Chapter 1
From Development as Democracy to Innovation as Development

Elias G. Carayannis

Abstract Current local, regional, and global economic and financial conditions and trends make the need to trigger, catalyze, and accelerate high quantity and quality entrepreneurial initiatives that are based on high quality and quantity innovations. Given the uncertainty and change inherent in the innovation process, management must develop skills and understanding of the process a method for managing the disruption. Technology changes the way society functions. The dramatic advances in technology over recent decades have collaterally precipitated wide sweeping and profound change to the functioning of almost every form of human exchange, the world over. Income inequality in the USA has being growing since the late 1970s, but easy credit and rising asset prices had allowed American households to increase financial leverage to finance consumption. Now an increasing number of academics and intellectuals recognize that the growing income inequality is one of the key aspects behind the financial crash. The first step in understanding how the income redistribution can lead to innovation and help an economy move from a stagnant state into a new sustainable economic growth path is to understand how long-term trends in rising and falling income inequality affect the market environment that firms must survive in. In the late twentieth and the beginning of the twenty first century, numerous scholars and practitioners such as Peter Drucker have identified knowledge as perhaps the sixth and most important key input and output factor of economic activity.

Keywords Democracy • Development • E-development • Equality • Innovation • Sustainable development • Technology

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1.1 Introduction

Developed and developing economies alike face increased resource scarcity and competitive rivalry. Science and technology increasingly appear as a main source of competitive and sustainable advantage for nations and regions alike. However, the key determinant of their efficacy is the quality and quantity of entrepreneurship-enabled innovation that unlocks and captures the pecuniary benefits of the science enterprise in the form of private, public, or hybrid goods (for instance, bio-entrepreneur-millionaires, knowledge for the public good—i.e., public health awareness, and new public–private research centers funded partly by bio-entrepreneur-millionaires and monies levied as taxes on bio-ventures).

Entrepreneurship and Innovation are human endeavors and socioeconomic phenomena that are *intrinsic to human nature* as well as constitute both social and political *engines of positive change and growth*, provided that they are balanced and guided by effective and transparent regulatory and incentive systems in place.

Current local, regional, and global economic and financial conditions and trends make the need to *trigger, catalyze*, *and accelerate high quantity and quality entrepreneurial initiatives* that are based on *high quality and quantity innovations* (low-tech, medium-tech, and high-tech) even more clear and present as this is one of the major ways and means to target and achieve *real, sustainable*, and *eventually accelerating GNP growth*. Such growth is much more likely to come from new and qualitative different and superior initiatives (from "sunrise" industries) rather than restructuring existing (and perhaps "sunset") industries. It may be strategically more prudent to invest scarce and precious resources in carefully calculated strategic "bets" rather than keep throwing them after waning industrial sectors and declining firms, and in that sense, it may be best to provide aggressive socioeconomic retraining, reinsertion, and/or early retirement programs to allow for real growth strategies to be implemented.

Moreover, we believe that the concepts of *robust competitiveness* and *sustainable entrepreneurship* (Carayannis, Elias G. 2008) are pillars of a regime called "*democratic capitalism*" (Carayannis and Kaloudis, 2010) (as opposed to "popular or casino capitalism"), where real opportunities for education and economic prosperity are available to all and especially the younger people (but not only the latter).

This would be the direct derivative of a collection of *top-down policies* as well as *bottom-up initiatives* (including strong R & D policies and funding but going beyond that to the development of *innovation networks and knowledge clusters across regions and sectors* (Carayannis and Campbell, 2006):

- We define *sustainable entrepreneurship* (Carayannis, 2008) as *the creation of viable, profitable, and scalable firms.* Such firms engender the formation of self-replicating and mutually enhancing innovation networks and knowledge clusters (innovation ecosystems) leading towards robust competitiveness.
- We understand *robust competitiveness* (Carayannis, 2008) as a state of economic being and becoming that avails systematic and defensible "unfair advantages" to the entities that are part of the economy. Such competitiveness is built on

mutually complementary and reinforcing low, medium, and high technology, public and private sector entities (government agencies, private firms, universities, and nongovernmental organizations). (see also excerpts from: http://search.barnesandnoble.com/Diversity-in-the-Knowledge-Economy-and-Society/Elias-Carayannis/e/9781847202116/?itm=5)

Existing and new small and medium enterprises (SMEs) that can provide better solutions for less will always be winners—even and perhaps especially in down markets and recessionary economic cycle stages—and this is the area where fiscal, monetary, institutional, intellectual property rights (IPR)-related and other public–private sectors programs and initiatives are needed to help unlock, capture, and leverage fully the value-adding potential of the Greek knowledge creation infrastructure (i.e., universities, research institutions, and private sector research and development (R & D) facilities) by providing incentives and establishing a large number, scale, and scope of pilots connecting organically and effectively all stages of the value adding knowledge chain (from the lab to the market via world-class SMEs that will be both locally and globally oriented by design and the new ones from their inception).

1.2 Innovation as Development

Discovery consists of looking at the same thing as everyone else and thinking something different.

Albert Szent-Györgyi—Nobel Prize Winner 1937

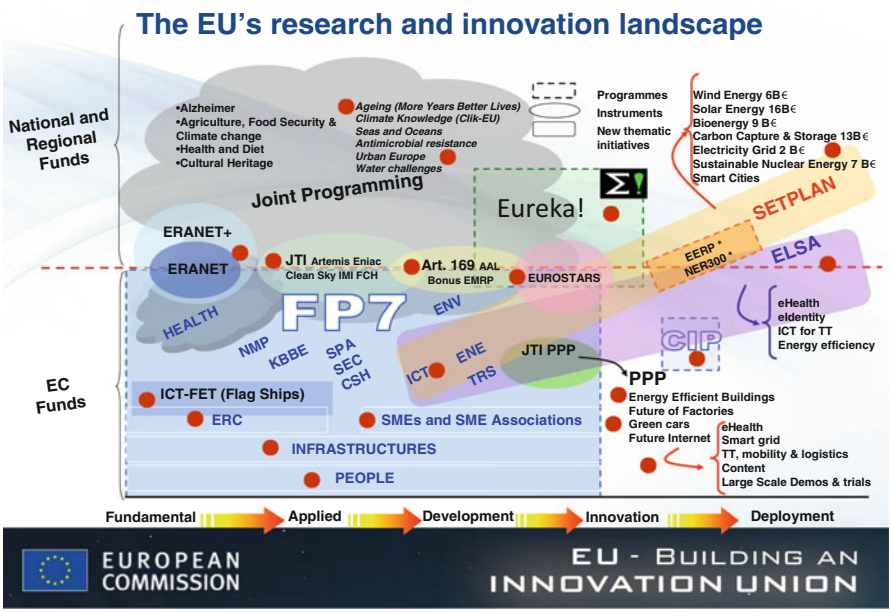

Fig. 1.1 Twenty-first century innovation ecosystem (Carayannis, Diversity in the Knowledge Economy and Society, Edward Elgar, May 2008)

Innovation is a word derived from the Latin, meaning to introduce something new to the existing realm and order of things or to change the yield of resources as stated by J.B. Say quoted in Drucker (Drucker, 1985).

In addition, innovation is often linked with creating a sustainable market around the introduction of new and superior product or process. Specifically, in the literature on the management of technology, technological innovation is characterized as the introduction of a new technology-based product into the market:

> *Technological innovation* is defined here as a situationally new development through which people extend their control over the environment. Essentially, technology is a tool of some kind that allows an individual to do something new. A technological innovation is basically information organized in a new way. So technology transfer amounts to the communication of information, usually from one organization to another. (Tornazky & Fleischer, 1990)

The broader interpretation of the term "innovation" refers to an innovation as an "idea, practice or material artifact" (Rogers and Shoemaker, 1971:19) adopted by a person or organization, where that artifact is "perceived to be new by the relevant unit of adoption" (Zaltman et al., 1973). Therefore, innovation tends to change perceptions and relationships at the organizational level, but its impact is not limited there. Innovation in its broader socio-technical, economic, and political context, can also substantially impact, shape, and evolve ways and means people live their lives, businesses form, compete, succeed and fail, and nations prosper or decline (see Fig. 1.1).

Specifically, Fig. 1.1 attempts to illustrate the nature and dynamics of an emerging globalization framework in which creativity and innovation—as enabler of technological effort in manufacturing and as an engine of industrial development—can lead to improved competitiveness and sustained development. On the other hand, lack of creativity and innovation constitutes a factor for failure in manufacturing

performance and, as a result, is a factor for failure in economic performance, too. For those countries in which creativity and innovation are applied effectively, globalization can be an engine of beneficial and sustainable economic integration. However, globalization can be a powerful force for deprivation, inequality, marginalization and economical disruption in those non-competitive countries.

Government or market success or failure is determined by how they take advantage of the four major elements that shape the setting for creativity, innovation and competitiveness in the globalized world: (1) The coordination and synergy in the relationship between governments, enterprises, research laboratories and other specialized bodies, universities and support agencies for small and medium enterprises (SMEs); (2) The power of information and communication technology; (3) The efficiency that managerial and organizational systems can bring to production and commerce; and (4) The international agreements, rules and regulations. All the four elements of this framework will impact on creativity and innovation at the micro level (firm level) as well as on innovation and competitiveness at the macro level (industry, national, global).

From a business perspective, an innovation is perceived as the happy ending of the commercialization journey of an invention, when that journey is indeed successful and leads to the creation of a sustainable and flourishing market niche or new market. Therefore, a technical discovery or invention (the creation of something new) is not significant to a company unless that new technology can be utilized to add value to the company, through increased revenues, reduced cost, and similar improvements in financial results. This has two important consequences for the analysis of any innovation in the context of a business organization.

First, an innovation must be integrated into the operations and strategy of the organization, so that it has a distinct impact on how the organization creates value or on the type of value the organization provides in the market.

Second, an innovation is a social process, since it is only through the intervention and management of people that an organization can realize the benefits of an innovation.

The discussion of innovation clearly leads to the development of a model, to understand the evolving nature of innovation. Innovation management is concerned with the activities of the firm undertaken to yield solutions to problems of product, process, and administration. Innovation involves uncertainty and disequilibrium. Nelson and Winter (1982) propose that almost any change, even trivial, represents innovation. They also suggest, given the uncertainty, that innovation results in the generation of new technologies and changes in relative weighting of existing technologies (ibid). This results in the ***disruptive process*** of disequilibrium. As an innovation is adopted and diffused, existing technologies may become less useful (reduction in weight factors) or even useless (weighing equivalent to "0") and abandoned altogether. The adoption phase is where uncertainty is introduced. New technologies are not adopted automatically, but rather markets influence the adoption rate (Carayannis, 1997, 1998). Innovative technologies must propose to solve a market need such as reduced costs or increased utility or increased productivity. The markets, however, are social constructs and subject to non-innovation related criteria.

For example, an invention may be promising, offering a substantial reduction on the cost of a product which normally would influence the market to accept the given innovation; but due to issues like information asymmetry (the lack of knowledge in the market concerning the invention's properties), the invention may not be readily accepted by the markets. Thus, the innovation may remain an invention. If, however, the innovation is market accepted, the results will bring about change to the existing technologies being replaced, leading to a change in the relative weighting of the existing technology. This is in effect ***disequilibrium.***

Given the uncertainty and change inherent in the innovation process, management must develop skills and understanding of the process as a method for managing the disruption. The problems of managing the resulting disruption are strategic in nature. The problems may be classified into three groups, ***engineering, entrepreneurial, and administrative*** (Drejer, 2002). This grouping correlates to the related types of innovation, namely, ***product, process, and administrative innovation***:

- *The engineering problem is one of selecting the appropriate technologies for proper operational performance.*
- *The entrepreneurial problem refers to defining the product/service domain and target markets.*
- *Administrative problems are concerned with reducing the uncertainty and risk during the previous phases.*

In much of the foregoing discussion, a recurring theme about innovation is that of ***uncertainty***, leading to the conclusion that an effective model of innovation must include a multidimensional approach (uncertainty is defined as unknown unknowns whereas risk is defined as known knowns). One model posited as an aide to understanding is the Multidimensional Model of Innovation (MMI) (Cooper, 1998). This model attempts to define the understanding of innovation by establishing three-dimensional boundaries. The planes are defined as product–process, incremental–radical, and administrative–technical. The product–process boundary concerns itself with the end product and its relationship to the methods employed by firms to produce and distribute the product. Incremental–radical defines the degree of relative strategic change that accompanies the diffusion of an innovation. This is a measure of the disturbance or disequilibrium in the market. Technological–administrative boundaries refer to the relationship of innovation change to the firm's operational core. The use of technological refers to the influences on basic firm output, while the administrative boundary would include innovations affecting associated factors of policy, resources, and social aspects of the firm.

1.2.1 Innovation Posture, Propensity, and Performance

We develop our conceptual model of organizational innovation from a resource-based perspective of the firm (Penrose, 1959; Barney, 1991). In particular, we draw upon the concept of knowledge as an intangible resource that flows throughout

organizations to render new routines, technologies, or structures that affect future performance (Nelson and Winter, 1982). In order to capture the multilayered influence of organizational innovation, we conceive our framework for innovation routines as a procedural model. We focus on intangible resources that contribute inputs to the innovation process. We examine the firm's capabilities for engaging in innovating activities and finally consider the range of organizational outputs from innovation that spans short-horizon outcomes to long-horizon lasting impacts.

This composite of measures is housed within a "3P" framework for organizational innovation. Innovation emerges from three critical firm-level factors: ***Posture, Propensity***, and ***Performance***.

- ***"Posture"*** refers to an organization's position within the greater innovation system of its environment (i.e., region, industry, technological domain). Specifically, Posture comprises a firm's state along three dimensions: the organizational, technological, and market life cycles, reflecting its readiness to both engage in and benefit from innovation (Damanpour, 1991). It thus identifies the conditions influencing a specific firm within a specific technology regime serving a specific market.
    - Each firm's ability to engage in innovative activities will be constrained by its Posture, which is exogenous to the innovation process being measured. That is, regardless of whether and what type of innovation process is employed, a firm exists at a point in its life cycle from formation to failure (organizational life cycle). The firm also selects technologies to employ in the implementation of its strategies and thus is subject to the state of the technology regime life cycle within which these technologies exist (technological life cycle).
    - For example, a handful of stagecoach companies continued operation for a period of time after the introduction of the automobile and thus their place in the stagecoach technology regime could be measured. Finally, the firm exists on a competitive landscape within significant strategic activities in one or more markets. These markets exist at various points in their own life cycle; therefore, they also constrain the innovative actions available to the firm.
- ***"Propensity"*** is a firm's ability to capitalize on its posture based on cultural acceptance of innovation. In this way, propensity is an intangible reflection of processes, routines and capabilities established within a firm. A firm may possess adequate resources and consequently higher externalized innovation stature, yet have an underdeveloped capacity for innovation due to cultural or other constraints.
- ***"Performance"*** is the lasting result of innovation. This part of the framework comprises three levels: output, outcome, and impact. Outputs occur as the immediate, internalized results of innovation. New product introductions, patents, and technology transfer licenses are among the outputs that emerge. Outcomes include mid-range results such as revenues contributed by new products. Finally, impacts represent more lasting, long-range benefits that accrue to the firm from its innovative competence and are transformed into results for the firm's environment too. Examples of impact performance include status as a top innovator in the industry.

All the three factors—Posture, Propensity, and Performance—are captured empirically in the form of a combinatorial we define as the ***Composite Innovation Index*** (CII). This comprehensive measure demonstrates the superior evaluative results of measuring innovation across all facets of its process in concert (Damanpour, 1991).

1.3 Development as Democracy

Technology changes the way society functions. The dramatic advances in technology over recent decades have collaterally precipitated wide sweeping and profound change to the functioning of almost every form of human exchange, the world over. What emerged in developed economies during the latter years of the twentieth Century is knowledge-based economics—an evolutionary framework of social transaction that now dominates the behavior of mankind in the twenty-first Century.

1.3.1 The Conceptual Framework of Knowledge Economy

> For countries in the vanguard of the world economy, the balance between knowledge and resources has shifted so far towards the former that knowledge has become perhaps the most important factor determining the standard of living – more than land, than tools, than labour. Today's most technologically advanced economies are truly knowledge-based. (*World Development Report, 1999*)

In classical economics, land, labor, and capital are the only factors of production. Knowledge, productivity, education, and intellectual capital are all regarded as exogenous factors, falling outside the system. The New Growth Theory recognizes two additional factors: technology, and the knowledge on which it is based. In today's environment, technology and knowledge are not merely additional factors of production; they have become the key factors of production. Knowledge is the basic form of capital. Economic growth is driven by the accumulation of knowledge and new technological developments create technical platforms for further innovations. These technical platforms, in turn, are drivers of economic growth. Technology raises the return on investment, which is why developed countries can sustain growth and why developing economies cannot attain growth without it. Even with unlimited labor, natural resources, and ample capital, traditional economics predicts that there are diminishing returns on investment. New Growth theorists argue that the non-rivalry and technical platform effects of new technology can lead to increasing rather than diminishing returns on technological investment.[1] Investment can make

[1] The Ministry of Economic Development (2001). The Knowledge Economy: A submission to the New Zealand Government by the Minister for Information Technology's IT Advisory Group, August 1999—What Is the Knowledge Economy? Available: http://www.med.govt.nz/pbt/infotech/knowledge_economy/knowledge_economy-04.html.

technology more valuable and vice versa. The cycle that results can raise a country's growth rate permanently—which contradicts traditional economics.

Earning monopoly rents on discoveries is important to provide incentive to invest in R & D for technological innovation. This is why protection of Intellectual Property Rights (IPR) is fundamental to growth and traditional economics sees "perfect competition" as the ideal. Enhancing human capital is critical for GDP growth, as well. To make investments in technology, a country must have sufficient human capital. Human capital is defined as the formal education, training, and on-the-job learning embodied in the workforce.

"A knowledge-driven economy is one in which the generation and exploitation of knowledge play the predominant part in the creation of wealth" (UK Department of Trade and Industry, 1998). In contrast, during the industrial era, machines replacing human labor created wealth. Nowadays, many people associate the knowledge economy with high-technology industries such as telecommunications and financial services. Actually, knowledge workers are workers who manipulate symbols rather than machines. Architects, bank workers, fashion designers, pharmaceutical researchers, teachers, and policy analysts are all examples of knowledge workers. More than 60 % of US workers are knowledge workers. For knowledge workers, *know-why* and *know-who* matters more than *know-what*. Knowledge gained by experience is as important as formal education and training——lifelong learning is vital for organizations and individuals and its intellectual capital is a firm's source of competitive advantage.

The knowledge-based economy can be characterized as fractal. It is nonlinear, unstable, and stochastic. Like chaos theory, simple algorithms iterated successively yield very complex patterns and interrelationships, as epitomized by the butterfly flapping its wings in the Amazon to trigger a hurricane over the Atlantic months later. The knowledge-based economy creates profit avalanches. Entrance is easy for small, intelligent companies, but there is no space for organic growth; the market is instantly global and a newcomer can attain dominance in 10 years. It also differentiates itself by the convergence of technologies, which removes market sector boundaries: wireless, satellite, cable, and telecom no longer belong to discrete sectors. In a mobile information society, services as well are different, impacted by the presence of Internet, virtual organization, or network transactions. Information and Communication Technologies (ICTs) are enablers of change; they release creative potential and knowledge and open up global markets and foster competition. Network transaction economies resemble the most complex network: the human brain.[2] The digital revolution can be a great equalizer, but national policies must be right to enable it. Proper training and education can make a network transaction economy, or knowledge economy, more effective and efficient: *smarter*.

[2] Routti, Jorma (2003). Research and Innovation in Finland—Transformation into a Knowledge Economy. In *Competitiveness and the Knowledge Economy Research and Innovation Strategies: Cases of Chile and Finland*, presented at the Inter-American Development Bank, Washington, DC.

This elevation requires methodical enhancement of the business development environment, e.g., via business incubators. Advancement also requires enhancement of the network technology infrastructure, i.e., ICT. The state of the art is the virtual incubator, in which ICT extends and multiplies the effectiveness of business incubation at lower cost.

Regardless of externalities, each organization seeks to sustain itself in competition and cooperation with other entities that depend on the same finite pool of resources. The fundamental challenge is the very heart of economic discipline: ***the management and allocation of scarce resources***.

The advantage of the Knowledge Economy is that knowledge grows by sharing—donors do not forfeit what they know when passing knowledge to recipients, who in turn can share with others. The greatest phenomenon of knowledge-based economics is this multiplier effect: ***Sharing knowledge capital actually creates more of it.***

1.3.1.1 Public Policy

Governments have not surrendered their power to capitalism, even if the world's biggest companies are more powerful than many of the world's governments. *Democracy is not a sham. People rule, not profits. Admittedly though, companies would run the world for profit if they could. What stops them is not governments, but markets.* Economic parity arrives when technology allows people to pursue their own goals and they are given the liberty to do so. If technology can support trade across borders, and people choose to trade across borders, integration occurs. Because people have freely chosen it, the outcome is accepted, and because a free market is self-equilibrating, the trade precipitates economic benefits as well. Government must have a long-term commitment to building a market economy, and defending the mechanisms and protections in which a free market thrives.[3]

1.3.1.2 Public Practice

Technology-enabled free trade is an economic equalizer. Governments have power, but they do not always exercise it wisely. They are unreliable servants of the public interest. But limited government is not worth buying Markets keep the spoils of corruption small. Government that intervenes vigorously is worth a great deal. Especially in developing countries with weak legal systems, taming capitalism by regulation or trade protection often proves such a hazardous endeavor.

Central strategic planning works best from a demand-side intervention, enacting and enforcing regulations that enable people to get what they want, while protecting society from harmful, wasteful, or unfair practices.

[3] Ibid.

Historically what fails is central planning of supply-side regulations that specify what people may have, through prohibitions and licensing, by creating surpluses and shortages, or by setting quotas and prices to influence commerce and trade.

Distributed tactical planning works best under the control of the entrepreneurs, organizations, and actors operating in a free-market system. Government and NGOs function best when serving as facilitators and resources, not as managers and operators. If national governments or NGOs disable markets, the economic consequences can be dire, with direct spillover into political and social consequences. Governments must build transnational bridges of collaboration and cooperation, with immediate and long-term long commitment to building a market-oriented economy unimpeded by traditional boundaries.

1.3.1.3 Private Policy

Research and innovation must be managed today to secure sustainability for tomorrow. Open innovation is a policy of collaboration. Companies must manage intellectual property to manage research: they need to access external IP; they need to profit from internal IP. Researchers must be knowledge brokers as well as knowledge generators. Companies can profit from one another's IP. No one company has claim to all the smart people in a field. Competition and collaboration can and must coexist. Open innovation is knowledge diffusion and recombination, producing the "seed corn" of tomorrow's breakthroughs. Researchers must recognize their own potential, and be able to articulate possibilities to a receptive management for further development.[4]

Science-driven academic research is vital to returns. Scientists decide the basic research; industrialists decide the applied R & D. Management culture must encourage risk-taking. Fear of failure suppresses creativity and innovation, which undermines competitiveness. Failure is a great educator. Institutionally, a deviation from plan is an irregularity, but competitively it is creative, innovative, exploratory work. Creativity is essential.[5]

There is tremendous "white space" in market opportunities: new products, new processes, new markets, and new unknowns. Strategic community creation is a calculated alliance of many stakeholders to manage the white-space risk and facilitate adoption.

1.3.1.4 Private Practice

The priorities of new venture formation in the knowledge economy are: ICT and Internet access; linkages to investors and lenders; formation of lean management and advisory boards comprising experienced individuals, competent in their fields

[4] Chesbrough, op. cit.

[5] Routti, op. cit.

of discipline and having as few members as needed to get the job done; and planning and securing facilities.

The priorities of e-Development and sustained growth are as follows: the ability to evaluate and react to risk well; protection of product; stimulation of existing market; the available population of skilled knowledge workers—whether centralized in a physical facility or linked via a virtual organization.

All knowledge workers must have access to the Internet and competency in its use, ample training in computer literacy in addition to their specific technical expertise, and basic computer, math, and language skills. Firms must practice ongoing training to keep skills current; competitive advantage is volatile and requires constant reinforcement.

1.4 Income Inequality

Income inequality in the USA has been growing since the late 1970s, but easy credit and rising asset prices had allowed American households to increase financial leverage to finance consumption. "Let them eat credit" is how Raghuram Rajan summarizes how the political establishment dealt with the growing income inequality in America as he explains how income inequality is a fundamental cause of the current crisis in his book Fault Lines. With the mortgage crisis and the end of easy credit, the fractures in the economy were exposed. Just as Prof. Rajan, now an increasing number of academics and intellectuals recognize that the growing income inequality is one of the key aspects behind the financial crash.

Along those lines, this article also argues that reducing income inequality is a key part of the long-term resolution of this type of crisis. It explores the effects of income redistribution on businesses' innovative behavior, which is essential to helping spark and sustain economic growth.

1.4.1 Income Distribution, the Markets, and Firm's Innovation

The first step in understanding how the income redistribution can lead to innovation and help an economy move from a stagnant state into a new sustainable economic growth path is to understand how long-term trends in rising and falling income inequality affect the market environment that firms must survive in.

In that regard, observe that multinational enterprises (MNEs) are generally good at adapting to different market conditions around the globe to explore their knowledge based assets, and to create new knowledge based assets through innovation. Campino 2010 demonstrates that country income-level variations do impact foreign

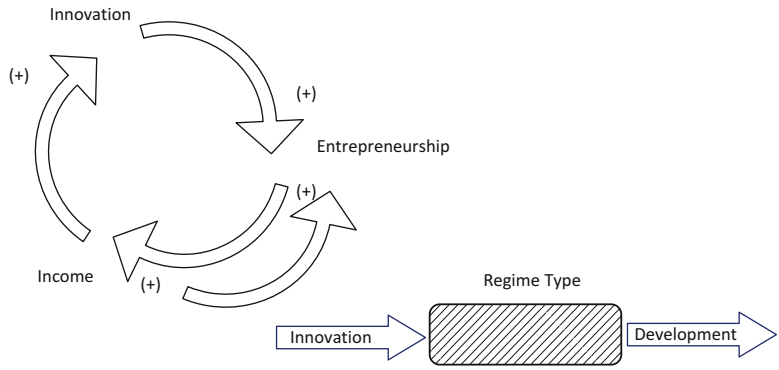

Fig. 1.2 Democracy, innovation development (DID) linkages

direct investments of MNEs, and that in particular MNEs' foreign direct investments behave in a manner that is consistent with that expected of high income elasticity of demand producers (i.e., luxury goods producers).

1.4.2 Preliminary Empirical Validation

At the macro level, innovation can translate into both top-down policies for a more efficient allocation of discretionary resources and a bottom-up increasing level of entrepreneurship. In addition, the type of regime under which a country operates can act as a catalyst or inhibitor of this process (see Fig. 1.2).

This article offers to explore the correlation between innovation and development. For this first attempt, we reduced development to only one of its numerous aspects: income distribution, which we in turn considered as an independent dependent variable.

At the firm level, innovation can be expressed in different ways depending on the time horizon. In the short-term, firm exhibit innovativeness; in the medium-term they exhibit different levels of innovative performance and in the long-term, different levels of innovative competence (Carayannis and Provance, 2007).

Both development and innovation are multidimensional concepts that cannot be easily captured in a single measure. For the purpose of this article, we measure one aspect of development as captured by the income distribution. We accept this limitation and hope to be able to expand our empirical model in future research. In this particular scenario, we were interested in the outcome of innovation, which we chose to proxy with the new-to-firm indicator of the European Innovation Scoreboard, as it measures the turnover of new or significantly improved products or processes to a firm.

Table 1.1 The new to firm measure

High income	*Lower middle income*
Austria	Bulgaria
Belgium	*Upper middle income*
Finland	Hungary
France	Latvia
Germany	Lithuania
Greece	Poland
Ireland	Slovak Republic
Italy	
Netherlands	
Portugal	
Slovenia	
Spain	
Sweden	
UK	

Regarding the New to Firm measure, the following results are for EU countries with a 3-year lag (Table 1.1). The New to Firm measure was available for 2004 and 2006 years only.

1.4.3 Hypothesis 1

Figure 1.3 shows the top 10 decile combinations ranked by R-square plus the combination containing all income-deciles (i.e., M_1023) obtained by regressing NewToFirm lagged by 3-years onto the GDP per-capita of 27 observations spanning 20 countries and 2-years.

There were 510 statistically significant decile combinations with R-square values higher than that obtained from the combination containing all income-deciles (i.e., M_1023) of 16.96 %. Therefore, with regards to H1, for this sample it is possible to reject null hypothesis in favor of the alternative for this sample.

Note that for these 510 decile combinations there was no positive or negative autocorrelation based on the Durbin–Watson test; the distribution of the error terms was statistically not different from normal with the Shapiro–Wilk W statistics close to one, and the error terms exhibit homoscedastic variance.

Observe that Chart 1 shows the prevalence of the individual deciles among these 510 decile combinations. They were dominated in descending order by D10, D9, D8, D7, D6, D5, D4, D1, D2, and D3. Furthermore, note that among the top ten combinations the prevalence of the individual deciles in descending order is given by D8, D9, D10, and D7.

3 year lagged New To Firm - EU

Model	Variable	OLS_Coe	OLS_Pval	OLS TRsq	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
M_4	Intercept	(1.13)	19.690%	17.660%	-	-	-	-	-	-	-	D8	-	-
M_4	GDPCap4	0.10	2.910%	17.660%	-	-	-	-	-	-	-	D8	-	-
M_6	Intercept	(1.15)	19.400%	17.610%	-	-	-	-	-	-	-	D8	D9	-
M_6	GDPCap6	0.10	2.930%	17.610%	-	-	-	-	-	-	-	D8	D9	-
M_2	Intercept	(1.17)	19.140%	17.570%	-	-	-	-	-	-	-	-	D9	-
M_2	GDPCap2	0.10	2.950%	17.570%	-	-	-	-	-	-	-	-	D9	-
M_7	Intercept	(1.24)	18.190%	17.540%	-	-	-	-	-	-	-	D8	D9	D10
M_7	GDPCap7	0.10	2.970%	17.540%	-	-	-	-	-	-	-	D8	D9	D10
M_5	Intercept	(1.27)	17.870%	17.510%	-	-	-	-	-	-	-	D8	-	D10
M_5	GDPCap5	0.11	2.990%	17.510%	-	-	-	-	-	-	-	D8	-	D10
M_3	Intercept	(1.28)	17.750%	17.500%	-	-	-	-	-	-	-	-	D9	D10
M_3	GDPCap3	0.11	2.990%	17.500%	-	-	-	-	-	-	-	-	D9	D10
M_14	Intercept	(1.12)	20.020%	17.490%	-	-	-	-	-	-	D7	D8	D9	-
M_14	GDPCap14	0.10	2.990%	17.490%	-	-	-	-	-	-	D7	D8	D9	-
M_15	Intercept	(1.21)	18.770%	17.470%	-	-	-	-	-	-	D7	D8	D9	D10
M_15	GDPCap15	0.10	3.010%	17.470%	-	-	-	-	-	-	D7	D8	D9	D10
M_12	Intercept	(1.10)	20.560%	17.460%	-	-	-	-	-	-	D7	D8	-	-
M_12	GDPCap12	0.10	3.010%	17.460%	-	-	-	-	-	-	D7	D8	-	-
M_13	Intercept	(1.22)	18.690%	17.420%	-	-	-	-	-	-	D7	D8	-	D10
M_13	GDPCap13	0.10	3.030%	17.420%	-	-	-	-	-	-	D7	D8	-	D10
M_1023	Intercept	(1.08)	21.540%	16.960%	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
M_1023	GDPCap1023	0.10	3.280%	16.960%	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10

TOTAL COMBINATIONS	510	510	510	510	510	510	510	510	510	510
COMBINATIONS CONTAINING DECILE:										
Number	189	187	179	197	240	248	277	337	341	356
%	37%	37%	35%	39%	47%	49%	54%	66%	67%	70%

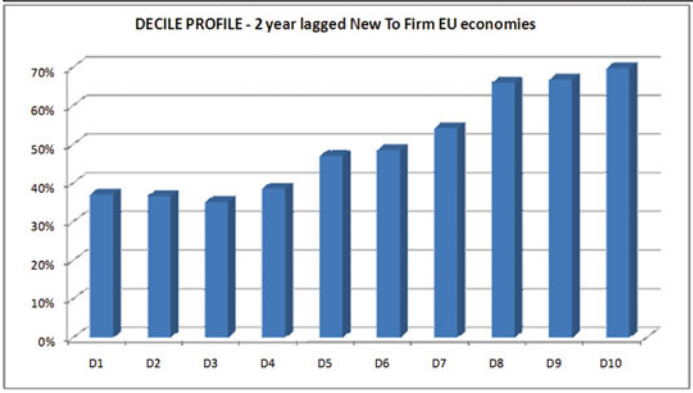

Fig. 1.3 Chart 1—Lag 3—New to firm—EU economies

1.4.4 Hypothesis 2

Regarding H2, for 168 or 33 % of these 510 decile combinations it is possible to fail to reject the null hypothesis, while for 342 or 67 % of these 510 decile combinations it is possible to reject the null in favor of the alternative. Therefore, considering all 510 decile combinations, on average the decile combinations with an explanatory power higher than that of M_1023 have a more equal distribution of income (i.e., have a lower Gini coefficient). Also, observe that all of the top 10 decile combinations ranked by R-square shown in Fig. 1.3 have Gini coefficients lower than that of M_1023.

1.5 Conclusion

Adam Smith defined *land, labor, and capital* as the key input factors of the economy in the eighteenth century. Joseph Schumpeter added *technology and entrepreneurship* as two more key input factors in the early twentieth century. He thus recognized the role and dynamic nature of technological change and innovation as well as path dependencies in shaping the health and future of the economy and moving away from the static approach of neoclassical economics.

In the late twentieth and the beginning of the twenty-first century, numerous scholars and practitioners such as Peter Drucker have identified *knowledge* as perhaps the sixth and most important key input and output factor of economic activity. We would like to also emphasize the role and significance of *technological and economic learning* as a driver of productivity gains and an accelerator of economic growth and prosperity (Carayannis, 1993; 1994; 1998; 1999; 2000; 2001).

The e-Development towards the Knowledge Economy book attempts to address the following issues:

- How could one develop more effective and efficient mechanisms to identify, capture and disseminate critical success and failure factors and findings from ongoing e-Development interventions to enable policy-maker and practitioners to shape, evolve, and implement "smarter" e-Development strategies in real time?
- Namely, how could the most timely, appropriate, and critical e-Development priorities, objectives, and goals be integrated in a strategic context of e-Development sequence, selection, and timing choices?

In this sense, the book should be of interest and use to both public sector policy makers, private sector practitioners and policy makers, nongovernmental organizations, and academics and students of development and the role that technology can play towards catalyzing and accelerating more sustainable, equitable, and effective development interventions.

Comparing and contrasting our analysis of the development cases across developed, transitioning, and developing economies, we note a number of points partly corroborated by earlier conceptual and empirical research. The study and analysis of these, and similar cases, of e-Development towards the Knowledge Economy may provide a conceptual framework that could serve as an integrative bridge between macroeconomic, mesoeconomic, and microeconomic development ideas and themes.

The overarching goal would be to attain the right *socio-technical congruence* between e-Development intervention and the type and stage of development the targeted economy is in bearing in mind the dynamic nature of both e-Development interventions and the economies they aim to advance. In other words, one could identify optimal practices and pathways in economic development in terms of *selection, sequencing, and timing decisions* undergirding e-Development interventions in order to attain a more *functional alignment* between the social, economic, and technological dimensions of the e-Development intervention and the readiness for e-Development (e-Readiness) of the targeted economy or sectors thereof.

Functional alignment implies that an e-Development intervention is designed in such a manner, targeted at such an entry point(s) in the economy and society, and at such a time, that the optimal configuration of critical success factors (buy-in from key stakeholders, awareness, availability, affordability, and accessibility of technology, educational/health/social status of targeted social groups, and support from public and private partners in the form of public–private partnerships (PPP) among several others) will augur strongly in favor of the success of the e-Development intervention in terms of both outcomes and impacts.

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