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An economist's carbon conundrum

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The Stern Review of the Economics of Climate Change described uncontrolled carbon emission as "the greatest and widest-ranging market failure ever seen." It added: "An effective response to climate change will depend on creating the conditions for international collective action." But, as the recent G8 summit has shown, international collective action is very difficult to achieve. Without these conditions being established, it is hard to see how or why many national governments would take action on their own.

Given that, many concerned people are taking part in local collective action and even private voluntary action. Private voluntary action means calculating and trying to reduce your personal carbon footprint by buying local food, installing energy-saving light bulbs, trading in your 4×4 for a bicycle, and taking your next holiday on the Cornish Riviera, not the Italian one. The Royal Society, for example, has created a website to help you calculate your carbon footprint (www.rsacarbonlimited.org).

Local collective action projects range from neighbourhood Carbon Reduction groups that pledge their members to a "lower carbon lifestyle" (www.cred-uk.org) to direct action groups that seek to blockade airports and power stations. Among British teenagers, environmental issues are said to be associated with increasing peer effects. According to a report in *The Guardian* ("Green teens back eco-guerrillas," January 10, 2008) more than one in eight 16-19 year olds would ban air travel for leisure; one in ten would ban car travel if the outlook does not improve; nearly one in ten would back "guerrilla activities" carried out by environmental groups. Strong peer effects are said to contribute to the spread of these views.

Unintended consequences of voluntary action by concerned individuals and groups are a clear problem. Suppose one part of the world cares about carbon emissions and the other part doesn't. Of those that care, many will be too poor to emit much carbon or have much discretion to reduce personal emissions. So, the scope for personal and local action lies with the caring rich. If they

succeed, they will somewhat reduce the global demand for carbon based products and activities. As a result, the relative price of these products and activities will be lower than otherwise. In direct consequence, the carbon emissions of the uncaring are likely to increase more than otherwise, partly offsetting the efforts of the caring.

Worse still, a lower real price of carbon fuels would shift the composition of energy demand adversely. Lower coal and oil prices would undermine the demand for the carbon-saving technologies now being designed to save the planet. Renewables and nuclear energy would become less attractive than new coal and gas fired power stations.

In short, the lifestyle changes of the caring rich will tend to create market opportunities for the uncaring. The good example of some will be offset by the bad example of the rest. Those who volunteer to do good, and fail, may become disillusioned and cynical. Many will give up; some will persist; a few will turn to direct action, lying down on runways, and planting bombs under power lines.

Most economists would see an effective solution in putting the real price of carbon fuels up to all consumers through a carbon tax or cap-and-trade licensing. Only higher global carbon prices can change the behaviour of the caring and the uncaring alike. This global price increase cannot be brought about by private or group action. It requires market intervention at an international level. But the will to intervene at this level is proving painfully difficult to establish. It may emerge too slowly, or not at all.

At this point economists should stop and think. There is a tremendous energy in the voluntary motivation and concern of the world's caring rich. How can we tap that energy for good? Economists don't seem to have an answer to this question; instinctively placing the full burden of responsibility where it belongs, on international governance, we dismiss the sum of individual energies for change among consumers and producers. Here is an economist's carbon conundrum: are there systematic mechanisms that we can design to let this human energy to be used productively?

Do it yourself? Why firms bring activities "in house"

In most developed economies, transactions within firms are roughly equal in value to those that occur in markets. But which sorts of transactions are best organised in firms and which in markets? In a recent survey, **Francine Lafontaine** and **Margaret Slade** summarise the latest theories and empirical evidence on the boundaries of the firm.

Where should firms end and markets begin? Managers constantly face choices about whether to do something themselves or buy in the services of another firm to do it for them. For example, car manufacturers must decide whether to produce car bodies or to purchase them from independent suppliers. In addition, firms can sell their products themselves or they can use independent retailers. For example, most fast-food franchisers operate some outlets themselves and franchise others.

Firms that undertake activities at different stages of the production process are "vertically integrated." For managers, whether to pursue "backward integration" by acquiring a supplier (the make-or-buy decision) or

"forward integration" by acquiring a retailer (so as to sell directly to customers) are crucial strategic questions.

The extent of vertical integration also raises issues for policy-makers, notably when assessing whether a proposed takeover by one firm of another at a different stage of production is potentially anti-competitive. For example, when a provider of cable TV services purchases a producer of cable TV programmes, competition authorities are concerned that programmes of rival producers will not be shown.

In the past, the economics profession has devoted much more attention to the workings of markets than to the study of firms, and even less attention to the boundaries

between the two. Nevertheless, a growing body of research has focused on what types of transactions are best brought within the firm, as well as the consequences of vertical integration for outcomes such as prices, output, investment and profits. For the most part, forward and backward integration have been analysed using different models.

Vertical integration is principally motivated by a desire to increase efficiency rather than to reduce competition

Forward integration into retailing » Forward integration, in which one firm owns another firm that operates closer to the consumer (say, McDonalds operates its own retail outlets), has mainly been analysed using moral-hazard models, in which both parties must be given incentives.

Without integration, a retailer has strong incentives to work hard, since he is an independent businessman. But an independent retailer is not protected from market risk, as he would be if he were a salaried employee. If the retailer is risk-averse, there is therefore a trade-off between providing him with incentives, which markets do well, and insurance, which firms do well.

For example, the operator of a petrol service station can be an employee of the oil company (forward integration) or he can be an independent operator. If the oil company owns the station, it can choose the vertical relationship between the two levels of the vertical chain.

In most cases, the chosen arrangement will depend on the characteristics of the station (for example, does it have a convenience store or repair bays?) and the market (for example, is the location urban or rural?). These characteristics are relevant because they determine the importance of the retailer's effort as well as the difficulty of monitoring his activities.

The empirical evidence indicates that forward integration is more likely to occur when the value of the manufacturer's brand is greater; when the retail outlet is larger; when the retailers' effort is less important; when the firm's operations are less dispersed geographically; and when the environment is less risky.

With the exception of the effect of risk, all these findings are supportive of a simple moral-hazard model of incentive provision. But the robust and perverse effect of risk casts doubt on the trade-off between incentives to supply effort and insurance that is fundamental to the model.

The drivers of vertical integration vary according to whether it is "forward" into retailing or "backward" into supply

Backward integration into input supply » Backward integration, in which one firm owns another that is further from the consumer (say, a car manufacturer owning a producer of car parts), has mainly been assessed using transaction-cost models, which emphasise the costs of writing contracts.

Here, contracts are modelled as incomplete (they do not specify what will happen in all circumstances) and investments are specific (they have more value inside than outside the relationship). Without integration, this combination of factors can give rise to costly and

inefficient re-contracting, opportunistic behaviour and under-investment. Each of these tends to be mitigated inside firms.

For example, a car manufacturer may ask a car parts supplier to produce a part that requires a machine with few alternative uses. Once the investment is made, the manufacturer can offer to pay a lower price for the part than the promised price. After the investment is sunk, the supplier of parts can only accept the lower price or refuse to supply, in which case he will have lost the value of his investment. But as the supplier can anticipate such opportunistic behaviour on the part of the manufacturer, he will not invest in the first place.

The empirical evidence indicates that backward integration is more likely when investments are specific; when the environment is uncertain; and when transactions are complex. These findings support the transaction-cost model (with the caveat that the model predicts that vertical integration is more likely to occur under a combination of these factors, not under each one individually).

Vertical mergers should be assumed to be benign unless there is strong evidence to the contrary

Consequences of vertical integration » The consequences are difficult to predict theoretically and there are many ambiguities. But most empirical studies find that vertical integration is motivated by a desire to increase efficiency rather than to reduce competition.

Furthermore, even when the analysis is limited to natural monopolies or tight oligopolies, the evidence of anti-competitive behaviour is not strong. This suggests that the authorities should assume the burden of proof of consumer harm. In other words, vertical mergers should be assumed to be benign unless there is strong evidence to the contrary.

Publication details

"Vertical Integration and Firm Boundaries: The Evidence," by Francine Lafontaine and Margaret Slade, was published in the *Journal of Economic Literature* 45:3, (September 2007), pp. 631-687

The authors

Francine Lafontaine is professor of business economics and public policy at the Ross School of Business at the University of Michigan. Margaret Slade was Leverhulme Professor of Industry and Organization in the University of Warwick's economics department between 2002 and 2007. She remains a professor in the department.

Further reading

» Francine Lafontaine and Margaret Slade (forthcoming). "Exclusive Contracts and Vertical Restraints: Empirical Evidence and Public Policy." In *The Handbook of Antitrust Economics*, edited by Paolo Buccirossi. MIT Press.

» Francine Lafontaine and Margaret Slade (2001). "Incentive Contracting and the Franchising Decision." In *Game Theory and Business Applications*, edited by Kalyan Chatterjee and William Samuelson. Kluwer Academic Press.

Saving accounts for the poor

Most poor people in developing countries do not have a bank account. In a study prepared for the Gates Foundation, **Alan Roe** and colleagues argue that even the poorest families both want and have the capacity to save – and that being able to do so would significantly improve their lives.

Discussion of the financial needs of the world's poorest people typically focuses on credit rather than savings. This is because of a widely held but mistaken belief that poor people cannot save. In fact, they have both the appetite and the capacity to save: in banking systems that target the poorest customers, there are typically five times as many depositors as there are borrowers.

Bank accounts offer a variety of benefits to poor people:

- » They enable the secure accumulation of funds to finance any anticipated future expenditures
- » They allow the accumulation of funds to help meet unanticipated fluctuations in income, possibly preventing the distress sale of income-generating assets (such as cattle) at knockdown prices during recessions
- » They improve access to other financial services, including insurance, while enabling the client to build up a financial history

Developing countries face two key challenges in improving access to formal saving for the poor: first, how to improve overall access to savings; and second, how to improve access to savings for the poorest people.

Physical remoteness and the high running costs of banks are major constraints on getting poor people access to a bank account

In general, we have much more data about the first challenge than the second, yet both are important for poverty reduction and economic growth. We must ensure that any financial development in the developing world includes the poor as well as the better off. But the objective of getting the poorest access to a bank account faces two major constraints: physical remoteness; and the high running costs of banks.

The challenge of physical remoteness is considerable: even those banks committed to widening access to savings to the poor do not find it economic to serve rural areas with low population densities. The case of Kenya is typical: while high-density poor areas such as the outskirts of Nairobi are well served by banks, sparsely populated rural areas typically are not – and this is where some of the poorest live.

The high running costs faced by banks mean that account charges are often prohibitive for most poor families. In Zambia, for example, the middle 60% of the population by income earns \$85 to \$100 a month, which is barely enough to ensure food security for a family of five. But most bank charges would be 10% of family income,

which is prohibitively high.

These high charges are a direct result of the high running costs of banks, which in turn are due to a heavy regulatory burden and inefficient operations. In developed countries with efficient banking systems, the ratio of operating costs to assets is typically 1.5% to 3%. But in many developing countries, the ratio exceeds 5%, and in some parts of Africa, it is higher than 10%.

Key drivers of improved access to savings for poor people are appropriate financial infrastructure and good access to institutions

What can be done? The key drivers of improved access to savings for poor people are appropriate financial infrastructure and good access to institutions. In many countries, the development of financial infrastructure is impeded by uncertainty over the meaning and enforcement of regulation. And banks need to take advantage of benign conditions (where they exist) to serve the poor. This need not be direct: Barclays has created arrangements with local financial agents in Ghana (called *susu* collectors) and so indirectly provides banking services to many poor people.

International institutions can also help the development of banking services for the poor. But the policy prescription depends on the level of financial development. In countries with well-developed financial infrastructure, working with existing banks may help widen access to the poor. In countries with poor financial infrastructure, it is difficult to make significant progress. Supporting advocates of reform may make a greater contribution to widening access to bank accounts than direct commercial intervention.

Publication details

“Increasing the Number of Deposit Accounts: A White Paper for Discussion,” by Alan Roe, Robert Stone, and Aby Carpio, was written for the Gates Foundation. The paper is available from

www.warwick.ac.uk/go/eri/bulletin/2007-08-3/.

The authors

Alan Roe is director and principal economist of Oxford Policy Management. Now retired from Warwick, he is associate fellow in the Department of Economics. Robert Stone and Aby Carpio are consultants at Oxford Policy Management.

Globalisation and the costs of trade from 1870 to the present

What has driven trade booms and trade busts over the past century and a half? **Dennis Novy** and colleagues use a new measure of the costs of international trade to estimate the contribution of falling costs to the first wave of globalisation around the turn of the twentieth century as well as the modern phenomenon of globalisation.

Most countries trade more on international markets today than ever before – both in absolute terms and as a proportion of their national output. How can we explain the phenomenal increase in international trade over the past few decades?

History provides a natural comparison. Starting around the mid-nineteenth century, the world saw a remarkable rise in international trade that came to a grinding halt during World War I and then in the Great Depression. This first wave of globalisation – from about 1870 until 1913 –

led to a degree of international integration (measured by trade-to-output ratios) that many countries only achieved again in the mid-1990s.

Our research compares the first wave of globalisation with the current wave, which began after World War II. We also examine the retreat of world trade during the interwar period from 1921 to 1939. We are interested in the driving forces behind these trade booms and trade busts: was it changes in global output or changes in trade costs that explain the evolution of international trade?

To answer that question, we set up a “gravity” model of international trade. This borrows Isaac Newton’s insight that the gravitational force between two planets in space diminishes as the distance between them increases. Instead of planets, we consider countries whose “gravitational force” is the amount of their bilateral exports and imports. And instead of physical distance, this bilateral trade is impeded by trade costs such as transportation costs, tariffs and language barriers.

Trade costs fell more rapidly and were a more important driver of trade growth before World War I than after World War II

The innovation of our approach is to model these trade costs in a micro-founded way and to obtain an analytical solution for them based on our gravity model. We then take the model to the data, inferring trade costs from observed output and trade data for France, the UK, the US and 18 of their trading partners for the period 1870-2000.

Perhaps surprisingly, our results show that trade costs dropped much faster during the first wave of globalisation up to World War I than during the second wave after World War II. The average level of trade costs for the countries in our sample fell by 23% in the 40 years before World War I; but from 1950 to 2000, average trade costs only fell by 16%. For the same countries, average trade costs increased by 10% in the 20 years from the end of World War I to the beginning of World War II.

What are the factors underlying these trade costs? Our evidence suggests that the ones that matter most are geographical distance (a rough proxy for transportation costs), trade policy and tariffs, adherence to fixed exchange rate regimes and membership of the British Empire or Commonwealth. In particular, the technological breakthrough and spread of the steamship in the course of the nineteenth century is associated with increased trade, as is the spread of container shipping from the 1960s.

On the surface, the percentage growth in trade volumes is roughly comparable in both waves of globalisation (400% and 471%, respectively). But since trade costs

dropped faster during the first wave, they are also more important in explaining the growth of trade in that period. From 1870 to 1913, falling trade costs account for over half of the growth in international trade, while the rest is explained by secular increases in output. But from 1950 to 2000, falling trade costs account for only a third of trade growth.

Unless there is a backlash in the form of protectionism, world trade has the potential to keep growing strongly over the coming decades

In explaining the trade bust of the 1930s, the role of trade costs is dominant. Based on output growth alone, we would have expected trade volumes to increase by nearly 90%. The fact that they declined by 13% highlights the critical role of the general tariff hike during the Great Depression and the collapse of the system of fixed exchange rates known as the gold standard.

What does our research say about the future of world trade? Compared with historical patterns, the level of bilateral trade costs is still high for many pairs of countries, especially for pairs that are far away from each other. This means that there is scope for costs to fall much further. Unless there is a backlash in the form of protectionism, world trade has the potential to keep growing strongly over the coming decades.

Publication details

“Trade Costs, 1870-2000,” by David Jacks, Christopher Meissner and Dennis Novy, is published in the *American Economic Review: Papers & Proceedings* 98(2), Papers & Proceedings, May 2008, pp. 529-534.

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