The Internet:
Still Wide Open and Competitive?

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Introduction

For many years now, the Internet seemed to be open, free, and competitive. Internet entrepreneurialism was high, financing easy, entry barriers low. But now, in the wake of the Internet’s bursting bubble, the reality of that competitiveness deserves a second look: Is the Internet still as open and competitive as it used to be, or is it becoming concentrated and dominated by a few firms with market power? To even ask this question raises emotional responses, so deeply held is the Internet’s self-image of openness and competitiveness, in contrast to the stodginess of the telecom, print, and TV industries.

Many people even have difficulty with the very concept of looking at the Internet as an industry. The early phases of the medium were indeed dominated by government, universities, and non-profit entities, all operating outside of private markets. But even when the Internet became commercialized, it was frequently asserted that the new ‘bit economy’ operated on fundamentally different principles than the traditional ‘atom economy’.

Today, a more balanced perspective has become possible and necessary. This starts with the recognition that the Internet is a set of interacting activities provided by a variety of business firms, operating in interacting sub-markets. The structure of those markets affect, in the classic paradigm of industrial economics, the behavior and hence the performance of these firms. A prime measure for
market structure is the extent of market concentration; it is an indicator and predictor of competitive behavior. Since the Internet has been arguably the major force for economic, societal, and cultural innovation in society in recent years, the extent of the competitive forces driving it is significant far beyond the sector itself.

**The study of Internet market concentration**

This Issue Brief summarizes part of a larger study on media concentration that we are presently undertaking at the Columbia Business School. We measure market concentration in the Internet sector, trace it over time, and compare it with trends in other information industries. I am not aware of any previous empirical effort to examine the market concentration of the Internet sector.

*What is the Internet sector?*

Before looking at the study and its findings, the term ‘Internet sector’ needs to be clearly defined. The Internet is today part of most organizations’ activities. To encompass all of them as part of the Internet industry would equate this sector with almost the entire economy, thereby making an analysis over-broad. Hence, we define the Internet sector much more narrowly: as the core industries that provide instrumentalities and infrastructure components underlying the Internet’s basic functioning.

Our definition of the Internet sector therefore excludes applications, content, computer hardware, and generic telecom/cable conduits. It includes the basic infrastructure components and instrumentalities of the Internet through eight sub-industries: Internet backbones; Internet service providers (ISPs); broadband providers; portals; browser software; search engines; media-player software; and Internet Protocol (IP) telephony. IP telephony straddles applications and infrastructure, and becomes increasingly part of the latter. Portals, browsers, search engines, and media players enable generic navigation on the Internet.
The nature of market concentration

We analyzed the market concentration trends for these eight Internet-sector industries in America. For each, we tracked revenue and calculated individual firms’ market shares in the particular industry sector for a period of twenty years. The resultant database is unprecedented in its scope. These market shares were then used to calculate ‘concentration indices’ and to track them over time.

The major concentration index employed was the Herfindahl-Hirschman Index (HHI), which is used by the US Department of Justice:\(^1\)

\[
HHI = \sum_{i=1}^{f} S_i^2
\]

where \(f\) = number of firms participating in an industry and \(S_i\) = each firm’s market share.

The US government’s Antitrust Enforcement Guidelines classify market concentrations according to their HHI score:

- Unconcentrated Market: HHI < 1,000
- Moderately Concentrated Market: HHI >1,000; and
- Highly Concentrated Market: HHI >1,800.

The study tracked these indices of concentration over time starting in 1983 and 1984, from just before and just after the Divestiture of AT&T telecoms in the US. Where industries do not go back for twenty years, a shorter time series is used.

As the next step, we create weighted averages of the concentration index of the various Internet industries\(^2\) and the weighted aggregate HHI\(^3\).

Findings

The findings from the study are illustrated in the ‘u’-shaped curve in Graph 1, whose recent tendency is distinctly up. This shows that:
1. the Internet sector's overall concentration has never been low;
2. concentration declined in the 1980s and into the mid-1990s, but in the mid-1990s it increased again; and
3. concentration is today in the highly-concentrated range.

Comparing Internet concentration with other media and information sectors

The findings of Graph 1 run counter to the accepted wisdom of a fragmented and competitive Internet. To put these Internet concentration trends further into perspective, we conducted similar empirical analyses for related media and for other sub-sectors of the information sector.

Graph 2 below shows concentration trends for several categories of other media: Print; Film; Broadcasting; 'New Media'; the Internet; and the Broadband Internet. Concentration is increased on a national rather than local level. The main overall finding is highly interesting: the newer the medium, the more concentrated it is, and (often) the more has its concentration risen in recent years.
Thus, print media are relatively unconcentrated, and rising only slowly in concentration. Film, Broadcasting, and New Media, the next entrants, are more concentrated in the order of chronology. Most concentrated are the Internet media, especially Broadband, the newest of delivery media. What are the reasons for this differential concentration? Most likely it is the large capital requirement, which increases from one media generation to the next and is associated with economies of scale and with network effects. This leads to increasing riskiness, as well as instability for newer media, especially of Internet media, and the consequent attempt to stabilize them by concentration and oligopoly.

**Vertical concentration trends**

Even if a firm does not dominate any specific market, its presence in several markets might, in combination, become powerful. To look at the trends of such concentration, we use a number of indicators of vertical integration.
Market share of the major Internet companies

Graph 3 shows one dimension of vertical trends: the share of the entire information sector – Internet, mass media, telecom, and IT – that is accounted for by the ten largest firms in the Internet sector. Their revenues include those of their non-Internet activities.

The results in the above graph show a pronounced recent increase in the share, to over 20 per cent of the information sector. Underlying this trend is the major entry of loose information into Internet activities, and the merger of major Internet firms with other major media sector firms (in particular AOL with Time Warner).

The Power Index

A second measure of vertical concentration is what I call a ‘Power Index’ (PI), which aggregates the top Internet companies' HHI scores across the several
Internet industries. For example, if a firm held 10 per cent in the ISP market and 20 per cent in the backbone market, and if the two markets were of equal size, its PI would be $\frac{1}{2}(100+400) = 250$. The results of the sectoral PI aggregate across the top 10 Internet firms, provided in Graph 4, show a strong upward rise in such an index, indicating increases in firms’ shares and in their participation in multiple Internet industries.

Factors leading to high market concentration

What are some of the factors leading to higher concentration in the Internet’s industries? Each of the sub-industries has a different story. But the common elements are high economies of scale (scalability) based on the high fixed costs and low marginal costs, and the way they are often complemented on the demand side by network effects (which economists call ‘positive externalities’).

These characteristics encouraged rapid expansions and created a period of intense competition in which prices were driven to levels that could not sustain
total costs. The eventual result was failure of some market participants, and efforts at consolidation by the survivors, with the aim of reducing competition and creating a market structure that could sustain higher prices. Such firms can also maintain access to financial markets, which have shut down for most entrants in the competitive segments. The Internet sector’s present downturn will, therefore, accelerate concentration trends that are part of the boom–bust process.

Similar concentration trends can be observed for industries closely related to the Internet’s core: e-commerce applications (e.g. online book retailing, auctions, travel services); operating system software; microprocessors; microcomputers and workstations; and telecommunications. Thus, a broader definition of the Internet sector does not change the results qualitatively.

**Implications for the Internet industry**

We have found pronounced horizontal and vertical trends of concentration in the Internet sector that challenge the view of the Internet as a highly competitive medium. What are the implications?

It would take a lengthy essay to fully analyze this question, but some effects can be anticipated:

1. Higher user prices
2. A consequently higher profitability of the major Internet firms, which will stabilize their financial condition.
3. A slowing of innovation and of upgrade.
4. Increased power of the major Internet firms over:
   (a) its governance, standards, and protocols;
   (b) access by content and applications providers; and
   (c) hardware providers.
5. Cross-subsidies, within major integrated Internet firms, from segments with oligopolistic pricing to more competitive segments, distorting competition in those segments.

6. The emergence of regulation to deal with such power.

Given the Internet’s centrality to commerce, culture, and politics, it is not likely to be left alone if it becomes dominated by a few firms. Debates over the opening of cable-provided Internet access are an early example of a similar situation. Others are likely to follow.

In the long term, therefore, the Internet might move from an entrepreneurial and libertarian model to one of market power, and of regulation resembling or even exceeding that of several other electronic media. These findings and conclusions may not fit the Internet’s self-image of being wide-open and competitive, but business strategies and public policies will benefit from a realistic rather than wishful assessment.

Notes

1 A second index is also used primarily to cross-check the HHI. This ‘C4’ index is the combined share of the top four firms in a market:

\[ C_{4j} = \sum_{i}^{4} s_{ij} \]

where: \( S_{i} \) = firm’s \( i \) market share of a given industry \( j \), with firms ordered by size of market share.

2 The formula for the C4 aggregation is

\[ WC_{4j} = \frac{\sum_{j=1}^{n} m_{j} \sum_{i=1}^{k} S_{ij}}{\sum_{j=1}^{n} m_{j}} \]

where \( j \) = an industry \( j \) within a larger segment; \( m_{j} \) = total revenue of an industry \( j \); \( i \) = firm in an industry; \( S_{ij} \) = market share of firm in a given industry; \( k \) = segment of industries; \( n \) = number of industries.

3 The weighted aggregate HHI is
WAHHI = \sum_{j=1}^{n} \frac{m_j}{m} \sum_{f=1}^{f} S_{ij}^2

where \( j = \) an industry; \( m_j = \) total revenue of an industry; \( S_i = \) each firm’s market share of a sub-industry; \( n = \) number of Internet sub-industries; \( f = \) number of firms in a sub-industry.

4 ‘Print’ includes: daily newspapers, trade and paperback books, educational books, other books, book retailing, magazines, academic journals, printing services. ‘Film’ includes: TV prime time, movie production/distribution, movie theaters. ‘Broadcasting’ includes: TV prime time production, TV stations, TV networks, TV syndication, radio stations, radio networks. ‘New media’ includes: home video, video rental, DBS providers, Cable TV operators, Cable TV channels, Cable TV set top converters. Broadband Internet involves local broadband providers.

5 The formula for the Power Index is:

\[ CPI_{industry} = \sum CPI_{i} = \sum \frac{S_j m_j}{M} \]

where: \( S_j = \) firm’s share in market \( j \); \( m_j = \) total revenue of sub-market \( j \); \( j = \) sub-industries, ranging from 1 to 95 (consisting of the 95 sub-industries); \( M = \) revenues of total information sector; \( i = \) firm \( i \) of main Internet firms.

Eli Noam has been Professor of Economics and Finance at the Columbia Business School since 1976. He served for three years as Commissioner with the New York State Public Service Commission, and is a member of the President’s Advisory Committee on Information Technology. He is the Director of the Columbia Institute for Tele-Information, a university-based research centre focusing on strategy, management, and policy issues in telecommunications, computing, and electronic mass media. Noam also chairs the MBA concentration in the Management of Media, Communications, and Information at the Business School. Besides over 300 articles in economic, legal, communications, and other journals, Professor Noam has also authored, and edited, more than 20 books.