Silicon Valley, Japan and France: A Comparative Study of Innovation Systems and Policies

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Abstract

In this paper we examine some characteristics of the innovation system and policy in France and Japan. Silicon Valley and California are the most fertile regions for innovation activities and they act as the focus of comparison for the two economies that we will examine in this paper.

As far as France is concerned, it can be stated that the innovation system and policy are under transformation, going from a strong state involvement to a more decentralized framework. This evolution leads to a multi-level governance of the innovation system and to the emergence of new actors.

For Japan, we highlight the important role of a combination of government policies and corporate practices developed during and before World War II, leading to intra-firm and inter-firm cooperation. Innovation is produced by a cooperative context, characterized by government involvement in planning, funding, and structuring the channels through which innovation can flow. This government involvement is accompanied by corporate structures that are responsive to government objectives. This has created a « national innovation ecosystem » that reflects government priorities regarding future growth and global technological leadership.

Keywords: Innovation system, Innovation policy, Silicon Valley, France, Japan

1. Introduction

The study of Freeman (1987) on the Japanese national innovation system stimulated a growing number of contributions to the innovation system (IS) approach at a national but also regional and sectoral level.

Taking into consideration the level of analysis, Edquist (1997) classified academic studies as follows:

- National Innovation Systems (Freeman, 1987; Lundvall, 1992; Nelson, 1993);
- Regional Innovation Systems (Camagni, 1991; Cooke *et al.*, 1997; Braczyk et al., 1998; Cooke, 2001; and Asheim & Isaksen, 1997);
- Sectoral and "technological innovation systems" (Breschi & Malerba, 1997; Carlsson, 1995; Carlsson & Stankiewicz, 1991: Malerba, 2004).

The central idea behind the IS approach is that innovation and diffusion of technology is both an individual and a collective deed. Determinants of technological change are not only to be found within the individual firm, but also within the IS. According to Freeman (1987), IS can be characterized as "….The network of institutions in the public and private sectors whose activities and interactions initiate, import, modify, and diffuse new technologies". Accordingly, the comprehension of innovation process has important implications for the design and implementation of public policy to support innovation.

The implications of the IS approach for public policy are in terms of incentive, focus and instruments. This is why, the academic discussion leaped in the political sphere. The Organization of Economic Co-operation and Development (OECD) played a significant role in promoting the use of the IS approach in the design and implementation of innovation policy in the OECD countries (Godin, 2004). However, as argued by Mytelka & Smith (2002), the IS approach has been quite unsuccessful in making the task of designing policy and proposing policy instruments easier. Chaminade and Edquist (2006) propose a survey of academic research on IS approach and give insights on how innovation system can be handled for innovation policy purposes.

In this context, it is useful to adopt a comparative approach to discuss the role of the government and the interplay between private and public actors in the IS. Therefore, the starting point of the analysis is a geographical area (as in National Systems of Innovation, NSI, or Regional Systems of Innovation, RSI) or an industrial sector (Sectoral Innovation System, SIS)[1].

In this paper, we will provide a critical examination of some important trends and features of innovation activities in Japan and France, using Silicon Valley, California as the basis for comparison. We will provide analysis related to recent characteristics as well as some recent historical accounts.

[1] It is noteworthy that some recent studies stress that traditional methods of IS approach that mainly focus on the structure of innovation systems can be considered as insufficient. Therefore, a new framework is proposed, focusing on analyzing technological change in a dynamic perspective. These studies put forward the concept of *technological system.* The starting point of the analysis is not anymore a geographical area (as NSI or RSI) or an industrial sector (SIS), but a technology. For a discussion see Hekkert *et al.* (2007).

In addition to data and insights pertaining to trends and characteristics of high technology and innovation, we will also use some case studies to illustrate certain important features of recent technology advances. The main *hypothesis* we have for this paper is as follows: Silicon Valley is the founding region of the computer, the internet age and social media. As a technology cluster, it has *repeatedly* changed from one technological paradigm to the next (from mainframe hardware to software to internet-driven tech, big data, cloud computing, social media and apps, etc.). Radical changes and adaptations have become *routines* and are embedded in the *social and business norms* of the Valley. These paradigm shifts are achieved by the rise of very different, new and young corporations (e.g. Hewlett-Packard and IBM are no longer leaders in software or search engines; instead Microsoft and Google have taken their places; Facebook, LinkedIn and Twitter are pioneers in social media and apps). Given that innovation often exhibits *path-dependence* and *persistence* (Rosenberg 1994, Arthur 1994), it is expected that in the near future, Silicon Valley and California will continue to be a global leader in fostering technological changes.

To compare the innovation systems of Silicon Valley, France and Japan, we can observe the following: while in all three cases, government policies and regulations are important, but the main impetus of change in Silicon Valley is *private sector-driven*. For France, despite efforts to localize and decentralize, it is still government ministry-driven and *topdown*. Japan exhibits some very interesting combinations of government involvement in planning, funding, and structuring the channels through which innovation can flow and some creative and adaptive private sector initiatives. One can characterize the Japanese system as a *hybrid* model.

In the next section, we will first highlight some important characteristics of Silicon Valley and innovation activities in California. In section 3, we will propose an overview of the French innovation system and policy and its trends in innovation governance. In section 4, we examine innovation in Japan. In the last section, we conclude.

2. Innovation, Silicon Valley and California

US innovation policy at the national level is influenced by the idea that innovation is primarily the purview of the private sector, aided by universities and government laboratories, not directed by the federal government itself. Under this perspective, the role of the national government is only to facilitate the interactions of these organizations.

The US innovation system is characterized as a structure with high mobility of human resources, strong competitiveness, high capacity network of companies, high risk and capital risk investment, academic excellence. This form of organization is perfectly suited innovation in the information technology sector, the "Silicon Valley model" as the main example, but most of these features are also seen in other sectors.

In this context, in this paper, we propose to take into consideration the charateristics of innovation in the most innovative US State, California and particularly the Silicon Valley rather than the innovation features at the national level.

2.1. Main features of innovation activities in the Silicon valley

According to Rowen and Toyoda (2003) and Fung (2014a, 2015), Fung, Aminian and Tung (2015), the business and economic model of Silicon Valley has some interesting features.

First, there is constant churning with new, high-growth firms. The ecosystem of innovation includes many new start-ups and entrants as well as old established incumbents. There are also world-class research institutes and global universities. In the extended Silicon Valley region, we have Stanford University, University of California, Santa Cruz as well as University of California, Berkeley and University of California, San Francisco. A significant amount of the innovative start-ups are created by professors, graduate students and researchers, many of whom are immigrants from Asia and elsewhere (Fung, 2015, Saxenian, 2002).

To sustain the constant stream of entrepreneurial entries, the firms and start-ups need specialized resources. These specialized resources include risk capital, angel investors, venture law firms, Initial Public Offering (IPO) underwriting firms and organizations that specialized in intellectual property management. To recruit the best talents, the region must have openness to foreign and global talents. It welcomes immigrants from different countries and backgrounds. The Valley is receptive to new ideas and it provides a friendly environment to foreign and new firms.

The business culture and social norms of the region reward risk-taking and they tolerate failures. There are multiple entries and re-entry points in an entrepreneur's careers so that the economic cost of failures would not become prohibitive. The workforce is highly mobile, with job-hopping being one form of technology transfer. There is significant knowledge transfer among businesses, universities and the government. The climate is highly competitive but mainly merit-based.

Networks are important, including universities ties and ethnic connections (Shane and Cable 2002). For example, there are an estimated 60,000 French nationals living in California (Mishkin and Carnegy 2014). There is also a new growing group of Australians in Silicon Valley (Watson 2015). But generally, these networks are mostly open and they tend to lead to productive partnerships. For example, many co-founders of start-ups in Silicon Valley come from the same University. There are constant *creative disruptions* with innovations being increasingly game-changing (e.g. 3-D printing, smart robots, etc.).

2.2. Silicon Valley's performances and trends

The state of *California*, the *University of California* (UC) as well as *Stanford University* are particularly important for innovative activities in *Silicon Valley*. According to Quirk-Silva (2017), California in 2016 was the sixth largest economy in the world. The California economy is tied to trade, tourism, innovation activities, and the movement of human capital and finance (CalChamber 2017, Quirk-Silva 2017). California's top export destination continued to be Mexico in 2016, with an export value of $25.26 billion, about 16% of all California exports. Computers and electronic products remained California's largest exports to Mexico.

California and the UC are leaders in innovation and activities related to intellectual property rights (IPRs) such as patents, copyrights and trademarks (Fung and Fu 2017, Fung 2017a, Fung 2017b). According to the Silicon Valley Institute for Regional Studies (2017), California accounted for close to 25% of U.S. internet-related jobs, about 22% of software jobs, and more than 40% of motion picture jobs. According to Joint Venture Silicon Valley (2018), $9.3 billion of venture capital investment flowed to Silicon Valley and an additional $13.8 billion went to San Francisco companies in 2016. The University of California (UC) system is a leader in contributing innovation. By February 2018, UC research produced 1,803 inventions, on average about *five* a day. The UC system develops more patents than any other university in the nation and it holds 12,420 active US patents. According to the University of California (2018), 1,029 startup companies were formed from UC inventions. Many of the California's leading industries grew from UC research, including biotechnology, computing, semiconductors, telecommunication and agriculture.

According to Joint Venture Silicon Valley (2018), 50% of adults in Silicon Valley have bachelor degrees or above in 2016. Silicon Valley is defined to include Santa Clara County, San Mateo County and parts of Alameda County and Santa Cruz County. In recent years, San Francisco has made significant contributions to high technology, especially in internet-based applications and social media. We thus also include San Francisco in our discussion of Silicon Valley.

The foreign-born population in this region was 37.8%, with 35.1% in San Francisco. In the whole state of California, 27.2% of the people were foreign-born, compared to 13.5% of the whole population of Americans being born outside the United States. These data support the view that in both Silicon Valley and in California, high-skilled immigrants play an important part of the innovation story. In addition, California is increasingly diverse (Fung, Aminian and Tung 2015). According to the United States Census Bureau, in 2017, the population in the state of California was 39.5 million. Non-Hispanic Whites accounted for 37.7%, while Hispanics accounted for 38.9%. Asians, Native Hawaiians and Pacific Islanders amounted to 15.3%. African Americans constituted 6.5%. California is the largest state both by population and by gross state domestic product. It is estimated that since July 2014, Hispanics became the largest ethnic group in California. This highlights two additional features concerning innovation activities: the size and scale of the market (which allows fixed cost to be spread over many units, including research and development R&D expenditures) and the ability of high-technology firms to draw talents from diverse ethnic groups and from all over the globe. Later, we will also highlight how the enlarged size of the population and the size of the internet market made possible by the Belt and Road Initiative can impact digital start-ups.

In 2017, per capita income in Silicon Valley was $112,060. In San Francisco, it was US$102,049. In 2016, patents originated from Silicon Valley and San Francisco accounted for 15.5% of total U.S. patents. Silicon Valley in 2016 had 636 patents granted per 100,000 people, whereas San Francisco had 329 patents granted per 100,000. The largest number of patents was in computers, data processing and information storage. Together with San Francisco, Silicon Valley in 2017 accounted for 38.9% of the venture capital in the United States. In 2014, 11% of the households in Silicon Valley made US$150,000 or more. Value added per employee in 2017 was almost US$200,000 in Silicon Valley.

In sum, California as a state has large market size, with a population bigger than that of Canada (Australian Government 2017) and an economy bigger than that of the Russian Federation (Quirk-Silva 2017, Fung 2017b). Even at the state level, this allows technology companies to serve a big internal market. It has a very high percentage of immigrants, including immigrants from China, Taiwan, Latin America and Europe. It has world-class universities and research institutes, including the *University of California*, which is an important host for research, and technology startups. Within California, Silicon Valley (including Santa Cruz and San Francisco) is the epicenter of innovation and startups. It is even more diverse, highly educated and with high household incomes. It is located near several global universities, including Stanford University, University of California, Santa Cruz, University of California, Berkeley as well as University of California, San Francisco. Silicon Valley and California are the originators of many new inventions. Silicon Valley has many features that enable it to be successful in modern innovation. In Table 1, we examine some of these factors in our "Silicon Valley" model.

Table 1. The "Silicon Valley" Model

Entry Barriers	Relatively easy entry Multiple entry and re-entry points Constant churning of new firms and startups
Networks	University connections Industry-university co-operations Some government-industry and government-university co-operations Ethnic ties including Indian, Chinese and Australian engineers Former employees of high-tech companies
Research Entities	Presence of major research institutes Presence of global research universities, e.g. University of California, Stanford University
Social Norms	Reward risk-taking Tolerate and acceptance of failures Mainly Merit-based Continuous adaptations and changes A youth culture focusing on new paradigms
Ecosystem	Including venture capital, angel investors, engineers, entrepreneurs, scientists, venture law firms, IPO underwriting firms, intellectual property management
Sources of talents	Global search and attraction for talents Immigrants from all over the world, including those from China, India, Australia and France Many high-skilled foreign born entrepreneurs, scientists and engineers

Source: Fung, Aminian and Tung 2015.

One important element of Silicon Valley is constant radical paradigm shifts, with technological deepening and adaptations by some incumbents as well as new firms that are differentiated from the existing pioneers (e.g. in smartphones, Apple and Samsung replacing Nokia and Blackberry). In this new era, a cluster of complementary new technologies has emerged. These include new and powerful applications of the internet---with increased digitalization of many sectors (e.g. e-commerce, e-health, e-finance, etc.), cloud computing, big data, wearable gadgets, e-sharing, smart robots, commercial drones, etc. Many of these technology revolutions are still ongoing, but they are often made possible by the enhanced communicative and computing power and abilities of the internet.

3. *The French Innovation system and policies*

Contrary to the US[2], France has a highly centralized innovation system, involving multiple actors, including political authorities, administrative bodies, public agencies, universities, the private sector, and intermediary organizations.

During the 1980s and 1990s, the French innovation system was still characterized by strong state involvement. The role of the private sector in the public research policy-making process is historically limited because national research policy decisions are centrally controlled. Since the early 2000s, the French innovation system is undergoing deep transformations, coupled with new actors, policies and frameworks, as well as new ways of implementing.

3.1 Structure and Key Actors

3.1.1. Political and governmental authorities

The top levels of the political representative framework, the President of the Republic, the Parliament and the Government, define the national research and innovation policies. Different governmental entities are involved in R&I policy making: the main ones are the Ministry for Higher Education, Research and Innovation (MESRI), the Ministry of the Armed Forces, the Ministry for Solidarity and Health, the Ministry for the Ecological and Inclusive Transition and the Ministry of Ecological and Solidarity Transition, whereas the Ministry of Economy and Finances is also involved in fiscal aspects of R&D policies. Moreover, the High Commission for Investment (CGI), placed under the Prime Minister's authority and in change of the Investments for the Future Programme (PIA), set up in 2010.

The coordination among actors is first achieved through the inter-ministerial R&D budget or MIRES (Mission Interministérielle Recherche et Enseignement Supérieur, the Inter-ministerial budget mission for higher education and research). However, neither the Ministry for Solidarity and Health nor the CGI were integrated within the MIRES. The remodeling in December 2017, of the CGI into SGI and a renewed participation of the MESRI on R&D and innovation decisions of SGI are aimed to achieve a better coordination in the French R&I system.

[2] For a comparison with the US system of innovation see Philip Shapira and Jan Youtie (2010).

Two further advisory bodies are the Parliamentary Office for Evaluation of Scientific and Technological Options (OPECST), created in 1983, and the Higher Council for Research and Technology (CSRT). According to the terms of the act, the OPECST aims "to inform Parliament of scientific and technological options in order, specifically, to make its decisions clear". By mobilizing private sector representatives and experts, OPECST "collects information, launches study programmes and carries out assessments".

Since the beginning of the 1980s, the regional level has gained importance in the French political system, including innovation-related issues. The different French regions do not have legislative power, but they receive part of the national tax income and have a significant budget to spend in their priority areas. Since 1986, French regions are regional authorities with an elected Council (Regional Council) that is responsible for the regional administration.

3.1.2 Intermediate bodies

The Ministry of Research manages the main framework for programming R&D by areas, themes and research organizations. In terms of funding, the role of the government is mainly to provide incentives for collaborative research and measures to support innovation.

Under the patronage of the Ministry of Research, several agencies are responsible for managing a number of funds through the implementation of scientific infrastructures and large project-oriented programs. R&I budgets are based on a number of strategic objectives recently compiled in a National Research Strategy (SNR, 2015) and are implemented through different agencies.

The most important of these agencies for financing public research is the new National Research Agency (ANR) which was created in 2005. The ANR’s mission is to support the development of basic and applied research, innovation and of partnerships between the public and private sectors, and to contribute to the transfer of technology produced by publicly funded research to the private economy. The other agencies are the *Association Nationale de la Recherche Technique* (ANRT), the *Agence de l'Environnement et de la Maîtrise de l'Energie* (ADEME), or the *Agence pour la Diffusion de l'Information Technologique* (ADIT).

OSEO, an agency dedicated to SMEs (Small and Medium Enterprises) and innovation, was a holding with public status referring to the Ministry for Economy, Finance and Employment, and the Ministry for Higher Education and Research, and had the mission to provide assistance and financial support to SMEs in crucial stages of their development, i.e. in the start-up, innovation, development and buy-out phases. In December 2012, OSEO has merged with *CDC Entreprises*[3], the *FSI*[4] and *FSI Régions* to become *Banque Publique d'Investissement* or *bpifrance,* the public investment bank providing funds for business R&D and innovation projects, especially SMEs.

The Agence d'Evaluation de la Recherche et de l'Enseignement Supérieur (AERES) became in 2014 HCERES (Haut Comité de l’Evaluation de la Recherche et de l’Enseignement Supérieur) and has the objective to evaluate public research, while the General Commission for Strategy and Economic Foresight (CNEPI) evaluates innovation policies.

[3]*Caisse des Dépôts et Consignations* (Deposits and Consignments Fund) is a French financial organization created in 1816, and part of the government institutions under the control of the Parliament.
[4] *Fonds Stratégique d’Investissement* is the French sovereign funds set up in 2008.

The Agency for Environment and Energy Management (ADEME) was created in 1991 to support and fund environmental and energy research. ADEME's missions comprise promoting, supervising, coordinating, facilitating and carrying out activities aimed at protecting the environment and improving energy savings.

3.1.3. Public Research Institutions

The main public research actors can be divided into three main groups:

- Public Research Organizations (PROs) are related to the historically important 'Large Technological Programmes', which are mainly government-driven in coordination with Large Public Companies (space, nuclear, energy, transport…). PROs are sub-divided in two main categories:

  (1) Industrial and Commercial Public Institutions (EPICs) like the "Commissariat à l'Energie atomique" (CEA), Ifremer (*Institut Français de Recherche pour l'Exploitation de la Mer*), etc. These institutions are mainly devoted to a specific area of R&D activity such as nuclear, health, information technology, etc., and a significant part of the budget comes from contracts with private sector;

  (2) Scientific and Technological Public Institutions (EPSTs), which are dedicated to academic or fundamental research. The most important French actor in basic research is the National Centre for Scientific Research (CNRS)[5], which covers all the academic disciplines. Specific research demand of government and public authorities is met by public research institutes (government laboratories): INRA, French National Institute for Agricultural Research; INRIA, the National Institute for Research in Computer Science and Control; INSERM, The National Institute for Health and Medical Research …

- Eighty five public Universities financed by the MENESR have, with the same public statute, a function of higher education and research.

- Lastly, within the higher education sector, the "Grandes Ecoles" play a significant role in research, particularly in engineering sciences.

3.1.4. Private Sector

The Private Sector coordinates and represents its interests through industry associations. These include (1) the Mouvement des Entreprises de France (Medef), which is the French Business Confederation providing national representation for all large, medium and small enterprises in industry, commerce and services, and (2) the Assembly of French Chambers of Commerce and Industry (ACFCI), which groups together 155 metropolitan and overseas local

[5] Founded in 1939 by a governmental decree, the CNRS emerged from the National Office of Science (*Caisse Nationale des Sciences*), but its strong development started after WW2.The different CNRS laboratories have their locations all over France. They work on contracts on a four-year basis and are continually evaluated. In 2005 a reorganization process was started in CNRS, giving the institutes' research activities a stronger regional focus. CNRS researchers are civil servants.

chambers as well as the 20 regional chambers. These organizations deal with research policy issues through working groups, advisory groups, participation in decision making bodies (representatives in the boards and orientations committees).

3.2 Research and Innovation Policy

For a long time, the French system of research and innovation was based on state involvement in science and technology, within a triangle of state, academic research, and industry. New forms of state intervention have emerged in the context of the drive for excellence, competitiveness and cohesion in the European Research Area (ERA), which has highlighted the structural gap between science, technology and innovation in France.

3.2.1. Restructuring of the public research and the higher education systems

As far as the public research institutions are concerned, during the 2000s, an important restructuring process has taken place, mainly the reorganization of the CNRS into thematic institutes: the French national institute for health and medical research (INSERM) and the IFSTTAR[6] in 2011. Moreover the missions of the new intermediary agencies, the ANR (national research agency) and the HCERES (evaluation agency), partly cover some of the initial missions of the CNRS. As a whole, the reforms have led to a greater role of the CNRS as a funding agency and a research operator.

The French higher education system has recently known major reforms including the convergence towards European standards under the Bologna Accords (LMD system), the implementation of the law on the Liberties and Responsibilities of the Universities or LRU and the establishment of research and higher education poles (PRES). The LRU law allows the universities to obtain the autonomy in terms of budget and human resources management. At the beginning of 2012, most universities have become autonomous. The current outcomes of the LRU law are still far behind the government's announcements. Efforts are still necessary to improve the governance, the efficiency of expenditures.

3.2.2. Decentralization policy

The traditional viewpoint of centralized policy design and implementation has changed over time and quite intensely during the last decade. The financial context has encouraged the French government to share certain functions relating to science, research and higher education with local and regional authorities, leading to a multi-level and multi-actors governance organization (Muller *et al.*, 2009).

In fact, the Law on Research Orientation (LRO) of 1982 defines a specific role for the Regional Councils in research funding, allows the possibility for public research institutions to have private affiliates, and allows for the creation of public joint venture organizations for

[6]From the merger of the French national institute for transport and safety research (INRETS) and the French public research laboratory (LCPC).

research[7], where private sector representatives can be members of the board. The Regional Councils influence R&D development by providing aid to companies, constituting or supporting research and technological intermediaries (scientific and innovation parks, clusters), establishing innovation and technology transfer centers, providing research allocations, and supporting European activities dealing with these items. However, the intensity of these activities varies across regions because each region makes its own decision on how much of its budget to devote to R&D and innovation. Interactions between public and private sector representatives could be significant at the regional level, facilitated by several organizations[8]that work to bring together the concerned actors.

More recently, another shift in policy can be observed : while the Government still defines the rules of the game, it does not specify implementation mechanisms but does create frameworks that have to be shaped by regional and local configurations. New concepts like "competitiveness clusters" (*Pôles de compétitivité*) program or PRES are designed on the initiative of decentralized actors (universities, territorial communities, and firms). The Competitiveness clusters' concept was launched in September 2004 and announced in July 2005. The initiative aims to strengthen the competitiveness of the French economy by boosting synergies between research institutes, firms and education institutions in a given geographical space. Indeed, cluster has, in a given area, three ingredients (business, higher education and research units) and three key factors (partnerships, R&D projects and international visibility). Collaboration between the cluster members are supposed to contribute to fostering synergies of the sector or technology underlying the cluster. Cluster members can benefit from direct aid, tax incentives and privileges for accessing funding sources[9]. However, the new governement annouced that the government involvement in « competitiveness clusters » will end up in 2020. This decision is consistent with decentralization policy and the emergence of new actors.

Another driver of an increasingly regional dimension to higher education, science and research is the development of the European Research Area (ERA). In this context, France had to support for the Lisbon challenge by raising R&D expenditure to 3% of GDP by 2010. Actually, while an emphasis on *centers of excellence* can be seen, efforts to increase public and private R&D to meet the 3% target have not been achieved in the general context of public budget restrictions.

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[7] "*Groupement d'Intérêt Public*".

[8] Such organizations include: Regional Innovation and Technology Transfer Centers (CRITT), Technological Resource Centers (CRT), which provide scientific and technological services, National Technological Research Centers (CNRT) which bring together public research laboratories and private research centers, and the Network for Technological Development (RDT, *Réseau pour le Développement Technologique*), aimed at sharing information and expertise between 21 regional networks of institutional actors (ANVAR, regional delegations of Ministry of Research, Chambers of commerce and Industry….) with the function of exchanging and providing information to the benefit of SMEs.

[9] See Calamel *et al.* (2010) for an evaluation of the French innovation. This study proposes a longitudinal research, which is based on observation of two collaborative
projects in one of the most largest clusters in France is to discuss management and HR issues.

3.3. Recent R&I characteristics and performances

At €48.6 billion, research and development (R&D) investments in France represented 2.22% of gross domestic product (GDP) in 2015[10]. The trend over time is mainly driven by increasing R&D expenditure in manufacturing industry.

The French government aims to support R&D through tax incentives[11], synergies between research centres, enterprises and teaching institutions, and efficient transfer of the results of publicly performed R&D to private companies.

According to Levratto *et al.* (2018), industrial R&I policy is based on around 63 different direct or indirect government-run schemes, which amounted to approximately €8.5 billion in funding in 2015, supporting (1) industrial R&D (€6.0 billion), (2) tech-transfer (€0.226 billion), (3) R&D networking (€0.613 billion), (4) entrepreneurship (€0.305 billion) and (5) growth (€1.406 billion). Of these policy tools, tax schemes amounted to €6.3 billion in 2015 (74.2%), direct policies amounted to €1.6 billion (19%), equity financing €0.38 billion (4.4%) and loans €0.20 billion (2.3%).

Public research is carried out by public research organisations (PROs) (accounting for 54% of the €16.8 billion non-business R&D expenditure in 2014), higher education institutions (HEIs) (40%), the private non-profit sector (5%) and government departments and other state institutions (1%). HEIs and PROs, including non-profit associations, conduct 35% of French R&D and employ 38% of national researchers. HEIs comprise about 70 universities and 223 “Grandes Ecoles”. In 2014, HEIs employed around 73,000 researchers, and PROs around 28,000 researchers. French PROs are relatively large: the National Centre for Scientific Research (CNRS) (169 European Patent Office (EPO) patent applications in 2016; €3.3 billion in 2017); the Atomic Energy Commission (CEA) with a budget of €2.6 billion in 2016 (for civilian R&D) and 592 EPO patent applications in 2016; the National Institute for Health and Medical Research (INSERM) with a €0.98 billion budget in 2017 and 292 EPO patent applications in 2016; the National Institute for Agricultural Research (INRA, €0.85 billion in 2016). However, between 2013 and 2014, the importance of public research in gross domestic expenditure on R&D decreased in PROs (e.g. CNRS –0.9%) and in HEIs (–0.1%).

As for the private sector, corporate company R&D expenditure increased from 1.29% to 1.45% of GDP between 2008 and 2015. While this proportion is lower than in some leading countries, many French firms are involved in R&D activities: in 2014, 65% of French businesses conducted R&D, which is similar to countries such as the UK (64%) and Germany (67.5%). Business expenditure on R&D stood at €31.7 billion in 2015, which represents about 65% of French R&D. In terms of innovation outputs, 40.9% of French firms introduced product or process innovation in 2012-2014, whereas the EU-28 average is 36.8%. France could be considered as an important innovator in Europe.

After a fall between 2009 and 2013, the proportion of Patent Cooperation Treaty patent filings reached 3.3% in 2015. France is lagging behind the USA, the UK and Germany, with fewer patents filed per firm. French business R&D is concentrated in three main regions : industrial researchers are mainly located in Ile de France (41%) - which hosts the largest population of

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[10] OECD (2017) MSTI data, OECD, Paris. http://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB 6 Eurostat (2017) CIS2014 data: http://ec.europa.eu/eurostat/web/science-technologyinnovation/data/database

[11] Support for Industrial R&D mainly operates through a R&D tax credit scheme (Crédit d’Impôt Recherche, CIR) giving companies a 30% tax reduction up to €100m R&D expenses (and 5% beyond) since 2008.

inventors in Europe -, the Auvergne-Rhône-Alpes and Occitanie regions. According to INSEE (2017), technological innovation is less frequent in Normandy and in the Grand Est region.

The French private sector is playing a greater role, but a stronger start-up culture and a more robust innovation ecosystem need to be nurtured. In Table 2, we examine French innovation in the context of the Silicon Valley model. The system can be characterized by being under transformation, but still government ministries-driven.

Table 2: France and The "Silicon Valley" Model

Factors in a Silicon Valley Model	**French Features**
Entry Barriers	Relatively easy entry but other companies require state sponsorships and political connections and backings Internet-related companies need more mentoring and fostering
Networks	Need stronger industry-university co-operations Some government-industry and government-university co-operations Establishment of Competitiveness Clusters Some "brain drains" and migration of high-tech companies to Silicon Valley as potential sources of networks
Research Entities	Presence of major research institutes Presence of major research universities, e.g. The French Grandes Ecoles
Social Norms	Need stronger reward of risk-taking Need greater tolerance and acceptance of failures A combination of business acumen, political connections and merit-based activities Need faster adaptations and changes A youth culture focusing on adapting and extending paradigms
Ecosystem	Some domestic venture capital, angel investors, engineers, entrepreneurs, scientists, IPO underwriting firms, government ministries Need deeper venture capital market; more mentoring
Sources of talents	Mainly domestic Need more skilled immigrants

4. *The Japanese Innovation system and policies*

The innovation system in Japan is characterized by a combination of government policies and corporate practices, developed during and before World War II, leading to intra-firm and inter-firm cooperation (RIETI, 2004). Innovation is produced in a cooperative context: the government involvement in planning, funding, and structuring the channels through which innovation can flow, accompanied by long-standing corporate structures that are responsive to government objectives. This has created an innovation ecosystem or a "national innovation ecosystem" that reflects government priorities regarding future growth and global technological leadership (Oona *et al*., 2018).

4.1. Government policies

The innovation system in Japan has undergone significant changes since early 1980s.Wakasugi (1986) emphiasizes that prior to the 1980s, the level of government intervention in R&D was relatively small. During the 1980s, Japanese growth and the innovative capacity of Japanese firms improved. Following the recessionary period in the 1990s, Japan endorsed the Science and Technology Basic Law in 1995, which drew a government policy towards science and technology. The policy introduced successive five-year S&T Basic Plans, defining different priority fields and reflecting a number of important objectives including strengthening Japan's scientific and technological capacity and advancing Japan's industrial competitiveness[12]. These policies had been accompanied by a reform of the institutional environment of research and have resulted in increased funding to Japanese universities and national laboratories.

The fifth S&T Basic Plan for 2016 to 2020 identifies sustainable development, climate change, national security and biodiversity as important areas of research. These plans are overseen by the government including the Ministry of International Trade and Industry (MITI), an important coordinator of Japanese industry.

MITI helps companies toward specific goals and encourages cooperation between firms. Once MITI selects an industry and a long-term strategic need that can be addressed by that industry, it provides a number of incentives specially R&D funding.

However, the Japanese innovation system is characterized by large firms with substantial in-house R&D resources dominating private R&D expenditure, with a lack of R&D collaboration between firms and universities (Motohashi, 2011). This is why, The Japanese government has taken several policy actions to facilitate "open innovation processes". Japan

[12] "Under this law, the Japanese government produces a five-year Science and Technology (S&T) Basic Plan. The first plan covered 1996–2000, the second 2001–2005), and the third 2006–2010. The fourth plan covers 2011–2016. This plan, approved by the Japanese cabinet, serves as a linchpin of science and technology policy in Japan. Under the S&T Basic Plan, the government set a goal of public spending on R&D of 17 trillion yen for the five-year period of 1996–2000, 24 trillion yen for 2001–2005, and 25 trillion yen for 2006–2010. The amount for 2011–2016 also totals 25 trillion yen. It should be noted that this is a goal for R&D spending, and is not binding on the government. The public R&D spending during 2006– 2010 was 21.6 trillion yen, 86.4% of the targeted 25 trillion yen." (Motahashi, 2011).

established R&D consortia in an effort to encourage the diffusion of research to participating firms. This Government-initiated consortia is quite similar to the French initiative to make better cooperation between the private sector and universities in order to enhance the diffusion of academic research. The Japanese government provided tax breaks to companies that cooperated. Branstetter and Sakakibara (2002) find that the establishment of R&D consortia have had positive effects on innovation of participating firms in Japan and brought together firms that had complementary research assets to work on projects with shared R&D.

In 2006, the Japanese Prime Minister Shinzo Abe introduced the “Innovation 25” initiative which reflected the government’s goal to increase international relevance of Japanese innovation. According to Stenberg and Nagano (2009), the initiative suggested that innovation policy needed to be focused on solving problems such as climate change and meeting the needs of Japan’s citizens.

In recent years, Japan has also introduced policies that are increasingly focused on fostering start-ups and developing new sources of funding for research and investment. As a matter of fact, Japan’s system of innovation can be characterized as being *in-house-oriented* and mainly driven by large corporations, but external collaboration in R&D has been increasing in Japan since the 2000s. This activity has mainly been occurring in small and medium-sized companies, however, and intra- or inter-firm innovation is still the norm within large corporations (RIETI, 2004).

According to Motahashi (2011) another important innovation issue for Japanese companies is globalization od their activities: “Countries such as China and India are growing in importance, not only because of their attractive markets but also as a source of human capital for R&D. Global US and European enterprises are becoming more active in R&D activities in China and India in order to take advantage of the research resources in those countries. In contrast, Japan is caught in a vicious cycle of macroeconomic contraction, constrained R&D investment, weakening international competitiveness, and declining performance. The key to breaking this cycle lies in the globalization of innovation.”.

4.2. Other key actors

About 77% of Japan's R&D is done by large corporations, putting it among world's largest corporate R&D investors, and 98% of that research is self-financed (OECD, 2012). Japan has one of the most R&D-intensive economies, with about 3.28% of GDP going to gross domestic expenditure on research and development, while the world average is only 2.23% of GDP (World Bank, 2018).

Japan’s R&D activities primarily occur in three sectors: industry, universities, and national research institutions. While each of these sectors play special roles in facilitating innovation and R&D activity, they interact with each other to form a cooperative system characterized by heavy government involvement. This has been described as an “in-house development principle"; many other countries (including the United States) rely on a network-type system (OECD, 2006).

As far as Universities are concerned, after reforms in 2004, national universities were "reorganized as corporations" with the aim of improving each university's autonomy to enhance education and research activities (Higher Education in Japan, 2008). According to Ranga et al. (2017), the role of universities has changed in Japan since the adoption of the 1995 Basic Science and Technology Plans, in order to led to the formation of a dense network of university-industry collaboration efforts. The second Basic Plan made national universities independent from MEXT. The fourth and fifth S&T Basic plans have emphasized the important role played by researchers in engineering innovation-based growth.

The structure of R&D activity in Japan includes a number of different national research institutes including the National Institute of Materials Science (NIMS) and the National Institute of Advanced Industrial Science and Technology (AIST).

MEXT, along with other ministries covering the areas of health, agriculture, telecommunications, environment, and transportation, have played a key role in determining the direction of S&T and allocating government funds[13].

The government has played a central role in Japan's R&D efforts, and the resulting structure encourages research in priority areas. Following the passage of the 1995 Science and Technology Basic Law, the first Science and Technology Basic Plan (1996 to 2000) emphasized not only an increase in the budget for research, but greater collaboration between universities and industry. Turpin and Krishna (2007) find that the Japanese research system experienced a rapid change that included the development of new industry-science links.

Japan's public research system now primarily focuses on applied and experimental R&D (70% of public expenditures) and mostly uses public labs (41%) (OECD, 2012).

Small startup firms do not make up a significant part of R&D because it is relatively hard for them to accumulate the necessary capital.

[13] R&D budgets are divided into two major departments, considered as important in the process of production and distribution of knowledge. The distinction between these two departments is based on the distinction between the knowledge base and the industrial technology that meets the needs.
MEXT: Ministry of education, culture, sports, science and technology. It receives 63%of science and technology budgets.
METI: Ministry of economy, trade and industry former MITI) which has 17% of research budgets.

4.3. Recent R&I characteristics and performances

According to Japan Economy Profile (2018), in 2017, 1% of Japanese GDP came from the agricultural sector, 29.7% from the industrial sector, and 69.3% from the service sector. However, most Japanese innovation occurs in the industrial sector.

Japan is characterized by *technology-intensive* firms that are global leaders in technological innovation, mainly in the motor vehicle, pharmaceutical and electronics industries.

Japan is a leader in the electronics industry, particularly in the fields of robotics and artificial intelligence. Japanese firms innovate at all levels of electronics production, positing novel solutions to the problems posed by everything from the manufacturing process, to team development. One driver of these innovations is the aging population, which demands robotic substitutes for human care and companionship, and better medical technology. Robots are also useful to substitute for labor force, leading to further increasing demand for robots.

Japan demonstrates global leadership in many *technology-* and *knowledge-intensive* industries. According to OECD (2017), Japan is also an important driver of the digital transformation as measured by patent applications in the field, and has rapidly rolled out its digital infrastructure, including high-speed fibre networks.

Even though there no project of nationally structured regional clusters, three regions/cities appear to be seeking future economic growth through innovative activity.

Tokyo appears to be an important center of internet innovation in Japan. The success of Tokyo in attracting and sustaining innovative activities is explained by its size and the central role it plays in Japan's transportation network. Its Akihabara electronics district played a role in the development of important software, while nearby Tsukuba Science City is "home to more than 60 national research institutes and boasts half the national research budget" (Wells, 2017); Tokyo's Shibuya district was the center of start-up activity during the dotcom boom.

Kyoto is reclaiming an established status through its work to define itself as an attractive location for innovation. Kyoto "was the political, economic, and cultural hub of Japan for over a millennium" (Ibata-Arens, 2005), and currently possesses a "self-sustaining core of innovative firms - a critical mass reached by the 1990s" (Ibata-Arens, 2005). Local innovators benefit from the presence of Kyoto University, which has "long-standing ties to private industry, with a number of enterprise spin-offs [resulting] from these synergies" (Ibata-Arens, 2005). The "Kyoto Model" of innovation relies on this nexus of favorable, mutually reinforcing social, political, and economic conditions. From this viewpoint, Kyoto can be considered as a *cluster*.

Last but not least, Fukuoka has adopted new policies that favor innovation. Chin (2016) stresses that Fukuoka is pursuing innovation-induced growth with the "Startup City Fukuoka Declaration," a six-step plan. This plan consists of "tax reduction schemes, where taxable income is reduced by 20% for five years," the attraction of foreign talent through "a startup visa which provides entrepreneurs with a six month window to establish their business," the provision of subsidies (loans and financial aid for entrepreneurs who want to rent space), business plan pitching contests (with awards for winning ideas and further financial aid), “a culling of regulation to make the city more business friendly,” and “urban development with private companies to make the city more conducive for businesses”. The city’s efforts seem to be efficient as far as Fukuoka boasts the highest annual growth rate of start-ups and the highest share of young people interested in starting a business among Japan’s 21 major cities, and saw its number of young residents increase by almost 20% between 2010 and 2015 (Springer, 2016).

In Table 3, we examine Japanese innovation in the context of the Silicon Valley model. The system can be characterized by being under transformation, but composed by a set of government policies and corporate practices, creating an innovation ecosystem wich favors future growth and global technological leadership.

Table 3: Japan and The "Silicon Valley" Model

Factors in a Silicon Valley Model	**Japanese Features**
Entry Barriers	The Japanese market is dominated by large corporations in relatively technology intensive industries. Firms that dominate the economy and the R&D sector function like oligopolies in their respective industries, this is the economic and cultural legacy of the *zaibatsu*'s extensive self-financing Relatively limited access to capital for startups
Networks	In-house development principle Collaboration between universities and industry is week of informal Needs development of start-up firms and supportive mechanisms which encourage entrepreneurial activity Needs capital and managerial support to boost venture capital efforts and to develop networks among Japanese entrepreneurs, investors and research institutions
Research Entities	The role of universities is low because their research is applied internally and the overall business R&D in the large companies have been guided by the government. Presence of major research institutes: National Institute of Materials Science (NIMS), the National Institute of Advanced Industrial Science and Technology (AIST). Presence of major research universities
Social Norms	Low rates of entrepreneurial activity, but high rates of innovative capacity, as measured by patent rates per population
Ecosystem	There is a set of government policies and corporate practices, which encourage intra-firm and inter-firm cooperation. There is a cooperative context with a government involvement in planning, funding, and structuring the channels through which innovation can flow, combined to corporate structures that are responsive to government goals. Exitence of a "national innovation ecosystem" reflecting government priorities to promote future growth and global technological leadership
Sources of talents	Mainly domestic Need more skilled immigrants and external collaboration in R&D

5. Concluding remarks

In this paper, we provide a comparative analysis of the French and Japanese innovation systems, using Silicon Valley, California as a benchmark. We argue that despite attempts by the French government to decentralize and to localize, the innovation system in France is still mainly driven by different important government ministries. There are interesting policies and new actors, including the creation of competitiveness clusters. The French private sector is playing a greater role, but a stronger start-up culture and a more robust innovation ecosystem need to be nurtured. The system can be characterized by being *under transformation*, but still *government ministries-driven.*

In contrast, Japanese innovation system is characterized by interactions between different actors. Each of them directly or indirectly involved in the production and transfers of knowledge. The role of the private sector is important regarding the production of innovation and Japan is characterized by *technology-intensive* firms that are global leaders in technological innovation. Japan's system of innovation can be categirized as being *in-house-oriented* and mainly driven by large corportions, even tough external collaboration in R&D has been increasing in Japan since the 2000s. This activity has mainly been occurring in small and medium-sized companies, however, and intra- or inter-firm innovation is still the norm within large corporations. The system in Japan can be viewed as a *hybrid model*, where the government is involved in planning, funding, and structuring the channels through which innovation can flow, combined with corporate structures that are responsive to government objectives. This has created a « national innovation ecosystem » that reflects government priorities regarding future growth and global technological leadership.

Ultimately, the benchmark of comparison is still Silicon Valley, with its dynamism, robust innovation system and a strong start-up culture. Silicon Valley is also blessed with world-class research universities, including the University of California and Stanford University.

References

Aminian N., Fung K.C., (2017), "Silicon Valley, France and China: A Comparative Study of Innovation Systems and Policies", Journal of Chinese Economic and Foreign Trade Studies, Vol. 10 Issue: 3, pp.194-214, https://doi.org/10.1108/JCEFTS-05-2016-001.

Asheim B. T., Isaksen A. (1997) Location, agglomeration and innovation: towards regional innovation systems in Norway, European Planning Studies 5(3), 299–330.

Berzina, Leva and Paul van Bommel, 2009, "Behind the Internet Business Models: An E-Health Industry Case," Copenhagen Business School, January.

Braczyk H.-J., Cooke P. and Heidenreich M. (Eds), (1998), Regional Innovation Systems; The Role of Governances in a GlobalizedWorld. UCL Press, London.

Branstetter, Lee and Mariko Sakakibara (2002). "When Do Research Consortia Work Well and Why? Evidence from Japanese Panel Data." American Economic Review, Vol. 92, pp. 143–159

Breschi, S. and F. Malerba, (1997), "Sectoral Innovation Systems: Technological Regimes, Schumpeterian Dynamics and Spatial Boundaries". Systems of Innovation: Technologies, Institutions and Organizations. C. EDQUIST. London, Pinter: 130-156.

CalChamber, 2017, "Memo on NAFTA to Members of the California Congressional Delegation," by Susanne Stirling, Vice President of International Affairs, California Chamber of Commerce, June 12, Sacramento, California.

Calamel L., Defélix C., Picq T., Retour D., (2010), « Inter-organisational projects in French innovation clusters: the construction of collaboration", Cahier de recherche n 2010- 01 E1.

Camagni, R., Ed. (1991). Innovation Networks: Spatial Perpectives. London, Belhaven Press.

Carlsson, B., Ed. (1995). Technological Systems and Economic Performance: The Case of Factory Automation. Dordrecht, Kluwer Academic Publishers.

Carlsson, B. and R. Stankiewicz (1991). "On the Nature and Composition of Technological Systems." Journal of Evolutionary Economics 1(2): 93.119.

Casper, Steven, 2007, "How Do Technology Clusters Emerge and Become Sustainable? Social Network Formation and Inter-Firm Mobility Within the San Diego Biotechnology Cluster," Research Policy, 36, 438-455.

Center for Continuing Study of the California Economy, 2014, "California Once Again the World's 8th Largest Economy," July, Palo Alto, California.

Chin, Charlene, (2016), "Why Has Fukuoka Launched Startup Cafes?" GovInsider (blog), July 21, 2016. https://govinsider.asia/digital-gov/why-has-fukuoka-launched-startup-cafes/

Cooke, Philip, Mikael Gomez Uranga and Goia Etxebarria, (1997), "Regional Systems of Innovation: Institutional and Organizational Dimensions", Research Policy, 26, 1997: 475-491.

Cooke P. (2001), "Regional innovation systems, clusters, and the knowledge economy", Industrial and Corporate Change, 10(4), 945–974.

Chaminade Cristina, Edquist Charles, (2006), "From theory to practice: the use of systems of innovation approach in innovation policy", In *Innovation, Science, and Institutional Change: A Research Handbook*, Chapter: 7, Publisher: Oxford University Press, Editors: Jerald Hage, Marius Meeus, pp.141-162

Dosso M. (2014), "Restructuring in France's innovation system: from the mission-oriented model to a systemic approach of innovation", LEM Working Paper Series, Institute of Economics ScuolaSuperioreSant'Anna, Italy.

Edquist, C. (1997). "Systems of Innovation Approaches - Their Emergence and Characteristics". Systems of Innovation: Technologies, Institutions and Organizations. C. EDQUIST. London, Pinter.

Edquist, C., Ed. (1997). Systems of Innovation: Technologies, Institutions and Organizations. London, Pinter.

Fallick, Bruce, Charles Fleischman and James Rebitzer, 2006, "Job-Hopping in Silicon Valley: Some Evidence Concerning The Microfoundations of a High-Technology Cluster," The Review of Economics and Statistics, 88(3): 472-481, August.

Freeman, C. (1987). Technology Policy and Economic Performance: Lessons from Japan. London, Pinter.

Fung, K.C., Nathalie Aminian, Maggie Fu and Iikka Kornhohen, 2017, "Internationalization of the use of Chinese Currency: Perspectives from the New and the Ancient Silk Roads," Journal of Chinese Economic and Business Studies, December, pp.1-16.

Fung, K.C., Nathalie Aminian and Chris Tung, 2015, " Some Characteristics of Innovation Activities: Silicon Valley, California, China and Taiwan," Economic Change and Restructuring, DOI 10.1007/s10644-015-9162-x, available on line.

Fung, K.C., 2014a, "'Silicon Valley' Model," Lecture Notes, EMBA-Global Asia, London Business School, Columbia University Business School and University of Hong Kong Business School.

Fung, K.C., 2017a, "Silicon Valley Model," Lecture Slides, London Business School-Hong Kong University Business School-Columbia Business School EMBA-Global Asia, Asian Business and Economics.

Fung, K.C., 2017b, "Digital Trade: California, Mexico and NAFTA 2.0," in NAFTA and the Future of U.S.-Mexico Relationship, ed. Melissa Floca, Mexico Initiative, University of California.

Fung, K.C., 2017c, "Culture, History, Business and Economics: Journey to the West and Silk Road," Lecture Slides, London Business School-Hong Kong University Business School-Columbia Business School EMBA-Global Asia, Asian Connectivity: Silk Road, Regions, Clusters and Organizations.

Godin, B. (2004). "The New Economy: What the Concept Owes to the Oecd." Research Policy 33(5): 679-690.

Gupta, Atul and Glen Thomas, 2001, "Organizational Learning in a High-tech Environment: From Theory to Practice," Industrial Management and Data Systems, Volume 101, Issue 9, pp. 502-507.

Hekkert M.P., Suurs R.A.A., Negro S.O., Kuhlmann S., Smits R.E.H.M., (2007), "Functions of innovation systems: A new approach for analyzing technological change", Technological Forecasting & Social Change 74 (2007) 413–432.

Hellmann, Thomas, (2000), "Venture Capitalists: The Coaches of Silicon Valley," mimeo, Graduate School of Business, Stanford University, Palo Alto, CA.

Ibata-Arens, Kathryn, (2005), Innovation and Entrepreneurship in Japan : Politics, Organizations, and High Technology Firms, Cambridge University Press. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/reed/detail.action?docID=244076

INSEE, (2017), L'information-communication et l'industrie sont les secteurs les plus innovants entre 2012 et 2014, INSEE Premiere, No 1635, Fevrier. Including CIS2014 data. Available at: https://www.insee.fr/fr/statistiques/2676243?sommaire=2676252

"Japan." Innovation Policy Platform. Accessed April 3, 2018. https://www.innovationpolicyplatform.org/content/japan

Joint Venture Silicon Valley, 2018, "Silicon Valley Indicators," Silicon Valley Institute for Regional Studies, San Jose, California.

Krcmar, Helmut, Marcus Bohm, SaschaFriesike and Thomas Schildhauer, (2011), "Innovation, Society and Business: Internet-Based Business Models and Their Implications," mimeo, Alexander von Humboldt Institute fur Internet und Gesellschaft.

Levratto, N., Lhuillery, S. , Zacharewicz, T. (2018), RIO Country Report 2017: France, EU Commission.

Lundvall, B.-A., Ed. (1992). National Systems of Innovation. Towards a Theory of Innovation and Interactive Learning. Londres, Pinter.

Madill, Judith, George Haines and Allan Riding, (2005), The Role of Angels in Technology SMEs: A Link to Venture Capital," Venture Capital: An International Journal of Entrepreneurial Finance, Volume 7, Issue 2.

Malerba , F., Ed. (2004) Sectoral Systems of Innovation: Concepts, Issues and analyses of Six Major Sectors in Europe, Cambridge, Cambridge University Press.

Medina, Jose, (2013), "Fast Facts on the California Economy," Assembly Committee on Jobs, Economic Development, and the Economy, State Government of California, Sacramento, California.

Mishkin, Sarah and Hugh Carnegy, (2014), "Francois Hollande Targets Silicon Valley Brain Drain," FT, February 12.

Motohashi, K., (2011), « Innovation Policy Challenges in Japan », IFRIS.

Muller E., Zenker A., Héraud J.-A., (2009), "France: Innovation System and Innovation Policy", Fraunhofer ISI Discussion Papers Innovation Systems and Policy Analysis, No. 18, ISSN 1612-1430, Karlsruhe.

Mytelka, L. K. and K. Smith (2002). "Policy Learning and Innovation Theory: An Interactive and Co-Evolving Process." Research Policy 31.

Nelson, R., Ed. (1993). National Innovation Systems. A Comparative Analysis. Nueva York, Oxford Univ. Press.

OECD 2012, OECD Science, Technology and Industry Outlook 2012, OECD Publishing. http://dx.doi.org/10.1787/sti_outlook-2012-en OECD.

OECD (2015c), OECD Economic Survey of Japan, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_ surveys-jpn-2015-en.

OECD Economic Surveys: Japan 2017. OECD Publishing, 2017.

OECD, (2018), Country Profile: France.

OECD, (2018), Achieving inclusive growth in the face of digital transformation and growth.

Oona Palmer, Uma Ilavarasan, Ella Mead, Ryan Keithahn, Alyse Cronk, (2018), « The National Innovation System of Japan », Economics 354: Economics of Science and Technology April 20, 2018.

Quirk-Silva, Sharon, 2017, "Fast Facts on the California Economy," Assembly Committee on Jobs, Economic Development and the Economy, November, Sacramento, California.

Ranga, Marina, Tomasz Mroczkowski, and Tsunehisa Araiso., (2017), "University–industry Cooperation and the Transition to Innovation Ecosystems in Japan." Industry and Higher Education31, no. 6 (December 1, 2017): 373–87. https://doi.org/10.1177/0950422217738588.

RIETI (2004), The 2003 Report of the R&D External Collaboration Survey, June 2004.

Rosenberg, Nathan, (1994), Exploring the Black Box: Technology, Economics and History, Cambridge University Press.

Rowen, Henry and A.M. Toyoda, (2003), "Japan has few High-Tech start-ups: Can it be Changed? Does it Mattered? "Asia/Pacific Research Center, Stanford University.

Saarenketo, Sami, KaisuPuumalainen, Olli Kuivalainen and KaleviKylaheiko, (2004), "Dynamic Knowledge-related Learning Processes in Internationalizing High-Tech SMEs," International Journal of Production Economics, Volume 89, Issue 3, pp.363-378.

Santos, Jose, Bert Spector and Ludo Van Der Heyden, (2009), "Toward a Theory of Business Model Innovation within Incumbent Firms," INSEAD Faculty and Research Working Paper, Fontainebleau, France.

SaxenianAnnaLee, (2001), "The Silicon Valley-Hsinchu Connection: Technical Communities and Industrial Upgrading," Economic Development Quarterly, V. 16, N1.

Saxenian Anna Lee, (2002), Local and Global Networks of Immigrant Professionals in Silicon Valley, Public Policy Institute of California, April, San Francisco, CA.

Shapira, Philip, Youtie, Jan (2010), "The Innovation System and Innovation Policy in the United States", Competing for Global Innovation Leadership: Innovation Systems and Policies in the USA, EU and Asia, Rainer Frietsch and Margot Schüller (Eds.), Fraunhofer IRB Verlag, Stuttgart, Chapter 2, pp. 5-29.

Shane, S. and D. Cable, 2002, "Network Ties, Reputation and the Financing of New Ventures," Management Science, 48(3): 29-45.

Silicon Valley Institute for Regional Studies, (2018), "The Peninsula Economy: Economic Update," July, San Jose, California

Springer, Kate, (2016), "Japan's Fukuoka Poised to Be the Country's Silicon Valley." CNNMoney, November 16, 2016. http://money.cnn.com/2016/11/16/technology/fukuoka-startupcity/index.html

Solomon, Richard, (2017), "Why the Silicon Valley Model Doesn't Work in Japan." Beacon Reports (blog), February 19, 2017. http://beaconreports.net/en/why-the-silicon-valley-modeldoesnt-work-in-japan/

Stenberg, Lennart (2004): Government Research and Innovation Policies in Japan, ITPS A2004:001, Östersund: ITPS.

Turpin, Tim, and V. V. Krishna, (2007), Science, Technology Policy and the Diffusion of Knowledge: Understanding the Dynamics of Innovation Systems in the Asia Pacific. Edward Elgar Publishing.

University of California, (2013), "Ideas, Inventions, Impact: Technology Commercialization Report," Oakland, California.

Wakasugi, R. (1986). "Gijutsu Kakushin to Kenkyu Kaihatsu no Keizai Bunseki: Nihon no Kigyo Kodo to Sangyo Seisaku" {The Economic Analysis of Research and Development and Technological Progress: Japanese Firm Activity and Industrial Policy}, Toyo Keizai Shimposha, Tokyo

Watson, Carlos, (2015), "The Hot New Players in Silicon Valley," mimeo.

Wells, Peter, (2017), "Cities Compete to Become Japan's Silicon Valley." Financial Times, October 17. https://www.ft.com/content/664a34d6-9e12-11e7-8b50-0b9f565a23e1.

Wong, Andrew, (2002), "Angel Finance: The Other Venture Capital," mimeo, Analysis Group, Chicago, Illinois.

Zhao, Mulan, (2007), "Zhongguancun" in Making IT: The Rise of Asia in High Tech, eds. Henry Rowen, Marguerite Gong Hancock and William Miller, Stanford University Press.