Preface

Carlota Perez has made several highly original contributions to the understanding of long-term technological transformations and the way in which such changes interact with wider economic, social and political changes. This book is perhaps her most original and controversial contribution. Her intense interest in these deep processes was aroused in the 1970s when, as a young researcher, she was studying the oil industry, then and still today of critical importance for her own native country, Venezuela. In trying to explain the causes and consequences of the so-called OPEC crisis of 1973, she became convinced that the global economy had begun a long-term transition from a mass-production economy based on cheap oil to an ‘information economy’ based on cheap micro-electronics. The arrival of the microprocessor – a ‘computer on a chip’ – served as a ‘big-bang’ announcing this probability and she was able to develop her theory at this time through a period of postgraduate research in California – a state which was already then at the forefront of the Information Revolution.

As a result of this research and her subsequent work with government and industry, she was able to publish in 1983 a paper that became an influential landmark in this field. It was entitled ‘Structural Change and the Assimilation of New Technologies in the Economic and Social System’ and the title adequately reflects the content. It became influential for three main reasons. First of all, it demonstrated that very big changes in technology entailed not just the extraordinarily rapid growth of a few new industries, but also, over a more prolonged period, the rejuvenation of many ‘old’ industries, which found ways to use the new technology and to make changes in their organization and management, influenced by the new industries. She designated this combination of new ways of thinking about the productive system, including its organization, its techniques and its interdependencies as a change of ‘techno-economic paradigm’. This concept of a paradigm change, with each major technological revolution, has become very widely accepted, particularly since Alan Greenspan began to use the expression in the 1990s to explain the upsurge in the American economy at that time.

The second major contribution which Carlota Perez made in that paper was to point out that such a ‘meta-paradigm’ change, affecting the entire economy entailed the very widespread use of new inputs. In each technological revolution, whether in earlier times with iron, coal, steel, or oil or with chips today, it
was possible to make very great economies of scale in the production of these
inputs, and frequently such a steep decline in price followed that they became
very attractive for economic as well as for purely technical reasons.

Finally, she showed up some of the fallacies of what is known to historians
as ‘technological determinism’ by her insistence that any transformation in
technology could only take place through an interactive and accompanying
process of social, political and managerial change. This meant that the change
of paradigm affected not only management and organization at the level of the
firm but it affected and was affected by the entire system of social and political
regulation. This is particularly obvious in such areas as education and training,
where the strong demand for new skills drives the changes, but it is also appar-
ent in the intellectual property regime (trademarks, patents and so on) and the
framework of company law, safety regulation and, even more, in international
trade and competition. All this has become particularly evident with the growth
of the institutions of the ‘information society’. Carlota Perez made the vital
point that countries and regions vary in their capacity and their desire to make
such institutional changes, depending on social and political factors, the par-
ticular historical circumstances and other social and political conflicts and ideas.

In this book, she makes an even more original and seminal contribution. She examines the interaction between that part of the economy commonly
known as financial capital and the upsurge of new technologies from their first
beginnings to the time when they predominate in the structure and behavior of
the economy. In his major work, Business Cycles (1939), Joseph Schumpeter,
whilst interpreting the major waves of economic growth and technological
transformation as ‘successive industrial revolutions’, insisted that these clus-
ters of radical innovations also depended on financial capital. In fact, more
space is devoted to finance in his book than to technology but, rather strangely,
his followers – often known as ‘neo-Schumpeterians’ – neglected this aspect
of his work. With characteristic boldness, Carlota Perez has attempted to fill
this gap. The Internet ‘bubble’ has made the gap especially apparent but she
began her work long before this.

Like Schumpeter, she believes that the early upsurge of a new technology is
a period of explosive growth, leading to great turbulence and uncertainty in
the economy. Venture capitalists, delighted at the new possibility of very high
profits first demonstrated by early applications (aptly designated by Carlota
Perez as the ‘big-bang’) rush to invest in the new activities and often in new
firms. However, the uncertainty which inevitably accompanies such revolu-
tionary developments, means that many of the early expectations will be dis-
appointed, leading to the collapse of bubbles created by financial speculation
as well as technological euphoria or ‘irrational exuberance’. The explosive
upsurge of the new industries and firms takes place within an environment still
dominated by the ‘old’ institutions, so that this is inevitably a time of great
contrasts, designated by many economists as a phase of ‘structural adjustment’.
Carlota Perez puts the accent on the process of propagation of the new technologies and calls it the ‘installation period’. She further divides it into two phases: ‘Irruption’ and ‘Frenzy’. In the later period, financial capital spurs investment in the new industries, activities and infrastructures so intensely that they become quite strong and the need for a new regime of regulation is more clearly apparent, at least in the leading countries.

In the end, as experience of political and social changes accumulates and as many firms grow accustomed to the new technology so that it becomes everyday ‘common sense’, the turbulence of the installation period may give way to a period of more harmonious growth, designated by Carlota Perez as ‘Deployment’ and again subdivided into two phases: ‘Synergy’ and ‘Maturity’. The deployment period can be a time of relatively stable and prosperous development based on a good match between technology and the institutional framework. Whereas structural unemployment is likely to be a feature of the installation period, high levels of employment may well be attained in many countries during ‘deployment’. This factor leads people to think of deployment as a ‘golden age’ or ‘belle époque’, even though measured GDP growth may actually have been higher in some countries during the frenzy phase of the installation period. However, in the maturity phase of the deployment period, diminishing returns set in for the (now) older and mature technologies. Arthritis may set in for some of the once vigorous new firms and activities. This phenomenon of diminishing returns has been observed by both engineers and economists and it leads to a new period of installation as attention switches to the next generation of radical innovations, which now begin to offer more exciting prospects, both for the engineers and the financiers.

The theory is certainly not intended as a straitjacket in which to force the untidy pattern of real historical events. As Goethe observed in ‘Faust’,

Grey my friend is all theory,
Green the golden tree of life.

Carlota Perez is very well aware of the complexity of the world of finance, technology and political change. Her model of four phases is not a reductionist model, it is rather a way of ordering and examining historical processes in order to illuminate some recurrent tendencies which may be present and may help us to interpret and understand better both the past and the present. A green tree is a beautiful sight in spring and summer, but deciduous trees in winter can reveal more of their structure and sources of growth by their spare and elegant fundamental features.

I strongly commend this fascinating book, not only to historians and economists but to engineers, scientists, managers, trade unionists and policy makers – indeed to all those interested in the past and future evolution of our complex social system. In one other respect, it also offers ideas which go beyond what
Schumpeter and most of his followers have discussed: it deals very effectively with the way in which new technologies spread to the ‘third’ world and the role of finance and of debt in this diffusion. Altogether, it is a thought-provoking and stimulating book, which should be widely read in all parts of the world economy.

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