



**Looking at the future  
Learning from history**

**THE GOLDEN AGE AHEAD  
IS BOTH DIGITAL AND GREEN**

Carlota Perez

Centennial Professor, London School of Economics, U.K.

Professor of Technology and Development, Nurdse Institute, Tallinn, Estonia

Honorary Professor, SPRU, University of Sussex, U.K.

Author of *Technological Revolutions and Financial Capital: the Dynamics of Bubbles and Golden Ages*. Elgar 2002

Swiss Telecommunication Summit, Bern, June 2016

## **A GOLDEN AGE AHEAD?**

Can anybody be optimistic  
in today's uncertain world?

**YES!**

By having a historical understanding  
of technological revolutions  
and of how markets and governments  
influence their patterns of diffusion

The history of technological revolutions  
teaches us  
that golden ages have risen  
from the recessions  
that follow  
major financial collapses

# FIVE TECHNOLOGICAL REVOLUTIONS IN 250 YEARS

1771

The 'Industrial Revolution' (machines, factories and canals)

1829

Age of Steam, Coal, Iron and Railways

1875

Age of Steel and Heavy Engineering (electrical, chemical, civil, naval)

1908

Age of the Automobile, Oil, Petrochemicals and Mass Production

1971

Age of Information Technology and Telecommunications

20??

Age of Biotech, Nanotech, Bioelectronics and new materials?

**EACH ONE LEADS TO A TECHNO-ECONOMIC PARADIGM SHIFT**

**Changing the direction for innovation and organisation across the economy and society**

New ways of  
LIVING

New ways of  
PRODUCING

**EACH NEW PARADIGM  
brings a far reaching  
transformation**

New ways of  
COMMUNICATING

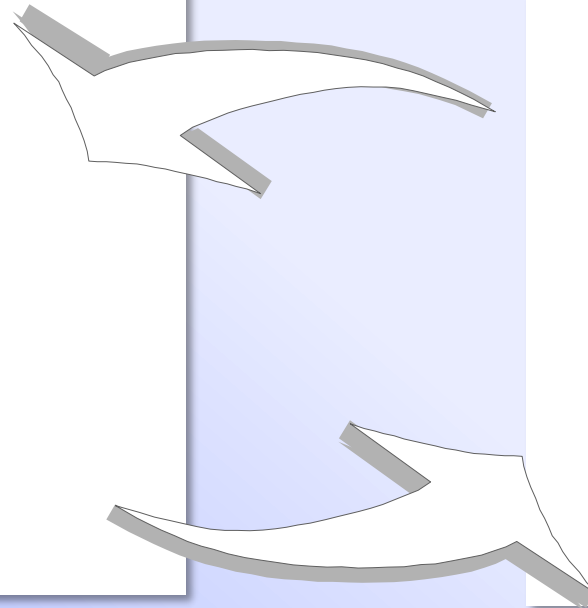
New ways of  
WORKING

**Because of resistance to such major paradigm shifts**

**CAPITALISM EXPERIENCES PENDULAR SWINGS EVERY TWO OR THREE DECADES**

**from bubble times to golden age and back**

From a period of  
**FINANCIAL CAPITALISM**  
to force the  
**INSTALLATION**  
of each technological revolution  
with unfettered  
free markets  
and income polarization

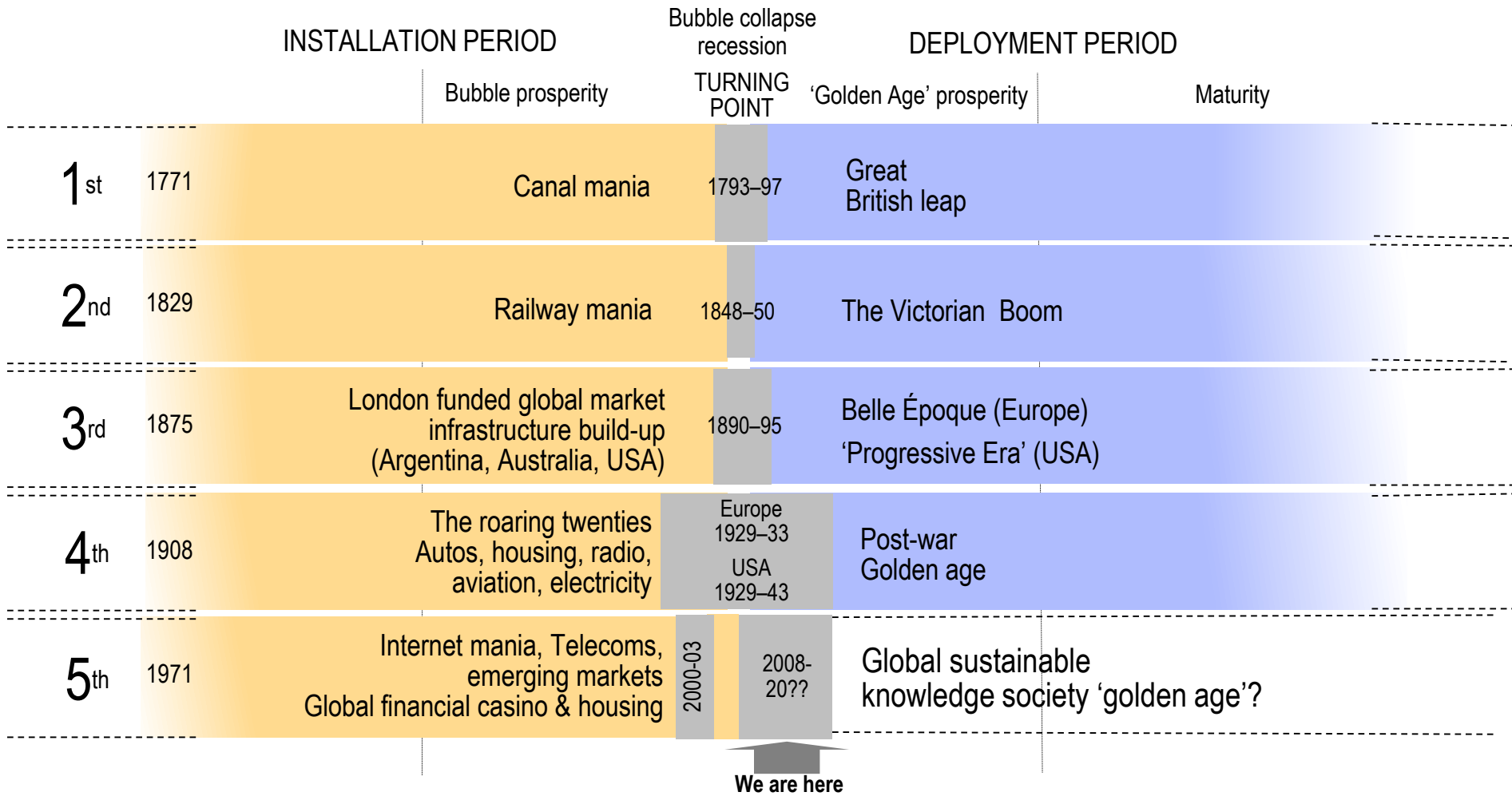


To a period of  
**PRODUCTION CAPITALISM**  
aided by government  
to enable the full  
**DEPLOYMENT**  
of the new potential  
across the whole economy  
and the spread of its benefits to society

**A MAJOR BUBBLE COLLAPSE SIGNALS THE NEED TO SWING THE PENDULUM**

**The resulting recession moves government, business and society  
to shift gear and unleash the Golden Age**

# The historical record: bubble prosperities, recessions and golden ages



## HOW DO THE TWO PROSPERITIES DIFFER?

	INSTALLATION BUBBLES	Turning point	GOLDEN AGE DEPLOYMENT
<b>Investment</b>	Concentrated in new technologies and finance		Widely spread across the real economy transforming all sectors
<b>Finance</b>	Self-serving casino behaviour		Profitable services to the new real economy
<b>Employment</b>	Declining with modernization and geographical shifts		Reviving with the new fabric of the economy (depending on policy) and especially with new lifestyles
<b>Innovation</b>	New products, services, processes and infrastructures SUPPLY PUSH		Institutional, policy and social innovations creating a favourable context for modernising all industries and activities applying the new technologies DEMAND PULL

**And people recognize when the times change from one mode to the other**



**BUT GOLDEN AGES  
DON'T COME AUTOMATICALLY**

**They must be facilitated by an active State  
giving a direction for innovation  
widening markets  
and ensuring social stability**

**WHY?**

**Because markets alone  
cannot change the context**

**After the collapse**  
markets continue making changes in production and consumption  
**BUT INNOVATING IN RANDOM DIRECTIONS**

**BUSINESS**

Restructuring  
of all industries  
and sectors

**GOVERNMENT**

Modernisation  
and redesign  
of the policy  
framework

A successful  
'turning point'  
involves promoting  
a clear, synergistic  
and common  
direction  
in three  
major areas

Articulation of  
a new different  
lifestyle

**CONSUMERS**

**THE POLICY DECISIONS TAKEN NOW**  
**WILL SHAPE THE NEXT TWO OR THREE DECADES... and possibly more!**

# EACH GOLDEN AGE BRINGS A NEW ASPIRATIONAL IDEAL OF THE 'GOOD LIFE'

Based on new goods and services at 'affordable' prices

From the 1850s: **VICTORIAN LIVING**

The rise of the urban upper and middle classes different from the rural aristocracy

From 1900: **THE BELLE ÉPOQUE**

Cosmopolitan lifestyles for upper and middle classes across the world

After WWII: **THE AMERICAN WAY OF LIFE**

Suburban lifestyles, reaching all workers in the advanced countries and middle classes in the 'third world'

Now: **SUSTAINABLE & TAILORED LIFESTYLES?**

Global diversity, urban and rural, using ICT in a green direction and lifting all boats???

**EACH NEW LIFESTYLE SPREADS FROM THE ELITES TO WIDER SECTIONS OF SOCIETY  
It shapes the consumption desires of the majority and guides innovation trajectories**

# THE NEW INFRASTRUCTURAL NETWORKS ARE CRUCIAL IN THE TRANSFORMATION

Each expands and transforms possible markets and guides product and service design



# What was happening in the United States in the 1930s after the crash of 1929

## THREE MAJOR DISCONNECTS

Potential for mass production

**INNOVATION**

Lack of mass demand

Risk-averse finance

**INVESTMENT**

Innovation and production potential

Business insisting on free markets

**ECONOMIC CONTEXT**

Government trying to shape the context

**Only war procurement taught business the advantages of working with government and of having truly massive markets for mass production**

# HOW WAS THE CONTEXT CHANGED FOR THE POST WAR GOLDEN AGE?

## CLEAR DIRECTIONS FOR INNOVATION

Suburbanization (government funded infrastructure),  
Marshall Plan for post-war reconstruction  
Cold war mass production and high tech

## A STRONG REVIVAL OF 'REAL' INVESTMENT

Growing demand from high salaries;  
consumer credit (with unemployment cover)  
mortgage insurance for home ownership;  
government procurement and R&D funding

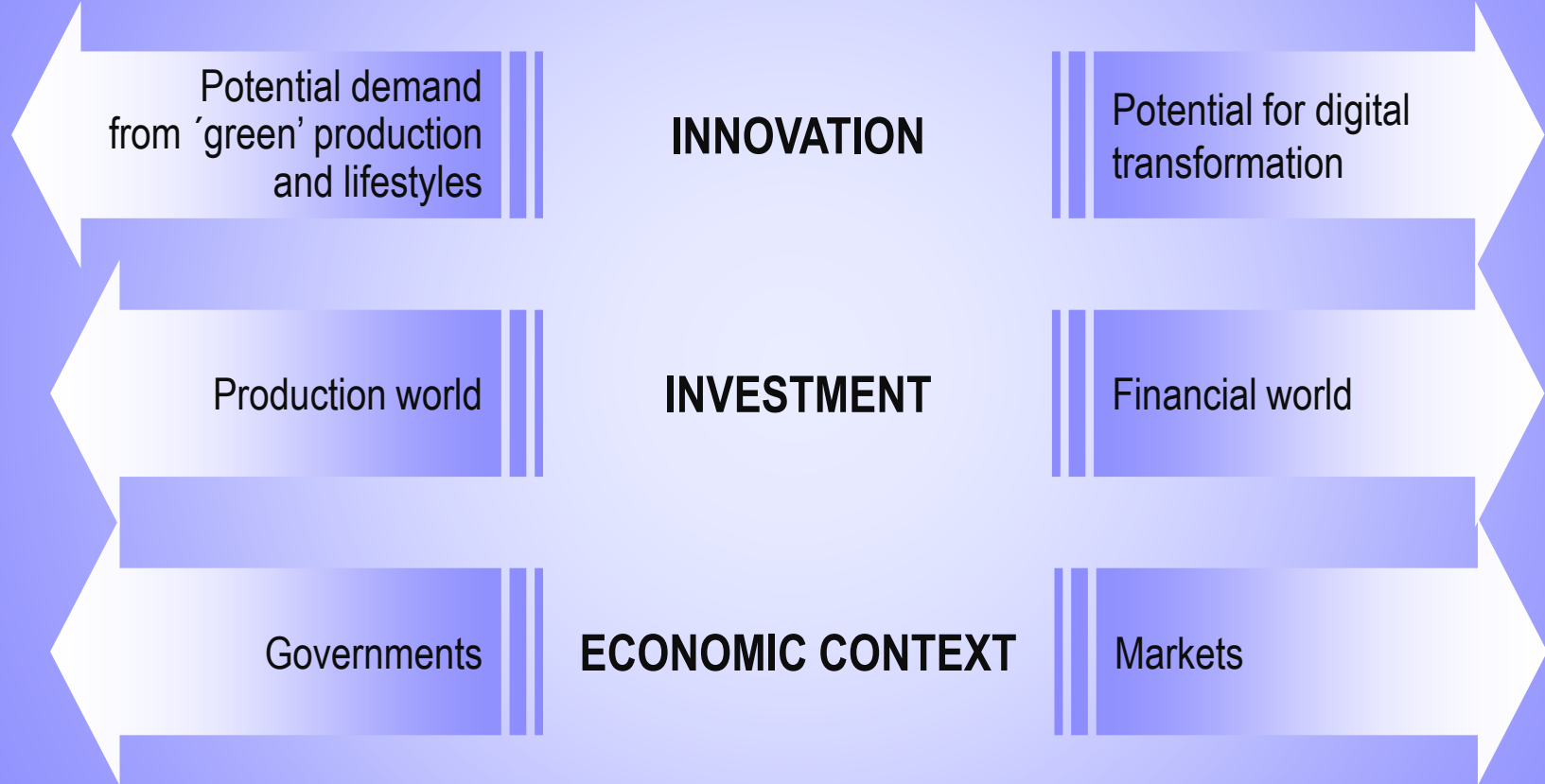
## A DYNAMIC AND STABLE ECONOMIC CONTEXT

Acceptance of:  
high taxes that turned into demand;  
of Keynesian policies nationally  
and of international institutions

**IT WAS A MASSIVE SET OF ADEQUATE INSTITUTIONAL INNOVATIONS  
THAT UNLEASHED AND SUPPORTED THE GREATEST BOOM IN HISTORY**

# What is happening now in the advanced world since the crash of 2008?

## THE BEST OF POSSIBLE FUTURES IS BEING HINDERED BY THREE GREAT DISCONNECTS



**GLOBAL GROWTH CANNOT BE FULLY REACTIVATED UNTIL THEY ARE RECONNECTED**

## **WHY GREEN?**

**What is its relation with ICT?**

**What is meant by 'green growth' ?**



# THE INTRINSIC CHARACTERISTICS OF ICT ARE COMPATIBLE WITH 'GREEN'

The paradigm shift that began in the 1970s has gradually made that clear

**FROM THE LOGIC  
OF CHEAP ENERGY (oil)  
for transport, electricity,  
synthetic materials, etc.**



**TO THE LOGIC  
OF CHEAP INFORMATION  
its processing  
transmission and productive use**

**Preference for tangible products  
and disposability  
Unthinking use  
of energy and materials**

**Preference for services  
and intangible value  
Huge potential for savings  
in energy and materials**

**Unavoidable environmental destruction**

**Potential environmental friendliness**

**SO DIGITISATION AND GREEN ARE 'MADE FOR EACH OTHER'**

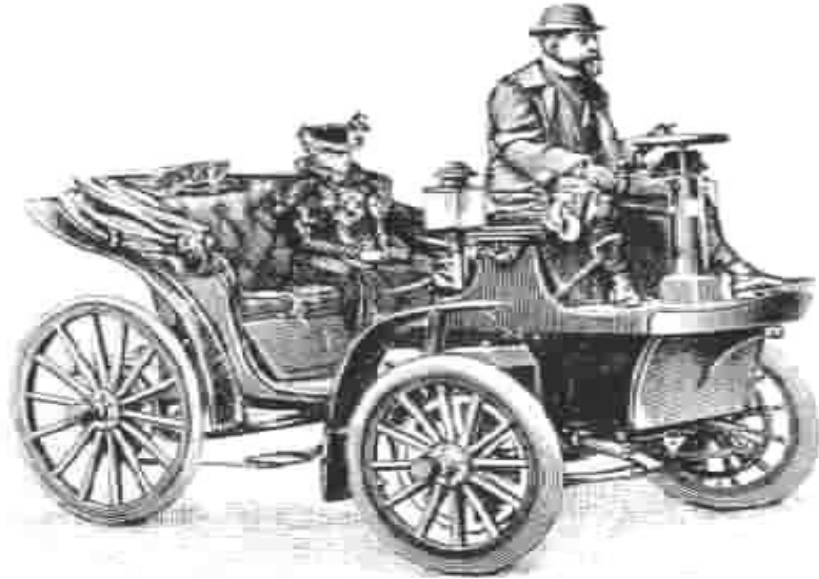
**The environment is not the problem... It's the solution!**

**Dynamic growth can occur with a radical increase in the proportion of intangibles in both lifestyles and GDP**  
**BUT THE NEW POTENTIAL IS ONLY SLOWLY EMERGING**

**WHY?**

**Because each new paradigm  
must at first be  
still wrapped in the old**

Early automobiles looked like horse-driven carriages



One of the early automobiles 1898

Reproduction: L. De Vries. 1972

**If and when the context is changed by intelligent policies, consumers and businesses will respond**

# THE TRANSFORMATION SPACES FOR THE NEW 'GREEN' PRODUCTION AND LIFESTYLES

## HUMAN CENTRED SERVICES

Health and care  
Leisure and sports  
Entertainment  
Mobility & Distribution  
Diversified electricity  
Education 'industry'  
The arts  
Intermediation  
Sharing and barter  
Conservation  
Logistics  
Maintenance  
Resource recovery, recycling, reuse  
Pollution reduction  
And so on



An aspirational  
'good life'  
with less energy  
and materials,  
more ICT and  
more jobs

## MODERNISATION OF PRODUCTION

Circular economy  
Truly durable products  
3-D printing  
Rental model  
Nanotechnology  
Renewable energy  
Batteries & carbon capture  
Sustainable architecture  
New construction methods  
Bio-plastics & Custom materials  
FTTH and Wi-Fi infrastructure  
Smart electrical grid  
Complex systems engineering  
Hydroponics and urban agriculture  
and so on

**Massive innovation and massive employment, next to robotics and AI  
in sustainable activities, enhanced and enabled by ICT**

# THE BEST OF POSSIBLE FUTURES REQUIRES THREE RECONNECTIONS

**CLEAR DIRECTIONS  
FOR INNOVATION**

Digital + Green and  
full global development

**A STRONG REVIVAL  
OF 'REAL' INVESTMENT**

Recoupling of the  
financial world  
with production

**A DYNAMIC AND STABLE  
ECONOMIC CONTEXT**

Strong consensus  
business-government  
nationally and globally

**SUCH A TILTING OF THE PLAYING FIELD**

**CAN OPEN INFINITE BUSINESS OPPORTUNITIES AND IMPROVE THE LIVES OF THE MAJORITY**

**IT'S UP TO ALL OF US  
TO MAKE IT HAPPEN**

**AND THIS TIME THE EUROPEANS  
CAN BE THE PIONEERS**

**THANK YOU!**

For more about all this:

[www.carlotaperez.org](http://www.carlotaperez.org)