APEC and Innovation Policy: Lessons to Learn from Europe

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ABSTRACT

In 2011, Asia-Pacific Economic Co-operation (APEC) leaders agreed to encourage co-operation and interaction among researchers and laboratories, including through joint research and development (R&D), in order to accelerate innovations that can be applied to address the common economic and other challenges faced by APEC economies. This is necessary because the degree to which Asia-Pacific researchers and firms are engaged in collaborative research and development seems to remain small. In contrast to the Asia-Pacific region, co-operation in science and technology (S&T) among member states has been a major component of integration in the European Union (EU). The purpose of this paper is to learn lessons from Europe with respect to regional research co-operation and collaboration, and to draw some policy implications for enhancing co-operative and collaborative R&D among Asia-Pacific economies.

The 1957 treaty establishing the European Economic Community (EEC) encouraged actions towards establishing an integrated community and research was considered as one such area. In the mid 1980s, the EEC launched the European Framework programmes (FPs), which have been renewed several times with increasing budgets, to support collaborative research projects involving three or more member and/or associated states. As a result, scientific collaboration has grown rapidly in Europe. Since 2000, the EU has been integrating the FPs and other collaborative instruments to create a European Research Area (ERA) with the aim of overcoming fragmentation in research and enhancing innovative capacity.

A diverse range of instruments of co-operation, collaboration, and co-ordination developed over five decades in Europe was found to have enabled the creation of critical mass, avoidance of fragmentation, enhancement of researcher mobility, and strengthening of cross-sector and cross-border networks within the EU. The authors conclude that Europe presents some models that APEC could modify and adapt in order to develop its own instruments of co-operation and collaboration.

1. Introduction

In 2011, APEC leaders agreed that the generation and commercialization of new ideas is vital to regional prosperity and that the promotion of innovation as a driver of trade, economic integration, supply-chain performance, and green growth should be made a top priority for 2012. As part of the process, APEC leaders also agreed to encourage co-operation and interaction among researchers and laboratories, including joint research and development (R&D), in order to accelerate innovations that could be applied to address common challenges faced by APEC economies.[1] This is necessary because the degree to which Asia-Pacific researchers and firms are engaged in collaborative R&D seems to remain small (Okamoto 2011).

Co-operation in science and technology (S&T) among member states has been a major component of integration in the European Union (EU). In the mid 1980s, the EU launched the European Framework Programmes (FPs), which have been renewed several times with increasing budgets, in order to support collaborative research projects involving three or more member and/or associated states. As a result, scientific collaboration has grown rapidly in Europe. Since 2000, the EU has been integrating the FPs and other collaborative instruments to create a European Research Area (ERA) with the aim of overcoming fragmentation in research and enhancing innovative capacity. Therefore, the purpose of this paper is to learn lessons from Europe with respect to regional research co-operation and collaboration and to draw some policy implications for promoting these schemes among APEC member economies.

The remainder of the paper is structured in the following manner. Section 2 examines the extent to which researchers and firms in the Asia-Pacific region have progressed in collaborative R&D over the past decade. Section 3 summarizes the EU's efforts to create the ERA and the impacts of those efforts on enhancing innovation activities of the EU members' economies. Section 4 discusses lessons to learn from Europe with respect to regional research co-operation and collaboration and draws some policy implications for enhancing these activities among APEC members.

2. International Co-operation and Collaboration in the Asia-Pacific Region [2]

2. 1 Rising S&T Capacity in the Asia-Pacific Region

While the US, Europe, and Japan still dominate the global innovation landscape, new Asian players such as China, India, South Korea, Taiwan, and Singapore are considered increasingly important (Leadbeater and Wilsdon 2007). Although, as

Table 1. R&D Intensity and Personnel

Country	Expenditure on R&D as Percentage of GDP		Researchers per Thousand Workers	
	1997/98	2007/08	1997/98	2007/08
Australia	1.51	2.35	6.7	8.2
Brunei Darussalam [1]	NA	0.02	NA	0.6
Canada	1.71	1.88	6.1	7.8
Chile	0.50	0.68	1.0	2.0
China	0.65	1.43	0.8	1.9
Hong Kong	0.43	0.75	2.1	5.1
Indonesia [2]	0.07	0.08	0.5	0.2
Japan	2.94	3.44	9.4	10.1
Malaysia	0.40	0.63	0.4	0.9
Mexico	0.36	0.37	0.5	0.8
New Zealand	1.08	1.17	4.4	8.1
Papua New Guinea	NA	NA	NA	NA
Peru	0.09	0.15	NA	NA
Philippines	0.15	0.11	0.2	0.2
Republic of Korea	2.41	3.29	4.5	9.5
Russian Federation	1.00	1.08	7.1	6.1
Singapore	1.64	2.49	5.5	11.3
Taiwan	1.87	2.68	5.8	10.3
Thailand	0.10	0.21	0.1	0.6
United States	2.58	2.71	8.0	8.8
Vietnam [3]	0.19	NA	0.2	NA

[1] Average of the figures for 2002, 2003, and 2004
[2] Figures for 2000 and 2009, respectively
[3] Figure for 2002
Source: The Council of Economic Planning and Development (2008, 2011) for Taiwan, and http://stats.ulis.unesco.org/, last accessed on 11 August 2011 for countries other than Taiwan.

Okamoto (2011) points out, some countries or economies fare better than others, the S&T capacity of almost all countries in the Asia-Pacific region seems to be increasing.

An important development has been the emergence of new indicators of innovation inputs and outputs, including economy-wide measures that have some degree of international comparability (Smith 2005: 148). By far, the longest-standing measure of innovation input is expenditure on R&D. Table 1 shows expenditure on R&D as a percentage of Gross Domestic Product (GDP) together with research personnel per thousand workers, by country in the region in 1997/98 and 2007/08. The rising S&T capacity in almost all the countries and economies in the Asia-Pacific region during the past decade seems to be clear, as demonstrated by the steady increase in R&D activities from the perspective of both expenditure and personnel.

Innovation-output measures such as number of scientific publications also seem to support the argument for the rising S&T capacity in the Asia-Pacific region. Table 2 shows the trends in the number of science and engineering articles on a *per capita* basis for Asia-Pacific countries/economies during the period 2000–2010. According to the table, the number increased in all the Asia-Pacific countries/economies except Papua New Guinea, although the rate of growth varies across the countries.

Table 2. Academic Output per Million Population

Country	2000	2010
Australia	1063	1886
Brunei Darussalam	119	198
Canada	1020	1615
Chile	118	314
China	32	161
Hong Kong	747	1219
Indonesia	2	6
Japan	622	634
Malaysia	46	317
Mexico	50	92
New Zealand	1080	1807
Papua New Guinea	14	13
Peru	8	25
Philippines	6	10
Republic of Korea	307	861
Russian Federation	190	215
Singapore	978	1772
Taiwan	493	1114
Thailand	27	122
United States	858	1098
Vietnam	4	16

Source: The Council for Economic Planning and Development (2012) for Taiwan.
Database of peer-reviewed literature called *SCOPUS, and World Bank Development Indicators Online*, last accessed on 15 May 2012 for countries other than Taiwan.

2. 2 Slow Progress of Research Co-operation and Collaboration in the Asia-Pacific Region

Gibbons et al. (1994) discovered fundamental changes in the ways in which scientific, social, and cultural knowledge is produced. They found that knowledge production is increasingly becoming a socially distributed process; moreover, its locus is becoming global. [3]

In establishing indicators of international collaboration between countries and across regions, researchers have developed statistical techniques that account for the unequal size of countries' S&T article output and co-authorship patterns (National Science Board 2010: 5-37). One of the simplest measures is the *index of international collaboration*, defined as the ratio of country A's rate of collaboration with country B divided by country B's rate of total international authorship. Indexes above one represent rates of co-authorship that are higher than expected, and indexes below one indicate rates of co-authorship that are lower than expected. This is similar to the concept of the index of trade intensity between countries and across regions.

Despite the rising S&T capacity in the Asia-Pacific region, its regional S&T co-operation and collaboration do not seem to be progressing very much. Figures 1 and 2 show average percentage changes in the indexes of international S&T co-operation for selected pairs of countries in the Asia-Pacific Region and EU respectively. [4] The EU differs from the Asia-Pacific region in terms of the fact that while between 1998 and 2008, indexes of international collaboration increased substantially within the EU (except Portugal) (Figure 2)—

thereby indicating growing integration across the EU in terms of S&T article publication—indexes of international collaboration for the selected pairs of Asia-Pacific countries and economies did not increase substantially, except for those of Russia, Mexico, and Singapore (Figure 1).

3. Co-operation and Collaboration in Research and Innovation in the EU—Origins and Framework Programmes in the European Research Area

European integration is often equated with its econmic and monetary union process, which is

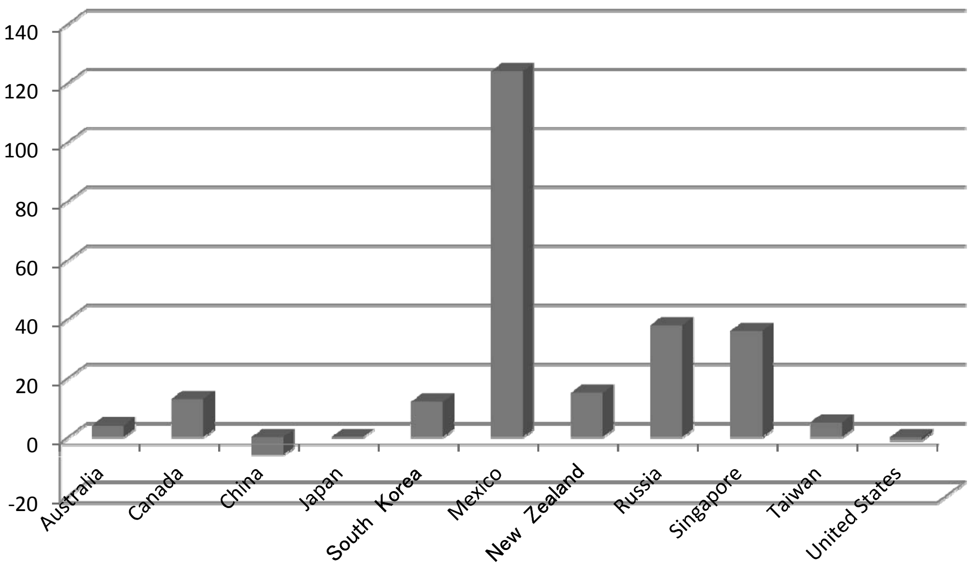

Figure 1. Average Percentage Changes in Indexes of International Collaboration for Selected Pairs of Countries in the Asia-Pacific Region between 1998 and 2008 (%)

Source: Based on data from the National Science Board (2010).

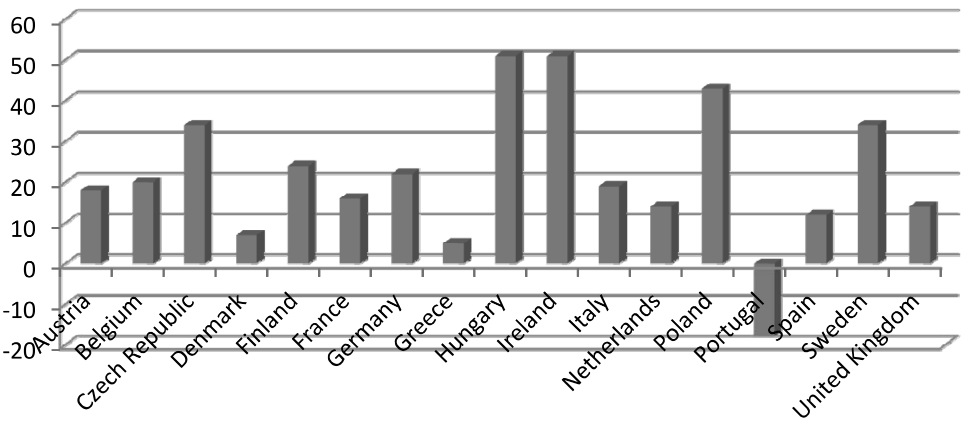

Figure 2. Average Percentage Changes in Indexes of International Collaboration for Selected Pairs of Countries in the EU between 1998 and 2008 (%)

Source: See Figure 1

slightly unfortunate, not only in view of the recent euro crisis, but also because European integration involves co-operation and integration in many other aspects that are neither as visible as the euro nor so well-recognized outside Europe. Indeed, co-operation and collaboration in research among member states and associated states have been a major component of integration within the EU and associated countries, which have also steadily developed over the past several decades.

3. 1 Origins and Early Developments

In Europe, it was recognized that no single country could offer sufficient resources for research and innovation to be globally competitive. Therefore, cross-border co-operation and collaboration was a means to strengthen the competitiveness of the European countries and creating critical mass in research efforts and avoiding fragmentation. A diverse array of institutions and programmes was created, including, notably, the Framework Programmes (FPs). Currently, Europe is moving towards creating a borderless European Research Area (ERA) integrating the diverse instruments of co-operation and collaboration.

The original treaty establishing the European Economic Community in 1957 encouraged the realization of the objective of an integrated community (article 235); co-operation in research was considered to constitute one area that would lead to this realization. European research organizations such as the European Nuclear Research Centre (CERN, founded in 1954) and the European Molecular Biology Organisation (EMBO, founded in 1964) were established as early as the 1950s. In 1977, the European Patent Organisation was established providing for a uniform application procedure for individual inventors and companies in 39 European countries.

During the 1970s and 80s, some bottom-up approaches to research co-operation and collaboration were established, notably the European Co-operation in Science and Technology (COST) in 1971, and EUREKA[5] in 1985. COST created an inter-governmental platform for collaborative projects involving at least five European countries. Projects are proposed by researchers and the terms of collaboration are defined in a Memorandum of Understanding (MoU) exchanged between the concerned parties, with approval by COST. The projects are not funded by COST as research activities are conducted by researchers in their organizations; however, financial support for joint activities such as conferences, short-term exchanges, and publications are provided. This is clearly aimed at reducing fragmentation of research activities by encouraging cross-border co-operation.

EUREKA focuses on creating intergovernmental networks to support market-oriented research and innovation projects undertaken by enterprises, research institutes, and universities in 39 countries. The promotion and facilitation of co-operation between industry and research sectors across borders are expected to stimulate the elaboration of joint industrial standards, thereby eliminating technical obstacles to trade—for example, through mutual recognition of inspection procedures and certificates—and ultimately to open up the system of public procurement. As with COST, the projects are prepared and implemented by enterprises and research institutes from at least two countries, who also raise funds. Participation of SMEs is encouraged. The EUREKA secretariat co-ordinates and facilitates networking. Through flexible, decentralized networks, the partners can have rapid access to requisite skills, expertise, and funding across borders. In both COST and EUREKA, the project research areas are pre-defined.

3. 2 Framework Programmes

During the 1980s, research became an explicit part of integration policy. The Single European Act of 1987 introduced into the EEC treaty the objective 'to strengthen the scientific and technological basis of European industry and to encourage it to become more competitive at the international level' (article 130F). The Act provides for the implementation of multi-annual FPs adopted unanimously by the Council. Subsequently, the Amsterdam Treaty substituted unanimous voting with qualified majority

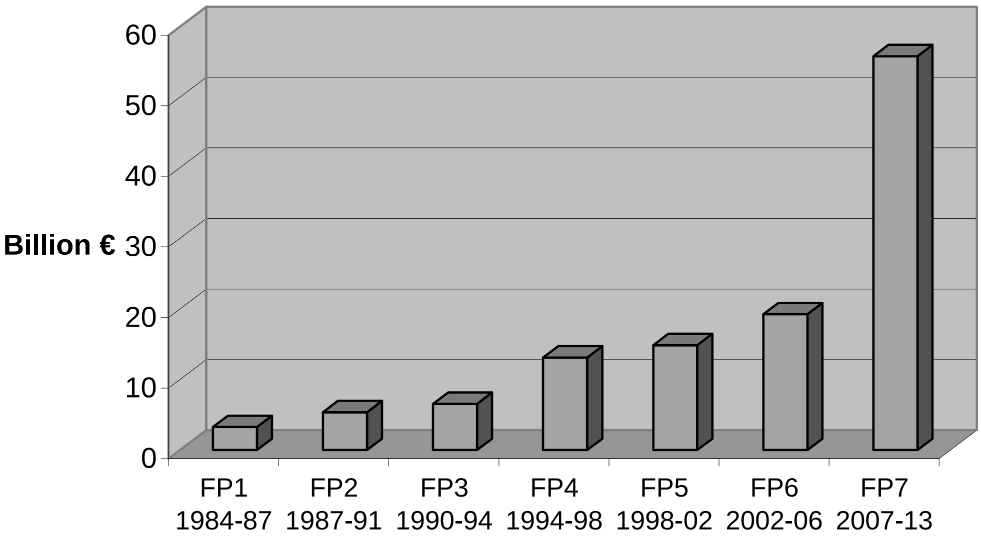

Figure 3. FP Budget Growth

Source: ec.europa.eu/research/fp7/pdf/fp-1984-2013_en.pdf

voting, thus facilitating the adoption process of the FPs.

Among a number of instruments of co-operation and collaboration in research in the EU, these multi-annual FPs have played a central role[6]. In contrast to bottom-up programmes such as COST or EUREKA, FPs have well-defined objectives and programme themes and details resulting from intensive interaction between the European Commission and stakeholder groups and negotiated with member states and the European Parliament. Further, this is a research funding scheme administered by the European Commission. FP funds cover most of the cost of the projects. The first FP, which disbursed 3.27ECUs, was initiated in 1984 Thus far, seven FPs have been launched; FP1–FP6 ran for five years each, and the current FP7 will run for seven. The budgets allocated to subsequent FPs have continued to increase. The current FP7 spanning 2007–2013 has a budget of over 55 billion euros (see Figure 3).

Promoting transnational mobility of researchers has been a major objective of the FPs, and the first FP already created Marie Curie Actions to provide individual grants to researchers for conducting research in another European country. However, pre-competitive collaborative research constitutes the central instrument of the FPs. Tenders on specific project themes are called for periodically and partners from at least three different member or associated states respond by forming consortia for proposing and undertaking a project. Strong participation of SMEs is encouraged and support services facilitating their participation are provided. Some of these projects are for conducting research (collaborative projects); others are 'networks of excellence' schemes that do not aim to conduct collaborative research, but support joint research programmes implemented by a number of research organizations in a given field aiming for long-term co-operation. Collaborative research in FP7 falls under nine thematic priorities: health; food, agriculture and biotechnology; ICT; nano-sciences, nano-technologies, materials and new production technologies; energy; environment (including climate change); transport (including aeronautics); socio-economic sciences and the humanities; and security and space. The thematic scope has widened through the FP cycles.

Although collaborative research accounts for more than half of the FP7 budget, other activities are also funded; notably, basic frontier research disbursed through the European Research Council in the 'Ideas' programme (approximately 15%), cross-border and cross-sector exchange and training, including for non-member country partners in the 'People' programme (10%), and 'Capacities' programme (10%) which includes support for research infrastructures, research for SMEs, development of regional clusters, science in society, and international co-operation activities with third countries.

In the EU, research co-operation and collaboration, including FPs, have consistently pursued the aim of promoting competitiveness of European industries. Initially, efforts of FPs towards this aim were limited to a few sectors; however, over time FPs have evolved into large funding and co-ordinating instruments for promoting research and innovation. Cross-border collaboration has enabled pooling of resources to achieve critical mass in research, the cost and complexity of which is continually increasing. Private sector participation in European research has had a leverage effect on private investments in research. Collaboration has certainly enhanced training and international mobility of researchers, boosting human capabilities in research. Research co-operation has contributed to overcoming fragmentation in research; it has also facilitated co-ordination of national research policies and activities. Moreover, having pre-defined thematic priorities meant that co-operation has taken place in areas of strategic interest to Europe. Addressing major common socio-economic challenges for Europe is a long-range aim of the FPs. Ultimately, research co-operation and collaboration would contribute to the effective implementation of EU policies and international commitments[7].

The evaluations of FPs conducted over the years[8] indicate that innovative and scientific performance is enhanced through participation in FPs. Enterprises participating in FPs tend to be more innovative, more likely to patent and engage in innovative co-operation with other firms and universities. International co-publication of peer-reviewed scientific publications resulting from FP projects increased. Thousands of researchers crossed borders to collaborate in research under Marie Curie actions. A large number of co-operation links between academia, industry, and public research institutes were formed. Further, the average number of participating member states in a project increased, effectively avoiding fragmentation of research. A recent report on the long-term impacts of FP assessed that in certain research areas that have been continuously supported (perhaps under different headings), such as quantum information processing and computing, stratospheric ozone research, and solar energy, the European research community has improved its relative position on a range of measures and is now operating in strength at the scientific frontier (EPEC 2011).

3. 3 Towards Creating a European Research Area

The most recent ongoing initiative by the EU is the creation of the ERA. Launched in 2000 in accordance with a proposal by the European Commission, the ERA brings together all the instruments of research and innovation co-operation and collaboration with the aim of creating a European-level open space for knowledge where researchers, businesses, and research institutions are able to circulate, compete, and co-operate across borders. In other words, the objective of the ERA is to break down barriers in order to create a single market for knowledge, research, and innovation. The ERA includes not only FPs and the organizations and instruments discussed above, but also other actors such as the European Research Council, created to fund basic 'frontier' research within FP7, and the European Institute of Innovation and Technology (EIT). Established in 2008, the EIT has created integrated structures called Knowledge and Innovation Communities (KIC), which link higher education, research and business sectors to boost innovation and entrepreneurship. The aim is to facilitate links from idea to product, research to market, and student to entrepreneur. Thus far, three KICs have been created that focus on priority areas of high societal impact: climate change mitigation, ICTs, and sustainable energies.

The ERA also includes initiatives for improving co-ordination of research activities and programmes in different countries and sectors. Initiated in 2002, European Technology Platforms (ETPs) allow industry and other stakeholders to develop shared long-term visions and strategic research agendas in key industry areas. Some ETPs are loose networks, while others have formal legal structures. There are 36 ETPs in areas including bio-fuels, smart grids, wind energy, photovoltaics, ICT, nano-medicine, sustainable chemistry, and aeronautics. They work on developing and updating the agendas of research priorities for their particular sector. They are developed through dialogue between industry, public researchers, and government. This enables enhancing of cross-sector co-ordination, avoiding duplication of research efforts, and promoting best practices. An evaluation of ETPs (IDEA Consult 2008) showed that they have contributed to the design of some of the main priorities of FP7, and some have gone beyond research to contribute to the production of standards and reviews of regulatory frameworks. Further, in working towards realizing the ERA, member states are launching partnership initiatives for promoting co-operation in improving working conditions of researchers and enhancing their mobility, developing world-class European research infrastructures, promoting transfer of knowledge and co-operation between public research and industry, and enhancing international co-operation in S&T. These areas are recognized as those that need further co-operation and co-ordination.

4. Conclusions and Policy Implications

In 2011, APEC leaders agreed that the generation and commercialization of new ideas is vital for regional prosperity and that the promotion of innovation as a driver of trade, economic integration, supply-chain performance, and green growth should be made a top priority for 2012. As part of this process, APEC leaders also agreed to encourage co-operation and interaction among researchers and laboratories, including joint research and development, in order to accelerate innovations that could be applied to address the common challenges faced by APEC economies.

However, despite the increasing S&T capacity of almost all APEC countries and economies, regional S&T co-operation and collaboration are not progressing significantly within APEC. The EU differs from the Asia-Pacific region in terms of the fact that between 1998 and 2008, regional S&T co-operation and collaboration increased substantially within the EU, thereby indicating growing research integration across the EU.

The development and evolution of co-operation and collaboration in research and innovation within the European integration process show that in order to achieve the aim of promoting the competitiveness of European industries, a diverse portfolio of instruments were created, ranging from research organizations such as CERN and EMBO, bottom-up, networking programmes such as COST and EUREKA, to a large 'top down' collaborative research funding scheme, the FPs, whose details and budgets are discussed by member governments and stakeholders and adopted by the Council. Newer instruments such as the ERC and the EIT focus on supporting basic research and enhancing cross-sector co-operation for innovation, respectively. ETPs and partnership initiatives promote co-ordination of research and innovation efforts in Europe. In working towards the creation of the ERA, Europe is on its way to achieving critical mass in research and innovation efforts, addressing fragmentation of research through collaboration and co-ordination, enhancing mobility of researchers, and creating networks of research and innovation between academia, business, and government sectors across borders.

Although it may not be realistic to create an 'APEC Research Area' sometime soon, given the diversity of APEC economies both economically and geographically, it is evident that member countries face an increasing number of common economic and other challenges such as shortage of water resources, underdevelopment of renewable energy resources, global climate change, lack of effective prevention and/or warning system for natural disasters. It is imperative for APEC to begin developing an institutional mechanism to enhance regional research co-operation and collaboration. The diversity of instruments of co-operation and collaboration developed over decades in Europe seems to present patterns and models that APEC could modify and adapt to develop its own instruments of co-operation and collaboration.

Future research is required to identify the common challenges faced by APEC economies, to prioritize them by degree of necessity, and to find out how European countries have been able to cope with them in further details. APEC needs to come up with its own institutional mechanism while learning lessons from Europe.

Footnotes

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An earlier version of this paper was presented at the 2012 APEC Study Center's Consortium Conference, held at Kazan, Russia, on 26–27 May 2012.

[1] See Annex A 'Promoting effective, non-discriminatory, and market-driven innovation policy', issued by APEC Leaders on November 12, 2011. Downloaded from http://www.apec.org/Meeting-Papers/Leaders-Declarations/2011/2011_aelm/2011_aelm_annexA.aspx, last accessed on 1 May 2012.

[2] Also see Okamoto (2011) for the details.

[3] Senker (2006) offers several theoretical explanations of why knowledge production is becoming global, particularly in the fields of life sciences and biotechnology.

[4] See Appendixes 1 and 2 for the details of calculation. Appendix3 shows both initaial and end levels of the degree of regional cooperation in the Asia-Pacific and the EU regions respectively.

[5] The name is not an abbreviation, but is probably inspired by the famous cry of Archimedes.

[6] The research and innovation activities of the EU are well documented in the European Commission website: http://ec.europa.eu/research/index.cfm, last accessed on 3 May 2012.

[7] Some of these points are presented in FP7 presentation slides by the European Commission: http://ec.europa.eu/research/fp7/pdf/fp7_press_launch.pdf, last accessed on 6 May 2012.

[8] There are numerous evaluation reports on FPs which are found in the European Commission' s research and innovation site: http://ec.europa.eu/research/evaluations, last accessed on 10 May 2012.

Appendix 1. Percentage Changes in the Indexes of International Collaboration for Selected Pairs of Countries in the Asia-Pacific Region between 1998 and 2008 (%)

	Australia	Canada	China	Japan	South Korea	Mexico	New Zealand	Russia	Singapore	Taiwan	United States	Average [1]
Australia		(2)	9	(12)	16	48	(11)	23	(12)	(4)	(3)	4
Canada	(2)		11	(7)	26	67	(9)	53	16	3	(2)	13
China	9	11		(10)	(32)	77	(28)	30	(43)	(34)	18	(6)
Japan	(12)	(7)	(10)		(5)	28	(7)	41	(21)	28	(14)	0
South Korea	16	26	(32)	(5)		(1)	63	8	220	(32)	(11)	12
Mexico	48	67	77	28	(1)		440	33	1700	340	2	124
New Zealand	(11)	(9)	(28)	(7)	63	440		13	(7)	(23)	1	15
Russia	23	53	30	41	8	33	13		83	118	13	38
Singapore	(12)	16	(43)	(21)	220	1700	(7)	83		(55)	8	36
Taiwan	(4)	3	(34)	28	(32)	340	(23)	118	(55)		(15)	5
United States	(3)	(2)	18	(14)	(11)	2	1	13	8	(15)		(1)

Notes: [1] Average percentage changes in the indexes of international collaboration for selected pairs of countries in the Asia-Pacific Region between 1998 and 2008. Figures in parentheses are negative.

Source: See Figure 1

Appendix 2. Percentage Changes in the Indexes of International Collaboration for Selected Pairs of Countries in the EU between 1998 and 2008 (%)

	Austria	Belgium	Czech Republic	Denmark	Finland	France	Germany	Greece	Hungary	Ireland	Italy	Netherlands	Poland	Portugal	Spain	Sweden	United Kingdom	Average [1]
Austria		55	(16)	(16)	20	32	12	(28)	49	20	38	13	74	(7)	17	76	13	18
Belgium	55		17	23	(14)	9	32	3	77	55	37	7	29	(23)	17	7	30	20
Czech Republic	(16)	17		10	37	34	15	6	167	322	28	5	62	(16)	10	53	31	34
Denmark	(16)	23	10		33	14	13	(47)	85	46	7	12	56	(46)	(13)	17	8	7
Finland	20	(14)	37	33		23	36	3	(6)	217	34	12	35	(14)	(5)	17	66	24
France	32	9	34	14	23		23	(10)	19	39	20	30	14	(21)	(10)	37	19	16
Germany	12	32	15	13	36	23		(4)	9	44	25	36	17	13	27	41	26	22
Greece	(28)	3	6	(47)	3	(10)	(4)		134	135	3	13	60	(54)	10	34	(9)	5
Hungary	49	77	167	85	(6)	19	9	134		74	23	15	129	26	27	114	7	51
Ireland	20	55	322	46	217	39	44	135	74		(5)	48	86	(49)	11	78	(3)	51
Italy	38	37	28	7	34	20	25	3	23	(5)		8	39	(11)	18	39	21	19
Netherlands	13	7	5	12	12	30	36	13	15	48	8		18	(31)	11	25	21	14
Poland	74	29	62	56	35	14	17	60	129	86	39	18		29	40	13	25	43
Portugal	(7)	(23)	(16)	(46)	(14)	(21)	13	(54)	26	(49)	(11)	(31)	29		14	(18)	(33)	(18)
Spain	17	17	10	(13)	(5)	(10)	27	10	27	11	18	11	40	14		28	2	12
Sweden	76	7	53	17	17	37	41	34	114	78	39	25	13	(18)	28		32	34
United Kingdom	13	30	31	8	66	19	26	(9)	7	(3)	21	21	25	(33)	2	32		14

Notes: [1] Average percentage changes in the indexes of international collaboration for selected pairs of countries in the EU between 1998 and 2008.
Figures in parentheses are negative.
Source: See Figure 1

Appendix 3. Averages of the Indexes of International Collaboration for Selected Pairs of Countries in the Asia-Pacific and in the EU Regions Respectively

Asia-Pacific	1998	2008	EU	1998	2008
Australia	0.81	0.84	Austria	1.11	1.31
Canada	0.63	0.71	Belgium	1.07	1.28
China	1.01	0.95	Czech Republic	1.16	1.55
Japan	0.82	0.82	Denmark	1.21	1.30
South Korea	0.76	0.86	Finland	1.18	1.46
Mexico	0.23	0.51	France	0.90	1.04
New Zealand	0.50	0.58	Germany	0.88	1.08
Russia	0.40	0.56	Greece	1.28	1.35
Singapore	0.55	0.76	Hungary	0.97	1.46
Taiwan	0.80	0.84	Ireland	0.81	1.23
United States	0.93	0.92	Italy	1.00	1.19
			Netherlands	1.10	1.26
			Poland	0.92	1.31
			Portugal	1.44	1.18
			Spain	1.05	1.17
			Sweden	0.99	1.32
			United Kingdom	0.91	1.04

Source: See Figure 1

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抄訳

本論文は、2012 年５月 26 日から 27 日にかけて、ロシアのカザンで開催された APEC スタディーセンター・コンソーシアム国際会議２日目の「イノベーションを通した成長のための協調はどうあるべきか」と題する第４セッションで発表された論文に加筆・修正を加えたものである。本論文は、以下の４章から構成されている。

第１章　はじめに
第２章　アジア太平洋地域における科学技術研究分野での域内協力の現状分析
第３章　欧州連合（EU）における研究分野での域内協力の歴史と今後の展望 −その起源、フレームワークプログラム（FP）から欧州研究領域（ERA）の結成へ
第４章　結論と政策提言

第１章では、論文の背景、目的、及び、その社会的意義について述べている。2011 年、アメリカ合衆国ハワイで開催された APEC 首脳会議において、新しいアイデアの創出とその実用化によって生まれるイノベーションは域内の貿易・投資をさらに活発化し、ひいては域内の持続的成長に大いに貢献する源泉とみなされ、その促進は 2012 年の APEC 最優先課題の１つに含まれた。また、2011 年の同会議で、APEC 首脳は、そのいち手段として、域内の様々な研究分野の研究者や研究機関の間で研究協力関係を緊密化することにも同意した。第２章で詳しく述べるが、アジア太平洋地域では貿易投資分野と比較すると域内での科学技術分野における研究協力が進展しておらず、2011 年のこの合意は大変意義があることだと考えられる。

一方、欧州では、研究分野における域内協力の歴史は長い。1980 年代には、大規模なフレームワークプログラム（FP）が立ち上がり、かつ、2000 年以降は、FP も含めて他の多くの研究協力プログラムが統合され、欧州研究領域（ERA）が形成されつつある。それによって、近年特に、EU 域内の研究協力が活発化したと言われる。そこで、本論文の目的は、今後 APEC 域内の研究協力を活発化し、同地域のイノベーションを促進するために、この領域で長い歴史と経験を有する欧州から学び、様々な教訓を得ることである。APEC は同分野では知識・ノウハウが蓄積されておらず、この初期の段階では欧州から学ぶことは大いに意義があると思われる。

第２章では、アジア太平洋地域における科学技術研究分野での域内協力の現状分析を行っている。まずは、研究開発（R&D）費の対 GDP 比、総労働者数に占める研究開発人材の占める割合、及び、人口一人当たり雑誌掲載論文数のここ 10 年間の推移を各国毎に考察した。その結果、APEC メンバー国はパプアニューギニアを除き、どの国でもすべての指標で改善が見られた。これはすなわち、アジア太平洋地域の国々のイノベーション能力が急速に上昇し始めていることを意味する。ヨーロッパでは近年、貿易・投資や生産のみならず、イノベーションの源泉も西洋からアジアにシフトし始めているのではないかとの懸念の声が上がっているが、少なくとも相対的にはアジア太平洋地域の研究開発能力が急上昇していることは間違いないであろう。

しかしながら、域内研究協力指数の推移を見ると、各国の研究開発能力の高まりが域内研究協力の上昇を伴っていたヨーロッパとは対照的に、アジア太平洋地域では、ある一部の国を除いては、あまり域内研究協力が活発化しているとは言い難いこともわかった。これは、貿易・投資の域内統合の進展とは対照的に、アジア太平洋地域のイノベーションの源泉となる新しい知識創造のプロセスでは域内統合化が進んでいないことを意味している。すなわち、アジア太平洋地域の経済が益々緊密化し、かつ、資源、エネルギー、感染症、貧困、自然災害等、共通に抱える問題・課題が山積しているにもかかわらず、それらを共同で解決できる体制がまだアジア太平洋地域で整っていないといえる。

第３章では、EU での研究協力の推進の目的、方法・手段の推移、及び、その成果をまとめている。EU の前身は 1957 年に設立されたヨーロッパ経済共同体（EEC）であるが、EEC では設立当初からすでに研究協力推進が謳われていたことは特筆に値する。すなわち、設立当初より、イノベーションという文言は使用されていなかったが、市場の統合や共同体創出のプロセスの手段として研究協力推進が明確に位置付けられ、それが各国及び域内全体の競争力向上を

促すと考えられていたのである。

1970年代から80年代にかけてはボトムアップ方式の研究協力推進プログラム（ヨーロッパ科学技術協力［COST］やEUREKA等）が採用され、研究者及び研究協力機関の自発的な提案により、共同研究開発が推進されていった。COSTでは、５カ国以上からの研究者又は研究機関の参加が見込まれ、プロジェクトの資金そのものは自前で調達できる場合のみ、共同研究が推進されていった。ただし、会議費用、出張費、出版費はCOSTの予算から念出された。一方、EUREKAもボトムアップ方式を採用した共同研究開発推進プログラムであったが、COSTよりもイノベーション推進のための各国政府間のネットワーク作りに主眼が置かれていた。

1980年代中盤に入ると、研究分野での協力が欧州統合の１つの明確な目的となり、法的根拠も与えられ、トップダウン方式で各国間の研究協力が推進されていった。この結果、できたのがFPプログラムである。これ以降、EUの政策執行機関である欧州委員会が共同研究予算を厳格に管理し、また、同委員会が関係国や研究機関、研究者と協議を行ったのち決定を下した共同研究目的、研究テーマ等に沿って、FPプログラムは厳格に実施に移されていった。90年代から21世紀に入り、FP予算が急速に伸びていったことは注目に値する。如何に、EUが統合プロセスの課程でイノベーション能力、そして、国際競争力を高めるためにこの共同研究開発プログラムを重要視していたかがわかる。近年EUでは、さらにヨーロッパ域内の障壁を取り払い、ヨーロッパ全体で１つの知識、技術、イノベーションのための市場（ERA）を作り上げるべく、新たな取り組みを開始している。

これまでEUで行われてきた政策評価を文献調査した結果、EUにおいて、以下のような明確な成果が生み出されてきたことが明らかとなる。

①域内の広範なネットワークの形成（これに関しては、第２章でも実証済み）
②民間企業自身によるR&D投資の誘発
③プログラムへの参加を通した研究人材育成及び域内移動の活発化
④共同研究成果（共同執筆論文数や共同出願のパテント数の上昇）の創出
⑤産学連携の強化
⑥中小企業の参加とその育成
⑦技術・規格の域内標準化、統一化
⑧欧州諸国の科学技術分野における政策協調の推進
⑨欧州が共通に抱えている問題・課題への解決の糸口の発見

第４章では、まとめと政策提言を行っている。制度的にはともかくも実質的にはますます経済の統合が進展しているのとは対照的に、アジア太平洋域内での研究協力における進展は見られず、この面でEUとの格差は拡大するばかりであることが明確となった。一方、EUは、その前身のEEC設立当初から経済統合プロセスと共同体創出の中に研究協力を組み込み、様々な試行錯誤を繰り返しながらも、着実な成果を挙げてきていることも明らかとなった。したがって、21世紀に入りアジア太平洋諸国が共通に直面する問題・課題が山積するようになった今、その解決に向けた仕組み作りが同地域で急務の課題であると結論づけるに至った。最後に、欧州の様々な取り組みを参考にしつつ、アジア太平洋地域の実情にあった研究開発協力モデル（例えば、環境対策、資源・エネルギー開発、防災システム構築といったテーマで、ボトムアップ方式によって、アジア太平洋地域の少なくとも数カ国間で立ち上げる、共同研究開発プロジェクト）の提案を行った。