 and received a monopoly on both producing and selling semen boxes. The European Green Press in the fourth quarter of the 20th century in general highly favoured the international collection of good bull semen (e.g., Diers, 1990).

Figure 1. Degree of self-sufficiency of Brown Cattle sperm in Switzerland.



The main beneficiaries were American breeders. Heimig (1995) mentioned four American companies entering the German market for cattle breeding at the same time.

Breeding objectives were an important factor leading to this development. Over many decades, Swiss breeders emphasised the small sizes of cows and prioritised several aesthetic factors, whereas American breeders tended to focus on milk yields. Welter (1998) portrayed a Swiss breeder who travelled to the US on a yearly base to collect promising genetic material, strongly criticising Swiss breeding strategists.

The only export of Swiss Brown Cattle at that time was heavily subsidised. By paying 1000 Swiss Francs for every bull being exported, the government fostered an annual export of 10,000 live animals per year, an uncompetitive and particularly animal harming way of distributing genetic material. These subsidies ceased in 2010, causing an immediate end to this trade flow.

4.3 Liberalisation and information policy

The decade between 1995 and 2005 was a period of transformation for the Swiss farming sector. Market support in general was strongly reduced, and farmers received direct payments as compensation. In parallel, the state's strong grip on genetics was also loosened. In 1995, the monopoly of the Swiss Association for Artificial Insemination was removed so that other organisations could start to apply for a license. In subsequent years, cantonal administrations transferred their shares of the Association towards breeding associations, while the insemination organisation itself was transformed into a commercial company in 2004. Finally, the requirement of a license to enter the trade of sperm was removed in 2005. Today, two Swiss companies select bulls for genetic purposes and sell their sperm, while two additional competitors specialise in the retail sector.

Letting market forces work, however, was not the only strategy of the administration. While the Swiss government traditionally offers a large range of subsidies to support farmers, the following support payments, adding up to 23 million Swiss Francs per year, fall into the range of cattle breeding:

- Two-thirds of the money is used to regularly measure the milk yields of dairy cows and to feed them into a broadly accessible database. This enables breeders to distinguish promising from average bulls
- The database in which not only milk yields but also other characteristics and genetic linkages are stored is called herdbook. The majority of costs for managing the herdbook are also covered by the federal administration.
- Minor budgets are available for collecting and storing information about outer appearance, meat quality and health status, all of which deliver supplementary information about genetic qualities.

This way, the accessibility of information for farmers has been smoothened. They do not only receive data from the herdbook and similar sources for free, they are also encouraged financially to feed in the information of their own animals. As a result with a high accessibility of information, this contributes for dairy farms to finding the most promising bull (i.e. genetic information) for their herd.

5. Discussion and Conclusions

It appears that the framework as developed in Section 2 is fully confirmed by the case of Brown Cattle breeding as depicted in Section 3. Table 1 summarizes the two aspects of the strategy that should foster competitiveness in information-intensive sectors and illustrates it with the case of cattle breeding.

It is plausible that the unprecedented success in regaining market shares of Brown Cattle breeding in Switzerland has been caused by a combination of liberalisation and intervention. Innovation often comes from unexpected directions, and competition gives a voice to such unlikely candidates. However, subsidising the structured management and accessibility of all relevant information has been the necessary second step to make use of the information generated in the field.

However, while allowing for competition and providing full access to the relevant information will in general be a promising strategy, it would be premature to declare it a panacea for competitiveness. Not all markets are as fully dependent on information as the market for

Table 1. A framework for strengthening competitiveness in information-intensive sectors.

	General strategy	Realisation for cattle breeding
Information generation	Let as much information as possible be generated in a decentralized way	Enable breeding efforts bottom up
Information dissemination	Make information as accessible as possible	Subsidize integration of animal information in database

genetic material. Other well-known factors for competitiveness, such as natural conditions or access to capital, remain important, probably more so for many markets.

For future research, it will therefore be crucial to identify sectors and branches with a similarly high reliance on information as the breeding market. For such cases, it should be possible to test whether the combination of competition and supportive access to information proves to be equally helpful to national competitiveness.

6. References

Allen, B. (1990). Information as an Economic Commodity. *American Economic Review* 80(2): 268-273.

Antle, J.M. (1999). The new economics of agriculture. *American Journal of Agricultural Economics* 81(5): 993-1010.

Bates, B.J. (1990). Information as an Economic Good: A ReEvaluation of Theoretical Approaches. In: B.D. Ruben & L.A. Lievrouw (Eds.), Mediation, Information, and Communication. Information and Behavior. Volume 3 (pp. 379-394). New Brunswick, NJ: Transaction.

Craig, G., T. Burchardt, D. Gordon (2008). Social Justice and Public Policy: Seeking Fairness in Diverse Societies. New York: Policy Press.

Diers, H. (1990). Die besten Vererber der deutschen Rotbuntzucht. *Der Tierzüchter* 2/90: 61-64.

Dolinayova, A., J. Camaj, J. Kamaj (2017). Charging railway infrastructure models and their impact to competitiveness of railway transport. *Transport Problems* 12(1): 139-150.

Elson, D. (1988). Market Socialism or Socialization of the Market? *New Left Review* 172: 3-19.

Faltin, G. (1999). Competences for innovative entrepreneurship. Presentation at the UNESCO Meeting on the Future of Work and Adult Learning.

Feng, F., Q. Sun, W.H.S. Tong (2004). Do government-linked companies underperform? *Journal of Banking and Finance* 28(10): 2461-2492.

Fuerst, C., Koeck, A., Egger-Danner, C., Fuerst-Waltl, B. (2011). Routine genetic evaluation for direct health traits in Austria and Germany. *Interbull Bulletin* (44), https://journal.interbull.org/index.php/ib/article/view/1220 (Sept 18, 2019).

Habier, D., R.L. Fernando, J.C.M. Dekkers (2007). The Impact of Genetic Relationship Information on Genome-Assisted Breeding Values. *Genetics* 177(4): 2389-2397.

Heimig, D. (1995). Die Amerikaner kommen. *Der Tierzüchter* 2/95: 20-22.

Henoch, B.T. (2006). An innovation framework for analysing and facilitating diasporas contribution to poverty reduction in developing countries. *World Review of Science, Technology and Sustainable Development* 3(1): 17-36.

Iezoni, A., C. Weebadde, J. Luby, Chengyan Yue, E. van de Weg, G. Fazio, D. Main, C.P. Peace, N.V. Bassil, J. McFerson (2010). Rosbreed: enabling marker-assisted breeding in rosaceae. *Acta Horticulturae* 859: 389-394.

Kljajic, M., A.S. Andelkovic, I. Mujan (2016). Assessment of relevance of different effects in energy infrastructure revitalization in non-residential buildings. *Energy & Buildings* 116(3): 684-693.

Lewis, D.W. (2012). The Inevitability of Open Access. *College and Research Libraries* 73(5): 493-506.

Li, M. (2013). Is there an alternative (to socialism)? *Science & Society* 77(1): 10-43.

Lidauer, M., Pedersen, J., Pösö, J., Mäntysaari, E.A., Strandén, I., Madsen, P., Nielsen, U.S., Eriksson, J.Å., Johansson, K. and Aamand, G.P., (2006). Joint Nordic test day model: Evaluation model. *Interbull Bulletin* 35: 103.

Mann, S. (2017). Are power asymmetries a reason for the state to intervene? *International Journal of Public Administration* 40(4): 342-347.

Mann, S., M. Gairing (2012). Does libertarian paternalism reconcile merit goods theory with mainstream economics? *Forum for Social Economics* 41(2-3): 206-219.

Mann, S., H. Wüstemann (2010). Public Governance of Information Asymmetries - the gap between reality and economic theory. *Journal of Socio-Economics* 39(2): 278-285.

Mann, S., A. Breukers, J. Schweiger, G. Mack (2011). Greenhouse vegetable production in the Netherlands and Switzerland – a grounded look at sector competitiveness. *Competitiveness Review* 21(4): 339-351.

Maskus, K.E., J.H. Reichman (2004). The globalization of private knowledge goods and the privatization of global public goods. *Journal of International Economic Law* 7(2): 279-320.

Musgrave, R.A. (1957). A Multiple Theory of Budget Determination. Finanzarchiv, N.F., 17, p. 341.

Musgrave, R.A. (1959). The Theory of Public Finance. New York: McGraw-Hill.

Namahoot, K.S., T. Laohavichien (2015). Quality management and trust of internet banking in Thailand. *International Journal of Scientific & Technology Research* 4(9): 257-262.

Nisbet, M.C., B.V. Lewenstein (2002). Biotechnology and the American Media. *Science Communication* 23(4): 359-391.

Nordhaus, W.D. (2005). Paul Samuelson and Global Public Goods. New Haven: Yale University Press.

Olff, M. (2014). Are we happy with the impact factor? *European Journal of Psychotraumatology* 5, doi:10.3402/ejpt.v5.2x6084

Poutvaara, P. (2008). Public and Private Education in an Integrated Europe: Studying to Migrate and Teaching to Stay? *The Scandinavian Journal of Economics* 110(3): 591-608.

Prybyla, J.S. (1991). The Road from Socialism: Why, Where, What and How. *Problems of Communism* 40(1-2): 1-18.

Samuelson, P. (1954). The Pure Theory of Public Expenditure. *The Review of Economics and Statistics* 36(4): 387-389.

Samuelson, P. (1958). Aspects of Public Expenditure Theories. *Review of Economics and Statistics* 40(4): 332-338.

Sivak, M. (1996). The Information That Drivers Use: Is it Indeed 90% Visual? *Perception* 25(9): 1081-1089.

Tang, Y. (2018). When does competition mitigate agency problems? *Journal of Corporate Finance* 51(2): 258-274.

Thaler, R.H., C.R. Sunstein (2008). Nudge – improving decisions about health, wealth and happiness. New Haven: Yale University Press.

Timmons, J. (1994). New venture creation, Entrepreneurship in the 1990s, 4th ed., Boston.

Vasconcelos Dantas, V., Pedroso Oaigen R., Souza dos Santos M. A., Spacek Godoy B., da Silva F., Pinto Corrêa R., Nogueira Domingues F. & Soares Simon Marques C. (2016). Characteristics of cattle breeders and dairy production in the southeastern and northeastern mesoregions of Pará state, Brazil. *Semina: Ciências Agrárias* 37 (Mayo-Junio).Zugang: <http://www.redalyc.org/articulo.oa?id=445746397030> [17 July 2018].

Weigel, K.A., R.S. Pralle, H. Adams, K. Cho, C. Do, H.M. White (2017). Prediction of whole-genome risk for selection and management of hyperketonemia in Holstein dairy cattle. *Journal of Animal Breeding and Genetics* 134(3): 275-285.

Welter M., (1998). Wenn Züchter spekulieren. *Landfreund* 6.10.1998, S. 12/13.

Yates, S., M. Lague, R. Knox, R. Cuthbert, F. Clarke, J. Clarke, Y. Ruan, J. Jatinder, V. Bhadauria (2018). Crop Information Engine and Research Assistant (CIERA) for managing genealogy, phenotypic and genotypic data for breeding programs. https://www.biorxiv.org/content/early/2018/10/11/439505 (Oct 19, 2018).