

# Transformational Growth in the 1990s: Government, Finance and High-tech

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**ABSTRACT** *Our aim is to understand how the process of transformational growth during the 1990s shaped the boom and bust of the New Economy. From the debate on new technologies and productivity growth, we move on to consider the questions raised by technological developments of the 1990s. Our focus is on the three-way relationship between the development of information and communications technologies, structural change and economic growth, as the key determinants of the cycle of expansion. This brings to the fore the effects of private investment driven by high-technology but we also need to consider the role played by finance and macro policy, and, in particular, the government budget.*

## 1. Transformational Growth and the 1990s

By most accounts the 1990s were years of high growth and macroeconomic stability. The exceptional performance of the US economy is reflected in the titles of Joseph Stiglitz's (2003) book *The Roaring Nineties* and Alan Blinder & Janet Yellen's (2002) *The Fabulous Decade*. Although new technologies are generally assigned a fundamental role in the decade's exceptional macroeconomic performance, in most accounts these technologies appear only as the basis of unprecedented productivity growth. Here we propose to investigate the structural dynamics of the period, to see whether it represents a new stage in the development of advanced market economies, that is, a new stage in the path of transformational growth (Nell, 1988, 1998). Our aim is to understand how the process of transformational growth (TG) during the 1990s shaped the boom and bust of the so-called New Economy. The focus is on the three-way relationship linking information and communications technologies (ICT), structural change and economic growth as the key determinants of the cycle of expansion. We shall see that the interaction between investment and changes in consumption driven by new products is a crucial component of that relationship.

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One of the main elements of the expansion of the 1990s was the rapid growth of the ICT sector and the massive spread of ICT-based products and innovation. But in addition to the effects of private investment driven by high-technology, we also need to consider the role played by finance and macroeconomic policy, and, in particular, the government budget. To argue that new technologies were at the root of the expansion does not mean that new technologies alone can explain the boom; other factors were at play. Nor are we required to subscribe to the ‘exceptional performance’ argument. Nevertheless, the development of new technologies is fundamental to understand the dynamics underlying the cycle, an example of intensive growth in highly different circumstances than in the 1980s (Gualerzi, 2001). This is the key to a complex relationship involving the real and the financial sectors that is central our TG interpretation of the 1990s.

The most noticeable economic features of the 1980s were the rise of financial services and the development of ‘glamorous consumption.’<sup>1</sup> The economic transformations of the 1990s appear to have been driven by ICT. The peculiarity of the cycle is an acceleration of R&D in the ICT sector, fueling an investment-driven expansion through the link established by new products/industries. Thus, the approach focuses on structural transformation and the evolution of consumption as fundamental forces, although not the only ones, determining macroeconomic performance and the dynamic instability of the 1990s.

## 2. Macroeconomics in the 1990s

### 2.1. Macroeconomic Accounts

Accounts of the decade stress, and perhaps even overstate, the exceptional performance of the US economy, calling attention to high growth rates, rising productivity and employment, low inflation and declining poverty.<sup>2</sup> The decade did indeed exhibit relatively high growth rates and employment, and low inflationary pressures. There were rising wages in the later years, and crime rates fell. Investment was strong in the later years, as high-tech boomed.

Stiglitz (2003) focuses on three themes. The first concerns the ‘doubling, or tripling [of the rate of productivity growth over] what it had been in the preceding two decades’ (Stiglitz, 2003, p. x). The second is economic policy or, as he puts it, the ‘balance between government and the market.’ Thirdly, he argues that finance came to dominate economic decision-making and, lacking appropriate regulation, eventually contributed to the end of the boom. Financial imprudence,

<sup>1</sup>We are referring to improvements in the standards and the social norms of consumption aimed largely at establishing status and enhancing the ‘glamour’ of the lifestyles of the new wealthy social classes (see Gualerzi, 2001, Chapter 11; Gualerzi, 2005, Section 6.2).

<sup>2</sup>This picture contrasts sharply with earlier accounts that had suggested a much bleaker macroeconomic picture, especially with respect to unemployment. In the aftermath of the 1990–91 recession and the weak recovery of 1992–93, much discussion had focused on the possibility of ‘jobless growth’.

in combination with a progressively less effective, or even wrong, economic policy fueled the bubble whose bursting brought the ‘fabulous decade’ to an end. When it burst, the effects were amplified by the Bush administration’s mismanagement of the economy. The administration’s tax cuts offered benefits to the old economy, not the new (Stiglitz, 2003, p. 328). The bust that followed the boom is not, Stiglitz argues, the beginning of a long-term stagnation, but a severe adjustment, which could be followed by economic growth, provided that some fundamentally wrong economic policies are corrected. With weak demand and productivity growing faster (3%) than output (1%), the Bush policies implied a rise in unemployment (Stiglitz, 2003, p. 182).

To adequately describe the ‘fabulous decade’ and its speculative bubble, Stiglitz must confront the phenomenon known as the New Economy. For Stiglitz, the New Economy is based on a fundamental shift from ‘the production of goods to the production of ideas’ (Stiglitz, 2003, p. 4); the resulting ‘knowledge economy’ transforms information into a commodity. This shift parallels that from agriculture to manufacturing in Britain that occurred in the first few decades of the 18th century, and then the rise of the ‘service economy’ in the 20th century. If the parallel holds, we now face a change of epochal dimensions. As Stiglitz notes, production and social life have nevertheless been transformed: ‘The economy today is markedly different from what it was a decade ago . . . New technologies, like the Internet and cell phones have changed the way we do business and communicate . . . [and have] engendered increases of productivity [that in turn entail] enormous difference in our living standards’ (Stiglitz, 2003, p. 321).

The New Economy is behind the surge of productivity that occurred during the decade, but it also stimulated over-investment in the telecommunications industry, including the build-up of ample unutilized capacity in the fiber optics infrastructure. Over-investment and the low interest rates that accompanied the federal government’s deficit reduction fueled the stock market bubble whose collapse brought the expansion to an abrupt end. The boom itself was indeed a ‘classic *bubble*, asset prices unrelated to underlying values, of a kind familiar to capitalism over the centuries’ (Stiglitz, 2003, p. 9). All bubbles must burst, and this one certainly did. One can understand in this light Stiglitz’s comment that the significance of the New Economy ‘has been exaggerated.’ Still, new technologies appear then to underlie strong investment spending and the ‘exuberance’ of the stock market, suggesting a pervasive industrial and economic transformation.

However, Stiglitz discusses the Internet, new technologies and high-tech mostly in relation to policy issues. Case studies about companies such as Enron (a model New Economy company) are presented to illustrate what went wrong in the 1990s. But he doesn’t provide an analysis of the technology-investment-transformation linkages.

## 2.2. Interpretations of the 1990s

In the interpretations of the 1990s, technology plays an important role, but its contribution is largely limited to explaining the unprecedented growth of productivity.

That is true in particular of what we can call *policy-driven interpretations*. It has been argued that the expansion was a result of the policies pursued by Treasury Secretary Robert Rubin and his successor Lawrence Summers, so-called ‘Rubinomics’—continuing some aspects of Reaganomics, but reducing the deficit rather than expanding it. Because of deficit reduction, it is claimed, interest rates fell, and this stimulated the expansion.

In many accounts, the master of the long expansion was Federal Reserve Chairman Alan Greenspan who kept liquidity readily available and interest rates low enough to make investment and stock market transactions easy and cheap, pushing the economy well beyond where it could be with a less accommodating monetary policy. Through luck or masterful management, inflation pressures were kept in check by productivity growth and the stagnation of wages.

A second group of interpretation we can call *wealth-driven interpretations*, since they focus on the wealth effect due to the soaring value of assets originating in the boom of the stock market (Brenner, 2002; Pollin, 2003). That, together with the running down of saving and the rise of debt, sustained consumption spending and investment. The collapse of the stock market, and the negative wealth effect it caused, started the downturn, which was then amplified by the dismay that follows the euphoria, leading to an overreaction as expectations turned sour.

Pollin questions the notion of a surge of productivity as the ultimate cause of the boom, focusing instead on the institutional and financial factors underlying the stock market rise of the 1990s, with a prominent role played by the accommodating monetary policy of the Federal Reserve:

the real gains in investment and productivity that occurred in the second half of the Clinton administration rested on what many observers even at the time could see was a fragile foundation—a stock market in which prices had exploded beyond any previous historical experience, inducing an enormous expansion of, first, private consumption spending, then investment spending. But because neither household income nor corporate profits rose at anywhere near the pace of the stock market boom, the result was unprecedented borrowing to pay for the spending spree. The springs of economic growth under Clinton came from a levitating stock market setting off a debt-financed spending boom. (Pollin, 2003, p. 6)

He also stresses that the period’s wage stagnation and growing inequality reflect a long-term trend of deterioration in the living standards of the vast majority of people in the US and outside. Pollin sees a continuity between the Clinton and Bush administrations.

Other critical views have also stressed the role of debt accumulated by households and firms in sustaining spending. Wynne Godley (2000, 2001), in particular, has argued that households have taken on an unprecedented volume of debt, while reducing their saving rate to zero. So while consumption growth kept the economy expanding, that growth was bound to reach a limit. When it did, in a debt crisis in 2007–2008, the result, worse than a slowdown, approached a severe recession. Still others have argued that the expansion was driven by a surge of profits. Ed Wolff (2003) has argued so in his studies of income distribution and inequality. A rising profit rate, he contends, was the result of three factors: the growth of

the profit share; a lower capital–labor ratio; and structural change in the composition of output—in this case, a shift to labor-intensive sectors.<sup>3</sup>

185 These interpretations offer important insights in the macro-dynamics of the 1990s, but do not provide the key to the fundamental dynamics of the decade. The explanation of the boom as stock-market driven assigns too much weight to the stock market as the main force driving spending, consumption spending in particular: consumption spending did not collapse after the stock market crash; nor did output and employment. There was a slowdown, and a strong decrease in investment, but not a collapse. The stock market had a hard  
190 landing, but then it began a slow rebound, followed by a long flat period. Importantly, investment did not pick up as the stock market began to rebound. Consumption spending, however, continued to grow, in spite of the crash. As for foreign capital, central banks continued to hold dollar assets in spite of the crash, as they did during previous asset price adjustments.

195 What, then, drove the unprecedented surge of stock market prices? And what effect did the stock market have on consumption and investment? The relationship between the real economy and the stock market is of course complicated, and it changes over time. It cannot be unraveled by the subtleties of technical analysis, however. There were exceptional circumstances driving that surge and they had to  
200 do with the advancing technological frontier.

### 3. Information Technologies and the US economy

#### 205 3.1. Productivity Growth

According to Dale Jorgenson (2001, p. 1) ‘the 1990s are a mirror image of the 1970s.’ The 1970s were characterized by a combination of a productivity slow-down, weak growth and inflation pressures; the 1990s appear as the polar opposite, with robust productivity growth supporting high growth rates and price stability.  
210 The causal relationship between Information Technologies (IT) and productivity is a matter of controversy. An often-cited 1987 comment of Robert Solow threw cold water on the idea of a technological revolution driven by IT.<sup>4</sup> The issue is still contentious, only partially resolved by recent studies.

215 Robert Gordon (2000) provides a skeptical interpretation of ICT and productivity growth, basically denying the existence of a productivity push due to the spread of new technologies. Gordon finds evidence of a significant acceleration of labor productivity in the second part of the 1990s, which follows from a rise of total factor productivity (TFP) and from capital deepening. The role of the ICT sector in promoting a process of capital deepening in the entire  
220 economy appears undeniable. Indeed, rapid technological change in the ICT sector has been combined with consistent reduction in the prices of ICT goods,

<sup>3</sup>We agree, but would argue that all three factors need to be explained in terms of the effects of changes in technology.

<sup>4</sup>See Solow (1987, p. 36): ‘You can see the computer age everywhere but in the productivity statistics.’

which induced a process of substitution of capital for labor. This, however, appears to be the only really general phenomenon. And, in terms of its impact on productivity growth, it has run most of its course.

230 Gordon distinguishes between the computer producing sector, which represents a small portion of the non-agricultural private sector, from the computer using sector, which represents a much bigger share of the economy. If a generalized technological revolution has occurred, we would expect to observe an acceleration of TFP growth in the computer using sector, as a spill-over effect from the former computer using sector. However, factor productivity grew only in the ICT  
235 sector and in the manufacturing industries producing durables. In the rest of the private sector, labor productivity growth has been weak and TFP growth negative. Indeed, the acceleration of the rate of growth of Average Labor Productivity in the Non Agricultural Private Sector after 1995, an estimated 0.81% per annum, is accounted for by capital deepening, on which computerization has a strong influence, and by the growth of TFP of the ICT sector *only*. The conclusion that aggregate productivity growth is the result of the exceptional performance of the ICT  
240 sector only is confirmed by observing that the growth of TFP of the Private Sector *without* ICT hardware production turns negative and even more so when subtracting the manufacturing of durables.

245 Gordon concludes that there is not much of a 'new economy' to speak of; instead, we see remarkable productivity growth in the ICT sector and a modest spill-over effect in manufacturing. The rise of the ICT sector cannot be compared, for example, to the diffusion of electric power or to the growth of the railroad industry. As for the exceptional performance of the US economy in the 1990s,  
250 Gordon argues that a large part of the acceleration of productivity growth depended on cyclical factors and the revision of price measurements. To a large extent the impressive performance of the US economy and in particular productivity growth are the effects rather than the causes of the cyclical expansion. This does not deny a contribution of ICT. However, while computer diffusion  
255 ranges across the entire economy, its impact on productivity is concentrated in a relatively small number of industries. Moreover, Gordon concludes, there is not much of a contribution to productivity to be expected from computers in the future.

260 Jorgenson & Stiroh (2000) also find, for the second half of the 1990s, evidence of growth in total factor productivity and of the crucial role played by ICT. According to their estimates, the ICT sector accounted for about one quarter of the observed increase in the growth rate of output between the first and the second half of the 1990s and for about half of the contribution of capital, given the spread of computers as productive inputs. Their estimates highlight the importance of the software and communication equipment industries.  
265 They consider 37 sectors and observe that the growth of TFP is the greatest in two industries, computers and especially semiconductors and communication equipment. They argue that semiconductors raise overall efficiency since they enter all sectors by way of the machinery that contains them.

270 Jorgenson & Stiroh's analysis suggests that Gordon's conclusions may be overly pessimistic, but are not without support. Total factors productivity grew only in some industries and the benefits are mostly internal to the ICT sector.

The technology revolution seems hardly to have touched most intermediate goods, with the noticeable exception of semiconductors and the diffusion of computers driving and monitoring production equipment. On the other hand, the hypothetical scenarios all show acceleration in total factor productivity. But here again the aggregate hides the fact that in nine out of 37 sectors productivity growth is actually negative! Further analysis shows that some of the most computerized industries, such as Finance, Insurance and Real Estate, have had very modest productivity gains.

### 3.2. *The Debate on Productivity*

Empirical evidence is often not capable of confirming a complex hypothesis; that is the case with the claim that ICT drove productivity enough to generate the 1990s expansion.<sup>5</sup> In spite of many differences, the empirical literature appears to be in general agreement on several points. First, there is a consensus that in the second part of the 1990s there was an acceleration of productivity growth in which ICT products became an important component of productive equipment, and that this came about through a significant investment drive sustained by falling technology prices. Second, the improvement of productivity within the ICT sector was important for overall productivity growth. Third, the falling prices of ICT products and the improvement of their capabilities had their roots in the rapid efficiency gains in the semiconductors industry. The really controversial point is the extent to which the rise in productivity growth was caused by ICT investment and the consequent spill-over effects on the entire economy.

None of these studies calls into question the rapid productivity growth of the period, but there is little agreement on whether it will continue.<sup>6</sup> That would require taking for granted both the pace of technological progress in ICT and continuing capital deepening throughout the economy. So, while ICT certainly contributed to the expansion in the second part of the 1990s, the question of whether a new engine of growth had emerged remains open.

## 4. ICTs: The Net-Economy, Structural Change and Increasing Returns

Most studies on the impact of IT have employed an analytical framework that limits the kind of questions that can be asked, and perhaps also imposes answers: analysis of productivity growth is based on an aggregate Cobb–Douglas production function, with average hourly labor productivity growth depending on the growth rate of total factor productivity, i.e. technological change, and capital-deepening, the growth of the capital–labor ratio weighted by the total

<sup>5</sup>Oliner & Sichel (2000) present the most optimistic interpretation, according to which we are witnessing a resurgence of productivity growth due to the contribution of computers and semiconductors. Just a few years earlier they had maintained precisely the opposite view (Oliner & Sichel, 1994).

<sup>6</sup>See Gordon (2003) for a discussion of the question.

product share attributed to capital. Other literature has stressed the notion of a general process of transformation, associated with the pervasive development of information technologies. The idea of a new economy, for example, stresses the process of structural transformation concerning not single industries, but the entire economic system (Cohen *et al.*, 2000). The growing importance of information and communication technologies would then explain not only the acceleration of growth, but also a significant process of structural change (OECD, 2000).

The studies considered above focus chiefly on what can be narrowly defined as information processing. But the pivotal role played by ICT can be better understood by considering the communication link, and therefore advanced telecommunications, in which information processing is now interconnected in a network. The development of networks, and of the internet in particular, is indeed the fundamental novelty of the 1990s and the key to the transformation of the new economy. In the ICT sector itself, the development of hardware and software has become increasingly oriented to networks. More importantly, there was a general impact on the economy, via the development of networks externalities, which made it possible to reorganize productive processes and marketing, leading ultimately to new products and services.

Through the development of networks the effects of the rapidly growing computing capabilities are passed on to the entire system. The growing pervasiveness and economic relevance of ICT suggests a process of innovation characterized by increasing returns. This would also be supported by the arguments treating the ICT as a general purpose technology. The point can be seen if we re-examine Robert Gordon's argument that the new economy is not the equivalent of the epoch-making inventions of the past. Gordon (2000) cites the lack of convincing evidence of a causal relationship between ICT and productivity growth; but he also argues that in the future ICT will be faced with the prospect of diminishing returns, exacerbated precisely by the growth of computing capabilities. The increasing computing power of the new electronic hardware has made it possible to run more sophisticated software. Its effects, however, are at the margin small. Moreover, computing capability has grown at a pace that largely outruns the possibility of use. Diminishing returns arise from the limit imposed by finite length of the workday, and from workers' finite capabilities to develop and interpret the vast amount of available information. Consequently, Gordon argues, the growing diffusion of ICT products cannot act as a stimulus to the kind of transformation induced by the great innovations involving general purpose technologies, such as electric power or the internal combustion engine.

The argument made here concerns precisely the relationship between rapid technological change in the semiconductor and computer producing industries and the development of the network. In this light it is not the productivity of a single operation—word processing—but productivity gains over the network that is the crucial point. A large network will more fully utilize the computing capabilities, which might otherwise merely appear excessive and unnecessary, for example, if their rate of growth exceeds the increase in the abilities of users to exploit additional power. The limit to productivity growth becomes the potential development of the network, which in turn can be approximated by some



notion of the potential market for its services, once the appropriate infrastructure is in place. The reference to a net-economy then seems appropriate.

365 All of this reinforces the argument about increasing returns. The efficiency gains in information processing and transmission and the increased sophistication of the ICT sector can actually lead to qualitative change in so far as the combination of increasing computing capabilities and overall effects of networks development creates the possibility for new products and new industries.<sup>7</sup> The dot.com boom could not have happened without such converging developments, changing the composition of the industrial structure and of output. To understand  
370 recent economic developments, we need to focus on qualitative change and the emergence of new markets and qualitative change, which means we must move beyond the analytical framework typically used to study the new economy and ICT.

## 375 5. Was Growth in the 1990s Transformational?

### *5.1. The Growth of Demand*

380 The next step in the transformational growth of the modern global economy is one in which ICT becomes a central aspect of development on both the demand and the supply sides. This builds on the Keynesian idea that growth in market economies is driven by investment, which generally will not be undertaken unless new markets are emerging or old ones are expanding. Most economists would agree that growth cannot be explained by reference to the supply side only—Say's Law is no more valid in the long run than in the short. Yet, surprisingly, the underlying causes of the growth of demand are seldom addressed specifically, either in  
385 theory or in empirical work.<sup>8</sup>

390 Leaving the foreign sector aside for the moment, we find that overall demand is usually considered to be  $C + I + G$ . But if  $G$  is treated as exogenous, determined by politics, growth will supposedly be 'explained' when  $I$  is accounted for, since  $I + G$  will then generate incomes, which will govern  $C$ .  $I$ , of course, is a function of many factors, and is generally volatile, but a conventional story based on interest rates and the availability of credit can usually be provided, augmented by other variables and gracefully framed by remarks about the 'climate for investment.'  
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The problem is that no matter what the climate for investment, and no matter how cheap or how readily available credit may be, no firm is going to build new capacity unless it believes that there will be a market for what it produces. Such a market will either be captured from someone else, because the products of the new  
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<sup>7</sup>Alyn Young (1928) drew a useful distinction between quantitative and qualitative increasing returns. In ICT, qualitative increasing returns arise from the growth of computing capabilities and network development, and manifest themselves in changes in the composition of demand in the markets for productive inputs and consumer goods. Q3

405 <sup>8</sup>Solow's growth model assumes full employment, and so fails to deal with demand. The Harrod–Domar model deals with aggregate demand, but does not explain the growth of demand.

capacity are cheaper or better or both, or it will represent a new market altogether. Competing for customers in terms of costs and quality is routine and has been examined in many studies. But the emergence of an altogether new market is another story. Where do the new customers come from? How does the firm  
 410 know they will be there with enough money to spend? Such questions are the province of ‘sales and marketing’, but they have not been considered much in the literature on growth.

So the crucial reason for building new capacity is the expectation that there will be an enlarged market that will provide new demand for the products of that  
 415 capacity at a price providing at least normal profits. But for new markets to emerge on a scale that justifies major investment spending, there will usually have to be changes in class and sectoral relationships; new classes or subclasses will have to emerge with new spending patterns, and new lifestyles, including new skills in consumption.

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## 5.2. *Growing Inequality and the High-tech Boom in the 1990s*

In the era of mass production it was normal to think that redistribution from upper  
 425 to lower income groups would strengthen demand; new markets would be created by permanently increased wages and by employment for a segment of the population that had been relatively poor. Their new prosperity would lead to a new lifestyle, creating new markets, calling for investment in productive capacity to serve them.

430 Recently, however, we have seen a new phenomenon; rising inequality can also create or help to create new markets. And inequality has been increasing as markets have been deregulated.

*The nature of markets.* We suggest that this is no accident, although we cannot  
 435 argue the case here. Unregulated capitalist markets with asset-based finance tend to generate inequality. This follows simply from the fact that success is rewarded and the rewards improve the performance of the agent, which leads to further success. Failure, on the other hand, leads to further failure. This applies to all such markets and competitive processes—product markets, ‘factor’  
 440 markets, real estate and rental markets— independently of scale.

The Welfare State, with its attendant systems of regulation, puts a floor under most markets. To some extent it also protects weaker firms and relatively powerless workers, and supports the poor. More generally, it reduces the ability of the successful to consolidate their successes at the expense of the losers. This tends  
 445 to retard the growth of inequality.

Deregulation restores the competitive rewarding of success and punishment of failure. As deregulation took hold in the 1980s and 1990s, markets tended to generate greater inequality; the ‘winner takes all’ pattern came to dominate many markets, and the ‘star system’ took hold in sports and entertainment. Pat-  
 450 terns of striking inequality developed in many sectors, trades, and professions. This brought about the emergence of a substantial class of sophisticated ‘high end’ consumers.

*High end consumers.* Deregulation removed restrictions and controls on many markets, allowing the natural tendencies of markets to reward success and punish failure to operate freely. At the same time, computerization and automation eliminated many routine jobs, in which all workers would work at the same pace and perform the same or similar operations. In these jobs there is little or no opportunity to exercise skill or display ingenuity. All workers perform the same and are paid the same. With these jobs largely gone, and with deregulation allowing the market free play, luck and skill will be rewarded, and those rewarded will be in a better position in the next round. The result: the emergence of striking inequality in the distribution of earned incomes.

This tends to produce a group of high-end potential consumers, willing to try new products and luxuries. This new class or subclass of consumers thus came to provide a potential market for new High-tech products, personal computers, Palm Pilots, cell-phones, Blackberry devices, etc. As the products improved and the markets expanded, prices came down, and the products began to penetrate the middle and even some lower levels of the income distribution.

*Launching new products.* New products can be launched in this group. Once they have caught on they will be improved and adjusted, interacting with the market; then they will be manufactured on a larger scale, bringing the price down. But most of the income gains have taken place at the very top of the income scale. This is not therefore a very large market. There is plenty of spending going on within this group, but the scale of operations for any particular new product will have to remain small if the market is confined to the high-income group. But since the middle and lower levels of the income distribution have not experienced noticeable income gains, these groups can adopt the new products only if they have access to additional credit.

*New products.* Our approach suggests that there are two stages in the development of ICT. The first phase, in the 1980s, represented the development of ICT products—personal computers most obviously, but many other types of electronic devices as well. The distinctive feature of these products, becoming more and more pronounced as they develop, is that they combine functions or activities. They are ‘Swiss Army Knives’, multi-tasking products. And in fact they combined many often unrelated low-tech activities into one multi-dimensional high-tech product. Think of a Palm Pilot: it combines address book, date book, pocket calculator, sketch book, account book and expense record, memo pad, notebook, camera and photo storage system, and a world clock, plus a few other minor operations. All of these are low-tech functions that are traditionally accomplished with simple and inexpensive tools like notebooks and ballpoint pens. But the Palm Pilot pulls them all together, and provides a high-tech framework with fast, accurate operations.

The second phase overlaps with the first. The crucial feature is that the multiplication of operations and uses increases the productivity of the technology. Adding functions or operations tends to reduce costs for already existing operations. This is a case of increasing returns; but it is different from the economies of scale familiar from mass production. Increasing the variety of uses and oper-

ations tends to reduce the costs for any single function. Adapting steam to water transport did not cheapen locomotives, but adapting computers to graphic design has improved word processing—and vice versa. Employing computers in mathematical analysis has advanced both computers and mathematics. The most  
 500 obvious case of increasing returns to variety, as well as to scale, is the Internet. Here we can easily see the ‘network effect’; the more users there are and the larger the variety of search topics, the greater the value of the Net to each user. So the second phase connects the various ‘Swiss Army Knives’ in networks, such as the Internet, cell-phone networks, local networks in offices or companies,  
 505 or networks of local or regional governments.

An important point is that when someone adopts a Palm Pilot, the activities and functions it displaces do not remotely ‘pay’ for it. The cost of the displaced notepads, sketch books and ballpoint pens do not come anywhere near to the cost of the new machine. So the purchase has to be financed either with new  
 510 income or with new credit.

## 6. Dynamic Instability in the 1990s

### 6.1. *The Role of Finance*

515 Although our main concern has been technology-driven transformation there are other factors at play. In particular, we shall examine both the causal links between high-tech growth, finance and real estate, and the mostly overlooked expansionary effects of the government budget. We will argue that the boom was a clear case of  
 520 ‘upward instability’.

*Technology and the expansion of credit.* The Internet had two effects on the financial sector: first, it enlarged and sped up stock market transactions by providing detailed and rapid information within the banking industry; and second, because  
 525 of advances in information technology many more institutions could provide credit cards. The most important result was a tremendous expansion of credit, with significant further consequences.

The expansion of credit drove a boom of the stock market, mainly focused on High-tech stocks, but with positive feedback effects. Soaring stock values  
 530 financed the demand for real estate, and booming real estate values reinforced the upward pressure in the stock market, since they made possible refinancing and new mortgage products, while freeing resources tied down in mortgages.

*Changes in corporate governance.* We rejected the simple stock market interpretation of the expansion. However, the stock price increases did have an effect; they  
 535 financed high-tech investment. But to understand this we have to look at changes in corporate governance.

Stock market prices soared in the 1990s; there were many reasons for this, but we want to suggest a hypothesis based on institutional changes, specifically,  
 540 changes in the pattern of control. That is, we propose looking beyond ‘irrational exuberance’ and the overvaluation of the stream of expected earnings to those institutional forces related to changes of regulation. The regulatory laxness of

the 1980s, we contend, together with new financial strategies, permitted the management to control the entire stream of earnings. During the 1980s, as regulations were weakened, corporations began using their earnings to buy back stock in order to support or drive up the share price.

545 After deregulation and changes in corporate governance, those who control a company now control almost the entire flow of profits, without having to pay dividends or, in practice, even provide detailed and accurate accounts of the use of the funds, to other stockholders who are not part of the control group—provided the controlling group can ensure high and rising share prices. So the price of complete  
550 control of the company's stream of earnings (minus what must be spent on buy-backs) is not the value of the company, but 51% (or much less). Competition for control—control over this stream of earnings—can therefore be expected to bid up the price-earnings ratio to more or less double the previous normal level.

555 From balance sheets we can calculate price-earning ratios. Whether we take a list of stocks, or consider an index like the Dow Jones or Standard & Poor index, we find the same trend: in the 1980s and for decades before, a price-earnings ratio of 12 to 14 was normal; in the 1990s it rose above 30, and stayed there not only in the boom, but even after the crash. This suggests that higher price-earnings ratios are not a temporary matter. The 'irrational exuberance' that troubled Alan Green-  
560 span leads to overpayment for a stream of returns. But what looks like overpayment might not be irrational after all if it leads to control of the company's earnings.

Similarly, real estate values rose throughout the 1990s, supporting the expansion, because the lowest interest rates of the post-war years encouraged both buying and refinancing real estate. The rising prices then made possible higher  
565 levels of borrowing against home values, often to pay off credit cards. This exerted a positive influence on consumption spending, even though personal incomes were growing sluggishly. The real estate boom may have helped prevent the stagnation of the early 2000s from becoming more severe. But by the late 2000s the bubble had burst.

570 In general, the rise of real estate values worked to provide easy credit to households, who accumulated debt to unprecedented levels during the 1990s. The real estate boom effectively relaxed the normal limits of indebtedness, stimulating households' consumption spending.<sup>9</sup>

575

## 6.2. *The Role of Government: The Balanced Budget*

The Clinton administration managed to hand over a large surplus to President George W. Bush, who took office in January 2001. Surpluses had not been seen  
580 in many years. To understand where they came from, we need to consider the changes in the tax code.

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<sup>9</sup>According to the National Consumer Law Center and the Consumer Federation of America an estimated nine million people sought the help of credit counselors in 2002. In 2003, the IRS launched an investigation of whether the not-for-profit status of these counseling services was simply a ruse to avoid taxes on the hefty fees charged to customers searching for ways to manage their debt (*New York Times*, October 14, 2003).

585

In 1986, the Reagan administration enacted a tax reform that had two main characteristics: it lowered the top marginal tax rate and reduced the number of tax brackets to four. Subsequently the Clinton administration added two more brackets, restored some of the progressivity Reagan had eliminated, and imposed a higher tax rate for upper-income earners. These changes in the tax code, in conjunction with the boom of the second part of the 1990s, led to an increase of government revenues and, by the end of the Clinton administration, a balanced Federal budget.

There is an ongoing debate on the merits, if any, of a balanced budget. Supporters of the Clinton administration argue that a balanced budget led to lower interest rates, which in turn stimulated growth. Post-Keynesians have consistently argued that expansions would be killed by balancing the budget (see for example Wray, 1999). But a budget can be in surplus and yet be stimulative. If the tax revenues obtained from capital gains and upper-income recipients (who have low propensities to consume) exceed the surplus, the budget provides a stimulus. Taxes reduce household or business demand when they fall on income that would otherwise be spent. But taxes that fall on savings or on income that is being withdrawn from circulation, do not reduce demand.<sup>10</sup>

From this perspective there may be a very different kind of case to be made for a balanced budget in some circumstances. Balancing the budget by taxing capital gains and corporate profits will not affect consumption adversely, and will at the same time siphon a portion of capital gains from the asset market, helping to prevent a bubble from developing.

In any case, the driving force behind higher tax revenues was the strong economic expansion. The government surplus appears to have been a consequence, not a cause of the cycle, or of the bust.

This highlights an important discontinuity between the Clinton and the Bush administration, one that is in conflict with the interpretations of the Clinton period put forth by Pollin and Brenner. The balanced budget of the Clinton years was the result of taxation of retained earnings, capital gains and the savings of the rich, portions of income that would normally be withdrawals from the spending stream. The government then spent equivalent money on real goods and services, supporting business and the economy, and raising employment enough to improve real wages slightly. So the ostensibly balanced budget was in fact expansionary. By contrast, the Bush administration reduced taxes on the rich and businesses and ran a deficit, putting money into the military and back into the pockets of the most affluent. Benefits were supposed to ‘trickle down’, but in fact there was no trickle, because the tax cuts tended to be saved rather than spent. Moreover, some new spending took the form of subsidies to corporations; these support profits, but do not stimulate the economy. The Bush deficits were less expansionary than they appeared. So while the overall economic policies of the two administrations could be seen as pro-business and supporting profits, the first had a—perhaps unintended—Keynesian orientation; the Bush administration adopted a pure reward-the-rich approach that, in the end, didn’t work.

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<sup>10</sup>The growth of State and Local government revenues also allowed for some growth of spending.

## 7. Three Overlapping Positive Feedback Systems

### 7.1. Three Self-reinforcing Processes

635 We may now pull the strands of our argument together, to see what sense can be made of the boom of the 1990s and the crash that followed. We have identified expansionary tendencies in financial markets, and in the government budget; we have also seen pressures towards expansion in the effects of the new technologies on consumption, with knock-on effects on investment spending.

640 In the previous sections we outlined three market-driven processes of ‘cumulative causation’, or ‘positive feedback’, all of which appear to have operated during the 1990s. Now we will examine them in the abstract, and look at the ways they fit together and mutually support each other. In each case, a change in a certain variable sets off a process of further changes in related variables, which ultimately react back on the first variable, causing it to move still further  
645 in the same direction: the processes are self-propelling. Each of the three is capable of operating on its own for at least a short time, but they also mutually reinforce each other. When this happens, they can set up a strong pattern of cumulative movement; this, we contend, is what happened in the late 1990s.

650 The first expansionary tendency concerns asset prices—stocks and shares, real estate, derivatives and securities of all kinds—in relation to credit. The second arises in connection with the introduction and diffusion of new high-tech products. The third connects the changes in the pattern of consumption—in particular, the rise in the ratio of collective or interactive consumption to more traditional personal or individual consumption—to investment spending. We may  
655 label these tendencies I, II and III.

#### I. Cumulative Causation in Financial Markets

660 Rising asset prices increase the value of bank capital, which allows banks to increase their lending. Higher asset prices also mean that collateral is more valuable, which increases creditworthiness, and allows higher debt-to-income ratios. But higher borrowing on the part of those active in financial markets is likely to lead to further bidding up of asset prices.

665 This can be set out as a formula, where  $\rightarrow$  means ‘tends to bring about’  
A rise in asset prices

- $\rightarrow$  a rise in the value of bank capital, and in the value of collateral
- $\rightarrow$  a rise in the amount of lending for speculation
- $\rightarrow$  a further increase in asset prices

670 Two features of the 1990s tended to support this process. First, during most of this period the long-term real rate of interest tended to lie near or above the real rate of growth of output. The growth of bank capital tends to closely follow, often to equal, the real rate of interest. When the latter is greater than the rate of growth, the potential money supply (available bank credit) will be growing faster than  
675 the demand for money for transactions and precautionary purposes, which grows with output. Hence there will be credit potentially available to support speculation.

Second, deregulation and changes in the pattern of corporate governance made it possible for corporate central management and core owners, as a group, to establish control over the entire stream of corporate net income, minus only the amount used in buybacks, provided those buybacks stimulated speculators to buy in, pushing up the stock price at a rate at least equal to the rate of interest.

These two features tended to support the stock market boom. But more is needed; a financial asset boom will become increasingly fragile over time, if the underlying real assets do not increase in tandem. Increases in productivity and growth of real assets are needed to support the financial asset boom, and this is exactly what the rise and diffusion of new high-tech products provided.

## *II. Introduction and Diffusion of New Products*

The new products tend to be ‘Swiss Army Knives’, combining a number of operations and functions, some altogether new, others displacing older ways of doing similar tasks. But even a huge pile of notebooks, ballpoint pens, sketchbooks, address books, and photograph albums do not add up to a Palm Pilot. It is a new item, and it is more interesting, comprehensive and versatile than the low-tech activities it displaces, just as computers are vastly more versatile than the typewriters and office machines they displaced. But while high-end consumers can afford the new products, lower income purchasers will need credit or enhanced income.

New high tech products are introduced to and accepted by high-end consumers:

- production on a larger scale
- economies of scale and lower costs
- lower prices
- expansion of the market to lower income consumers
- further expansion of scale
- a need for significant investment
- a multiplier-induced expansion of incomes
- further market expansion

If the expansion of new products leads to higher productivity and greater investment in high-tech, this could spread, and the resulting boom in output and employment generally would support the process. New credit will help, if it is made available to the lower income groups into which the marketing of the new products is penetrating. The government budget provided a stimulus during the 1990s, and this tended to support income levels in the middle classes; towards the end of the 1990s, unemployment fell enough (and labor force participation rose enough) that labor markets tended to tighten; as a result, real wages rose more or less across the board, again supporting consumption.

## *III. The Changing Composition of Consumption*

A result of the transformative new technologies has been a general rise in the ratio of interactive or collective consumption to private or personal consumption. Entertainment, education, communications, medical care, transportation, travel



and tourism, all have increased more rapidly than incomes, while food, clothing and shelter have increased more slowly.

New products lead to network effects:

- 725 → higher productivity and increased value of interactive consumption
- increased spending on such consumption
- increased output and lower costs
- further increases in such consumption
- further network effects and productivity increases
- further investment
- 730 → multiplier effects on income and employment

Clearly, the availability of additional credit will help this process along. The more productivity is enhanced the greater the likelihood that the process will engender a general boom.

735

### *7.2. Interactions between the Three Processes*

Process I generates new credit, which will tend to support and enhance Processes II and III. Process II generates and diffuses new products, which promotes Process III. Processes II and III increase productivity and tend to generate an investment boom, which enhances the value of real assets, supporting Process I. When the processes interact they reinforce one another, and set a powerful boom in motion.

740 But the most important interaction in the 1990s involved the housing market, as this became the method for distributing new credit. Increases in stocks and other asset prices pulled up housing prices; the higher housing prices were also reinforced by the wealth of high-end consumers, who tended to bid up prices in the more desirable neighborhoods. Higher housing prices allowed for refinancing on an immense scale. But this in turn made it possible for households to pay down credit cards. The increased value of housing and other assets was used to support increased consumption. When the stock market collapsed, housing prices did not fall; indeed, they continued to rise, partly because interest rates were gradually lowered starting in 2001 until the danger of serious recession had passed.

### *7.3. A Simple Dynamic Model*

755 We can put these dynamic relationships together in a simple cobweb-style model. Let  $\Delta\xi/\xi$  be the appreciation of stock prices,  $\Delta I/I$  the growth of investment,  $\Delta C/C$  the growth of consumption and  $\Delta Y/Y$  the growth aggregate output. Drawing on the preceding discussion, we can postulate: stock market growth supports investment growth (in new products); investment growth generates consumption growth (in new markets); consumption growth (in new markets) leads through the multiplier to output growth, which in turn leads to higher profits that engender stock market growth. These can be arranged in a four quadrant diagram as in Figure 1.

760 First, suppose the relationships are linear. Then if the angles between the independent and dependent variables add up to  $180^\circ$ , an initial impulse creates a cycle that repeats itself indefinitely (solid arrows), but if they add up to more than  $180^\circ$ , the cycle will expand; if less, the cycle will peter out, as the dotted lines show.

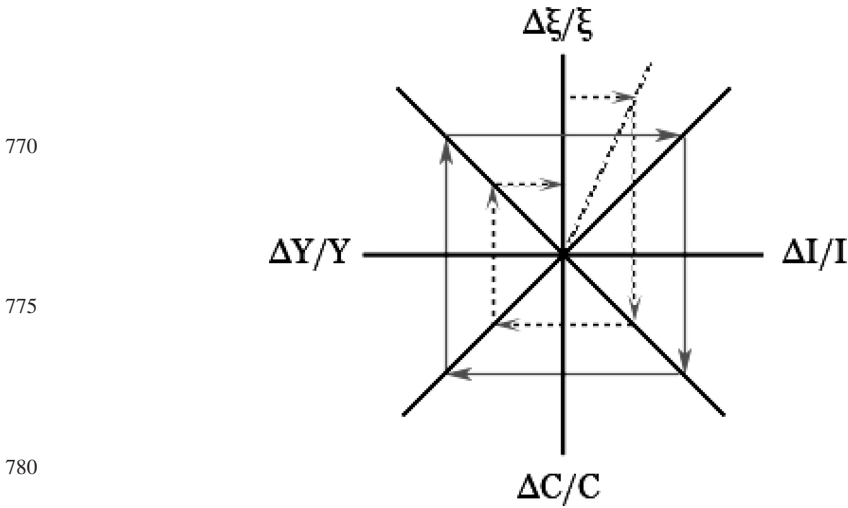


Figure 1.

Q4

785 Next we consider non-linear relationships. Suppose that the impact of the  
 790 stock market on investment is sigmoidal, and that the effects of investment on  
 the growth of consumption also take a sigmoid form. That is, initially a large  
 impact is needed to increase the dependent variable, but then that variable  
 becomes very responsive and expands rapidly, but at a certain point becomes  
 less responsive again. Under these conditions a small initial expansion in the  
 stock market will lead to a cycle of responses that eventually peters out (dotted  
 arrows), but a large initial response will lead to an expanding cycle (solid  
 arrows) (see Figure 2).

795 The New Technologies, then, did create a 'New Economy', in a sense. They  
 created a set of interacting market processes, characterized by increasing returns,  
 which were strongly 'cumulative' or self-augmenting. This led to a strong boom,  
 which partly collapsed when the stock market overreached. But it did not collapse  
 entirely, because consumption continued to be strong, reflecting, among other  
 things, the fact that lifestyles were changing significantly because of the new products.

800

## 8. ICT: A New Step in the Path of Transformational Growth?

805 Nell (1988) argues that the slowdown of the US economy was caused by weakening  
 in the process of transformational growth. During the 1920s and again following  
 the Second World War, advanced markets grew in tandem with the rising prosperity  
 of new social classes. But by the 1970s the ability of mass production to  
 create and expand markets had largely run its course.<sup>11</sup> The sources of growth

810 <sup>11</sup>A massive attack on poverty might well have created new markets on the scale needed;  
 but the War on Poverty failed, and redistribution ran in the opposite direction starting in  
 the 1980s.

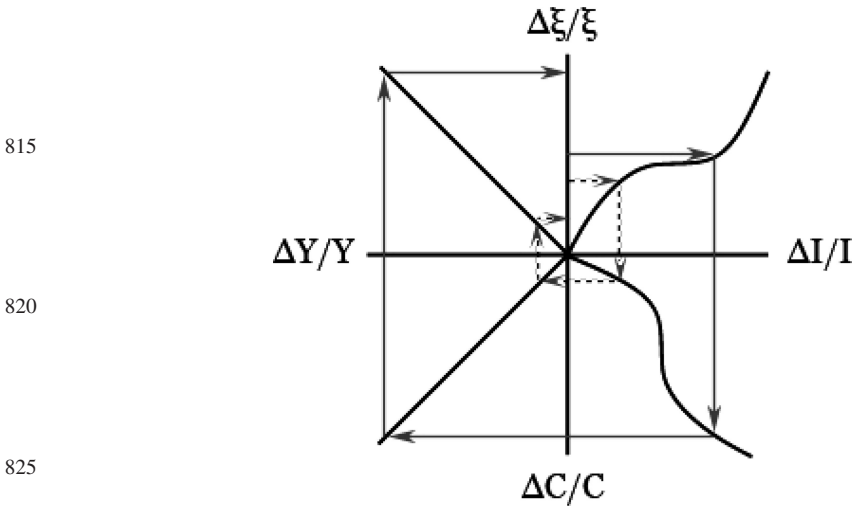


Figure 2.

Q4

830 had become largely exhausted and new ones were not yet in place. Conservative  
 public policy only made things worse. Industrial mass production entered a period  
 of stagnation in the 1970s when ‘the setting up of the information economy had  
 hardly begun’ (Nell, 1988, p. 171). The question arises, then: what is the new  
 835 pattern of growth to be, following the end of mass production (consumption) in  
 the advanced industrial economies of the post-war world?

In the 1980s, the new information technologies were still not able to create the  
 conditions for new markets at a sufficient rate to sustain robust growth. But the  
 emerging consumption patterns were quite different from those of mass consump-  
 840 tion. In the era of mass production, social groups whose incomes were rising, and  
 whose members usually had similar forms of employment, adopted new lifestyles.  
 This created a mass market, and encouraged an investment boom. Instead, in the  
 1980s, innovation in consumption took the form of new upgraded goods and ser-  
 845 vices for the wealthy, leading to an evolution of the Consumption Sphere associ-  
 ated with glamorous modes of life (Gualerzi, 2001). But a glamour boom for the  
 wealthy is not the answer to the end of mass consumption; this will not re-estab-  
 lish high growth rates. Yet the ICT technologies flowered during the two Clinton  
 administrations, allowing at least a first glimpse of the next stage, that of compu-  
 terized production and biotech agriculture (Nell, 1998). Indeed, The ICT sector  
 seemed to cause an acceleration of growth during the years of the boom.

850 But the expansion collapsed suddenly, raising the question of whether it  
 really represented the start of a trend in long-term growth. The strong upturn of  
 the second part of the 1990s suggests that information technologies did in fact  
 reach a new level of importance in the economy. From this perspective the end  
 of the boom could be seen as an adjustment after excessive euphoria, a typical  
 855 cyclical pattern. The underlying issue, however, is whether a transformation cen-  
 tered on ICT is capable of sustaining a long-term growth pattern, as other ‘general  
 purposes technologies’ appear to have done in the past.

A 'general purpose technology' (Bresnahan & Trajtenberg, 1995; Helpman, 1998) is one that has several applications and sets in motion a large transformation, as in the case of the steam engine, the electric motor and electrical power transmission, or internal combustion. It takes time for general purpose technologies to make an impact, depending on the diffusion process and the specific characteristics of the technology.

Paul David (1990), drawing on a parallel between the computer and the dynamo, argued that we should expect a 'diffusion lag'. This is reasonable but it does not help us decide whether we are entering a new phase. David also argued that the existing productivity measures are problematic for new products and processes, and especially so for computers, which, as he says, are *not* dynamos.<sup>12</sup> The 1980s may not have been the infancy of a new transformative ICT industry, but they certainly were an initial stage of something. And the spurt of productivity in the second part of the 1990s, appears to be the maturing of what began then.

David agrees that structural dynamics proceed by successive stages that articulate a long-term trend in specific episodes of growth, along a fundamental technological trajectory. It takes time for a stage to become fully realized, and the next may by then already be beginning. The problem is to provide an analysis of the main characteristics of a specific stage of development, explaining the linkages between technology, innovation and structural change. Moreover, market creation not only takes time, but requires a deep transformation of the consumption sphere. The new products meet new needs and require new skills on the part of consumers, as well as calling for new financing.

So the boom of the ICT sector is the result of an internal process of development, along a technological and industrial trajectory involving the advances of basic science in the fields of electronics and computer science and the rise of a high-tech industrial complex.<sup>13</sup> Precisely because of that, the new dominance of ICT in the 1990s was incubated and prepared in the previous decade. Consequently, the structural dynamics of market creation and the effect on macro-performance were different.

Our analysis suggests that the dynamic instability of the 1990s offers hints to the character of the next stage of transformational growth. While the transformation of those years sustained an episode of growth, the next step of ICT-driven development will depend on a much deeper transformation of production and consumption than that observed so far. The boom collapsed when the complexities and difficulty of such a transformation became more evident. The collapse of

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<sup>12</sup>The nature of man-machine interactions and the technical problems of designing efficient interfaces for humans and computers are enormously more subtle and complex than those that arose in the implementation of electric lighting and power technology' (David, 1990, p. 360).

<sup>13</sup>The manufacturing industries that consistently had above-average rates of output growth in the four peak to peak cycles from 1958 to 1989 were mostly high-tech (Gualerzi, 2001, chapter 7). This relatively small group (17 out of 143) includes such industries as Office and Computing Machines and Electronic Components and Accessories.

the boom raises questions about the social and economic sustainability of such a path of development.

We see a different road ahead than that described by the rhetoric of the New Economy, or, for that matter, by the more skeptical observations of Stiglitz and Gordon. New technologies are likely to continue exert a major influence on the long-term growth of the US economy, but it remains an open question whether this is the beginning of a new phase in the path of transformational growth following the stagnation crisis of mass consumption in the 1970s.

## References

- Blinder, A. & Yellen, J. (2002) *The Fabulous Decade* (New York: The Century Foundation).
- Bresnahan, T. & Trajtenberg, M. (1995) General purpose technologies: engines of growth, *Journal of Econometrics*, 65, pp. 83–108.
- Brenner, R. (2002) *The Boom and the Bubble* (New York: Verso).
- Cohen, S., De Long, B. & Zysman, J. (2000) Tools for thought: what is new and important about the ‘e-economy’, *BRIE Working Paper*, no. 138.
- David, P. (1990) The dynamo and the computer: an historical perspective on the productivity paradox, *American Economic Review*, 80, pp. 355–361.
- Godley, W. (2000) Drowning in debt. Jerome Levy Economics Institute Policy Note 2000/6.
- Godley, W. (2001) Fiscal policy to the rescue. Jerome Levy Economics Institute Policy Note 2001/1.
- Gordon, R. (2000) Does the New Economy measure up to the great inventions of the past? *Journal of Economic Perspectives*, 14(4), pp. 49–74.
- Gordon, R. (2003) Exploding productivity growth: context, causes and implications, *Brookings Papers on Economic Activity*, no. 2, pp. 207–298.
- Gualerzi, D. (2001) *Consumption and Growth: Recovery and Structural Change in the US Economy* (Cheltenham: Edward Elgar).
- Helpman, E. (Ed.) (1998) *General Purpose Technologies and Economic Growth* (Cambridge, MA: MIT Press).
- Jorgenson, D. (2001) Information technology and the US economy, *American Economic Review*, 91, pp. 1–32.
- Jorgenson, D. & Stiroh, K. (2000) Raising the speed limit: US economic growth in the information age, *Brookings Papers on Economic Activity*, no. 1, pp. 125–211.
- Nell, E.J. (1988) *Prosperity and Public Spending* (London: Allen & Unwin).
- Nell, E.J. (1998) *The General Theory of Transformational Growth* (Cambridge: Cambridge University Press).
- OECD (2000) *Is There a New Economy? First Report on the OECD Growth Project* (Paris: OECD).
- Oliner, S. & Sichel, D. (1994) Computers and output growth revisited: how big is the puzzle? *Brookings Papers on Economic Activity*, no. 2, pp. 273–334.
- Oliner, S. & Sichel, D. (2000) The resurgence of growth in the late 1990s: is information technology the story? *Journal of Economic Perspectives*, 14(4), pp. 3–22.
- Pollin, R. (2003) *Contours of Descent: US Economic Fractures and the Landscape of Global Austerity* (New York: Verso).
- Solow, R. (1987) We’d better watch out, *New York Times Book Review*, July 12, p. 36.
- Stiglitz, J. (2003) *The Roaring Nineties* (New York: W.W. Norton).
- Wolff, E. (2003) What’s behind the rise of profitability in the US in the 1980s and 1990s? *Cambridge Journal of Economics*, 27, pp. 479–499.
- Wray, R. (1999) Abolish the surplus, Center for Full Employment and Price Stability Policy Note 99/1.