FARE Share

Sharing valuable insights

Glenn Fox Retirement Issue
April 2021

What's Inside?

This issue of *FARE Share* celebrates the legacy of Professor Glenn Fox who recently retired from the Department of Food, Agricultural and Resource Economics (FARE). In the pages ahead, you'll find tributes to Glenn from former students and colleagues alongside some of his distinguished work.

It is an honour and privilege to put together this special issue to highlight Professor Fox's contributions to the University of Guelph, FARE, and the agricultural economics society. I strongly believe that his contribution to FARE and to our profession is unparalleled.

Contact:
Getu Hailu
Editor, *FARE Share*
ghailu@uoguelph.ca

The FARE Share Newsletter features research and analysis from faculty and students in the Institute for the Advanced Study of Food and Agricultural Policy in the Department of Food, Agricultural and Resource Economics (FARE).

Celebrating a legacy

By: Andreas Boecker,
Associate Professor and Chair, FARE

It was the summer of 1985 when Glenn Fox returned to the University of Guelph's Department of Agricultural Economics and Business to start his 35-year academic career after receiving his PhD in Agricultural Economics and Economics from the University of Minnesota. He had received his BSc in Agriculture and his MSc in Agricultural Economics from the University of Guelph and taught at the Department of Economics at Western University. Glenn became a full Professor in 1996.

Glenn started his research in agricultural production economics and expanded to environmental and natural resource economics to address the increasing importance of environmental issues in food and fiber production. In the intersection of the two areas, he has made significant contributions to a variety of fields, such as the economics of technical change, damage control inputs, soil health and erosion, property rights, and environmental regulation and competitiveness.

He can look back on an impressive publication record with more than 70 papers authored or co-authored in peer-reviewed journals. The diversity of disciplines, approaches and perspectives covered by these publications speaks to Glenn's ability to work in interdisciplinary teams and his critical reflection on different economic perspectives. Almost half of the papers having been published in the *Canadian* and *American Journals of Agricultural Economics* is also a powerful testimony to his academic home and roots. Among his many awards and honours, being named Fellow of the Canadian Agricultural Economics Society and Senior Research Fellow of the Fraser Institute stand out.

"He has made significant contributions to a variety of fields, such as the economics of technical change, damage control inputs, soil health and erosion, property rights, and environmental regulation and competitiveness."

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The wide reception of Glenn's and his co-authors' work is further evidenced by more than 70 research reports and more than 130 papers in refereed proceedings of academic and professional conferences. His collaborative outreach efforts reflect the emphasis he has put on service to the university, stakeholders and society throughout his career. He has served on the boards of several not-for-profit organizations, and taken on the role of acting chair and graduate program coordinator of his department.

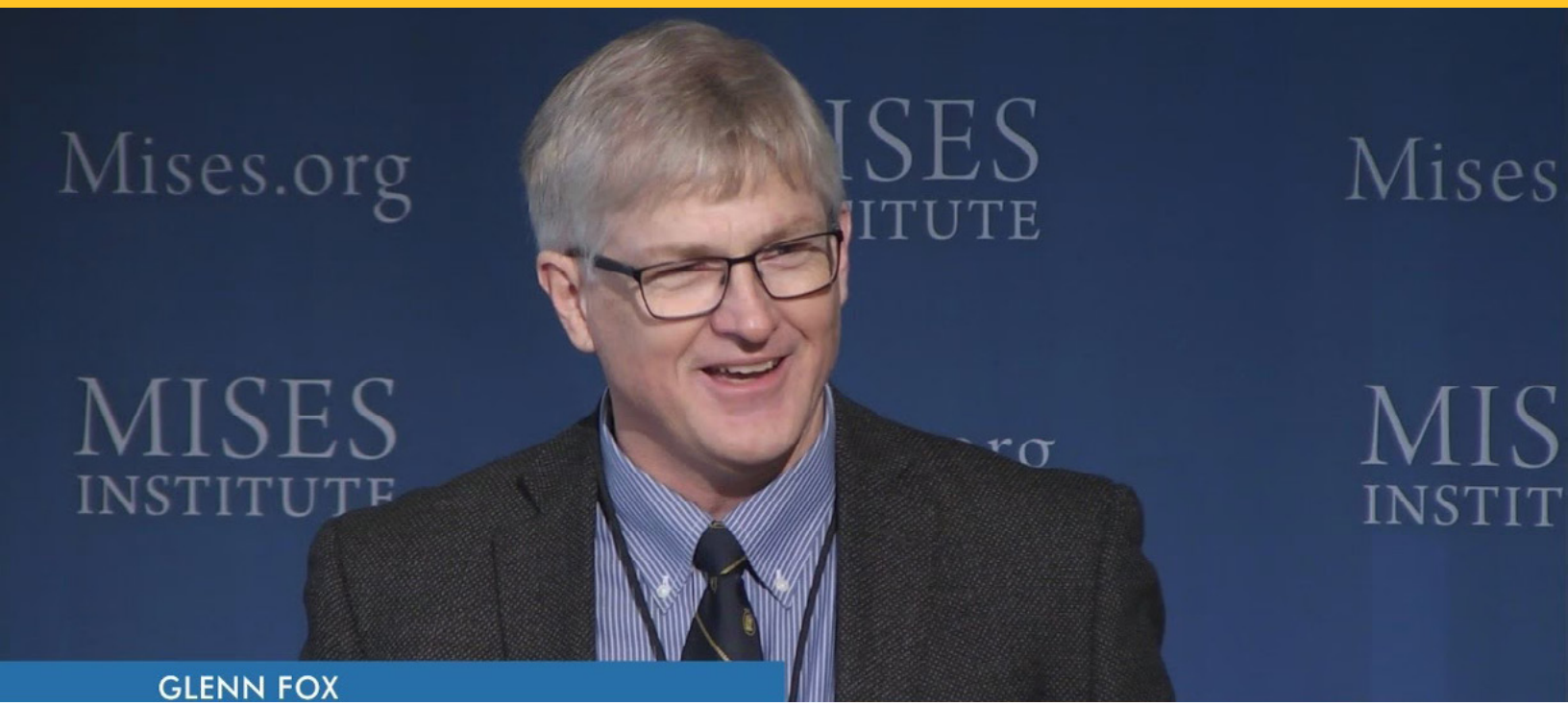
He was most impactful in his role as Research Program Director of the Agricultural and Rural Policy theme of the Research Partnership between the Ontario Ministry of Agriculture, Food and Rural Affairs, and the University of Guelph (2010 to 2018).

Recognizing his commitment to the core mandate of the university enterprise, Glenn's contributions to teaching and advising students have been outstanding. At the undergraduate level, through his work in curriculum development and in his role as faculty advisor, he has significantly improved the department's program in Environmental Economics and Policy. At the graduate level, his methodologies course has prepared scores of students for their thesis proposal and work. Having supervised 62 MSc, 14 MBA and 9 PhD students, Glenn has been a powerful engine of the department's graduate research enterprise.

On behalf of all in the Department of Food, Agricultural and Resource Economics at the University of Guelph, I express my heartfelt respect and admiration for Glenn. He cares deeply about the people around him, lightens up their day with his humour, and enjoys seeing our students grow. Glenn has been an outstanding academic and an excellent and valued colleague.

U.S. investment in ag research

By: Glenn Fox, "Is the United States Really Underinvesting in Agricultural Research?" published in the American Journal of Agricultural Economics *(1985)*



I took several elective courses in public finance and public choice theory during my second year in the PhD program at the University of Minnesota. One of the public finance final exam questions asked about the effect of the marginal excess burden on the evaluation of government expenditures. At the time, I was reading the agricultural economics literature on the returns to taxpayer-financed agricultural research for my dissertation research. As I wrote my answer to that final exam question, which, by the way, had nothing to do with the returns to agricultural research, I experienced something of an epiphany. In all of the literature that I had read on the returns to taxpayer-financed agricultural research, I had never seen a reference to the marginal excess burden. This epiphany led to "Is the United States Really Underinvesting in Agricultural Research?"

The marginal excess burden is an economic measure of some of the additional costs that need to be acknowledged when a project is financed through taxation. The implication of the marginal excess burden is that the expenditure of a dollar on a project that is financed through taxation has an opportunity

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cost of more than $1. The marginal excess burden should be differentiated from the administrative and compliance costs associated with taxation. Yes, the collection of taxes requires the payment of salaries and benefits to the employees of the tax collection agency and it also requires additional record keeping and reporting on the part of the individuals and organizations who pay the tax. And these costs are real. But the marginal excess burden is something different. The marginal excess burden arises in a market in which a tax is levied.

Think about a traditional supply and demand diagram. The supply curve slopes up to the right, reflecting the increased opportunity costs incurred by sellers as they offer increased quantities of something to sell. And the demand curve slopes down to the right as buyers' valuations of successive quantities of the good, service or factor of production decline as higher quantities are purchased. Equilibrium occurs when the two schedules cross, when the marginal opportunity cost of the last unit offered for sale equals the marginal valuation attached to that unit by a buyer. This equality of magnitudes at the margin has efficiency implications. To buy and sell more than the equilibrium quantity means that buyers value the additional units less than the opportunity cost incurred by the seller to make these units available. To buy and sell fewer units than the equilibrium quantity means that sellers would value quantities more than the opportunity cost incurred by sellers to make a few more units available. The equilibrium quantity is a Goldilocks outcome.

Now, suppose a tax is added to this story. Now buyers, in addition to having to compensate sellers for their increasing opportunity costs to access incrementally higher quantities of something, must also pay a tax. If you are drawing a supply and demand diagram, you can illustrate this new situation by drawing a new effective supply function by adding the amount of the tax to the height of the old supply function. This new effective supply function crosses the original demand function at a higher price and a lower quantity than those that prevailed without the tax. At this new higher price and lower quantity, the value that buyers attach to the last unit bought and sold is higher than the opportunity cost incurred by the seller of that last unit. This results in an efficiency loss. Economists illustrate the magnitude of this loss by the triangular area situated under the demand curve and above the original supply curve between the equilibrium quantity without a tax and the quantity bought and sold when a tax is imposed. This area, which is a quantity multiplied by a price per unit, is the efficiency loss, in dollars, incurred to raise the amount of tax revenue collected in this market. The tax revenue raised is the product of the tax per unit times the number of units bought and sold. Taxpayer-funded agricultural research is paid out of that tax revenue. But the additional triangular area is an additional cost, a marginal excess burden, that is incurred due to the efficiency losses caused by the collection of the tax. A dollar of tax revenue spent on agricultural research costs more than $1. This additional cost has been largely ignored in the agricultural economics literature.

Another deficiency of the agricultural economics literature on the returns to taxpayer-financed agricultural research is that an implicit comparison is made to the returns to private investment. If the returns to agricultural research are 20% per year and the returns to private investment are 10% per year, then more agricultural research should be undertaken. Previously, I explained that the estimated 20% per year return to taxpayer-financed agricultural research typically understates the cost of that research, due to the omission of the marginal excess burden. So the actual economic returns are less than 20%. A second problem has to do with a difference in what is considered to count in these two estimated rates of return.

"If the returns to agricultural research are 20% per year and the returns to private investment are 10% per year, then more agricultural research should be undertaken."

The benefits of agricultural research include the increases in producers' incomes (increases in producers' surplus) that arise as the agricultural technology developed from research is adopted by producers and the supply curve shifts to the right. But the benefits of agricultural research also include the increases in consumers' surplus that occur as prices fall due to the shift in the supply curve induced by technological change. In contrast, the returns to private investment only include the increases in incomes of firms that occur as a consequence of capital investment. Private investment returns only include benefits that are appropriable by the firm. But investments in capital by firms also make products available to consumers that would otherwise not be available, or not be available to the same extent in the absence of those increases in capital. Private investment in capital by firms also increases consumers' surplus. But this benefit is not included in the hypothetical 10% return. So this rate of return is an understatement of the social returns to capital investment if we treat capital investment in the same way that agricultural research has been treated in the agricultural economics literature.

Although this paper has been cited frequently, agricultural economists still ignore the marginal excess burden when they analyze taxpayer-financed agricultural programs.

"Although this paper has been cited frequently, agricultural economists still ignore the marginal excess burden when they analyze taxpayer-financed agricultural programs. "

Wit, humour and love

By: Alfons Weersink, Professor, FARE

Glenn's dedication and contribution to the various incarnations of FARE since his time as an undergrad in the late 1970s to his recent retirement are truly impressive. Tributes from former students, staff and faculty in this newsletter highlight his impact.

I have three short observations that encapsulate Glenn:

1. Glenn has always provided thoughtful comments for all graduate students seeking his advice. During one particular supervisory committee, Glenn started his remarks by saying he had five major suggestions for the student to consider. The first was to remember the NAR. As he was moving onto his second point, the confused graduate student asked Glenn to clarify what he meant by "NAR." Glenn told him it stood for the "No Acronym Rule"– point made in his typical witty manner and of course the big, room-shaking laugh.
2. During one Tenure and Promotion meeting, the College Committee member asked for clarification on Glenn's bi-annual report, which listed a weekly workshop held every Monday at noon on "Dynamic Optimization." This "workshop," otherwise known as Monday pick-up hockey, involved Glenn ensuring the presence of two goalies, the right number of skaters, two different colour jerseys, etc. The workshop was indeed very well-organized as would be expected, but again reflects Glenn's sense of humour and the ability not to take things too seriously.
3. Finally, a highlight of Glenn and Cora's life was the arrival of Jasmine. His love for her is as obvious as the huge portrait of Jasmine that hangs in his office. Fatherhood not only provided benefits for Glenn, but I feel made him a better teacher, researcher and colleague.

"Fatherhood not only provided benefits for Glenn, but I feel made him a better teacher, researcher and colleague."

Glenn has so many abilities and passions (i.e., sailing, motorcycling, guitar, planes) that he will continue to be busy during his retirement. However, I think he should seriously consider hiring out his services as an emcee, a job for which he is uniquely qualified as demonstrated at FARE's annual Christmas party.

Glenn, thanks for all you have done for FARE, the Canadian Agricultural Economics Society (CAES) and the University of Guelph.

Glenn's environmental dabblings

By: Dan McKenney, Director, Integrative Ecology and Economics, and Emily Hope, Forest Resource Economist, Natural Resources Canada, Canadian Forest Service, Sault Ste. Marie

We have had a great pleasure (and honour!) of working with Glenn for many years; one of us perhaps his first student at the University of Guelph and the other, one of his more recent graduate students. Time does fly! For those with personal experience with Glenn, you know one of his strengths is a natural curiosity and no fear in stepping into new territories (not talking about his hockey or fishing prowess).

If memory serves me correctly, Glenn was fresh from the University of Minnesota when I arrived for my Master's degree at FARE. Like many of his vintage from that Graduate program, Glenn worked on the economics of research. Who would have thought that the economics of research would extend to include the economics of forest tree improvement (forest genetics)? In fact, we published several articles on that subject that still are useful to the forestry profession. After I finished my PhD in Australia and returned to Canada to continue forest-related research with the Canadian Forest Service, I was fortunate enough to be able to continue to collaborate with Glenn. The Canadian Forest Service has lots of problems for an inquisitive economist (note the play on words – standard fare in Glenn parlance!). The money chasing for graduate students began, and over the years he/we collaborated on a fairly eclectic set of applied projects. In the early days, subjects ranged from "A financial analysis of using sawmill residues for cogeneration in Northern Ontario." with Naomi Beke and another with Naomi's partner John, "A framework for the use of economic thresholds in Forest Pest Management."

The great ice storm of 1998 that hit Ontario and Quebec gave Glenn a chance to work on disasters. While some might say Glenn's career was just one disaster after another, the Ice Storm offered us a chance to work on specific impacts of these kinds of weather phenomena (e.g., pine and cedar forests with Jeremy Heigh; the maple syrup industry with Jennifer Kidon). In the early days, we even got Glenn out for some tours of northern forests, so he was not just an academic outstanding in his (crop) field. Maybe he was just looking for prospective fishing holes?

Glenn's academic interest in resource/environmental economics did not stop with trees. One subject we tackled several years ago with another one of Glenn's illustrious students (Al Mussell) was woodland caribou management. This iconic animal with impressive antlers continues to be a management challenge ... was Glenn just "a-head" of his time?

Over time, his involvement and interest in natural resource/environmental economics continued, allowing us to take advantage of his knowledge and perspectives on a wide range of topics, including environmental (carbon) pricing, the use of fast-growing forests to help manage municipal effluent (Elizabeth Ramlal) and even climate change and crop growth (Qin Xu). This provides just a sampling of Glenn's forays – we know we have not covered the entire breadth and depth of his environment-related work and apologize for not mentioning everyone.

Emily's interactions with Glenn were more academically focused, but perhaps just as meaningful. She completed both her undergraduate and Master's degree within FARE, and had the opportunity to learn from Glenn on a number of occasions. In the lecture hall, Glenn taught his students to develop critical thinking and analytical skills, key tools for any aspiring researcher that are so often overlooked. He encouraged us to explore the world with an economic lens, and instilled a sense of wonder at the notion that economics, the most dismal of sciences, could be used to evaluate and solve pressing environmental problems. Indeed, Anderson and Leal's book Free Market Environmentalism (the touchstone for one of the undergraduate classes Emily took with Glenn) occupies a place of honour on Emily's bookshelf.

Glenn's passion for economic thought has inspired generations of students to apply economic solutions to environmental problems. Glenn's career has touched so many students, us included. We don't want this to sound like an obituary but a note of gratitude! Glenn did what a true educator should – helped us challenge our paradigms and thinking with some fun along the way. Thanks, Glenn, and enjoy your retirement!

"Glenn's passion for economic thought has inspired generations of students to apply economic solutions to environmental problems."

The *real* Coase theorems

By: Glenn Fox, published in The Cato Journal *(2007)*

2020 marks the 60th anniversary of the publication of Ronald Coase's essay, "The Problem of Social Cost." This essay continues to be one of the most cited papers in our discipline. It is difficult to find a course in environmental economics, economics and law or even general economic theory that does not refer to something called "The Coase Theorem." I had known about the Coase Theorem for many years before I read "The Problem of Social Cost." *If property rights are well defined, and there are no transaction costs, then it doesn't matter who initially owns a piece of property. Eventually, that property will be employed in its most valuable use*. This enigmatic proposition is invoked in an ever-growing list of social problems. If you find yourself bored amid a group of economists, just say "in situation X, the Coase Theorem does not apply" (you can with equal effect say "in situation X the Coase Theorem applies") then stand back and watch the fun. Bored you will not be.

The open dark secret about this infamous eponymous theorem is that the person for whom it is named denies any association with its content. And the putative original source of this theorem, "The Problem of Social Cost" not only does not state the theorem, but in fact states that the claims of the theorem are irrelevant. "The *Real* Coase Theorems" is my attempt to set the record straight on what "The Problem of Social Cost" does and does not say. In contrast to my *American Journal of Agricultural Economics (AJAE)* paper on the returns to agricultural research, which was conceived in a final exam and written in about a day, "The *Real* Coase Theorems" took over a decade to write and get published.

The mystery of "The Problem of Social Cost" is that it contains a sentence which both Coase's acolytes and critics seem to have not read. Tragically, this single sentence is the key that opens up the vault of Coasian insight. This sentence occurs at the beginning of the 6th section of the essay. "The Problem of Social Cost" runs to about 44 pages and is divided into 10 sections. The thesis of the essay does not appear until Section 6. Neither the introductory nor the concluding sections of the paper acknowledge this thesis. This crucial sentence states that in sections 2 through 5 of the paper, the author assumed an environment in which transaction costs were absent. Coase then states that this is a wildly unrealistic assumption. Let me re-state this for emphasis. The person for whom the Coase Theorem was named states that the assumption of zero transaction costs is unrealistic, that it does not apply in concrete, actual, real situations. According to Coase, the world in which we live is full of transaction costs. Transaction costs influence virtually all forms and instances of human interaction. So the conditions invoked in the so-called "Coase Theorem" occur rarely, if ever. Hence the controversial inference of the theorem, the consequent condition that property ends up employed in its most highly valued use, is the stuff of science fiction.

So what are the *Real* Coase Theorems? They appear in Section 6, after the sentence that I discussed above. The first real Coase Theorem is that in a world with positive transaction costs, meaning the world in which we live, the Courts or the Government can re-distribute property to its most highly valued use when transaction costs prevent that outcome from being achieved through voluntary transactions. The Courts or the Government can do this because they can avoid the transaction costs that are inevitable in voluntary exchange. They order the transfer and back up this order with force. In this Coaseian world, a net gain in welfare ensues. A resource is used more beneficially, and no transaction costs were incurred in securing this benefit. But Coase hastens to add his second Theorem, which constitutes a sort of warning label on his first Theorem. While it may be the case that the Courts or the Government could direct a resource to its most valued use without incurring transaction costs in the process, they may not actually know what the most valued use of the resource in question is. Or, in the unlikely event that they do possess this knowledge, they may not have the motivation or incentive to bring about the required conditions. And there is a non-trivial chance that the actions that they take may make matters worse. Coase presents a long list of situations that had been identified by economists as externalities in the market failure literature that he claims are really the result of past and ongoing government actions. What economists had identified as market failures, in Coase's treatment, are nothing of the kind.

The *Real* Coase Theorems pose several inconvenient questions for economists. Why have so many economists engaged in such a long and irrelevant debate over the realism of the assumptions invoked in "The Coase Theorem?" Why have economists been so reluctant to follow Coase's advice and think more critically about externality theory, in particular about the institutional and historical causes of the situations that we label as externalities in our textbooks and lectures? Why has one of the most widely cited papers in our discipline been so poorly read? If nothing else, this sad episode is an illustration of the importance for students in economics to read, and read carefully, original sources, as part of their training.

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Nirvana economics and funding ag research

*By: Deepananda Herath, Senior Economist, Agriculture and Agr-Food Canada**

Glenn was on my PhD thesis committee and taught me production economics and methodology of research among many other things; his teachings and advisements have had an enormous influence on my day-to-day work as an economist at Agriculture and Agri-Food Canada.

Among many of Glenn's intellectual influences on myself, I thought I would write about the "fallacy of nirvana economics." In my everyday work, I face this fallacy, which Glenn taught us using Demsetz's (1969) article: *"Information and efficiency: another viewpoint."* Demsetz's main argument in the article was that much public policy economics implicitly presents the relevant choice as between an ideal norm and an existing "imperfect" institutional arrangement. Glenn taught us that this comparison is naïve because a non-attainable ideal norm is irrelevant for public policy analysis since this ideal norm is like nirvana: almost impossible to achieve. Some of the market failures are misconceived thanks to this fallacy, and recommended interventions could be more damaging (to society) than the original market failure itself.

As recently as June 2019, Glenn wrote the following on this fallacy: *The economic theory of policy combines the theories of market failure and non-market or policy failure. According to the economic theory of policy, documentation of a significant and persistent market failure is a necessary, but not a sufficient, condition for government action. Compliance with this standard requires rigour in the application of market failure categories. Casual claims of public goods, excessive discounting or externality problems causing specific agricultural environmental problems are not enough. Historical and institutional analysis is required to distinguish between externalities and derived externalities or legalized nuisances. Misdiagnosis of the market or non-market failure of an environmental problem can lead to the application of the wrong remedy (p.16).*

Demsetz's (1969) article is about one of the enduring debates of the market failure in inventions and knowledge creation. In fact, Demsetz was critiquing Arrow's (1962) article: "Economic Welfare and the Allocation of Resources for Invention" in which Arrow claimed (p.619): *"To sum up, we expect a free enterprise economy to underinvest in invention and research (as compared with an ideal) because it is risky, because the product can be appropriated only to a limited extent, and because of increasing returns in use."* It did not really matter to Arrow that the "comparison with an ideal" is irrelevant to the real-world institutional arrangements among which the policy makers have to find their solution. The misdiagnosis by Arrow of "failure of the competitive system to achieve an optimal resource allocation hold in the case of invention" is still an important rationale for government intervention in knowledge creation and inventions.

Glenn intervened in 1985 to make the comparison a bit more realistic between publicly funded agriculture research and the comparable activities by private enterprises with his article in the AJAE. Glenn asked agricultural economists to take the "cost of taxation" (marginal excess burden in taxes) into account when estimating returns to publicly funded research. Expanding even further on this "comparative institutional" approach for publicly funded agriculture research, in 1995, Glenn revisited the issue and noted that: *"What I did not discuss in my 1985 paper, and in hindsight I regret this omission, is that recognition of the marginal excess burden is not the end of the story in the analysis of the costs of programs financed through taxes. Two additional costs of tax collection should be included: the costs of processing income tax returns, monitoring compliance with tax codes, and the general administrative operations of the tax collection agencies; and second, the costs incurred by private citizens, businesses, and other organizations in the preparation of tax returns and in the record keeping necessary to provide documentation for those returns."*

The treatment of "public funds" as free lunch continues to this day, and agricultural economists are still far away from systematic "comparative institutional" analysis. Market failures are still diagnosed with a "comparison of non-attainable ideal." The greatest tribute to Professor Glenn Fox would be to engage in policy analysis with these lessons in mind.

**The views expressed here are the author's and do not reflect the AAFC's official standing.*

"The greatest tribute to Professor Glenn Fox would be to engage in policy analysis with these lessons in mind."

Five economic solitudes

By: Glenn Fox, "The Origins, Nature and Content of the Right to Property: Five Economic Solitudes," published in the Canadian Journal of Agricultural Economics *(2012)*

I started to do research on the economics of regulatory takings in the early 1990s. A regulatory taking is said to occur when government regulation of the use of property imposes a substantial burden on the property owner. The origin of the term "takings" is the so-called takings clause of the Fifth Amendment to the United States Constitution, which stipulates "nor shall private property be taken for public use, without just compensation." The literature on regulatory takings mostly centres on a few U.S. Supreme Court cases that have involved property owners claiming relief for various types of government regulations. This literature is legendary for its inconsistency. Writers examine the same small number of cases. They use the same words and appear to be invoking the same concepts. They address similar questions. "Can a regulation of property use constitute a taking, under the Fifth Amendment?" "If a taking occurs as a consequence of a regulation, is compensation due to the adversely affected property owner?" "If compensation is due, what amount of compensation is just?"

Mike Ivy was working on his MSc thesis on this topic in the early 1990s. He and I spent many a delightful hour discussing this chaotic literature. Initially, it was difficult to see how writers could start with similar concepts and words, what appeared to be a similar theory of property, and yet reach such divergent conclusions. Then, we realized that a literature that superficially appeared to be almost random in its conflicted conclusions indeed had a structure. At first, we identified three distinct theories of the right to property that were invoked by different authors. Later, we expanded the taxonomy to five theories. These five theories are the focus of my CAES Fellows address, published in the CJAE in 2012.

Five theories of property rights appear in the literature on the economics of regulatory takings. These theories can be grouped into two. Two of the theories, Classical Liberalism and Modern Libertarianism, have several elements in common. The second group, consisting of Utilitarianism, Pragmatism and Legal Positivism, are associated with the Progressive Movement. Utilitarianism as a theory of a right to property pre-dates the origins of the Progressive Movement, but progressives, especially economists in the Progressive Movement, embraced Utilitarianism. Utilitarianism, Pragmatism and Legal Positivism are distinct theories of property, but they have more in common with one another than they do with theories in the other group.

Economists often talk about property rights, generally invoking a utilitarian theory of rights. They have not shown an awareness of the limitations of utilitarianism as a theory of rights nor have they acknowledged that other theories exist. A critical problem with utilitarianism and its modern economic manifestations in welfare economics is its requirement to calculate differences in sums of utilities. Early utilitarians were explicit about this, even though they acknowledged that there were what they considered to be technological obstacles to the observation and measurement of magnitudes of utility.

One of the founders of neoclassical economics, William Stanley Jevons, was an enthusiastic follower of Jeremy Bentham's utilitarianism. Jevons anticipated a day when scientific advances would make possible the objective measurement of magnitudes of utility. Jevons, like many neoclassical economists who followed him, chose to assume this problem away, believing that someone in the future would solve it. He proceeded to get on with the development of an approach to economic theorizing that presumed that this utility measurement problem had been solved. As time went on, this aspect of the intellectual history of economics became less and less well understood by practitioners. And this forgotten assumption was no longer acknowledged. So now we have a complex theoretical characterization of things like marginal costs, marginal benefits, equilibrium and efficiency that rely, implicitly, on the objective measurement of something that economists have never been able to measure objectively. The fatal flaw of utilitarianism, including the utilitarian theory of property rights, continues to cause mischief.

My 2012 paper was an effort to raise awareness among agricultural and natural resource economists about the importance of understanding private property as a social institution from a theoretical and an ethical point of view. Private, or to use Hayek's term several, property is a necessary foundation of the price system. It is not the exclusive foundation, but it is a necessary one. It is necessary, as Hayek and Barnett have explained, to transform inaccessible, unobservable subjective information into objective information that can facilitate social coordination in non-dictatorial human societies. It is necessary because, apart from it, we have not found a way to observe and measure magnitudes of utility. In 1871, Jevons assumed that we would have accomplished this by now. He was wrong.

FARE Talk Podcast

In this edition of FARE Talk, Brady Deaton speaks with Glenn Fox about his longstanding interest in property rights and his CJAE article referenced on this page. Glenn argues that a better understanding of property rights is important to understanding a number of contemporary issues in agricultural and natural resource economics.

To hear the podcast, scan this QR Code:

Moments of illumination

By: Danny LeRoy, Associate Professor of Economics, University of Lethbridge

"Glenn has motivated researchers and students to consider the purpose of economic inquiry, the appropriate structure of economic theory, the scope of empirical application, and to differentiate legitimate knowledge from scientism."

I first met Glenn Fox when I was a student at the University of Guelph in September 1992. But I knew something about him beforehand. In 1977, Glenn and my first cousin participated in a leadership program through the Navigators of Canada in London, Ontario. My cousin told me about this versatile, Christian, capable individual, and of course, his laugh. When I met him, two things I quickly learned about Glenn were his extraordinary ability to think beyond the default point of most others and his talent of communicating his insights to technical and lay audiences.

Problem-solving is as valuable in economics as it is in any other discipline. Glenn's contributions in teaching, research, and service highlight the importance of the skill that precedes it: asking the right questions. The outworking of his inquisitive proclivity is the wide array of his research interests: methodology, property rights and natural resource stewardship, regulatory takings, economic theories of the firm, Austrian economics, technological change, trade and environment, transaction costs, and competition policy.

In terms of lines of inquiry, few have grappled with the epistemological problems of applied agricultural economics as extensively or successfully. These problems stem from the nature, origin, and limits of human knowledge about individual decision making under ubiquitous conditions of scarcity and uncertainty. What is the relation of that knowledge to the object of inquiry and to the mode of economic analysis? How do we determine what is and what is not true in economics? What are the methods we should use? What constitutes a true proposition and how do we know? Having clear answers to these foundational questions with a vivid impression of what is true, what is belief, and what is justification, is a necessary antecedent for any meaningful research undertaking.

Glenn has examined the tension between economics as the logic of individual choice and as a predictive science including in his 1997 book "Reason and Reality in the Methodologies of Economics: An Introduction." This was a culmination of years of reflections on methods, including the relation of economics to the philosophy of science, ethics, and the theory of knowledge.

It is important to know how we know and what we know, and to distinguish it from what we do not and cannot. To this end, Glenn has motivated researchers and students to consider the purpose of economic inquiry, the appropriate structure of economic theory, the scope of empirical application, and to differentiate legitimate knowledge from scientism. He has inspired us to contemplate the role of mathematics in economics, the writing and rhetoric of economics, and the relation between theory, observation, application, and methods.

Nothing pleases a teacher more than when an expression of understanding lights up a face. I suspect Glenn has witnessed these moments of illumination many, many times. The most transformative of these is when a person realizes the validity of economic theory exists independent of the particular conditions of time and place, and they come to know this through pure deductive reasoning.

Fox's Haiku

Fox enters FARE land
questioning all boundaries:
are Our markings best?

~ Brady Deaton, McCain Family Chair in Food Security and Professor, FARE

Rural land use policies

By: Glenn Fox & Yi Wang, Former Graduate Student (2016)

Many myths are associated with modern agriculture. Farmers and non-farmers alike subscribe to these myths. One of the most enduring of these myths has to do with the availability and importance of agricultural land. This myth is expressed in several ways. One expression is the normative claim that the best agricultural land must not be allowed to be used for non-agricultural purposes. Another expression is raised as an alarm that agricultural land is disappearing and that this threatens the future of agriculture and of the food supply.

Julian Simon and Bjorn Lomborg have led the way in myth-busting concerns about agricultural land. More recently, Jesse Ausable has developed "Peak Land Theory" that suggests that the combination of falling human population growth rates and improved agricultural technology and management is already freeing up agricultural land for non-agricultural uses and that this trend will continue. In the Ontario context, in 1980, Mark Frankena and David Scheffman, examined the evidence supporting agricultural land mythology at the provincial level. They found that evidence wanting. Nevertheless, affirmations of the myth are easy to find in the farm press in Ontario to this day. Yi Wang and I revisited this topic on the 35th anniversary of Frankena and Scheffman's work to see if more recent data or advances in theory had overturned their evaluation.

There are theoretical and empirical dimensions to the mythology of agricultural land. The theoretical dimension involves the distinction between absolute and comparative advantage. The empirical dimension has to do with an important definitional distinction.

Comparative advantage is one of the most important but one of the most perplexing concepts in economics. It might be easier to start with the more commonly understood concept of absolute advantage. A person has an absolute advantage in performing an activity if he or she is the best in the world at performing that activity. A resource has an absolute advantage in some employment when it is the best resource in the world in that use. Economists contrast absolute advantage with comparative advantage. The person who enjoys a comparative advantage in performing an activity is the person who sacrifices the least, really who has the lowest opportunity cost, in performing that activity. A resource has a comparative advantage in some employment when it has the lowest opportunity cost in its next best alternative employment. Comparative advantage is a reflection of opportunity cost. Opportunity cost is an odd concept, in that it is the value of something that is not done. Opportunity cost is the value of the most valuable thing that a person could have done but did not do because they did the thing that they did do.

So what does the distinction between absolute and comparative advantage have to do with agricultural land mythology? It is often maintained that the best agricultural land should be retained in agriculture, that it should be prevented from being used for non-agricultural purposes. The Canada Land Inventory is a classification system that is used to categorized land with respect to its suitability for agricultural production. The land best suited for agricultural production is Class 1. It is frequently claimed that all Class 1 land should be restricted to agricultural use. This is a standard of absolute advantage. Class 1 land is the best land for agriculture. But the theory of comparative advantage says that there is more to the story than this. The theory of comparative advantage looks at alternatives that are sacrificed. It asks what other things might a person or a resource be doing if they are not engaged in their present activity? And what value is attached to the things that are not done? It turns out that the land that is best for agricultural production is also the best at doing other things. We don't have a land use classification system comparable to the Canada Land Inventory for those other things. But the land that is best for agriculture might also be best for residential or commercial real estate use, for recreational use, for transportation infrastructure use or some other use. So what is to be done with the land that is best suited to doing agriculture but also best suited to doing these other things as well? A theory of absolute advantage can't answer that question. The Canada Land Inventory cannot answer that question, except by assumption. The theory of comparative advantage requires an examination of the value of alternative uses of a resource. A resource may have many absolute advantages but generally has only one comparative advantage.

The empirical aspect of the agricultural land myth has to do with an important definitional distinction. I often see statements in the farm press of the form "Ontario is losing X acres of farmland every hour." X is generally a number that invokes fear and regret. What many readers of such statements don't appreciate, however, is that the technical definition of "farmland" does not mean what they think it means when they think of agricultural land. What most people seem to think about when they think about agricultural land corresponds more closely to the definition of "cropland." Not surprisingly, cropland is land area devoted to the production of crops. Grain crops, oilseed crops, fruits and vegetables and hay. The definition of agricultural land is cropland plus some other categories of land use. These other categories include woodlots, wetlands, farmyards and homesteads, windrows between fields, some unimproved pasture-land and laneways. The data that Yi and I present in our report show that over the past 60 years there has been a decline in farmland area in Ontario but that there has been virtually no change in total cropland area in the province. We argue that cropland area is the measure that corresponds more closely to what people have in mind when they think about agricultural land. And if there has been virtually no change in that area over 60 years, then what is the policy problem? The decline in farmland area is largely driven by declines in land uses that are not directly related to food production. That is not to say that there might be valid concerns over the changes in use of land previously falling into the farmland category but that are not cropland. But wrapping up these concerns in the flag of saving agricultural land in order to protect the food system is at best misguided and at worst ingenuine.

"Over the past 60 years, there has been a decline in farmland area in Ontario but there has been virtually no change in total cropland area in the province."

Dear Professor Fox,

I was so lucky to have you as my supervisor. You are the person who guided me through the world of economic philosophy. I will never forget your teaching, your encouragement, and your bravery.

Wishing you a very happy retirement,

Yi Wang

Irrigation & climate change

By: Qin Xu, Post-Doc and Sessional Lecturer, FARE & Glenn Fox (2017)

Climate change has increased the possibility of having water scarcity in rural Ontario. There is an increasing concern about the effect of increasing dry events on crop yields. The moisture for field crops is mainly from precipitation in Ontario, so irrigation is currently not widely used in crop production. Since a severe drought in the summer of 2012, crop farmers were considering the merits of irrigating their crops. But given the high capital cost of irrigation equipment, would it be profitable for farmers to irrigate crops in a changing climate in Ontario in future?

We forecasted the corn and soybean yields with/without irrigation under four alternative climate scenarios across 29 counties in Ontario for 2020-2070. The four selected climate scenarios are:

- Base scenario with historical climate trend
- RCP 8.5 with assumed low increased precipitation variability
- RCP 8.5 with assumed medium increased precipitation variability
- RCP 8.5 with assumed high increased precipitation variability

RCP 8.5 is an extreme climate change scenario with the highest greenhouse gas emission and the highest projected increase in global surface temperature. We assume that the variation in precipitation in RCP 8.5 increases at different rates to study the effect of irrigation on crop yields and the economic feasibility of irrigation.

We found that the provincial corn and soybean yields would increase under the four studied climate scenarios for 2020-2070. However, when the variation in precipitation becomes larger, the crop yields would increase at a slower rate and have larger variation.

Does irrigation improve crop yields and reduce the vulnerability under climate change? Yes, we found that when the operating cost of irrigation is only considered, irrigation would increase corn yields by 2.4% - 11.1% and soybean yields by 1.7% - 8.0% in 2070, depending on the climate scenarios. Crop yields gain more from irrigation in three RCP 8.5 climate change scenarios when the variation in precipitation becomes larger.

Though irrigation is beneficial for crop production, the capital cost of irrigation equipment is high. Under climate change, could the benefit of irrigation outweigh its cost in future? We found that, at current costs and with current climate conditions, irrigation is not economically attractive to field crop producers across Ontario. However, lower capital costs and a more variable climate might make irrigation economically attractive as a climate adaptation option for Ontario field crop producers in the future. For example, at a fixed cost of $550/acre and an operation cost of $1/m3, irrigation would be profitable for 5-10 counties in the RCP 8.5 climate change scenarios. Moreover, irrigation would be more attractive under a more extreme climate. So, irrigation would be more attractive near the end of the studied time period (i.e. 2054-2071).

Overall, the projection of changes in temperature and precipitation with high greenhouse gas emissions (RCP 8.5) would not result in appreciable threats to corn and soybean yields in Ontario for 2020-2070. The economic feasibility of irrigation as a climate change adaptation strategy would be greater under lower costs and more extreme climate scenarios.

"Glenn Fox is a fantastic professor and mentor. He opened another door for me to economic research and gave valuable suggestions to improve my skills which would be beneficial to my whole life. His advice is always clear, constructive, and inspiring. I'm extremely grateful to be taught and advised by him."

~Qin Xu

"At current costs and with current climate conditions, irrigation is not economically attractive to field crop producers across Ontario. However, lower capital costs and a more variable climate might make irrigation economically attractive as a climate adaptation option for Ontario field crop producers in the future."

Attention & green comments

By: Yusman Syaukat, Professor, Department of Resource and Environmental Economics, Faculty of Economics and Management (FEM), Bogor Agricultural University (IPB University)

During my study at Guelph, from May 1995 to January 2000, I worked with Prof. Glenn Fox several times, both as a research assistant and as a teaching assistant. Later, Glenn became my supervisor in writing my dissertation. We produced two published articles: "An economic analysis of the financial viability of switchgrass as a raw material for pulp production in Eastern Ontario" (*Biomass and Bioenergy*, 1999) and "Conjunctive surface and groundwater management in the Jakarta Region, Indonesia" (*Journal of the American Water Resources Association*, 2004).

On this occasion, my family and I would like to thank Glenn for his attention, guidance and "green comments" during my time as a PhD student. Congratulations on your retirement! Wishing you endless days with your God, family, and friends…

An economic analysis of the financial viability of switchgrass as a raw material for pulp production in eastern Ontario

(Glenn Fox, Patrick Girouard, Yusman Syaukat).

This paper examines the economic viability of producing switchgrass to be used as pulp in fine paper production. Pulp mills in eastern Ontario and western Quebec are considered to be the potential market for switchgrass. The potential size of the market for switchgrass pulp is assessed. Budgets for switchgrass are constructed and various measures of the potential market value of switchgrass are calculated. Based on these preliminary findings, it appears that switchgrass could be an attractive crop for farmers in eastern Ontario and western Quebec. The total land area required to satisfy the potential demand for switchgrass fibre for pulping in eastern Ontario is estimated to be between 22,000 and 48,000 hectares. *These findings have showed us that this "Pulp is not Fiction"…*

Conjunctive surface and groundwater management in the Jakarta Region, Indonesia

(Yusman Syaukat and Glenn Fox)

This study investigates the degree of economic inefficiency of the current institutional arrangements for surface and groundwater management in meeting urban water demand in the Jakarta region. A numerical model of integrated surface and groundwater management is developed using GAMS software. The model maximizes the NPV of social benefits from piped and groundwater consumption across all users over time, from 1999 to 2025. Four policy scenarios are examined: the status quo, the social planner's solution, and two groundwater pumping quota scenarios: an aggregate groundwater pumping quota and a partial quota applied to commercial and industrial users. The status quo, depending on the investment option, the growth of water demand, and the discount rate, results in a 7.4 to 47.8 percent loss in economic efficiency relative to the social planner's solution. The partial quota is the most feasible, applicable, and manageable scenario. The optimal investment option of PAM Jaya could increase the volume of piped water supply and reduce the cost of water production. The volume of water delivery could increase by up to 156 percent, but it implies only a 35 percent increase in the surface raw water demands above the current level. However, it does not significantly reduce cumulative groundwater extraction over the time period considered. *Unfortunately, 20 years later, PAM Jaya's performance has not improved either...*

"Professor Fox is the most important figure in my academic development. I first experienced his unique teaching style almost 20 years ago as a student in his AGEC*4310. This was a turning point in my worldview that exposed me to ideas, methods, and research strategies that led me to the path of lifelong learning. Professor Fox supported me as my PhD advisor, co-author, but more importantly, as a friend during some challenging times. I am most fond of our policy papers, and I am looking forward to working on our critical assessment of the policy response to the coronavirus pandemic."

~ Predrag Rajsic, Postdoctoral Fellow, FARE

Food, Agricultural and Resource Economics

OAC Ontario Agricultural College — Food Agriculture Communities Environment

University of Guelph
Department of Food, Agricultural and Resource Economics (FARE)
J.D. MacLachlan Building
Guelph, Ontario, Canada N1G 2W1

Telephone: 519-824-4120 x53625

https://www.uoguelph.ca/fare/