

Indicators & the New Economy

Moses A. Boudourides

University of Patras

mboudour@upatras.gr

<http://www.math.upatras.gr/~mboudour>

Topics of Discussion

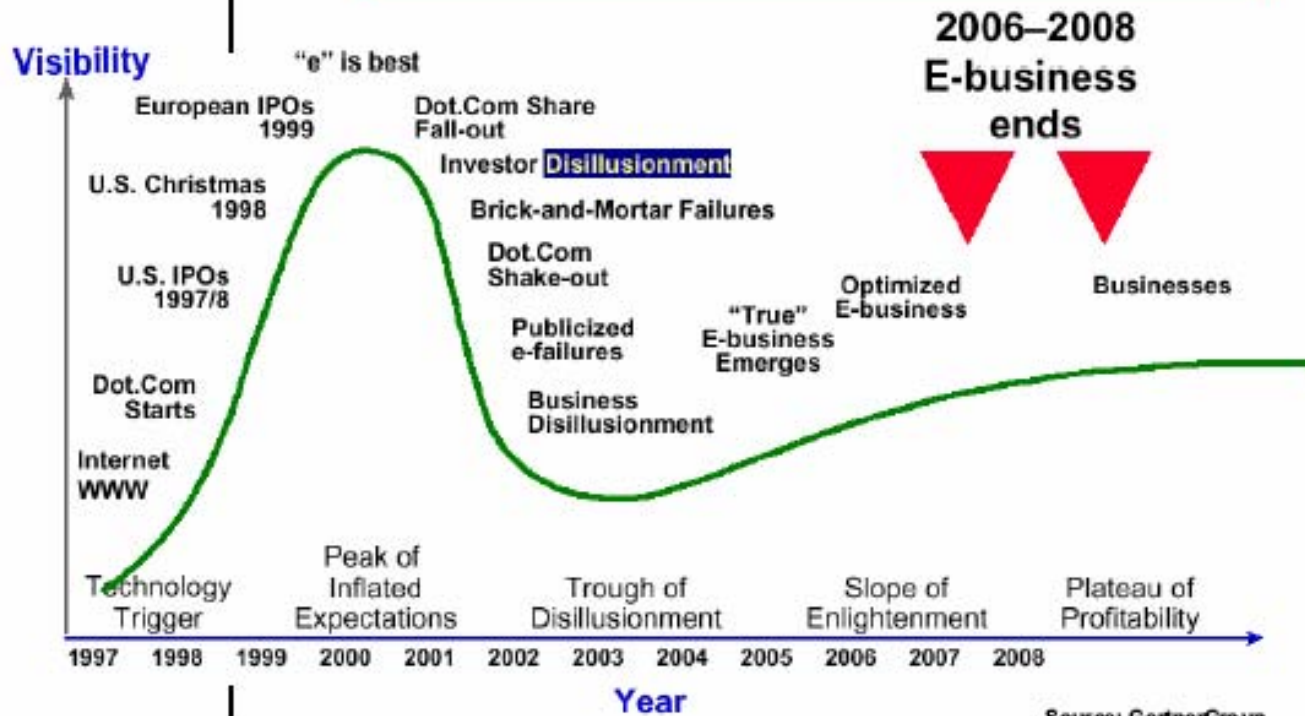
- ▶ **New Economy: Sources of Growth - Laws**
- ▶ **Network Economics: Productivity Growth & Paradox**
- ▶ **Internet & the New Economics: Increasing or Diminishing Returns?**
- ▶ **E-Commerce**
- ▶ **Measuring the New Economy**

New Economy

- ▶ According to OECD (*A New Economy? The Changing Role of Innovation and Information Technology in Growth* [2000]), ICTs shape the New Economy through:
 - Higher rates of non-inflationary growth;
 - Lower rates of unemployment;
 - New sources of growth such as increasing returns to scale, network effects and externalities.

Only a hype?

The *new* New Economy



New Economy & Services

According to Olof Gärdin (2002), NE evolves with services from 3 points of view:

1. Production & consumption
2. Organization, work & employment
3. Development (i.e., services as a dynamic force in societal development)

Gärdin argues that although official statistics is familiar with 1. & 2., it is not yet prepared to cover 3. which represents what is essentially behind the NE.

New Economy & Knowledge-Based Society

- ▶ As NE moves from materials towards services, knowledge production, trading & dissemination become focal.
- ▶ Thus, NE is "*basically about co-ordination, innovation, selection and learning*" (Gärden, 2002).

Sources of Growth in the New Economy

- ▶ Moore's Law
- ▶ Metcalfe's Law
- ▶ Gilder's Law

Moore's Law

- ▶ Gordon Moore (co-founder of Intel) observed in the 1960s:
 - *The number of transistor circuits in a chip doubles every 18 months.*
- ▶ Consequences on the increase in computer memory and processing power:
 - Tenfold every 5 years,
 - Hundredfold every 10 years,
 - Thousandfold every 15 years.

Metcalfe's Law

- ▶ Bob Metcalfe (inventor of Ethernet) observed in the 1970s:
 - *The value of a network is proportional to the square of the number of nodes, i.e., the number of people using it.*
- ▶ The '*network effect*' implying increasing returns in a network economy

Gilder's Law

- ▶ George Gilder (high-tech futurologist) observed and forecasted in 1997:
 - *The total bandwidth of the ICTs will triple every year for the next 25 years.*
- ▶ Consequences (due to improvements in data compression, amplification and multiplexing):
 - FDDI network at 25 terabits per second.

Network Economics

- ▶ Productivity Growth
- ▶ Productivity Paradox
- ▶ Internet Economics
- ▶ New Economics
- ▶ Increasing or Diminishing Returns?

Productivity Growth

- ▶ According to Jorgenson & Stiroh (2000):
 - IT has accelerated productivity growth
 - and has contributed to the US growth resurgence in the 1990s.
- ▶ But they have focused on the price-performance indicators of the IT and the resulting substitution of lower-cost capital services.
- ▶ They see “little support for the ‘new economy’ picture of spillovers cascading from IT producers onto users of this technology.”

The Productivity Paradox

- ▶ Nobel Prize economist Robert Solow (1987):
 - *"You can see the computer age everywhere but in the productivity statistics."*
- ▶ Brynjolfsson's (1993) explanations:
 - Measurement errors;
 - Time lags (according to David [1990] IT could not have a measurable impact on productivity until it reached a critical mass);
 - Management delays to take advantages;
 - Relative (not global economy) profits of redistribution.

The Productivity Paradox (continued)

- ▶ Refutations in the 1990s:
 - Brynjolfsson & Hitt (1993) and Lichtenberg (1995) showed that IT investment was highly correlated with higher levels of output.
- ▶ US economy's surge of productivity growth in the late 1990s (supported by David's argument).
- ▶ At the end of 2000, because of the NASDAQ collapse and the US economy slowing, the New Economy appeared as a brief bubble.
- ▶ Future forecasts vary from optimism (Jorgenson, Bresnahan, more, Baily, Sichel, less) to skepticism (Gordon, Greenspan & Fed economists).

New Economics

- ▶ Kelly's *New Rules for the New Economy* (1999) is an example of the 'you ain't seen nothing yet' school of new economics.
- ▶ Inexorability on "no one can escape the transforming power of machines."
- ▶ But also taking into account a crucial issue: uncertainty because of which Kelly pledges for innovative and untried forms of marketing strategies.

Increasing Returns

- ▶ According to Kelly (1999):
 - *"The prime law of networks" is that "value explodes exponentially with membership" (Metcalfe's law).*
 - *"At first glance the law of increasing returns may seem identical to the familiar textbook notion of economies of scale: The more of a product you make, the more efficient the process becomes."*
 - *However, "industrial economies of scale increase value gradually and linearly. Small efforts yield small results; large efforts give large results."*
 - *"Networks, on the other hand, increase value exponentially – small efforts reinforce one another so that results can quickly snowball into an avalanche."*

Diminishing Returns?

- ▶ According to Krugman (1997):
 - Suppose that the network consists of cities whose population is distributed by the 'rank-size rule': *"the second city has half the population of the first, the third 1/3 the population, and so on. So, imagine a country whose biggest city has 120 people, the next 60, the third 40, and so on."*
 - Then, *"the connection between the two biggest cities will create 7200 (120×60) possible communications. Adding the third city to the network will add another 7200 (180×40). Then the network starts to run into diminishing returns: the next connection adds 6600 possible communications, the one after that 6000, and so on. The size of the base to link to keeps getting bigger, but the size of the next city keeps getting smaller, and the latter effect dominates."*
 - *"The point is not that networks necessarily face diminishing rather than increasing returns; rather it is that increasing returns are by no means guaranteed. Against Metcalfe's Law must be set DeLong's Law (after Berkeley's Brad DeLong, who has made this point several times): in building a network, you tend to do the most valuable connections first. Is the net effect increasing or diminishing returns? It can go either way."*

E-Commerce

- ▶ All e-commerce activities involve the following four basic levels (Bar & Murasse [1999], Pico et al. [1999]):
 - **Communications infrastructure** (where messages about prices, quantities, qualities or service circulate);
 - **Market** (where sellers and buyers meet and negotiate – including *intermediaries*);
 - **Transaction mechanisms** (to send, execute and settle orders – including *payments*);
 - **Deliverables** (the service or merchandise being exchanged).

General Features of E-Commerce

- ▶ According to Lovelock & Ure (2002) five broad themes can be discerned in the emergence of e-commerce:
 - **Time compression** (e.g., by speeding up production cycles and enabling around-the-clock transactions);
 - **Disappearance of geographic boundaries** (doing business anywhere, any time);
 - **Intermediation-Disintermediation;**
 - **Reliance on Open Source;**
 - **Catalytic effect** (in the diffusion-adoption of innovations, regulations, globalization).

Measuring the New Economy

- ▶ Problems in Measuring the New Economy
- ▶ Areas of Research and Policy Interest
- ▶ Data Needs for the New Economy
- ▶ Indicators for the New Economy

Problems in Measuring the New Economy

- ▶ Haltiwanger & Jarmin (2000) argue:
 - The example of ATMs (services not directly measured where their cost of installation is) manifests the problems confronting statistical agencies.
 - Usually the magnitude of aggregate investment in computers is measured through the output of sectors producing them (by adjusting for exports-imports). But little is known about which firms and industries are implementing ITCs.
 - Usually there is no systematic attempt to break out sales by method of selling: How much do firms sell via e-commerce?
 - Needs for better measures of the activities of firms in the 'unmeasured' sectors of the economy (e.g., services).

Areas of Research and Policy Interest

- ▶ According to Haltiwanger & Jarmin (2000):
 1. **Impact of IT on productivity.**
 2. **Impact of IT on labor markets and income distribution** (e.g., the 'digital divide').
 3. **Impact of IT on the organization of production and on market structure** (including the *degree of substitution* between goods & services purchased through e-commerce and traditional channels).

Data Needs for the New Economy

According to Haltiwanger & Jarmin (2000):

- 1. Measures of IT Infrastructure**
- 2. Measures of E-Commerce**
- 3. Measures of Firm & Industry Organization**
- 4. Measures of Demographic & Work Characteristics**
- 5. Measures of Price Behavior**

Measures of IT Infrastructure

- ▶ Investments in physical infrastructure
 - Capacity of the Internet
 - Actual traffic on the Internet
- ▶ Investments in software infrastructure
- ▶ Depreciation in infrastructure
- ▶ How do investments and depreciation act to change the capacity of the New Economy?

Measures of E-Commerce

- ▶ Magnitude & type of both B2B & B2C e-commerce.
- ▶ Distinction between digital & nondigital goods & services (digital goods may have very different pricing structures due to their high fixed costs & low marginal costs – Shapiro & Varian, 1999).
- ▶ Use of e-commerce for both transactions & nontransaction purposes (e.g., customer service, general information, bid posting etc.).

Measures of Firm & Industry Organization

- ▶ Quantify changes in businesses concerning their:
 - Location
 - Size
 - Organizational structure
 - Input mix (e.g., capital labor, inventories)
 - Relationships with other businesses (e.g., outsourcing)

Measures of Demographic & Work Characteristics

- ▶ Comparisons between those participating in the New Economy & those not.
- ▶ Examples of measures:
 - Computer use at school, work & home
 - Relations of the above with measures of economic outcome (such as wages & assets) and demographic characteristics (such as education, occupation, gender, race, age, place of residence etc.)

Measures of Price Behavior

- ▶ Price deflators for goods & services
- ▶ Dependence on methods of selling (e.g., e-commerce vs. traditional methods)
- ▶ Price dispersion across producers using the same method
- ▶ Understand the changing nature of competition in the New Economy

Indicators for the New Economy

Gärardin's (2002) hierarchy of complexity:

Basic Indicators (for eEurope benchmarking, analysis of digital divide etc.):

- ▶ **Readiness Indicators**
- ▶ **Intensity Indicators**

Indicators related to socio-economic changes:

- 3. Impact Indicators**
- 4. Outcome Indicators**

Readiness Indicators

- ▶ They indicate the potential for use of ICTs.
- ▶ They describe variables such as:
 - ICT infrastructure
 - Access to & availability of Internet, e-mail, PCs & IT-skills

Intensity Indicators

- ▶ They indicate actual use & applications of ICTs.
- ▶ They describe variables such as:
 - ICT investments
 - Extent of Internet use, e-mail, PCs, e-commerce etc.
 - Different context & settings of usage (domestic, work-place, public spaces)

Impact Indicators

- ▶ They indicate impact at the micro level & organizations (business & government).
- ▶ They describe new ways of:
 - Organizing work
 - Relationships between people & organizations
 - Organizing production (outsourcing, joint ventures, licensing, mobility, knowledge supply, human investment & resources, innovation, spin-offs etc.)

Outcome Indicators

- ▶ They indicate what is the outcome at the macro or societal level.
- ▶ They describe:
 - Economic growth
 - Productivity & competitiveness
 - Employment & the labor market
 - Social inclusion & participation
 - Sustainable economic development