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ERRATUM

In issue 77 there was a typographical error in the name of the author of the preface. His name and title should read Habil. Dr. Antanas Čenys. [Our apologies to Dr. Čenys for the error.]

This can clearly have positive implications in that by removing the obstacle of distance it expands consumer choice by making transactions possible with a wider range of potential suppliers. It can also however have other implications, whose outcome is not so clear cut.

First, it is likely to widen gaps in income distribution: within the same profession, fees (and hence incomes) will vary widely, often for the same type of service. Second, although less obviously, though not necessarily less a matter of concern, it may divert attention and valuable resources towards marketing and promotional exercises. This is quite likely in activities in which it is very hard for purchasers to determine the quality of the service or product before they buy it. This is typically the case where asymmetric information is involved, i.e. the seller, or someone similarly trained is inherently better positioned to know more about the product than the layman purchaser.

If the fees a professional is able to command can vary hugely, depending on how many people have a high regard for his or her services, then it may pay to devote time and resources to marketing or promotion. By way of example, most medical operations will be performed equally well and with the desired results by most accredited surgeons; nevertheless a few 'well-known' ones will command very high fees, even for operations that are run-of-the-mill, and which most of their colleagues would perform equally well.

This rush into promotion and marketing by the service-seller can have two problematic corollaries: first, it will divert limited resources (e.g. time) away from activities that can actually enhance the quality of the service but may be more demanding and have a slower and less spectacular payoff (e.g. further study, training research, etc.). Second, as more and more of those service-sellers make this calculation and adopt this strategy, demand will rise for the services of intermediaries (i.e. promoters, marketers, publicists, etc.), making these jobs highly lucrative and attracting talent to them (and away from more "productive" activities). We may end up at an equilibrium in which quality is stagnant, the incomes of the service sellers do not change drastically, as the efforts of the intermediaries involved in promotion wars, cancel each other out, and the only true beneficiaries are the intermediaries themselves (whose services become indispensable, for defensive reasons if for no other reason, i.e. to counter the effect of competitors using them).

Whereas the first consequence was of a distributional nature, this last one affects not simply the distribution of income/welfare, but also the overall levels of income/welfare achieved.

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not so clear. It is for this reason that much of the research in this area supported by EU RTD programmes has focused on encouraging cultural change in public administrations; research projects typically centre on training and new working methods as ways of preparing the ground for reform. These programmes can help the process, but they rely on strong commitment and political leadership on the part of governments for their success.

Government-specific factors

If organizational rationalization and efficiency is only part of the story, the other part relates to themes which are the essence of government, and for which eGovernment provides a golden opportunity for their reinforcement. A conference on eGovernment organized in 2001 by the then Belgian Presidency of the EU identified five fundamental criteria for good government: transparency, participation, responsibility, effectiveness and coherence.[2] These and other aspects have been reaffirmed more recently.[3]

Transparency is perhaps the most sensitive criterion, due to its different treatment in each of the Member States according to their traditional cultural views with respect to the openness and availability of information. In some Scandinavian countries, for example, citizens have far greater rights of access and inspection than in most countries. But transparency is a necessity which could make public administration more **responsible** and accountable, and new technologies can facilitate this. For example, the publication of public procurement tender conditions on the Internet ensures open procedures which give equal opportunities for suppliers and diminish the possibilities of fraud or corruption. Such processes can also have a positive influence on industrial policy. One of the recent initiatives regarding transparency has been the proposal for a Directive on the re-use and exploitation of public sector documents. This was driven partly by a need to ensure a level playing field between public and private players in new digital content markets, but also to put to use the enormous amount of information in the public domain in order to kick-start those markets.

Access and participation. Electronic public services have to be available for all citizens – this in turn implies equality of access for all – unlike the private sector, which can (within certain limits) choose its customers. Equal access to eGovernment services is an aspect of social inclusion. Technologically, this involves the use of all kinds of technical infrastructure, maximizing convergence between platforms (in simple terms, this means the use of the Internet through fixed, and mobile networks, and even digital television platforms).

Coherence and interconnection criteria are as much organizational as they are technological. Currently, emphasis is given to the need for a single access point for citizens to all eGovernment services. This implies a high degree of coherence between the different parts of public organizations and as well as an interconnection and fluid inter operability between them.

The question of interoperability has become as essential for the future of eGovernment as it has for the future of the Information Society as a whole. Full interoperability is facilitated by open systems with open interfaces, something in which the public sector can play an important role – yet another example pointing to a relationship with industrial policy. The European Commission is working towards a European interoperability framework to tackle the technical aspect of cross-border collaboration. This work has shown that open systems are important, but they must be complemented with agreements at the level of specific implementation. Interoperability is not simply a technical matter, it relates also to the ability of different branches of government to work together -'joined-up' government as the British call it.[4]

The five fundamental criteria for good government have been identified as transparency, participation, responsibility, effectiveness and coherence

Interoperability has become as essential for the future of eGovernment as it has for the future of the Information Society as a whole

ations), it may be necessary to extend these to a wider range of government services.

eGovernment Services over open technology platforms

There are good arguments for a technology policy approach that favours the use of open platforms as the vehicle for eGovernment service delivery. The provision of eGovernment services is by nature very costly since deployment has to be massive to be effective - most public services need to reach as many users as possible in an undifferentiated way. Establishing and applying formal standards in this area would be very difficult in view of the diversity and fragmentation both within and across Member States, combined with the constant stream innovation involved.

But as a result a lot of money is being wasted reinventing systems, a situation compounded by the possibilities of costly failures. Code-sharing, the use of open source software, open interfaces and *de facto* standards could be built into the practice of e-governance as one way of overcoming the problem. Open source approaches would reduce the costs of deployment, and of adapting and repairing failures, as well as having some spin-off advantages in terms of ICT sectoral policy.

eGovernment and Security

Public service provision involving the exchange of large amounts of personal information requires strong security and privacy protection. Such exchanges may be between governments and citizens, businesses or other public sector organizations. In order to facilitate creating a climate of trust and confidence in the use of eGovernment applications, it will be necessary to incorporate at the design stage technology-based Identity Management Systems (IMS). Multi-purpose IMS which meet multilateral and multi-channel security requirements, and which protect the citizen's privacy, can provide the necessary functionality and accommodate law enforcement needs. Identity Management Systems can thus constitute a trusted platform for information exchange with public authorities.[9] The potential role of Public Key Encryption (PKC) and Public Key Infrastructure (PKI) will need to be reassessed in the light of these emerging systems.[10]

Going beyond the present eGovernment paradigm

The discussion so far has shown that today's paradigm of eGovernment is based on bringing more efficiency to public services, either by delivering what exists more cheaply or by complementing existing services with added features.

That perspective sees the transformational possibilities of ICTs from a standpoint of the internal operations, front- or back-office, of governmental organizations. However, as we have hinted above, concentrating on the supply-side might make one oblivious to the potential influence of demand factors and societal change, and might also lead us to ignore the possibilities of new and emerging technologies as facilitators of change. Taken together, such factors could lead to a new paradigm of eGovernment based on citizens' needs as well of those of governments.

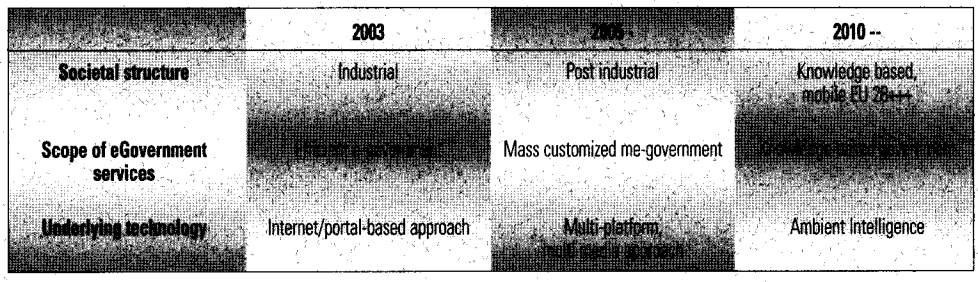
New demands for future eGovernment services

The picture of society we are likely to see developing over the next decade and beyond has been described by many observers and thinkers as one in which Europe will undergo some fundamental changes and deep transitions. The European Union will almost double in size, will be characterized by extreme cultural and religious diversity, will have a higher proportion of older people, and will battle with significant social and economic differences,

Concentrating on the supply-side could lead to the potential influence of demand factors and societal change being underestimated

government in the interests of citizens, but would also need to examine the risks, particularly with regard to security and control. In fact the security issues referred to earlier take on an entirely new dimension in the Ambient Intelligence environment, with location-independent virtual indicators of identity replacing today's geographically-based equivalents.[13]

Box 1. A roadmap of future developments in eGovernment



Keywords

eGovernment, ICTs, public services

Notes

1. This paper is based on presentations made by Jean-Claude Burgelman to the meeting of the High-level Socio-economic Expert Group held in Brussels on 19 March 2003, and by Bernard Clements to the Conference on *eAdministración: Administración Pública y Tecnologías de la Información y la Comunicación*, 29-30 May 2003 at the Pompeu Fabra University, Barcelona. Conference on eGovernment.

2. EU Presidency Conference on eGovernment: "From Policy to Practice", Brussels, 29-30 November 2001, **http://europa.eu.int/information_society/eeurope/egovconf/2001/index_en.htm**

3. See for example, E. Liikanen, EC Commissioner for Enterprise and Information Society, *e-Government: An EU Perspective*, Journal of Political Marketing, Special Issue on e-Government (forthcoming), or by the same author: *eGovernment: Europe's Challenge*, presented at the EU Presidency Conference on eGovernment, 7-8 July 2003, Como, Italy,
http://europa.eu.int/information_society/eeurope/egovconf/index_en.htm

4. See *e-Government Interoperability Framework*, UK Cabinet Office, Office of the e-Envoy, Version 5.0, 25 April 2003,
http://212.137.45.209/oee/oee.nsf/sections/frameworks-egif5/$file/e-GIF_v5_part1.pdf

5. The Prisma project is an accompanying measure within the 5th Framework IST EU RTD Programme. See **http://www.prisma-eu.net**

6. The eEurope Action Plan, **http://europa.eu.int/information_society/eeurope/index_en.htm**

7. See *Web-based Survey on Electronic Public Services, Results of the Third Measurement, October 2002*, prepared for DG Information Society of the European Commission by Cap Gemini, report published February 2003, **http://www.cgey.com/news/2003/0206egov.pdf**

8. See *The E-Government Imperative*, OECD 'Flagship' Report on eGovernment, 2003 (forthcoming), ISBN: 92-64-10117-9, **http://www.oecd.org/dataoecd/60/60/2502539.pdf**

Making New Capital and Innovation Explicit in Growth Modelling

Volodymyr Ryaboshlyk, *Institute for Reforms, Ukraine*

Issue: Scientific research can produce technological innovations which in turn lead to capital investment in new, more efficient technology. However, existing modelling approaches deal with average parameters based on the aggregate capital stock and so fail to capture the impact of the spread of new technology.

Relevance: Disaggregating capital-related parameters could enhance economic models and improve analysis of the impact of technological developments on the overall functioning of the economy, thus helping policy-makers understand and foster innovation.

The increased focus on technological innovation needs to be accompanied by closer attention to the role of 'innovations' in modelling the economy so as to link the creation and absorption of technological developments more consistently.

To date the influence of technological progress on the overall functioning of the economy has been evaluated using standard simulation models (Christidis, Ciscar et all, 2002), (IPTS, 2002). In this approach the modelling efforts are limited to selecting the most appropriate models from among those currently available (High Level Economists Group, 2000).

This article aims to highlight ways to improve modelling techniques based on the Cobb-Douglas function. The assumptions used in many models may be too simplistic; revisions and greater sophistication could bring the resulting models significantly closer to reality. This could also lead to greater convergence between macro- and micro- analysis.

To start with, in its simplest form the Cobb-Douglas approach rests on an aggregation of both capital and labour, and consequently conveys technological progress in average terms, i.e. as average labour productivity and its growth.

However, it is the case that progress is primarily associated with capital embodying new technologies and with those sections of the labour force which are equipped with this new technology and adept at using it. As the new technology gradually displaces the old, through a process of diffusion of industrial transformation, the output of all sectors of the economy will include a mixture of products created by both new and old technologies simultaneously.

The Cobb-Douglas approach upon which many models are based rests on an aggregation of both capital and labour, and consequently conveys technological progress only in average terms

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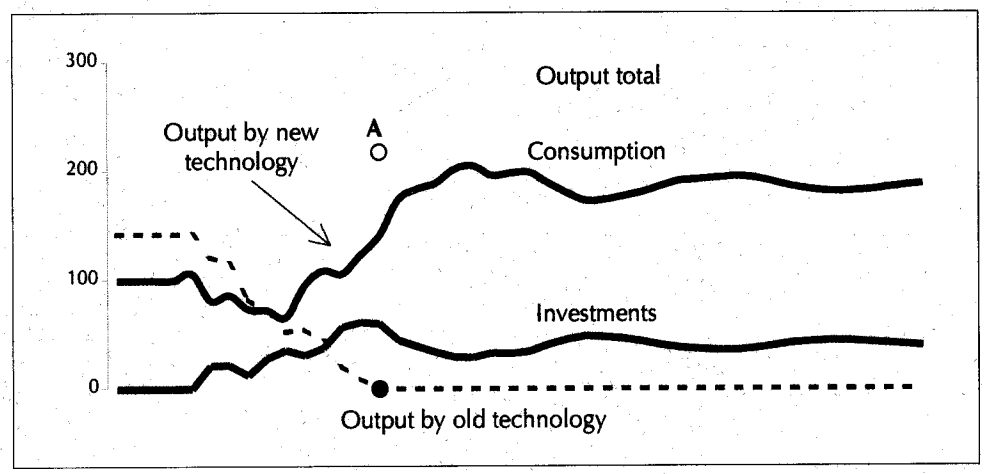
Figure 1. Growth in a Two-Technology and Two-Sector Model with Explicit New Capital



capital is 3.75 times higher than that of one using existing technology;

- creation of a technologically advanced workplace needs capital produced by 4 workers who will be engaged in producing investment goods;
- capital assets are assumed to operate over 10 years (in physical terms, capital goods are assumed to be equally productive throughout their lifetime until scrapped at the end of the period. This contrasts with depreciation in financial terms, whereby the value of capital goods is reduced by a fraction each year);
- investments are considered not as a direct physical channelling of some share of the output into capital stock, but in a more comprehensive way richer in microeconomic detail, in which apart from households' monetary savings, accrued depreciation, retained earnings and even creation of money by the central bank are all taken into account. The model assumes 15% of personal income is saved and can finance investments.

Progress in the modelled economy is driven by the substitution of old technology by the new one via investments, accompanied by redistribution of the labour force. Labour leaving the contracting sector is either employed producing new capital or working using it. The new equilibrium (also referred to as the steady state or saturation phase) is established at a higher level of output.

Unexpectedly the model generated endogenous cycles, giving quantitative backing to the Schumpeterian idea that cycles are an integral part of innovation-based growth (S. Campodall'Orto and N. Sandri, 2002).

At the same time this result does not match the alternative view of cycles as random "fluctuations that occur around a trend" and with the consequent contradictions between long- and short-term analyses which seek "to evaluate the long-term trend of economic activity and the extent to which current output diverges from it" (G. Fiorentini, 2002).

Among the features of the cycle shown by the model is the well-known fact that investment fluctuations lead to fluctuations in total output, so that a decline in investments prefigures the beginning of a recession, and an increase in investment – the beginning of recovery (see Figure 1).

One of the reasons for cycles emerging in the model is that in the early stages of adoption of new

Unexpectedly the model generated endogenous cycles, giving quantitative backing to the Schumpeterian idea that cycles are an integral part of innovation-based growth

Among the features of the cycle shown by the model is the well-known fact that investment fluctuations lead to fluctuations in total output

econometrics, and here we have sought to offer evidence for the view that this effort is justified. For example, comparing the "old" and "new" capital parameters gives a way of assessing an economy's position in the cycle.

In future research the closed economy model presented here could be extended to an open one. This would entail considering a 'closed set of open economies' i.e. it would mean taking into account the fact that all open economies are parts of an ultimately closed global economy and their indicators are subordinated to global constraints. This might encourage cooperative policy-making to elaborate mutually favourable scenarios of development, etc.; differential analysis of the country-specific and the common business cycle; analysis of interactions between economies which are technology leaders and those which are followers, and so on. Issues of employment could be reflected in the model if we allow for inertia in the movement of labour between sectors, frictional unemployment, etc. A more complex network of input-output links between sectors also needs to be built.

All in all, the proposed explicit-new-capital approach to growth modelling can give a holistic explanation for issues which have to date been dispersed across various sub-disciplines of economics such as innovation, growth, business cycles and general equilibrium analyses. This approach could be put forward as a possible basis on which to build a framework in which policy-making can understand and ultimately foster innovation.

In future research the closed economy model presented here could be extended to an open economy

Economic Indicators and the New Economy

Asterios Hatziparadissis, *General Secretariat for Research and Technology, Ministry of Development, Greece*

Issue: Although new technologies have developed and spread in radical and revolutionary ways, this fact has been not reflected in the economic indicators, giving rise to a so-called "productivity paradox". Part of the reason may lie in the fact that existing economic indicators assume a primarily manufacturing-based economy and do not easily assimilate rapid technological change, the emergence of new products and the importance of services characteristic of today's economies.

Relevance: The productivity paradox has created an urgent need to develop a valid theory able to explain the consequences of the development and spread of ICTs across the whole economic spectrum. Policy-makers need valid and accurate indices in order to direct ICT-related policy appropriately. Consistent underestimation of the benefits of ICTs by existing indicators may lead to a tendency to provide inadequate support to their adoption, thus jeopardizing future growth and competitiveness.

Introduction

Over the last two decades awareness of the paradoxes affecting certain economic indicators has grown and economists have at times been at a loss to provide persuasive answers. There is a strong impression that although the development in new technologies is radical and revolutionary, this has been not reflected in the economic indicators. These indicators show Gross Domestic Product (GDP) to be increasing only slowly and the rate of productivity growth to be slowing. Information and Communication Technology (ICT) has penetrated all levels of the economy and may be expected to have caused a number of changes that indicators do not appear to be able to reflect.

There is, therefore, an urgent need to develop a valid theory able to explain the consequences of the development and spread of ICTs across the whole economic spectrum. The European Commission, in cooperation with the OECD, has produced a publication as the outcome of a workshop, under the title "The Economics of the Information Society" (Dumort & Dryden, 1997). Another significant study was conducted by Michel Volle (Volle, 1999) in which the author sought to model a series of topics, such as electronic commerce, information systems, audiovisual industry projects,

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Although new technologies have developed and spread in radical and revolutionary ways, this fact has been not reflected in the economic indicators, giving rise to a so-called "productivity paradox"

This paradox has created an urgent need to develop a valid theory able to explain the consequences of the development and spread of ICTs across the whole economic spectrum

Two official bodies in the United States, the BEA (Bureau of Economic Analysis) and the BLS (Bureau of Labour Statistics) give very different figures –sometimes more than twice as high– for labour productivity during the period 1967-1987, for example, labour productivity improvements by airlines was 1.6% according to the BEA and 5.2% according to the BLS. Similarly, the BEA's figure for banks was 1.9%, as against the BLS's figure of 3.6%, and for productivity by utilities their figures were 3% and 0.7%, and so on.

Diewert and Smith (Diewert & Smith, 1994), while studying the case of a big Canadian delivery company, found an astonishingly high rate of growth of the total factor productivity of the company of 9.4% in each of six consecutive quarters. In their view, this growth was due computerization, which improved management of purchasing and sales and maintaining directories cheaper and more efficient.

Over time as new surveys have appeared showing rapid productivity growth after 1995, the view that ICT contributes significantly in productivity seems increasingly to prevail. However, Robert Gordon (Gordon, 1999) insists that there is no such phenomenon, only a huge increase in the computer manufacturing industry, which grew by 42% during the period 1995-1999, driving productivity for the whole of manufacturing industry upwards.

Brynjolfsson and Hitt published a further article in 1998 (Brynjolfsson and Hitt, 1998) suggesting a new methodology for the measuring of computer-induced productivity. According to this new approach, productivity should not be measured over a one year period. Rather, longer periods of between one and seven years should be analysed so that there is enough time for the effects to show. In a more recent article (Brynjolfsson and Hitt, 2000) they state that the contribution is not only long-term but is also accompanied by significant related investments and organizational changes. They estimate, that in a sample of enterprises they studied, for every dollar invested in ICT, the enterprise accumulated 4-19 dollars in intangible assets. Furthermore, they pinpoint the weakness of the official index system when it comes to expressing the progress achieved in ICT intensive industries, such as banking, health, etc. Here the paradox persists, since the official statistics indicate that since 1977 productivity in banking has grown 80%, productivity in health care 70% and productivity in legal services 65% The authors characterize these results as unrealistic, but they do not provide any further explanation. A more sophisticated approach, taking into account quality considerations too, is used by Jorgensen and Wessner (Jorgensen & Wessner, 2002), according to which fast productivity growth in the nineties can be attributed to efficiency gains in the high-tech industries themselves, but finds there to be little boosting of productivity in the services sector.

The impact of ICT on other indicators

Although the methodology improvement proposed by Brynjolfsson and Hitt is very useful, it does not succeed in highlighting the real growth in productivity, which could be a lot bigger. For the sake of a more reliable picture of productivity growth, adjustments to other indices, used for the estimation of productivity such as the increases in Gross Domestic Product (GDP) and the Consumer (or Retail) Price Index, may also be necessary.

Gross Domestic Product (GDP) is an economy's total annual value added and is used as the basic index for a variety of economic measurements and for estimating other derivative indices. For example, productivity, at national level, is calculated by dividing GDP by the total labour force of the country. Changes in GDP therefore affect the resulting productivity index. Moreover, any inaccuracies in the way GDP is calculated will clearly also affect the figure for productivity.

As new surveys have appeared showing rapid productivity growth after 1995, the view that ICT contributes significantly to productivity seems increasingly to prevail

Gross Domestic Product (GDP) is a measure of an economy's total value-added during a given period and is used as the basis for calculating a series of other indices, including productivity

simple. However, if it were to be done, it is very likely that we would find the figures showing deflation in most Western countries, resulting in further increases in real GDP and productivity.

Although the adjustments described above would improve the accuracy of productivity features they would still fall short of showing the real impact of ICT on productivity. This is because of the way in which productivity is measured, and more specifically in the use of production or value added as the numerator. Calculating productivity in this way underestimates the effect of ICT because it dramatically enhances the potential of the economy without producing a corresponding change in value added, since its products and services are offered at very low prices. The examples of e-mail, online newspapers and of online information in general illustrate this point.

To obtain an idea about the progress achieved since ICTs began to play a role in the economy, we have to attempt a conversion of the new economy in terms of the old economy. Litan and Rivlin (Litan & Rivlin, 2001) estimated the monetary value of the Internet to be 100 billion dollars, including the software industry infrastructure and the information facilities provided to enterprises and individuals. This is tiny as it does not represent more than 1% of US GDP. Furthermore, despite the rapid diffusion of the Internet, no dramatic increase in its money value is foreseen in the immediate future. If from this size we isolate only the part which many authors call the international Internet library, that is the part which refers to the education-training –and moreover the part which is offered for free—and attempt to evaluate the cost of a physical library, with buildings, books, shelves, human resources etc., which includes all these articles, books, pictures, data, etc. we obtain a price that is very much higher than that quoted above for the Internet as a whole. However, even this estimate would be incomplete because the Internet library is effectively not just one library, but many millions of libraries, indeed as many as there are Internet users, since each user can access it regardless of where they are and who else is using it. The picture becomes even more dramatic if we take into account the following: the speed in which users can enter the library and search for the information they need and retrieve it in both hard copy and in electronic format, the information processing and generation capabilities, etc. Finally, if we add to all this the speed with which the library can be updated, which takes place automatically for all Internet users, we can obtain an idea about how much the Internet international library offers relative to its contribution to GDP as currently calculated.

This exercise illustrates the type of products produced by the new economy and how little these products are mirrored in the existing indices. If –and this is a crucial if– their production were made with material means –which is impossible– then, GDP and productivity would increase by two-digit percentages and the paradox would disappear.

Jean Gadrey in his book on the service economy (Gadrey, 1996) undertook a thorough study of an ICT intensive industry (banking in this case) and reached the same conclusion. For the period 1978-1984 the productivity of an employee at a French bank, if the calculation is based on total accounts, cheques and transactions, in general, that this person deals with, grew by 10% per year. However, if this calculation is based on the value added or the bank's earnings, then it fell by 3% a year. This example highlights the changes brought by ICT to services: ICT has dramatically improved efficiency without having an impact on conventional calculations such as that used for GDP. The aforementioned studies show similar phenomena in the case of the insurance industry, where the formal hourly labour productivity for the period 1980-1988 fell by 3.2%, while the use of alternative "natural" indices shows an increase of more than 3%.

ICT enhances the potential of the economy without producing a corresponding change in value added, since it often enables products and services to be offered at very low prices

Attempting to place an "old economy" value on the Internet gives an idea of the scale of the discrepancy between the old models and current reality

Particularly in the services ICT has dramatically improved efficiency without having an impact on conventional calculations

and specifically with so-called "natural" indices for specific fields. For instance, the quantity of products-services produced, when detectable and measurable, is an equally important index to their monetary value. At the beginning of the 19th century, in an attempt to analyse the performance of the new industrial economy of that time, economists resorted to studies, reviews, case studies etc., due to the lack of aggregate indices. Something similar would also be very helpful at this juncture. One of the main aims of all these tasks should be the measurement of the ICT penetration level in an economy. The degree of "computerization" of an economy, as is alternatively called, gives us today valuable information about how we should understand and interpret a series of indices, such us Gross Domestic Product, the Consumer Price Index, productivity etc. The discussion, however, on the category of indices depicting in the best possible way the level of ICT penetration in an economy has not kept up with the underlying developments.

Keywords

productivity paradox, hedonic indices, gross domestic product, consumer price index, ICTs

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Sustainable Land Management and Soil Use: Economic Factors

Martin Held, *Protestant Academy Tutzing*

Issue: Soil is an essential part of the environment and its degradation can have impacts that are potentially as serious as better known issues such as global warming. Nevertheless, land management has tended to concentrate on considering land as space for agricultural, building or other uses, without taking into account the functions of the soil itself.

Relevance: Sustainable land use requires that soil-related issues also be taken into account. This calls for increased awareness of these issues overall, and this may best be achieved through building up a community of stakeholders who participate actively in the debate and can take a proactive approach to soil management issues.

The Starting Point[1]

Soils are essential for life and soil functions provide basic ecological "services" to the environment. Soil degradation (erosion, sealing, contamination etc.) is a major threat to these basic functions and services, and hence to the environment as a whole. This threat is inherently linked to other major environmental issues (WBGU, 1995), in particular climate change, loss of biodiversity and changes in water cycles. Soil and soil functions need to be taken into account particularly because of their influence on these other threats. Moreover, at the same time the impacts of climate change and changes in the water-cycle are also adversely affecting soils and their functions. Soil degradation is one of the major problems of global change, indeed it is as serious as climate change and loss of biodiversity. However, the soil degradation problem has a number of specific features that need to be taken into account if it is to be understood properly. First of all, unlike the case of many environmental issues, where common ownership or non-ownership is the pattern –and often an obstacle to finding workable solutions– land usually has property-rights of some kind associated with it. A fuller understanding of the land tenure systems and its characteristics is therefore essential for all efforts towards sustainable development.

Soils are essential for life and soil functions provide basic ecological "services" to the environment

Soil degradation is one of the major problems of global change, and it is one that has to be recognized as being as serious a problem as climate change and loss of biodiversity

The issue of soil protection has for a long time been dominated by a reactive approach. Although urgent measures might on occasion be taken to tackle specific soil contamination hot spots, there has generally been little awareness of the overall issues. This has finally begun to change and we are now beginning to see the start of a proactive ap-

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ce public understanding and acceptance of this rationale. This challenging task could be compared with decoupling energy consumption from economic growth. There are two main links between soil and the economy: soil functions and the economic framework for land use. The first of these links is that soil functions provide ecological services which have an economic value, even if this is often not made explicit (tending to manifest itself as a cost when the soil fails to perform its function). However, the actors involved are often not directly interested in soil use, but wish to use land for various purposes such as building homes, commercial premises, transport facilities, etc. This being the case, we need to learn more about the consequences of neglecting soils in the various economic sectors and in the economy as a whole, as this may help us identify the potential for sustainable economic activities in various sectors such as financial services, agriculture and food, construction, transport/mobility, tourism, etc.

The second link between soil and the economy concerns the existing institutional arrangements, legal rules, taxes and subsidies which give actors incentives to seal land surfaces and carry out activities that cause other forms of soil degradation (erosion, contamination, salinization, etc.), i.e. for the dominant non-sustainable use of soils and land management. Understanding land tenure systems and the specific institutional arrangements that underpin them is part of that analysis. In addition this focus enables a systematic debate to begin on economic instruments for soil protection and their role in the overall mix of instruments.

The driving forces of soil degradation

Analysis of the factors involved in soil degradation needs to start with soil functions: habitat, regulation, utilization and a "cultural" function. Understanding soil functions properly will help us predict and quantify the impacts of soil degradation caused by unsustainable soil use and land management. Soil functions play a basic role in the environment as a whole through the ecological services they provide, and these interact with climate and water cycles. The ecological services provided by the soil are of economic importance, but are typically assumed to be a free good. However, sealing, soil erosion, contamination, salinization, etc. will degrade ecological services provided by soils, thus imposing external costs, such as:

- accelerating climate change,
- inducing more severe floods and land-slides,
- increasing the costs of waste-water management,
- degrading the quality of life in settlements,
- causing problems for food quality, etc.

Awareness of these impacts clearly needs to be raised. In some cases it may help that actors realize the potential for cost reduction. For example, if construction work is done properly sealing can be minimized and the cost of managing run-off-water may be reduced.

One factor that needs to be taken into account in the initial stages of embarking on a pro-active approach to soil management is that the economic interests of the key players still mainly focus on land and not on soil as such. In modern economies we are no longer directly interested in soil and its fertility but mainly in land (as space for building houses or roads, etc.). Sealing soils with concrete, etc., and thereby destroying and degrading basic soil functions, typically increases its economic value to its owner. This is the main driving force for soil degradation. This being the case, it is important to give economic incentives to land-users to avoid erosion and not to seal soil surfaces.

Economic instruments for the sustainable use of soils and land management

There is a broad range of instruments for soil protection, including both regulatory measures

Understanding the economic stakes involved will help us identify the potential for sustainable economic activities in various sectors such as financial services, agriculture and food, construction, transport/mobility, tourism, etc.

The existing institutional framework giving actors incentives to seal land surfaces and carry out activities that cause other forms of soil degradation need to be understood in order for a systematic debate to be begun on economic instruments for soil protection

which deserve closer analysis. For example, the overarching issue of centralization and decentralization, or charging for infrastructure in relation to sealing. It is also important to bear in mind that economic instruments do not stand alone but have to be seen as part of the overall policy mix. For instance, direct or indirect subsidies for remote areas can have the unintended effect of encouraging sprawl.

The success of policy measures will depend to a large extent on encouraging a general trend towards strong pro-active attitudes among enterprises in sustainability-relevant sectors, including sustainable soil and land use, where individual efforts are backed by an active public, NGOs active in the field and a proactive business community. Therefore, as well as implementing economic instruments, the role of pro-active behaviour by actors also needs to be fostered.

Benefits and costs of sustainable use of soils and land management: Perspectives for proactive behaviour

The incipient debate on the economics of sustainable soil use and land management has so far mainly focused on economic instruments. This is understandable given that the field lags 10 or 20 years behind climate protection. However, we have to understand at the very beginning of forming a European strategy and complementary national strategies for proactive soil protection that we need to have a much broader picture in mind. Proactive stakeholders play a major role in transforming our dominant pattern of non-sustainable land use to achieve sustainable soil use and land management:

- Proactive behaviour by the business community may play an important role within the broad range of stakeholders as was already demonstrated in other fields such as climate change. The commitment of economic actors to sustainable development and specifically to sustainable soil use and land management can set the stage for an overall transition to a proactive soil strategy at all policy-making levels right across the economy and society.
- Ethical investment could form an active bridge between such a commitment within the business community and civil society. If there is a lively public debate on the issues and a rising awareness of soil issues, the proactive part of the business community will have a more favourable setting.
- There are other important stakeholders such as NGOs, scientists and the media. Proactive businesses will be encouraged if there is a climate of innovative debate, openness to civil society and future needs regarding soil sustainability. Ethical investment in turn will have better chances in such an atmosphere as we could learn in cases like wind-power, regional tourism projects, organic farming, etc.
- Interest in corporate governance may be helpful in disseminating first-mover advantages on sustainable land management to other firms and sectors.
- There is also a close link to the general orientation on all political levels. It is important to identify what institutional arrangements, taxes, subsidies etc. should be changed to give incentives for pro-active sectors and enterprises. Here also, there is a tie in with economic instruments.

When looking at the mix of stakeholders it is useful to identify the motives and interests of pro-active enterprises under existing conditions. Sectors with a link to land use on which measures to promote a proactive approach could be focused include financial services and insurance, as well as more direct users of land such as agriculture, tourism and construction.

Agriculture is clearly an important sector since the quality of its products, environmental effects,

The incipient debate on the economics of sustainable soil use and land management has so far mainly focused on economic instrument. However, the broader picture also needs to be kept in mind

In relation to agricultural land use, new rules in Common Agricultural Policy may make it possible to give soil protection criteria a higher priority thus enhancing the potential for investment in organic farming and food processing

analysis since soil protection preserves these functions and thus avoids other costs, such as those for water-management and flood-prevention. Economic analysis is also relevant as a way of including the role of proactive businesses and other stakeholders in the overall picture, and should be given a prominent place in initiatives such as Soil Conservation and Protection Strategies for Europe (SCAPE) and the work of Working Groups for a European Strategy for Soil Protection.

Keywords

soil functions, land use, economic interests, sustainable land management, economic instruments

Notes

1. This article draws extensively on a paper due to be printed in Martin Held, Anton Imeson and Luca Montanarella 2003 (forthcoming), and which is part of the proceedings of an international workshop "Economic Interests and Benefits of Sustainable Use of Soils and Land Management" which took place at Thalwil (CH) January 30 to 31, 2003.

2. There is an incipient debate on economic instruments, see Blak 2003; BLAK is a body within the German environmental ministry at the federal levels with environmental ministries of the 16 states within Germany.

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Consumer Choices that Drive the Car Market

Panayotis Christidis, Ignacio Hidalgo and Antonio Soria, *IPTS*

Issue: The introduction of alternative technologies for road transport has been made a policy priority. However, to achieve this aim many technical and economic obstacles will need to be overcome. Measures aiming to accelerate the adoption of fuel cells, electric and hybrid vehicles, alternative fuels or other technically feasible options need to take into account the dynamics of the car market and the underlying economics if they are to be effective.

Relevance: Consumer choices regarding car ownership depend on a number of economic and technological factors, as well as on user perceptions and marketing. The car market consists of many different market segments with different user requirements and product characteristics. An analysis of the patterns of purchasing, replacing and scrapping cars can provide useful clues for technology policy.

Introduction

The decision to buy, replace or scrap a car is a choice made by the individual owner on the basis of various financial, socio-economic and technological parameters. Car ownership is an important element of modern society and its level often reflects a country's average income and underlying consumption patterns. Although the degree may vary depending on local conditions, there is an evident correlation between car ownership and per capita income that has been consistent in the past and is expected to remain so in the future (figure 1). The relevant literature generally suggests that aggregate car ownership levels increase with income until they reach a saturation level, when the income elasticity of car ownership falls to zero (Greenspan and Cohen, 1996; Dargay and Gately, 1999; Schafer and Victor, 2000; Medlock and Soligo, 2002). Saturation levels for Western Europe and North America are estimated to be in the range of 600 to 700 passenger cars per 1000 inhabitants. Such levels would mean that the majority of holders of driving licences who can afford to own a car actually own one (or more).

Buying a car

At the individual level, the decision to buy a car depends on household income and utility, and can be compared to the purchasing behaviour

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The decision to buy, replace or scrap a car is a choice made by the individual owner on the basis of various financial, socio-economic and technological parameters

The decision to buy a car tends to depend on household income relative to the cost of buying and running a car

Table 1. Income, variable cost and fixed cost elasticities of car ownership

% change in car ownership as a result of a 1% change in:	Norway	Denmark	Holland
Income	[illegible]	+0.41	[illegible]
Variable costs	-1.33	-0.78	-0.41
Fixed costs	-2.65	-1.29	-0.80

Source: Bjorner (1999)

ownership has reached saturation, and the country-specific parameters related to urbanization and transport patterns. A number of cars are also removed each year because they are too old or too expensive to maintain. New car registrations therefore include both cars bought by first-time buyers (i.e. individuals that did not own a car before, either because they didn't need or want one, couldn't afford one, or because they have only recently obtained a driving licence) and cars bought to replace scrapped vehicles.

The type of car purchased depends on numerous variables, not all of them quantifiable. Purchase and running costs are certainly important parameters, and probably provide a reliable indicator of market segmentation: high-price cars are bought by high-income households, low-income households are more sensitive to price differences, etc. There are, however, numerous non-economic factors that influence the type of car the individual consumer buys. Such factors may include the prestige associated with a certain make or size of car, fashion or lifestyle trends, advertising and marketing, and technological progress itself. The combination of the above factors in the last decade has resulted in a highly fragmented car market with strongly connected segments.

Car buyers base their choice of vehicle on subjective factors such as image or prestige as much as on technical characteristics

The share of the small and lower-medium segments has increased, probably as a result of the gradual fall in car prices compared to the lower and medium income levels (table 2). The fact that more young drivers and women buy cars, combined with the increasing number of second and third cars in each household, are probably the

The trend in Europe has been towards smaller cars, although off-road vehicles are also becoming more popular

Figure 2. Households with regular use of car, UK

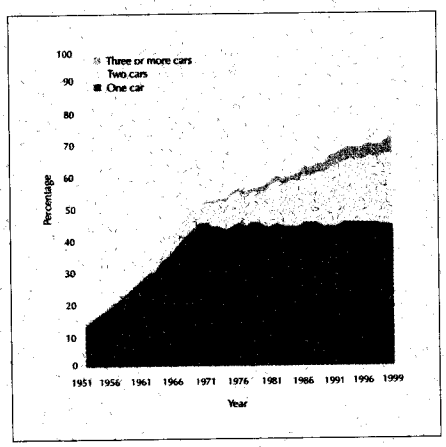
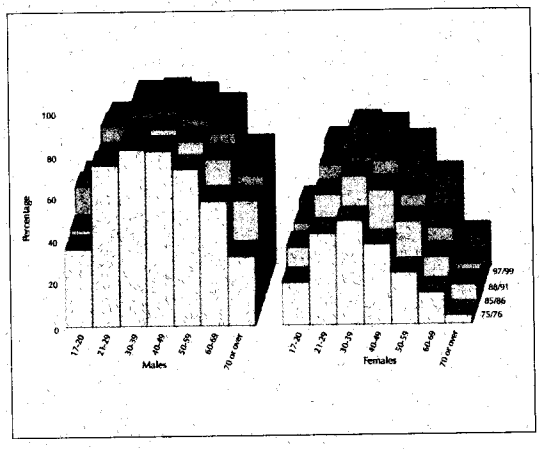


Figure 3. Driving licence holders statistics, UK



Source: DETR (2001)

internal combustion engines, the individual's choice depends largely on price, performance and running costs. Since diesel technology has made great improvements in the last 10 years in terms of performance, fuel efficiency and environmental impacts, the share of diesel-engine vehicles in total sales has risen from under 14% in 1990 to over 35% in 2001. Except some limitations for diesel-engine cars in urban areas (e.g. in Greece), and the still limited supply of a full range of diesel models (e.g. Japanese cars or smaller models), there does not seem to be any other differentiating factor between petrol and diesel cars of comparable performance, apart from cost. However, the same cannot easily be said about emerging technologies such as electric cars, fuel cells or natural gas or bio-fuel powered cars. Whereas petrol and diesel are well-established fuels, and the internal combustion engine is a proven technology, the emerging alternatives still lag in terms of maturity, infrastructure and fuel availability, safety and public perception, and are not yet looked upon as viable alternatives by consumers. Whether they will eventually become such, when their cost falls to competitive levels, remains to be seen.

Car scrapping

Car scrapping refers to the case of a car being removed from circulation. This can be the consequence of one or more of the following:

- the car is no longer usable (e.g. because of mechanical problems or as a result of an accident)
- the car is too expensive to use or maintain: other options such as buying another car or owning no car at all are more attractive for the owner, and no other buyer can be found
- the car is sold in another country as a used car: this case has more to do with statistics rather than with actual scrapping, but it also implies that the perceived value of the used car in the country of origin is lower than in the destination
- specific regulations or measures prohibit the use of a specific type or age group of cars, or stimulate the early retirement of older vehicles

In all of the above cases, the underlying variables are the cost of use and the remaining value of the car. A micro-economic approach modelling the decision to buy or scrap a car was used by Adda

The emerging alternatives to petrol and diesel still lag in terms of maturity, infrastructure and fuel availability, safety and public perception, and are not yet looked upon as viable alternatives by consumers

The decision to scrap a car is generally made when its running and/or repair costs exceed the cost of buying a new vehicle

Table 3. Average engine power of new cars

Average Power (kW)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
AUSTRIA	62	64	64	63	63	63	65	66	69	71	73	76
BELGIUM	57	58	60	61	62	62	64	64	66	66	68	73
DENMARK	63	66	66	67	66	67	69	71	72	73	74	77
FINLAND												
FRANCE	54	54	54	56	55	55	56	60	61	63	65	71
GERMANY	67	68	67	68	69	69	71	73	76	78	81	83
GREECE												
IRELAND	51	53	54	58	58	58	58	58	62	62	63	66
ITALY	62	64	64	64	67	69	71	73	73	73	73	75
LUXEMBOURG	66	68	69	71	73	74	75	77	80	81	82	83
NETHERLANDS	60	60	61	62	63	64	66	67	67	69	70	76
PORTUGAL	47	49	50	51	50	52	54	57	59	60	62	64
SPAIN	58	61	63	61	58	58	60	61	63	65	67	69
SWEDEN	80	83	86	88	90	91	90	89	89	91	92	101
UNITED KINGDOM	63	63	64	64	65	67	69	71	73	74	74	76
EUROPEAN UNION (15)						63	65	66	68	70	71	75
ICELAND												
NORWAY										75	77	82
SWITZERLAND	80	83	84	84	85	87	87	89	91	93	95	99
EFTA						87	87	89	91	89	90	95
WEST. EUROPE	60	61	61	62	63	64	65	67	68	70	71	75

Source: ACEA (2002)

gies such as hybrid or electric vehicles and fuel cells, research results suggest that differential taxation policy is probably required in order to allow emerging technologies to become commercially competitive. Imposing a carbon tax would have a similar impact, favouring technologies that lead to lower CO_2 emissions. The use of hybrid cars would be favoured while electric cars could be also become competitive, as long as the energy mix in electricity generation becomes greener.

Subsidizing the purchase of an alternative technology car could have positive impacts at the early stages of introduction. Subsidies could help cover part of the difference in price between electric, hybrid or fuel cell vehicles and that of conventional technologies and thus allow these alternative technologies to achieve a critical mass earlier. However, if applied as an independent policy measure, subsidies cannot be justified in economic terms. The cost-benefit ratio of subsidies is low compared to other technical or financial measures, at least in the short term.

Emission limits are a strong legislative measure that can drastically change the situation as regards the type of cars available on the market. Emission limits can refer to the type of cars allowed to be used in specific areas (e.g. zero-emission cars in urban centres) or the technical characteristics of cars sold by manufacturers (e.g. the average emissions of cars sold on an annual basis). Although the benefit from such measures in environmental terms could be large, the cost to users and/or car manufacturers could be a discouraging factor.

Policy measures can also aim at decreasing the uncertainty of car manufacturers concerning the potential of each alternative technology. A clear political willingness to support given technologies could play a key role in persuading the industry to invest in them and achieve the full potential that each technology promises.

The fact that the average car remains in circulation for 12 to 15 years means that there is a considerable time lag between enacting car technology policy measures and the achievement of noticeable changes in the car fleet as a whole. Consumer tastes and ultimate choices change slowly and often depend on the consumer's income level; equity issues may be therefore raised if policy measures are not planned well. The used-car market should not be under-estimated either, since it also plays a role in technology diffusion. This is particularly important for countries of lower income levels, such as EU enlargement/candidate countries. Since used cars imported from the EU are an important share

Subsidizing the purchase of an alternative technology car could have positive impacts at the early stages of introduction. However, subsidies can be inefficient relative to other technical and financial measures

The fact that the average car remains in circulation for 12 to 15 years means that there is a considerable time lag between when car technology policy measures are enacted and when they bear fruit

Table 4. Used car sales in various EU countries

	Used car sales (m)	[illegible]	Used/new car sales ratio
UK	7.5	126	3.3
Germany	7.4	91	2.8
France	4.7	80	2.4
Italy	[illegible]	38	[illegible]
Netherlands	[illegible]	110	[illegible]
Spain	1.4	35	1.4
Belgium	0.7	63	1.3
Portugal	0.5	49	1.9
Denmark	0.4	67	2.2
Sweden	0.3	36	1.1
Poland	0.3	[illegible]	2.4

Source: UKCC (2000)

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