

A Smart Green ‘European Way of Life’: the Path for Growth, Jobs and Wellbeing

Carlota Perez
and
Tamsin Murray Leach

March 2018

WORKING PAPER SERIES

The aim of this Working Paper Series is to gradually make available the results of the research project Beyond the Technological Revolution (BTTR): The Role of the State in Shaping Innovation and Growth.

BTTR

Beyond the Technological Revolution is a four-year research project led by Carlota Perez, as a continuation of the work done for her 2002 book Technological Revolutions and Financial Capital.

CONTACT

info@beyondthetechrevolution.com

SUPPORTED BY



anthemis | group



A Smart Green ‘European Way of Life’: the Path for Growth, Jobs and Wellbeing

Abstract	3
Introduction	3
Technological revolutions and social change	4
New products, new lifestyles, new jobs	7
The last lifestyle shift: the American Way of Life	12
The emergent lifestyle shift today	15
The interplay of markets and policy in lifestyle changes	17
A European Way of Life?	19
Conclusion: Policy-making for a smart green future	21
Bibliography	23

A Smart Green ‘European Way of Life’: the Path for Growth, Jobs and Wellbeing

Carlota Perez

Abstract

This paper was written to appear as a chapter in Europe 2050: Rethinking Europe (forthcoming), a publication created by the Austrian Council for Research and Technology Development. Austria will assume the Presidency of the Council of the European Union in July 2018. For those familiar with Carlota Perez’ theory of technological revolutions, the first section of the paper will be a recap and can be skipped. The focus here is on a key source of demand-pull that has led to Golden Ages in previous revolutions: a paradigmatic shift in society’s image and practice of the ‘good life’. These changes in lifestyle, underpinned by the new technologies and fostered by government policy, have, in each case, led to investment, employment and innovation, counterbalancing the inevitable deskilling and job reduction brought by the ‘creative destruction’ processes of each revolution. In this paper we look at why this is the case; examine the lifestyle shifts that have occurred each time; and analyse the legacy of the ‘American Way of Life’ as the most recent example. We hold that, although the new lifestyles have depended on the new technologies, they are nevertheless a socio-political choice deriving from the realm of the possible that these technologies provide. Furthermore, we aim to show why the shift cannot be achieved by markets alone, but has each time occurred as an interplay between markets and government policy. We suggest that a new smart, green, way of living is slowly becoming the aspirational good life of our current technological paradigm. And we submit the idea that Europe is in a position to lead in fostering this way of life, thus playing a formative role in the creation of a sustainable global golden age.

Introduction

In the history of technological revolutions, there is a moment in each revolutionary surge of development when the wild period of Schumpeterian creative destruction has collapsed, and the future promised by the new technologies looks both uncertain and threatening. We are at this juncture today. Ten years after the 2007-08 crash, tenuously out of the subsequent recession, we face the point in the cycle when something must occur to foster investment, employment and innovation. The saviour in the past has been demand. And an important source of that demand has often been a change in lifestyle: a new

aspirational 'good life', underpinned by the new technologies and fostered by government policy.

In this paper, we look at why this is the case, and examine the lifestyle shifts that have occurred in previous technological revolutions. We analyse in depth the legacy of the last surge of development: the 'American Way of Life', an aspirational lifestyle reliant on mass consumption, which developed in response to the technologies of the automobile, oil, electricity and mass production. From our research, we assess that these shifts are not determined by the new technologies themselves: rather, lifestyle shifts are a socio-political choice, arising from the realm of the possible that the new technologies provide, but fostered by an interplay of markets and government policy. As Perez has argued elsewhere, we suggest that a new smart, green way of living is slowly becoming the aspirational good life of our current technological paradigm, looking at how this lifestyle has arisen and examining the ways it can address the negative legacy of past choices. Analysing the role of lifestyles in the past, we show that markets alone cannot help to establish the new 'good life' in a profitable direction for all without systemic government policies that clearly tilt the playing field in that direction. We conclude suggesting that Europe is in a unique position to adopt this way of life as its own, and to play a formative role in fostering a global golden age in the years to come.

Technological revolutions and social change

Strong regularities are apparent when one analyses the way in which technological revolutions are assimilated into the economy and across society. According to our periodisation, five technological revolutions have occurred since the first 'industrial revolution', each driving a great surge of development that brings profound and qualitative shifts across society (see figure 1). These surges, driven by a powerful cluster of interdependent new and dynamic industries and infrastructures, usher in major structural changes in production, finance, distribution, communication and consumption, transforming the whole economy and providing a new techno-economic paradigm – or common sense best-practice – for all activities. (Perez 2002)

Yet these recurrent changes are also unique. The recurring patterns have their causal explanations in how major surges of technical change are assimilated; their uniqueness is due both to the particular characteristics of the new

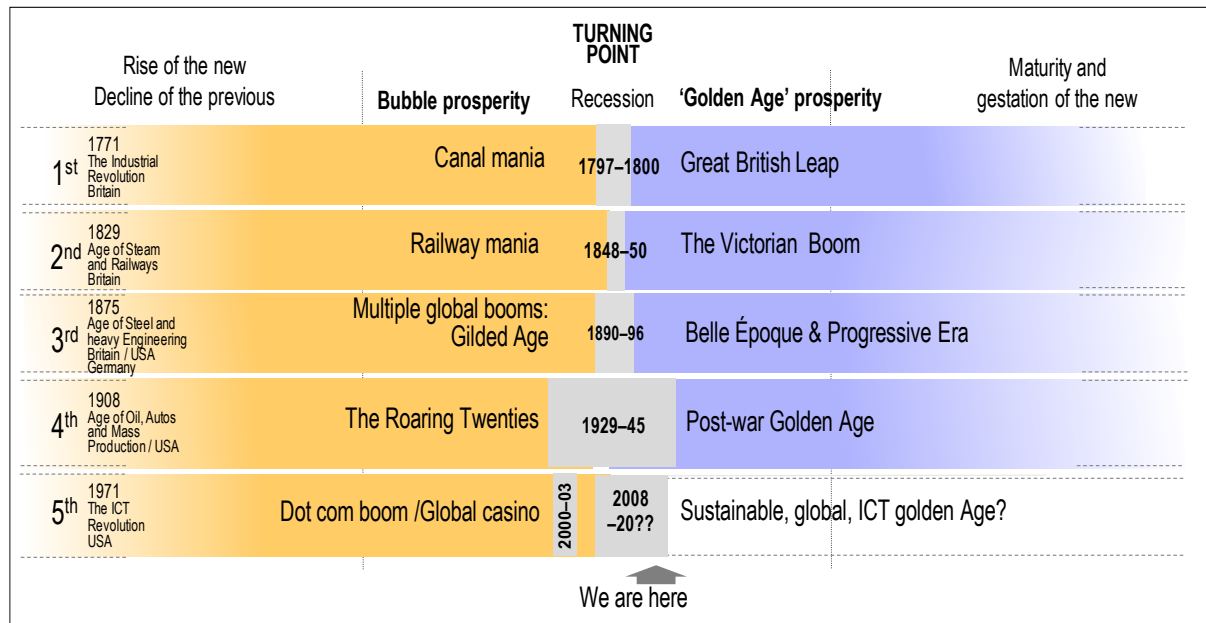
technologies and to the historical, political and cultural context. Thus, while each revolution brings a paradigm shift in the direction of innovation and the general criteria for competitiveness, it is ultimately the social forces and their institutions that define what part of that new opportunity space will be deployed and how.

The process by which these revolutions propagate is broken into two markedly different periods: installation, which is the early financialised and turbulent period of Schumpeterian 'creative destruction' as the new industries and infrastructures become established; and deployment, the later years, in which the installed potential spreads across the whole economy bringing greater social benefits. Installation is led by finance; deployment by production. A bubble followed by a major financial collapse marks the beginning of the role switch. The recession that follows these bubbles is a time when the installed potential is ready to transform the rest of the economy, but government must provide the policies that bring what have been called the 'Golden Ages' of prosperity.

The transition period that follows the crash is what we are experiencing now (the last equivalent period was in the 1930s, after the crash of 1929). Our current revolution, which began roughly in 1971, the year Intel's microprocessor was launched, is only half way through its diffusion path. If history is a guide, it has twenty to thirty years of deployment ahead. In the past, those years have typically been a positive-sum game between business and society, thanks to government providing a common direction for convergent innovation and profitable investment, based on dynamic and sufficient demand.

Figure 1

The five technological revolutions since 1771, showing installation and deployment periods



Source: Based on Perez 2002 and 2009

Innovation cannot be promoted for itself; it is not an economic panacea. Innovation scholars point to the importance of clustering innovation systems for success (OECD 2015): the productive and profitable synergies that occur due to the interdependence of a group of industries with one or more infrastructural networks and multiple common services and skills. The spread of a new technological era requires such synergies on a societal scale: the establishment of a whole network of interconnected services including a new infrastructure, specialized suppliers, distribution channels, appropriate skills and maintenance capabilities. It involves a vast learning process from producers through to consumers, and a raft of institutional enablers: new rules and regulations, standards, supervisory bodies, financial innovations, specialized training and education, and so on. Thus, the successful realisation of a technological potential involves innovation of multiple sorts: products, processes, services, organisations, institutions and policies.

It also requires a shift in *lifestyle*. These new ways of living which become possible due to technical change are often overlooked as simply a by-product of 'progress' – yet they are key. With each major technological change, it is the new

lifestyles that shape demand for new products and services, and those products and services become the major source of new jobs and well-being. Understanding this aspect of each paradigm shift – and the role that government has and must now play in enabling it – is the main object of this paper.

New products, new lifestyles, new jobs

In the early days of each great surge of development, each revolution provides a new inter-related set of life-shaping goods and services, which emerge initially in niche form. As there is an overlap between the early installation phase of each revolution and the late maturity phase of the previous, these initial experiments with new technologies and ways of living are not necessarily obvious game-changers at the start. Typically, such changes to the status quo begin either at the top of the income scale and/or in niche groups seen as radical outliers (Geels 2012). New products and services that are initially expensive are adopted by the elite as ‘conspicuous consumption’ (Veblen 1899) becoming an aspirational lifestyle for those less affluent, and, since the shift occurs in times of income polarisation, those products become the preferred innovation trajectory for business. However, such lifestyle innovations, which are often next adopted (and modified) by the young, are still perceived as ‘novel’ and may be considered either unacceptable or out of reach for the majorities. Indeed, much of the resistance to each surge of development can be witnessed in the evolution of lifestyles. What is desirable to one generation can seem odd but tolerable to the one preceding it, yet intolerable and/or bizarre to those who have lived their entire lives in a previous paradigm.

It is a pattern that echoes the way that radical new products spread: the first iPhone was expensive and became a status symbol, but within a few years prices and multiple imitators had made the smartphone accessible to the majority, as much of a ‘must-have’ as the automobile had become in the mid-twentieth century. The radical becomes the standard; the novel taken for granted. Disposable plastics were the norm from the 1950s, but unimaginable at the turn of the century: brittle coal-based Bakelite was available, but not to be wasted. Disposable Gillette steel razor blades, introduced in 1904, were inconceivable half a century before, when steel for the barber's sharpened blades was as precious as platinum is now. Personal computers seen as indispensable today

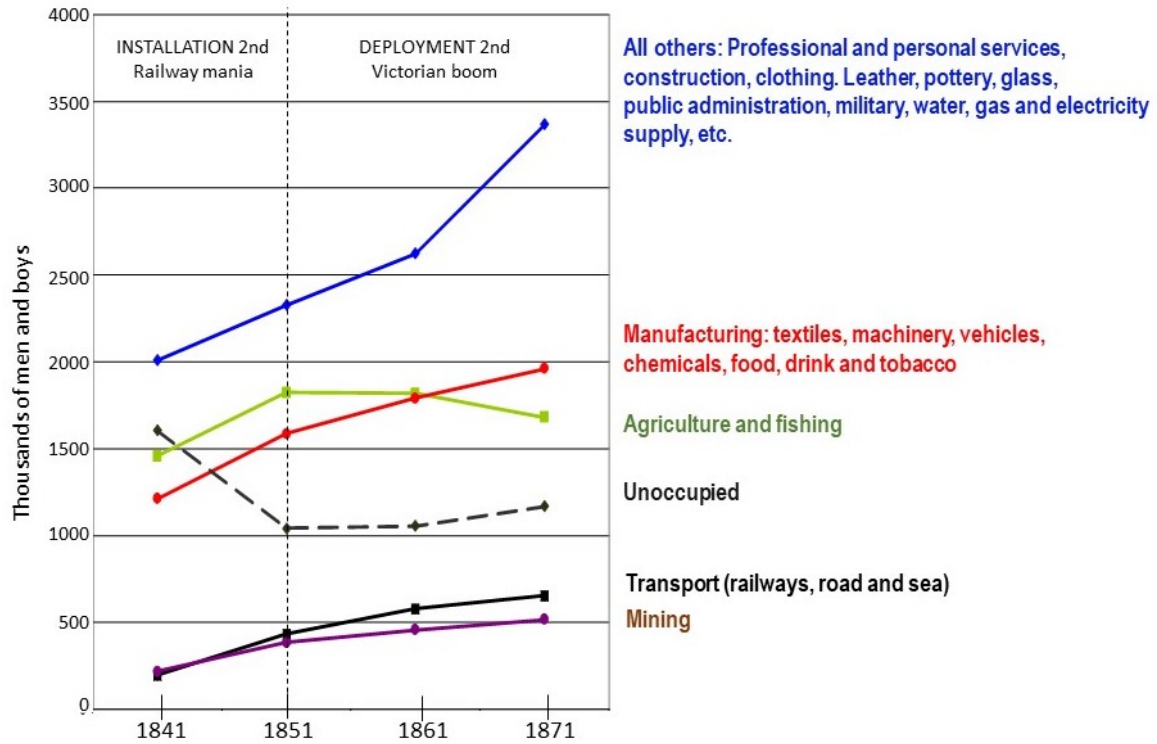
(and even incorporated into our mobile phones) were at first only terminals in big company offices.

It is the coupling of these new innovative products with new innovative ways of living that is key to the lifestyle shift. Their production methods also change applying new technologies, at the same time as the gradual increase in demand results in economies of scale, bringing prices down in a virtuous spiral. As this new lifestyle slowly becomes the model of 'the good life', it shapes the aspirational desires of the majority, guiding innovation trajectories as it gradually spreads across society.

This interconnection of products and lifestyles leads to systemic change, affecting the service economy as well as the production economy. The car as both status symbol and practical mode of transport, for example, needs not just the innovation of the automobile, but petrol stations, mechanics, car insurance and traffic reports. Gardening as a hobby, to give an example not immediately associated with 'innovation', resulted from the practical reality of suddenly having one's own yard – or conversely, no longer having servants – and required the development of seed catalogues, commercial nurseries and garden centres, implements and chemicals. In fact, it is this systemic innovation around new lifestyles that ultimately provides the majority of employment growth for each new technological age. In each period of creative destruction, there has been a focus on the job-destroying effects of the new technologies – from the Luddites to those now warning of a robot takeover. However, these fears are misplaced. For it is not the new industries that are key to most employment, although they are responsible for increasing productivity. It is the demand for new services and supplies around the new way of life that creates massive numbers of new jobs across the economic spectrum (see Figures 2a and 2b).

Figure 2a

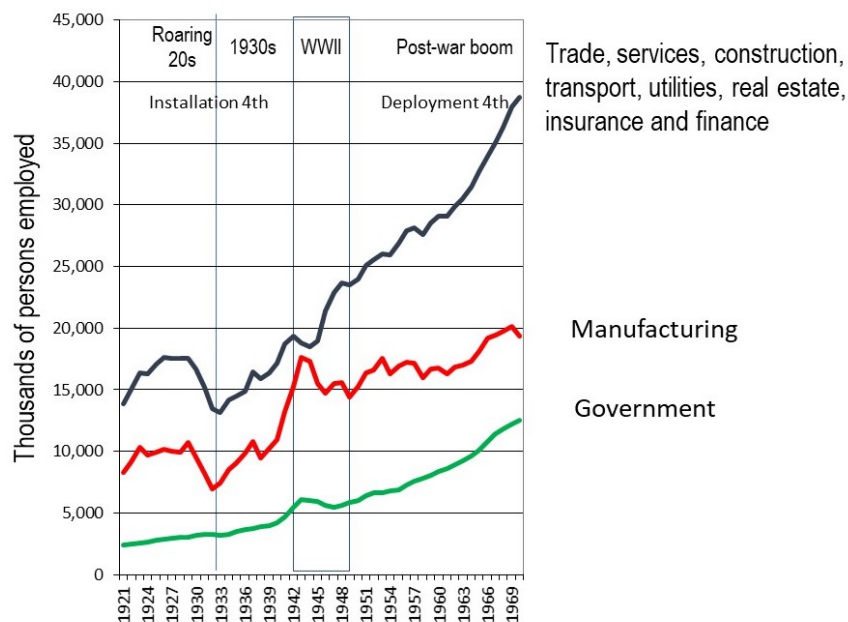
Employment by sector during the Age of Steam and Rail



Source: Mitchell (1988), Table II-2. Based on 1911 census categories; our period indicators.

Figure 2b

Employment by sector during the Age of Mass Production



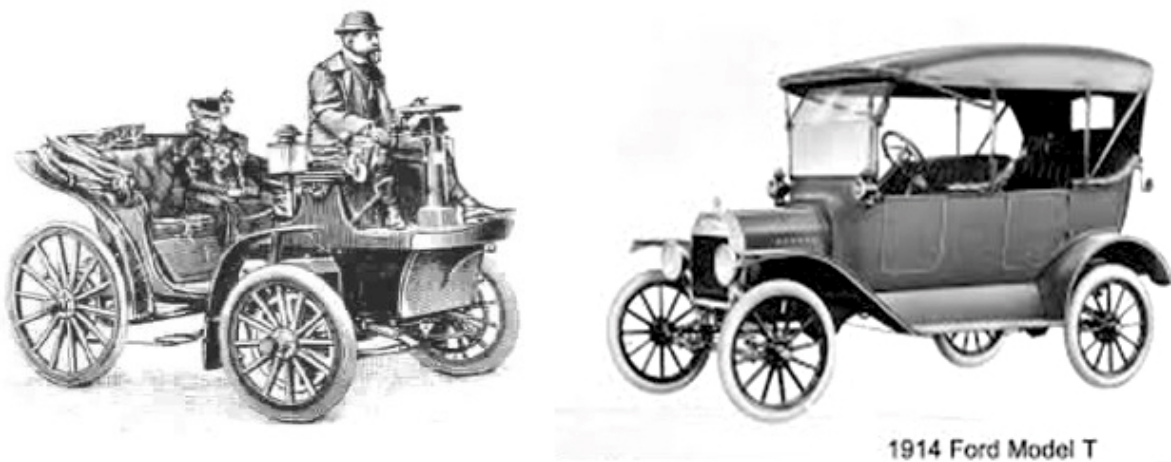
Source: US Department of Commerce, Historical Statistics; our period indicators.

If such demand is encouraged by the setting of a synergistic direction for the appropriate context, this systemic change happens faster and more dramatically. Without direction and context, innovators act at high risk. There were many 'failed' experiments in the Installation years, when – within the potential inherent in the new technology – everything was still up in the air and the 'common sense' of the previous paradigm was still dominant. Nobody today (other than collectors) is using a Sinclair C5. An electric tricycle marketed in the 1980s as an alternative to the use of cars or bicycles, it appealed to neither; it was wrong for the physical context of its time (a cold and rainy Britain dominated by petrol-based cars). Yet it was an early pioneer of today's flourishing electric car market, now underpinned by sustainability concerns and related legislation.

From their niche beginnings, once these changes have spread sufficiently, the new way of living becomes so natural as to appear indispensable, universal and eternal. However, this process takes time. The first automobiles looked like horse-driven carriages (see figure 3).

Figure 3

From the first automobiles to the mass-produced Model-T



Source: De Vries (1971) p. 28. [bilwissedition Ltd. & Co. KG / Alamy Stock Photo] / public domain.

The driver sat as if holding reins, the engine was measured in horse-power and the other parts were made by the same workshops that made the carriages. It takes decades to arrive at a design that is consistent with the essence of the new technology; in the case of the automobile, the first affordable model produced

along lines that we would recognise today was the Model-T Ford, first released in 1908 but mass produced from 1913. Only 8000 cars were in use in the US in 1900, owned by the very wealthy; by 1913, aided by emerging credit system, 485,000 of the world's 606,124 automobiles were sold in the US¹. And it would take yet another 30 years before demand for a car (or two) in every garage was created by the last major lifestyle shift: the suburban lifestyle of standardised mass consumption which, together with the Cold War, fuelled the post-war boom of the twentieth century.

A century earlier, in the age of steam, coal, iron and railways, the shift was to city-based *Victorian living*. This aspirational model was a very different way of life from that associated with the country-based aristocracy. The new British industrial and commercial classes established an urban lifestyle, which spread to elites around the globe. Isolated mansions in the middle of vast estates were eschewed in favour of tall, narrow houses situated next to each other on expensive land. Cities became as crowded with people as the homes were cluttered with decorative objects. Comfort and consumption depended on the many domestic, commercial and professional services provided for the new way of living. With the shared use of public facilities and the maintenance of public health in such crowded conditions issues, that cut across all classes, responsibility for the provision of adequate streets, lighting, water and sewerage systems fell to city authorities – who also implemented early welfare measures around education, health and poverty, in keeping with the aspirational ideology of scientific knowledge and self-improvement. Businesses, large and small, found inexhaustible demand in the growing numbers of city dwellers, who, in turn, served as test bed for export markets.

At the turn of the nineteenth century, in the age of steel and heavy engineering, the Belle Époque in Europe (in parallel with the Progressive Era in the US) encapsulated the good life of the day. During this first period of globalisation, the upper and burgeoning 'professional' classes of the West established a cosmopolitan lifestyle which spread to the upper classes of the world. It was a time of transcontinental travel, a taste for the exotic and of intense flows of information. Newspapers, magazines, pamphlets and book publishing flourished, as did the theatre, opera, museums, galleries and other forms of

¹ Gordon, Robert (2016:2017) *The Rise and Fall of American Growth*. Princeton and Oxfordshire: Princeton University Press

entertainment. Cities grew upward: multi-story buildings housed offices, apartments and hotels, lit by electricity and connected by telephone. However, although a significant layer of skilled workers was able to participate in at least some elements of this 'good life', and the period saw the rise of municipal government and proliferation of some elements of welfare provision (in public health and housing, education and labour regulations, for example), there was still a significant portion of the unskilled working population practically excluded. It was not until the mass-production boom that the aspirational lifestyle of the *American Way of Life* spread to the whole of the working classes of the advanced countries and to the middle classes of the developing world.

The last lifestyle shift: the American Way of Life

To have an idea of the depth of change involved in each of these transitions, and the key role that lifestyle plays, we shall examine this last shift more closely. This is the lifestyle that dominated the twentieth century, which remains as the norm today and is still being copied in the emerging markets. The underlying shift was in energy, going from expensive and scarce to cheap and seemingly unlimited. This appeared in three primary forms: electricity, which powered lighting and home appliances; fuels for automobiles, airplanes and shipping; and materials in the form of cheap petrochemical plastics for all purposes. Previously, electricity was expensive, kerosene and oil were fire-prone and uncomfortable, and materials were dear and not as universally easy to shape and use as the new plastics.

This shift changed almost every aspect of life: from trains, horses, carriages, stage coaches, ships and bicycles to automobiles, buses, trucks, airplanes and motorcycles; from local newspapers, posters, theatres and parties to mass media, radio, movies and television; from ice boxes and coal stoves to refrigerators and central heating; from housework done by hand to household appliances; from the use of natural materials (cotton, wool, leather, silk) to synthetic materials; from paper, cardboard, wood and glass packaging to disposable plastics of all sorts; from fresh food bought daily from specialised suppliers to refrigerated, frozen or preserved food bought periodically in supermarkets; and from urban or country living and working to suburban living separate from work.

But these changes took time. While the potential inherent in the combination of oil, oil-derived plastics, electricity and the automobile was present in the first decades of the twentieth century, the Roaring Twenties were archetypal years of creative destruction, witnessing a glut of unregulated investment (much in construction) eventually turning on itself. Stock prices advanced in a few years as much as they had in the previous three decades, finally crashing in 1929 and initiating the years of the Great Depression. Fears of 'secular stagnation' and of structural unemployment due to labour displacement by the newly installed mass production systems became as widespread as the fears of low growth and robotics are now (Hansen 1938). As the queues grew for soup kitchens in the 1930s, the idea that within twenty years blue-collar workers would have lifetime jobs and fully-equipped suburban homes with cars at the door would have seemed lunacy.

Then, as now, the problem was not a shortage of innovation potential nor potential demand. At this *turning point* in the cycle the problem lies in imaginative and financial constraints, with both investors and politicians still stuck trying to get back to the 'business as usual' of the previous 'market led' prosperity, brushing aside the fact that it was a bubble. It is precisely at this point that the state can step in to play a decisive role: encouraging patient, long-term investment, and supporting a mission-oriented direction for innovation that can best unleash the potential of the new technologies and infrastructures to create a positive-sum game for business and society. In the 1930s, Keynes (1938) and Roosevelt looked to investment in suburban housing to provide a new basis for the economy: the then-affordable automobile and the growing highway system meant that cheap out-of-town land became suitable for commuter living. However, in the US as elsewhere in the West, the case for greater change in the societal structures and policy framework only succeeded after the experience of World War II. War procurement demonstrated the power of mass production techniques for decreasing costs with increasing production quantities and, therefore, the advantage of counting on massive and constant demand.

The post-war boom that followed was a result of a synergistic combination of institutional changes, technological potential and investment. Firms adopted the organisational innovations of Fordism for assembled products, and of continuous processing in the chemicals and food industries. Operating economies of scale, they promoted disposability and, later, planned obsolescence, underpinned by advertising on the new home radios and

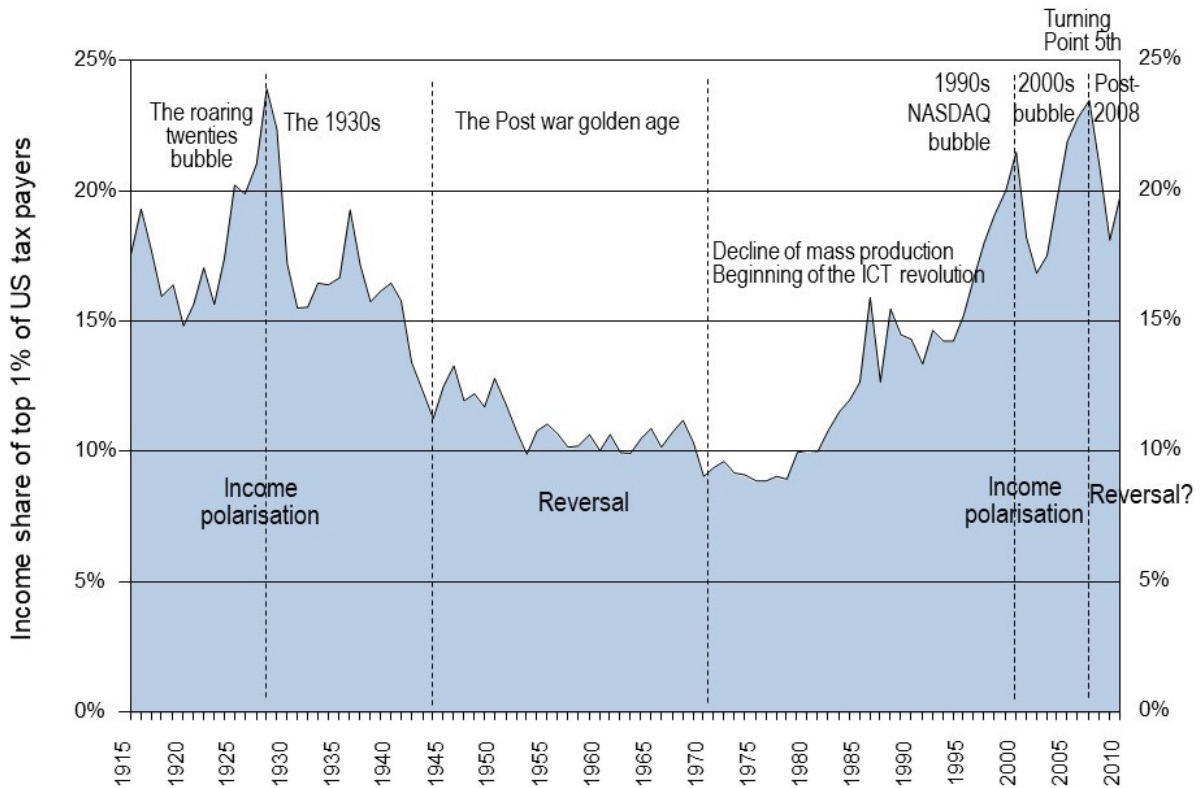
televisions. Such strategies were aided by the creation of international institutions to support stability and global market expansion, such as the World Bank, IMF and the Marshall Plan. But on the demand side, much of the huge economic growth witnessed in the third quarter of the twentieth century was engendered by another key element of the new 'good life': the institutional innovations of the welfare state. The credit system, unemployment and mortgage insurance, labour-union secured salaries, free or subsidised education and health care, and a progressive tax-system that allowed consumers to buy into this new aspirational lifestyle without great risk of personal default. Hence, increasing well-being for the majorities underpinned investment and innovation in mass consumer products and services.

And the economy boomed. While the new high productivity technology in mass manufacturing and mechanised agriculture did destroy many of the jobs from the previous paradigm,² it also created new jobs requiring different skills and demand for new supplies and services that increased employment in complementary sectors and activities. But it was the change in lifestyles, based on home ownership, which created the massive numbers of new jobs across the economic spectrum, from construction to retail trade (see figure 2 above). At the same time, inequality was partially reversed. While in the 1920s in the US, the top 1% of taxpayers received 25% of all declared income – typical of installation periods - their share dropped massively to 10% (See figure 4), with the low-employment but high-productivity industries driving wages up across all sectors and the Welfare State providing short and long-term security for – almost– all. To pay for such conditions, taxes were high across the advanced world; in the US in the 1950s, the top rate of income tax was 90%.

² In the US, jobs in agriculture went from 25% of the employed population in 1920 to a mere 6% in 1970 (US. Dept. Of Commerce. Historical Statistics)

Figure 4

**Percentage of income earned by top 1% of tax payers
(including capital gains) – US 1915-2010**



Source: Picketty and Saez (2010) – our period indicators.

But the advent of a new lifestyle that will lead to a Golden Age is not automatic, nor is it determined by the technologies, although it depends on the range of options they facilitate. The ultimate outcome will be defined by the socio-political choices made to shape them.

The emergent lifestyle shift today

In the early 1970s, when the ICT revolution was beginning, 'going back to nature' was seen as the province of hippies and other outliers. At the time, that particular niche lifestyle was considered almost the opposite of the emerging digital future, one propelled by computer 'nerds' and filled with shiny high-tech gadgets. Yet since then, digital technology has decreased in price and spread across the globe, becoming integral to the lifestyle of the majority. And at the same time, awareness of increasing and converging environmental pressures – resource scarcity, environmental degradation and climate change – has seen

support for 'green' living grow. Far from being oppositional, this aspiration to 'green' combined with the technologies of ICT has in fact resulted in the gradual emergence of what we call a 'smart green' lifestyle.

This new way of life is marked by the desire to reduce pollution and toxicity, to protect the environment and to promote health, to purchase experiences over products and to adopt sharing or rented services rather than permanent ownership of goods, and to aspire to 'networked' creative and collaborative work rather than joining pyramidal hierarchies. Such new practices and new values can already be observed among the educated, the wealthy and the young.³ Good health is a central aspiration, reflected in the rapidly growing market for organic, locally-sourced fresh foods, the surging popularity of cycling as a mode of city transport, and the increasing abundance of exercise apps, personal trainers, physiotherapists, and all other aspects of preventive self-care. Solar panels, 'living' roofs and environmentally-friendly architecture are showpieces for the elite, and no longer reserved for those 'living off the grid'; electric/hybrid cars and energy-efficient appliances are sold at the top of their respective ranges, while those who can't afford the new technology are seen to make do with 'old-fashioned' polluters.

Given the lessons of previous lifestyle adoptions, we believe that enabling, promoting and accelerating this 'smart green' lifestyle as a *direction* for innovation could be the most suitable way to bring about a successful deployment of the ICT age. Currently, 'green', or 'green growth', is used most often to refer to replacing most fossil fuels with renewables, or to the development of more 'environmentally friendly' products. But the notion of 'green' as a systemic policy *direction* is not limited to the energy sector or to a few segments of the economy, just as the suburbanisation/mass consumption direction was not aimed at a single industry or set of industries. As a *direction* for innovation and investment, it encompasses a significant shift in lifestyles and modes of consumption, leading to a shift in materials and product design, and, in this instance, the increasing replacement of tangible goods with services.

Already, we see systemic results of ICT-driven green living: the emergence of a whole range of new jobs, products and processes in personal services, health,

³ Given the current 'elitist' nature of what could eventually become everybody's way of living, Currid-Halkett (2017) presents the whole lifestyle shift at the top in the same way as Veblen did in the 1920s with 'conspicuous consumption'.

education, training, coaching, 'quality of life' goods and services, creative industries, information intermediation, maintenance, rental services, energy conservation, recycling and other climate and resource related activities in the 'green' direction. Though seeming paradoxical, this technology which transgresses spatial borders is enabling a burgeoning demand for the local and the 'traditional' (i.e. not mass produced), particularly in food production and consumption – small-herd cheese, artisan bread, microbrews and so on. In turn, this is generating a whole new layer of production and distribution associated with health, nutrition and – up to a point – community values, which have the potential to multiply geographically. And although the traditional capitalist modes of exchange are likely to prevail (as seen with the rise of Uber and AirBnB), the fact that many of the new local industries are flourishing due to collaborative action and the sharing economy should not be underestimated.

Increasingly, the manufacturers that are trying out sustainable strategies and catering to this emerging market are discovering, in the process, that they are more profitable. Recent surveys by Eurobarometer show that it is a combination of lifestyle adoption and product development that creates a direction for production: they found that the choice of firms to produce green products was mainly – and increasingly – moved by demand, at the same time as adopting resource efficiency was primarily being driven by cost savings.⁴ At a time of slow aggregate growth in Europe and of widespread high unemployment, the eco-industries have globally grown 15% on average (European Commission 2016, p.7).

The interplay of markets and policy in lifestyle changes

While many economists continue to see environmental issues – and sustainability legislation as costly externalities – we argue that enabling the 'smart green' lifestyle is actually the key to economic growth today, with the potential not only to address the environmental degradation of the globe, but to increase jobs and welfare, decrease inequality and drive economic growth.

But as with previous revolutions, this lifestyle needs to be nurtured. The green 'good life' is not yet the aspiration of the world's majorities. The behaviours and ideals of the mass consumption era linger on, even though it is now widely

⁴ See Figures 2 and 3, European Commission (2016)

recognised that there are simply not enough resources on the planet – raw materials, water, air, land – to support that old model across the world.⁵ The global middle class is expected to increase from 1.8 billion in 2009 to 3.2 billion by 2020 and 4.9 billion by 2030 (Pezzini 2012) yet even if only the two currently most dynamic emerging countries – China and India – were to reach full development in the next couple of decades, they could not do so by adopting the old energy and materials-intensive ‘American way of life’. Not only is environmental degradation and resource scarcity causing quality of life issues across the planet, but – at the purely practical financial level - scarcity, pollution and waste disposal are already increasing prices, making cost a further obstacle.

On the supply-side, mass production disposability and high use of energy and materials are still prevalent. The technologies of the ICT revolution have intrinsic characteristics that enable moving society from the logic of cheap energy (oil) to the logic of cheap information; from tangible products and disposability to services and intangible value; from unthinking use of energy and materials to huge savings in energy and materials. So why does the old consumerist model still prevail?

The broad answer is that ‘the market’ cannot operate in policy isolation to make the required radical shift. The full deployment of the enormous wealth-creating potential brought forth by each technological revolution requires, each time, significant socio-institutional recomposition. What is needed is a systemically aligned institutional framework that facilitates interactions between innovations, favours a coherent direction underpinned by the new lifestyle, and eliminates the obstacles to following it. The existing framework, established to handle growth based on the previous set of technologies, is no longer suitable; changes are required in the regulatory framework, along with the redesign of a whole range of institutions, from government through financial regulation to education, to modifications of social behaviours and ideas.

We have already discussed the radical institutional innovations that brought about the post-war prosperity. The Victorian boom (see figure 1) did not fully materialise until two decades after the invention of the steam engine, after a network of railroads had been installed and had brought about a mania that led to a financial panic. Prosperity was unleashed by a whole set of new institutions

⁵ Rockström, J. et al. (2009) ‘Planetary boundaries: exploring the safe operating space for humanity.’ *Ecology and Society* 14:2, 32.

that ordered national markets, regulated banking and finance, and enabled the continued expansion of the railway network and the increasing number of steam-powered factories. The 'Belle Époque', with its truly international markets, required worldwide regulation (from the general acceptance of the London-based Gold Standard to universal agreements on measurement, patents, insurance, transport, communications and shipping practices), while structural changes in production were facilitated by deep educational reforms and social legislation.

It is true that we are on an almost unavoidable path that will eventually force at least a partial adoption of this lifestyle direction in any case. Resource- and fossil fuel energy-intensive consumption will result in rising prices, from raw materials to production and distribution, while the environmental impact of globalised growth is already leading to increasing costs, from health hazards to risk insurance premia. Such increases are likely to result in the geographic relocation and re-specialisation of physical production into optimal local, regional and global networks, and in a shift from tangible to intangibles in the composition of world production. This would imply a redefinition of consumption patterns – exactly what the 'smart green' lifestyle adopters are already doing.

In short, environmental risks – even disasters – could play the role that war and depression did in the previous turning point: the final straw that forces the state to act. Indeed, we have seen portents of the latter in the last decade, with global unrest and the rise of both left and right populism. This turmoil is typical of the turning point years. The irony is that, at present, all the conditions are there for unleashing a truly global golden age of growth. The installation period has left a powerful legacy: the new paradigm has been learned by both producers and consumers, and the new infrastructure (the Internet) has widened and deepened access to consumers and suppliers. The profile of the 'smart green' dynamics of demand can now shape a future 'golden age' – if governments are prepared to tilt the playing field in that direction.

A European Way of Life?

The EU is in a key position to promote future investment and well-being in a smart green direction. With a long history of industrial development, the European nations have already found themselves pushed up against land and other resource limits. EU citizens are culturally acclimatised to environmental

concerns and, at the same time, more or less used to regulatory, socially democratic states. Particularly in the Nordics, where the latter is most true, and in Germany, where the Greens have been very influential politically since reunification, we already see significant legislation in favour of this shift, from local transport programmes to the *Energiewende*, the energy transition considered an integral part of Germany's overall economic strategy.⁶

Such national practices are augmented by Europe-wide 'best practice' sustainability directives, such as the **WEEE directive on recycling or the Waste Framework and Landfill Directives**. The Italian legislation created to meet this directive is a great example of the successful combination of new technologies, the growth of a formally 'niche' lifestyle and the willingness of supranational and national governments to tilt the playing field to encourage industrial synergies. The legislation, which restricted consumers to a choice of long-life reusable carrier bags or biodegradable, compostable bags, has resulted in a 50% reduction of disposable bag use and a 30% decrease of greenhouse gas emissions – while creating jobs along the value chain (from agriculture and chemistry to waste management). As the Expert Group on Green Growth and Jobs for the EU put it:

"Perhaps most crucially, [the carrier bag legislation] has tapped into prevailing public sentiments and supported lifestyle change by providing an easily-adoptable, transitional product choice: 94% of the Italians support the law, demonstrating that consumers are ready to change their habits quickly in order to adopt more sustainable behaviours, when they know that they have a positive impact on the environment and it is easy for them to do so." (European Commission 2016, p.21).

The fact that consumers are willing and able to try out such lifestyle changes is one reason why Europe can become the test bed for smart green innovation. The middle classes in the emerging countries are currently following the *American Way of Life* because it remains the dominant model of the good life. Europe could provide an alternative model to follow: a '*European Way of Life*', a new, sustainable ideal for middle class aspirations that is both exciting and

⁶ Both energy and the economy, traditionally treated as separate government concerns, are in Germany now overseen by the same department: the Federal Ministry for Economic Affairs and Energy (<http://www.bmwi.de/>).

anxiety-alleviating, because it addresses worrying environmental issues while turning them into opportunities for innovation and profitable growth.

At the same time, promoting a direction for smart green lifestyles now would position the EU to take the lead as the markets of the future inevitably move in that direction. On average and together, the European countries have sufficient scientific knowledge, technological know-how, and innovation capabilities to realise that transformation. The region is low in material resources but already high in knowledge, creativity and in the service-intensity of its economy. Home to many of the world's most innovative companies and currently the world leader in environmental technologies, the EU is leading the global market in 'smart green' fields such as health, food, renewable energies, biotechnologies, environmental technologies and transport (European Commission 2013).

A smart green direction therefore would make the most of the European technological capacities by increasing productivity and the durability of its limited resources. It is already well positioned to play a major export role as globalisation leads to increasing demands for the development of sustainable equipment and infrastructure adapted to the needs of the rising developing world; international data illustrate that the number of young and rapidly growing companies in these new markets is larger in the EU than elsewhere (European Commission 2016; fig.5, p.12). Thus adopting policies with the explicit aim of branding 'made in Europe' products and services as a sign of aspirational good living – products that are healthy, safe, environmentally friendly, sustainable (reusable, recyclable), use the most advanced technology and production standards – would attract companies to use the EU as test bed for 'smart green' products and services. And as the new 'green' lifestyles increasingly entice the new millions joining the middle classes across the world, Europe would have the competitive edge in the production of innovative and premium products and services to cater to this new lifestyle.

Conclusion: Policy-making for a smart green future

The role of lifestyle change in the unleashing of innovation and economic growth should not be underestimated. The patterns of history suggest that the golden age of our current technological revolution is yet to come, and that its potential will be shaped not only by business strategies and government policies, but by consumer values. To bring about a golden age the three must be: (a) consistent

with the potential of the technological paradigm; (b) mutually compatible and reinforcing; and (3) a positive-sum game for all participants.

The way to achieve this is to provide a systemically coherent policy framework that will strengthen and accelerate the production and lifestyle changes that are already underway; for the state to set a 'smart green' direction for production and investment, broadly understood as one that leads to a circular low-waste economy, focuses on preventive care and healthy lives, increases the productivity of energy and resources, multiplies the creative industries, and encourages a move from possession to access, and from material goods to intangibles.

Realigning EU policies towards 'green' would provide a driver for growth and jobs and unleash a wave of investment that cannot be achieved with isolated policies within the old framework. Due to the globalising and diversifying nature of digital technologies, the policy space cannot just be at the national level. The state must be operational at the local, national, regional and global levels. Currently, the EU has the edge on the supranational, and is forging ahead of those who would rather bet on the past. We believe that while the past holds lessons, it teaches us that boldly moving forward is the only strategy that has ever really worked.

Bibliography

- Currid-Halkett, E. (2017) *The Sum of Small Things: A Theory of the Aspirational Class*. New Jersey: Princeton University Press
- De Vries, Leonard (1971) *Victorian Inventions*. London: John Murray.
- European Commission (2013) 'Innovation Union Competitiveness Report', Commission Staff Working Document, Directorate-General for Research and Innovation. Available online at: https://ec.europa.eu/research/innovation-union/pdf/competitiveness_report_2013.pdf
- European Commission (2016) 'Changing gear in R&I: green growth for jobs and prosperity in the EU', report of European Commission Expert Group 'R&I policy framework for Green Growth & Jobs', for the Directorate-General for Research and Innovation. Available online at: <https://publications.europa.eu/en/publication-detail/-/publication/893ae121-02cc-11e6-b713-01aa75ed71a1/language-en>
- OECD (2015) 'The Innovation Imperative: Contributing to Productivity, Growth and Well-being'. OECD (2015) System Innovation: Synthesis Report. Available at: https://www.innovationpolicyplatform.org/sites/default/files/general/SYSTEMINNOVATION_FINALREPORT.pdf
- Geels, F.W. (2002) 'Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and case study.' *Research Policy*, 31, 1257-1274.
- Hansen, A. (1938) *Full Recovery or Stagnation?* New York: W. W. Norton.
- Innovation Union Competitiveness Report 2013, SWD(2013) 505
- Keynes, J.M. (1938) 'Private letter to Franklin Delano Roosevelt,' February 1st, 1938, in Moggridge, D.E. (1992) *Maynard Keynes: An economist's biography*. London: Routledge.
- Mitchell, B.R. (1988) *British Historical Statistics*. Cambridge: C.U.P.
- Perez, C. (2002) *Technological Revolutions and Financial Capital: The Dynamics of Bubbles and Golden Ages*. Cheltenham: Edward Elgar
- Perez, C. (2010) "Technological Revolutions and Techno-economic paradigms" in *Cambridge Journal of Economics*, Vol. 34, No.1, pp. 185-202.
- Pezzini, M. (2012) 'An emerging middle class', OECD Yearbook 2012. Available online at:

http://oecdobserver.org/news/fullstory.php/aid/3681/An_emerging_middle_class.html

Piketty, T. and Saez, E. (2003; revised data 2016) 'Income Inequality in the United States, 1913-1998', *Quarterly Journal of Economics*, 118(1), 2003, 1-39 (for data see <https://eml.berkeley.edu/~saez/>).

Rockström, J. et al. (2009) 'Planetary boundaries: exploring the safe operating space for humanity.' *Ecology and Society* 14:2, 32.

Veblen, T. (1899) *The Theory of the Leisure Class: An Economic Study of Institutions*