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*The Transition from Doctoral Dissertation to
Labor Market in France and Japan:
a Comparative Exploration*

博士人材の学位取得から労働市場への移行:

フランスと日本の比較研究

2018年4月

文部科学省 科学技術・学術政策研究所

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The Transition from Doctoral Dissertation to Labor Market in France and Japan: a Comparative Exploration

ABSTRACT

Nowadays, PhDs transition from thesis to labor market is a great issue in major developed countries. Historically, the main labor output of these high qualified workers used to be academic sector and more generally Higher Education. Competition between countries, development of knowledge society all around the world have change the role of PhDs and give new challenges to doctoral education. In fact, now, society expects that PhDs integrate Higher Education but also private sector and firms. This goal is also enhance by the fact that there is now a high and international competition in access to permanent positions in academic sector leading to chaotic professional transition from doctorate to labor market. Comparing two national experiences in France and in Japan and using two original statistic dataset, researchers from NISTEP and CEREQ demonstrate these evidences in an international perspective. If Japanese PhDs have fewer difficulties find a job than those from France, both graduates are concerned with fixed terms contracts in their early career and low penetration in private organizations.

***The Transition from Doctoral Dissertation to Labor Market in France
and Japan: a Comparative Exploration***

Julien Calmand (Céreq¹), Yoshie Kobayashi (NISTEP²), Hiroastu Nohara (LEST³)

Introduction

The doctorate is recognized as one of the most international diploma (Noble 1994; Park 2007) around the world. In fact, compared to other level of study, doctorate is common to every educational system. In every country, doctoral education is the most prestigious diploma and it is linked with high degree of scientific expertise. All around the world, PhD is traditionally a key entry to academia. Nowadays, role of doctoral education changes and there are new challenges for academics who are in charge of doctoral education and also for young PhDs who enter on the labor market. With the development of the knowledge society (Foray 2009), there is a need of high qualified workers in every area on the economy. PhD should be capable to hold positions in academia but also in private companies.

PhD transition and their situation on the labor market are very different under countries. In some of them there is an underproduction of PhD which is dramatic to meet the demands of knowledge economy. In some countries there is a huge production of

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doctoral degree holders but national state are not capable to keep them on their national labor market. Finally, in some countries PhD holders have difficulties on the labor market, more than graduates with lower education. Despite all this differences, there is a common point; there is a huge competition in access to academic permanent positions, PhDs experience non stable job period in their early working career (Ma and Stephan 2005). Queue line for academic permanent positions depends of the level of the competition.

Such international differences need to be investigated and it is a crucial purpose for scientific researchers in social sciences. International organization such OECD or EUROSTA give information on PHD production by countries and some indicators on labor market situations. Few years ago, OECD developed the KNOWINNO (Auriol 2012) project in order to compare PhDs situations on the labor market in an international way, but results are constructed on national database. In fact, there is no international survey mainly because researchers face difficulties to construct international and comparable databases. There are some initiatives. In 2018, the National Research University in Moscow⁴ launches a study in order to compare doctoral education all around the world. In order to enhance knowledge on this transition process NISTEP (National Institute of Sciences and Technologies Policy) in Tokyo and CEREQ (Centre d'Etudes et de Recherche sur les Qualifications) in Marseille have decided in 2017 to compare PhD transition on the labor market in Japan and France.

This article presents results of this cooperation between Japan and France. In order to compare PhD transition on the labor market, researchers have exploited two quantitative surveys: the Japan Doctoral Human Resource Profiling and the Generation survey from CEREQ. In the first part of the article we briefly present each national scientific labor market in Japan in France. In the second part, we will focus on the methodological aspects of the statistical comparison of the two surveys. Finally, we will present main results regarding the entrance and the situation of Japanese and French PhD on the labor market.

We investigate some crucial research questions. Are there difficulties in labor market entrance? Are PhD employed mainly in academic sector or in private companies? In academic sector, is there a more or less waiting queue in access to permanent positions? According to different sector access, are there job situations differences in term of job contract or job situations?

France-Japan scientific labor market, what are the differences?

The aim of this part is to present the reality of the scientific labor market in the two countries. Two points are tackled the transition on the labor market of young PhD

⁴ Trends and Issues in Doctoral Education Worldwide: An International Research Inquiry : <https://cinst.hse.ru/en/docedu>

and the presentation of statistical surveys which permit to observe this process.

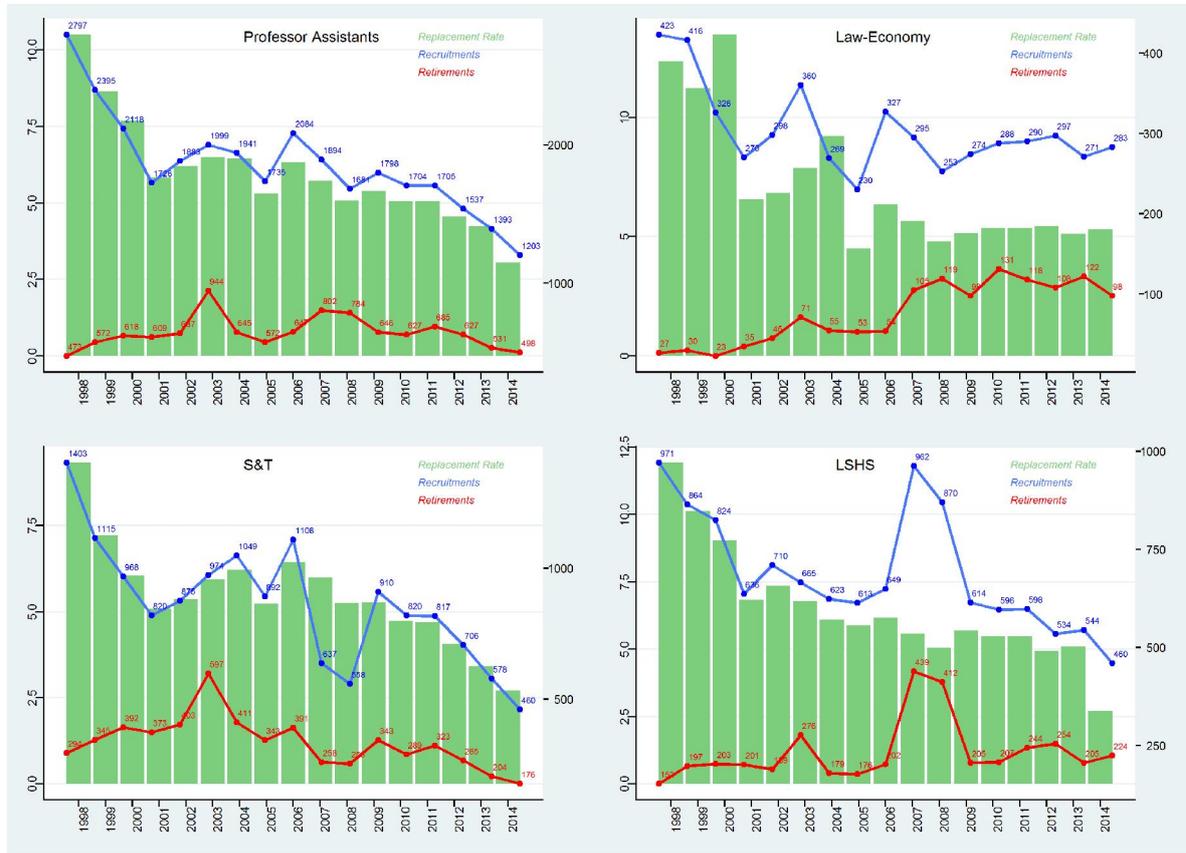
France

In France, the morphology of "doctorate" audiences evolved over the last 10 years. Thus, the number of PhDs has increased significantly as a result of the massification of higher education and the general rise in the level of education. Compared to OECD countries, as a percentage of an age group, most OECD countries train more doctors than France (Harfi and Auriol 2010). Administrative data show that the number of doctorates awarded increased from 9,200 in 2004 to more than 9,100 in 2014. However, it is mainly the share of foreign graduates which increased the most from 27% to 44% (2500 to 5500). This data may reflect a stronger internationalization of the degree, less attractiveness of French students for the doctorate course often explained by a disaffection of young people for scientific careers. Distribution by discipline has changed over the same period; the share of graduates in engineering sciences has increased from 10% to 17%. Finally, even if women's share has increased from 41% to 45%, they remain in the minority and are more represented in Humanities. PhD transition from thesis to labor market used to be described as "difficult" compared to other graduates from French Higher Education. Results from longitudinal statistical survey "Génération" from CEREQ show that, in the early 2000s, three years after their thesis defense, the unemployment rate for PhDs, although low (6.5% for Generation 98 graduates), was higher than that of graduates from "Grandes Ecoles" or than that of the university Master (Calmand 2017). Gradually, this trend reversed, the three-year unemployment rate of PhD increased but stabilized at around 9% in 2013, while under the effects of the economic situation, at the same time, that of university graduates reach 11%. If we witness a reversal, it does not concern all PhDs, there are strong disciplinary disparities and the advantage of graduates from "Grandes Ecole" persists (Mason Nohara 2010). In addition, the beginnings of PhDs careers are marked by the pregnancy of fixed-term jobs in professional trajectories.

Fixed-terms jobs experiences in early careers can be explained by the regulation of the academic sector which is traditionally the main opportunity for PhDs. In fact, administrative data from National Education Ministry show that permanent positions such as professor assistant (first permanent position in academic) increase drastically over the last fifteen years. As the graphic (1) demonstrates this trend is common to all fields of studies. This reduction of permanent possibility in academic sector has a repercussion on transition on the labor market through higher competition between doctorate and an extent of the access queue line to permanent position. If this phenomenon can be explained by the state regulation of jobs in academic sector, we assume that it also reflects an international science modus operandi with the development of "postdoctoral" experiences (Recotillet 2007). These jobs allow PhD to enhance their thesis (publications, skills development etc.) but especially to wait until new recruitment sessions for permanent positions. From employer side, it allows during

a longer period to test the competences of young PhDs (Giret 2011).

Figure 1 : Professor Assistant position evolution in France from 1998 to 2014



Source : Bilan des recrutements aux postes de Maitres de Conférences, MENESR, 1998-2014, Calmand, 2017

PhDs difficulties on the labor market are also enhanced by their low integration in the private sector. In France, highly skilled jobs in the private sector, and more specifically in R&D, are traditionally fueled by engineering school graduates. While a large literature explains the preference of doctors for academicism (Merton 1973; Menger 1989), very few materials focus on demonstrating the lack of interest of private recruiters for doctoral graduates. The existing one insists, on the one hand, on a lack of knowledge on the part of employers of PhDs and doctoral training (d’Agostino et al. 2009) and on the other hand on a preference for graduates of “Grandes Ecoles” who would have a more developed culture of the company and more transferable skills acquired by their training (Mason, Beltramo, and Paul 2004). PhDs are therefore poorly represented in companies and especially in R&D jobs. The administrative data of the

MENESR / DGRI (Perrain and Boinet 2017; Perrain 2016) show that over the period 97-2013, the share of researchers in companies with a doctorate as the highest degree has decreased.

In order to face these difficulties, French public authorities have launched a large set of reforms since the middle of the 2000's. Lots of them are related to doctoral education. The ministerial order of August 2006 marked a turning point in the history of doctoral education in France. First, it made an explicit reference to professional integration of the graduates as a central issue of doctoral education. The point had never been mentioned in the numerous regulations passed on the subject since the 1970s. Second, it stated clearly the doctoral programs do not prepare exclusively for careers in the public sector of academic research, as it was traditionally considered, but also for employment in the private sector. Consequently, doctoral schools were assigned the new mission of fostering the integration of new PhDs on the labor market. Nowadays, doctoral studies does not have much to do with what in was twenty years ago. Now doctoral students should prepare and secure their professional entrance in the labor market in addition to thesis writing. On the other side, doctoral schools have emphasized student supervision in order to avoid chaotic scholarship and professional pathways. One of the initiatives settled by French Public Authorities is related to higher observation of the PhD transition to the labor market. Recently, in an article (Calmand 2016), we demonstrate that there are more than thirties devices (at local or national level) that gives information on PhDs' professional pathways. Data used in this article from Génération national survey plays a great role in this environment.

Japan

Before the description of the Japanese labor market for PhD graduates, we may have to refer to the Graduate School reforms and the evolution of PhD students in recent years.

In accordance with the emergence of knowledge economy, Japanese policymakers in charge of the higher education system projected to reform the educational and professional pathway constituted by PhDs, with a common aim of speeding up scientific knowledge production and innovation (Nohara 2006).

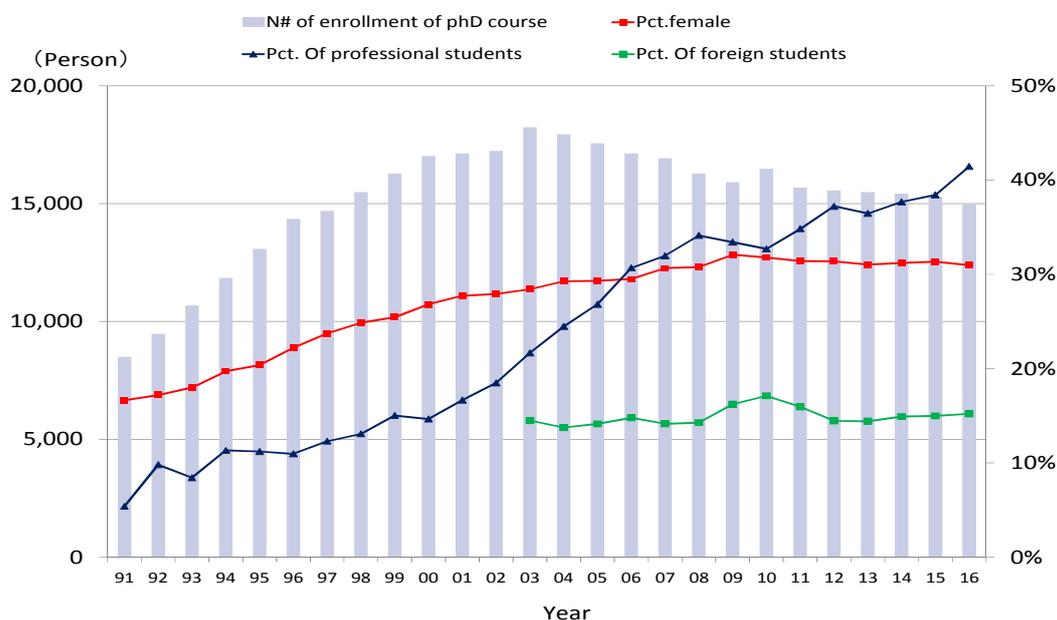
While PhD programs are highly valued within the Japanese university system, they remained traditionally under the hierarchical control of the 'chair system.' In the early 2000s, the Ministry of Education tried to radically reform the system by introducing a greater degree of competitiveness into it. The national universities became autonomous agency in 2004: teaching staff and researchers, previously civil servants, were then employed on private open-ended contracts. At the same time, academic research institutions and Graduate Schools were required to undergo competitive tendering procedures before their research program could be funded. Subsequently, around 30 world-class university 'centers of excellence' were to be created: these benefit from substantial financial resources, which are distributed to fund equipment and

provide financial support for PhD students and post-docs. This increasingly selective funding is reinforcing the existing university hierarchy and creating a marked split between research universities, regarded as producers of scientific excellence, and the teaching universities. Consequently, the conditions under which PhD students are working are diversifying further, depending on whether or not they belong to doctoral schools that are beneficiaries of the 'center of excellence' programs.

The PhD training remains very heterogeneous: the reforms have not completely dislocated the 'chair system,' even though it has been replaced by an American-style 'principal investigator system. Graduate schools continue to be governed by the professors in charge of the research institutes, in such domains as the organizational structure of courses and, primarily, the future careers of PhD students themselves. As a result, the PhD qualification has a high symbolic profile in academy, but a low profile among private employers who are not part of the academic establishment (Lanciano-Morandat, Nohara 2013).

As far as the conditions of doctoral study are concerned, we must mention the fundamental difference, when one compare the two countries Japan-France. In fact, Japanese PhD students are considered fundamentally as 'students in training', whereas their French counterparts are virtually 'research workers' remunerated either by academic grants, fellowships or research contracts. It's why there are few PhDs recipients of fellowships in Japan (25%: Mext, 2012), and a part of them ought to often fund their studies through casual works and/or by bank loans. Consequently, more than half of young primo-students (who go directly to the doctoral courses after Master degree) carry about, on average, 4.4 million yen of student loan, when they achieve their courses. So, we must keep in mind such difference of 'status' between France and Japan.

Figure 2 General Information of Doctoral Course



Source: Developed based on the School Basic Survey, Ministry of Education, Culture, Sports, Science and Technology, and other MEXT survey.

http://www.mext.go.jp/b_menu/shingi/chukyo/chukyo4/004/gijiroku/_icsFiles/afieldfile/2010/09/27/1297248_04.pdf

As to the evolution of PhD students, they are by definition the holders having cutting-edge knowledge and skill who may have to play a central role in the creation of new knowledge and promote the innovation through the development of science and technology. Yet the PhDs production is declining in Japan for a decade, which means a certain falloff of reservoir of talented young people.

According to the figure 2, the number of young students enrolled in Japanese doctoral courses increases up to the early 2000s and starts to decline afterwards. In 2016, they account for 14,972 persons, while they reached a peak in 2003 where 18,232 students were registered in the different graduate schools all over the nation. This means that they dropped off under the 15,000 line for the first time in 19 years since 1997. Between the two moments, the number of young PhD students has declined by more than 3,000. In terms of PhDs density as to the population, Japan is also one of the nations which produce the fewest doctors among the OECD countries. From this point of view, Japan is left behind the main European and American competitors.

The composition of PhD students is also changing. This category experiences a great diversification:

In recent years, PhD students constitute a more and more heterogenic category composed of different groups. Also, they have various motives for engaging in a doctoral course. We can distinguish three groups: young primo-students, mature adult students -

who have returned to university after some years of professional experience - and foreign students.

The most striking phenomenon is that the proportion of mature adult PhD students is steadily increasing, while the primo-students is decreasing. The former has grown up rapidly to represent up to 40% of all category in 2016. The latter is highly interested in research itself and much more academy-orientated, while the mature adult students are rather applied science-orientated and sometimes recommended by their employers. Their behaviors during the study and the professional choices after graduation are quit logically very different. As to the foreign students, who account for less than 20%, their number remains relatively stable. Many foreign students come to Japan from Asian countries nearby -China, Korea, Vietnam, Indonesia etc., as they usually receive a fellowship program or tuition fee exemption. However, after graduating from the doctoral course, more than half of foreign students are said to return to their home countries. Japan is expected to use them more effectively to provide the domestic industry or the research institutes with highly skilled people, in order to fill the gap between demand and supply. Finally, the number of female PhD students is also increasing, but the percentage of around 30% is still under the average rate of the OECD countries. This talent pool and its effective use are one of big challenges Japan must address in the near future.

Back to the labor market situation for the young PhD graduates, supply-demand equilibrium is becoming less and less favorable for them. Mainly the academic tenure jobs are reducing, as the universities don't offer any more stable posts due to the declining demographic problems (shortcoming of young teenagers). The government also tends to reduce the budget and posts destined to the national institutes of research. This phenomenon however has happened not only in Japan but also all over the world (Cyranoski et al. 2011). Thus, increasing numbers of young PhDs are often obliged to pass through an intermediate and 'precarious' stage in their careers before gaining stable jobs in academia. The transition between graduate school and academic job becomes tortuous and difficult (Lanciano-Morandat, Nohara 2013). Equally, the efforts of governments to interest large Japanese companies in the skills of PhD graduates have seemed to meet with only small success.

The fact is that in the late 1990s, the Japanese government put in motion a policy to triple the number of postdoc positions with non-permanent contract up to ten thousand and stepped up PhD recruitment to meet that goal. This policy aimed at bringing Japan's science capacity up to match that of the American and European countries, by providing the universities and research institutes with the talented but flexible labor force. But this measure became quickly disapproved because, although the objective attained, it lacked a long-term consideration about where all those postdoc young researchers were going to end up. Universities don't need more academic staff, as the number of young students entering higher education has been reducing. Japanese industries, which have traditionally preferred master's graduates who can be trained on the job, continue to

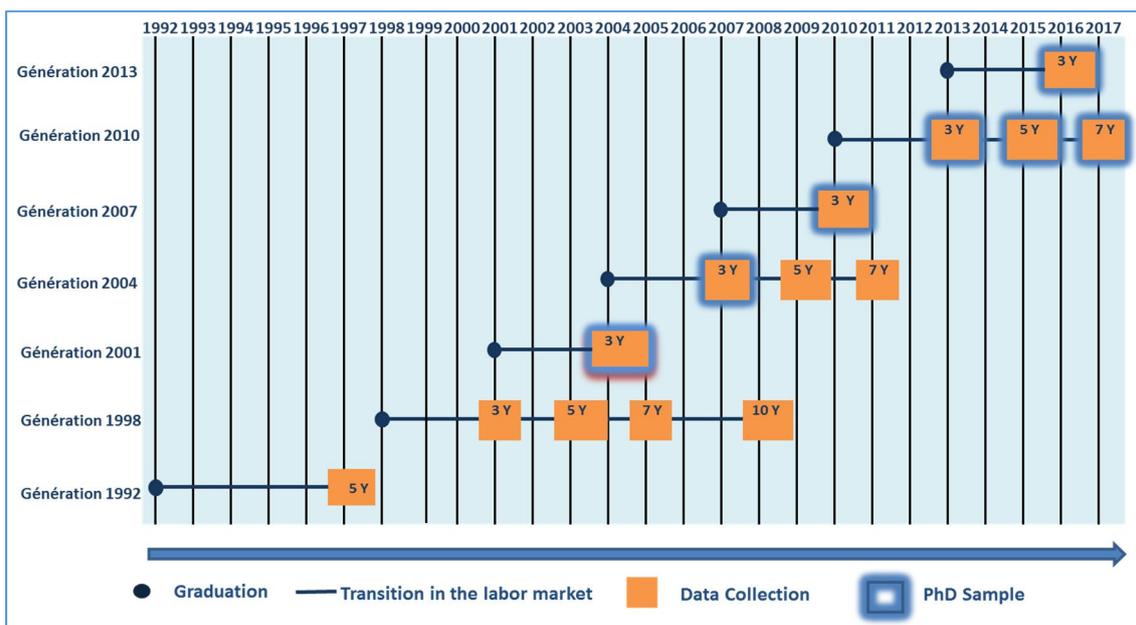
hesitate the recruitment of PhDs graduates. This means that fewer jobs -particularly stable jobs- remain for the current generations of PhD students. A great majority of them have to get through the post-doc position which means that their jobs are maintained only on the basis of ‘soft money’. The main characteristics of such precarious jobs are uncertainty, instability, and insecurity which directly reflect on the work-life balance of postdocs.

Such discouraging prospects may have triggered the drop-off of number of young students entering PhD programs after the year 2008. In an era of knowledge economy, the volume of talent pool and its distribution remain of high importance for the society, as it is an essential producer and diffusor of knowledge.

Generation Survey from Cereq

The Generation survey is labelled as a national statistic system. The longitudinal aspect of Generation is one of the best advantage. Since 1992, the Céreq has launched 7 waves of the Génération survey. Since the 1998, there are data collection about transition from school to work of young people who enter on the labor market three years before. As the graph shows, the Génération device is structured around a regular entanglement of surveys at 3 years, but also at 5, 7 and sometimes 10 years. The young people who came out in 1998 were, for example, re-interviewed in 2001, 2003, 2005 and 2008 in order to be able to study career developments and mobilities and thus enrich the analyzes carried out on entering the workforce. The presence of regular surveys every three years makes it possible to take into account the effects of the economic situation on school to work transition..

Figure 3 The Generation survey from Cereq



Source : Calmand, 2016

The Génération system is based on the concept of first-time outgoing students in a given year. This definition, which has changed somewhat since 1998, allows the comparability of the surveyed populations and is based on the following criterias:

- To have been enrolled in a training establishment in France during a given school year n.
- Leaving the education system between October n-1 and October n.
- Have not interrupted studies for one year or more before year n (except for health reasons).
- Not returning to school during the school year following entry into the labor market.
- 35 years old or younger in year n.
- To be located in France (Metropolitan + DomDOM) at the time of the survey.

The last survey Génération 2013 is used in this research. From April to July 2016, Céreq surveyed a representative sample of the 693,000 young people who left the education system for the first time in France during or at the end of the academic year 2012-2013. Some 19,500 young people of all levels of education responded to this telephone survey; the average interview duration was 30 minutes. As a basis for investigating the differences in the conditions of access to employment depending on the initial education completed and various individual characteristics (gender, social background, national origin), the survey gathered information on each respondent's educational trajectory and its specific characteristics (such as time spent abroad, for example) but more particularly on their month-by-month employment situation from the time they left the education system to the spring of 2016.

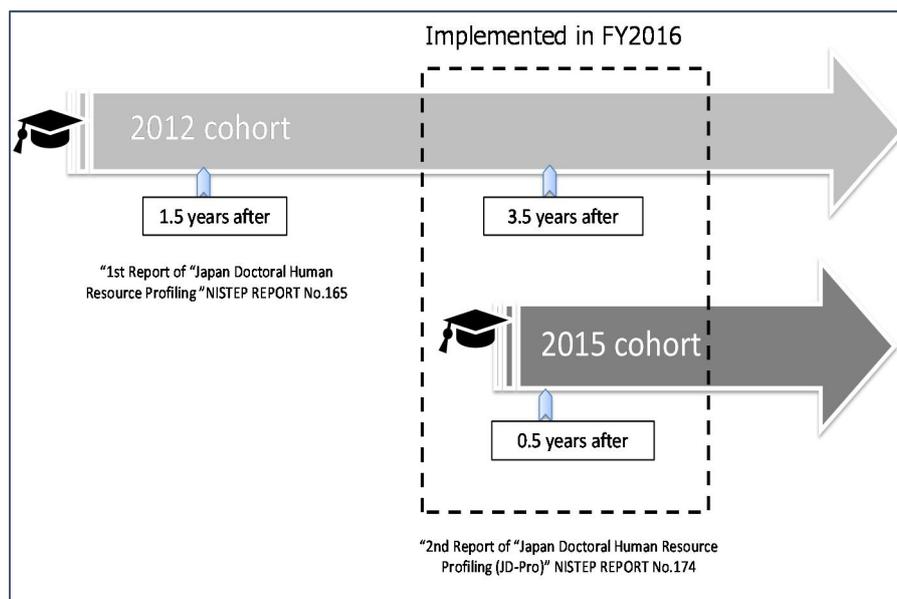
The "Génération" survey is a great device when once wants to address the question of PhD transition from thesis to labor market. In fact, since 2001 there is a "PhD module", it means that there are some specific questions addresses to PhD and this population is overweighed in the "Génération" sample. In 2016, more than 1600 PhDs⁵ who have finished their doctoral training in 2013 have been interviewed about their scholarship and their first three years on the labor market.

⁵ PhDs from Health, Pharmacy are excluded in the Generation sample

Japan Doctoral Human Resource Profiling

In view of that, the National Institute of Science and Technology Policy (NISTEP) has been conducting the Japan Doctoral Human Resource Profiling (JD-Pro) survey since 2014 with the aim of capturing information concerning the status of doctoral course graduates prior to their enrollment in doctoral courses, their experiences during the period of the course, and their current employment status and status of their research activities. Through this survey, NISTEP aims to continuously capture information about the career path of doctoral course graduates, and to build evidence toward the realization of policy formulation that is based on objective grounds.

Figure4: Implementation of the Japan Doctoral Human Resource Profiling Survey



Source: NISTEP, Kobayashi, 2018

In 2016, the survey was conducted on graduates who had completed their doctoral courses at graduate schools in Japan in FY2012 (hereafter, “the 2012 cohort”) 3.5 years after the completion of their doctoral courses, and on graduates who had completed their doctoral courses at graduate schools in Japan in FY2015 (hereafter, “the 2015 cohort”) 0.5 years after the completion of their doctoral courses (Figure4). The contents of the survey include the following: reasons for pursuing a doctoral course, educational/research experience during the doctoral course, financial support during the doctoral course, status of obtaining the doctoral degree, employment status, career

consciousness, status of research, and state of households. With regard to the response status, in the 2012 cohort survey conducted 3.5 years after the completion of the doctoral courses, the number of subjects to whom surveys were sent was 5,044; 2,661 responses were received, of which 2,614 were valid responses (Response rate: 52.8%, Effective response rate: 51.8%). In the 2015 cohort survey conducted 0.5 years after the completion of the doctoral courses, the number of subjects to whom surveys were sent from universities was 13,517 (Request rate: 87.8%), and 4,922 valid responses were received (Effective response rate: 36.4%).

A comparative observation of PhD transition to labor market: methodological issues

This explanatory incentive between CEREQ and NISTEP stands on the comparison between two surveys: the “Generation 2013 cohort, interrogation 3 years later of leavers from French Educational System in 2013” in France and the “Japan Doctoral Human Resource Profiling (FY 2012 doctoral course graduates_3 years later)” in Japan. The aim of this part is to present the two surveys and to explain how we make them comparable.

Methodological approach

The previous sections show that there are some differences in the database that we are using in this report. As a consequence we need to adjust fields of the two samples in order to make them comparable. In fact, as the field of the Japan survey seems to be wider we need to restrict it on special aspects:

- PhDs who are graduated in 2012
- PhDs who live in Japan at time of data collection in 2015
- PhDs who are aged under 35 years old at time of graduation
- PhDs who are not been graduated in Health.

Table 1: JD-Pro 2012 sample evolution

	Initial JD-Pro 2012 Data	Graduated in 2012	Live in Japan in 2015	Under 35 years old	Not graduated in Health
	n	n	n	n	n
Sample size	5052	4371	2061	1434	1059

Table2 shows the decrease of Japan Doctoral Human Resource Profiling sample after restrictions. As a final sample, we retain 1059 individuals in the Japan database; it means that only 21% of the overall initial Japan sample is used in our exploitations. Using weights, the Japan sample is around 3045 individuals and the French sample is around 7814 individuals. The table () shows the repartition by fields of studies for each sample. There are some differences, PhDs from Math, Physic and Chemistry is more represented (31% against 25%) and those from Biology is less represented (17% against 24%) in the Japan database. One major difference between the two databases affects the repartition between men and women. Women are underrepresented in the Japanese sample, only 23% of the sample against 50% in the French sample.

Table 2 : JD-Pro 2012 and Generation 2013 comparable structure

	JD-Pro 2012			Generation 2013		
	n	N	%	n	N	%
Fields of studies						
Math, Physic and Chemistry	332	935	31%	437	1896	25%
Engineering field	254	771	25%	343	1973	25%
Biology	198	529	17%	412	1899	24%
Humanities, Economics and Law	275	810	27%	479	2046	26%
Gender						
Men	832	2342	77%	918	3918	50%
Women	227	704	23%	753	3898	50%
Total	1059	3045	100%	1671	7814	100%

Source : JD-Pro 2012 & Generation 2013 , Calmand, Kobayashi, Nohara, 2018

Exploratory results

The aim of this section is to present exploratory results about PhDs transition from thesis to labor market in Japan and in France. Before starting, we have to precise that in Japan data PhD from 2012 are interviewed in 2015 and in the French survey they

are interviewed in 2016. We only focus our analyses at time of interviews, which means that we do not consider professional trajectories during the first years on the labor market. We will present main indicators that are important when once need to consider PhDs transition on the labor market process.

Employment/Unemployment

PhD situation on the labor market three years after graduation is fundamentally opposed in France and in Japan. French PhD situation on the labor market in 2016 is characterized by a high level of unemployment rate. In fact, the unemployment rate is 10% in 2016. PhDs in Biology, Math, Physics and Chemistry, Humanities, Economics and Law are those who are the most unemployed at time of data collection. Men are more often employed than women in France. These labor market difficulties do not exist in Japan. The unemployment rate is very low in 2015 and there are no fields of studies or gender differences.

Table 3 : Labor market situation three years after graduation

	JD-Pro 2012				Generation 2013			
	Employment	Unemployment	Out of Labor market	Unemployment rate	Employment	Unemployment	Out of Labor market	Unemployment rate
Fields of studies								
Math, Physic and Chemistry	98%	2%	1%	2%	87%	10%	3%	10%
Engineering field	98%	1%	9%	1%	90%	6%	4%	7%
Biology	97%	1%	9%	1%	82%	13%	5%	14%
Humanities, Economics and Law	96%	3%	0%	3%	86%	10%	4%	10%
Gender								
Men	97%	2%	6%	2%	88%	8%	4%	8%
Women	96%	1%	8%	1%	85%	12%	4%	12%
Total	97%	2%	7%	2%	86%	10%	4%	10%

Source: JD-Pro 2012 & Generation 2013 , Calmand, Kobayashi, Nohara, 2018

Job Contract

As we wrote in introduction, access to permanent position is one major difficulties of PhD. Comparison between Japan and France seems to confirm this trend. In these two countries, a third of a cohort does not have a permanent contract at the time of the survey. PhDs from Biology and Humanities, Economics and Laws are the most concerned by non-stable positions three years after their graduation. The situation of PhDs graduated in Biology in Japan and in France suggests that there is an international type of labor market regulation in these particular fields of studies. Our results show that there are more gender differences in Japan than in France.

Table 4 : Job contract among PhDs who are in employment three years after graduation

	JD-Pro 2012			Generation 2013		
	Long term	Fixed term	Other	Long term	Fixed term	Other
Fields of studies						
Math, Physic and Chemistry	68%	30%	2%	64%	34%	2%
Engineering field	74%	25%	2%	81%	18%	2%
Biology	50%	47%	3%	50%	49%	2%
Humanities, Economics and Law	58%	39%	3%	62%	32%	6%
Gender						
Men	66%	32%	2%	67%	31%	3%
Women	54%	43%	3%	62%	35%	3%
Total	64%	34%	2%	64%	33%	3%

Source: JD-Pro 2012 & Generation 2013 , Calmand, Kobayashi, Nohara, 2018

Sector repartition

One major point of the PhD transition on the labor market is to consider sector repartition at time of data collection. Two results need to be identified: the repartition between public and private sector and the repartition between the academic and R&D activities.

Public/Private repartition

In France, PhD integrates more often the public sector than in Japan (54% in France against 47% in Japan). There are some interesting differences. In both countries, PhDs in Biology and Humanities, Economics and Law are those who are working in the public sector three years after

graduation. Graduates from engineering fields in France are working are more recruited in the private sector than in Japan (34% in France against 45% in Japan). Do we can conclude that PhDs in France have more difficulties to integrate firms? It is not simple to respond to this question as far as we know that in Japan there are a large number of private universities, it means that among the 53% of PhDs who are working in the private sector a large number of them are not working in firms but rather in Higher Education.

Table 5 : Sector repartition among PhDs who are in employment three years after graduation

	JD-Pro 2012		Generation 2013	
	Public	Private	Public	Private
Fields of studies				
Math, Physic and Chemistry	45%	55%	52%	48%
Engineering field	45%	55%	34%	66%
Biology	51%	49%	61%	40%
Humanities, Economics and Law	48%	53%	71%	29%
Gender				
Men	46%	54%	50%	50%
Women	52%	48%	59%	41%
Total	47%	53%	54%	46%

Source: JD-Pro 2012 & Generation 2013, Calmand, Kobayashi, Nohara, 2018

Academic, R&D activities repartition

The aim of the next exploitation is to figure the repartition between research activities and type of organization. Generally we can split into four categories: public research, public non research, R&D and private non research. We cross the nature of the organization of the job activities in order to have this classification. For Japan, activities such as Researcher (natural sciences, humanities, and social sciences), Manufacturing engineers (development) and Schoolteacher (university, graduate school) are considered as research activities. For France, we use the Frascati classification in order to have the research/non research repartition. Considering Japan Higher Education specificities (a great importance of the private educational sector) we decide to add one more category for this case which is private educational research. This category is not relevant for France because there is a few PhD who are working as a research in private schools.

Table 6 : Sector, activities repartition among PhDs who are in employment three years after graduation

	JD-Pro 2012				
	Public Research	Public Non Research	Private Educational Research	R&D	Private Non Research
Fields of studies					
Math, Physic and Chemistry	39%	6%	9%	34%	12%
Engineering field	37%	9%	12%	25%	18%
Biology	45%	6%	12%	20%	18%
Humanities, Economics and Law	36%	11%	39%	2%	11%
Gender					
Men	38%	8%	16%	24%	15%
Women	42%	10%	24%	12%	13%
Total	39%	8%	18%	21%	14%
	Génération 2013				
	Public Research	Public Non Research	Private Educational Research	R&D	Private Non Research
Fields of studies					
Math, Physic and Chemistry	42%	10%	N.S	28%	20%
Engineering field	28%	6%	N.S	36%	30%
Biology	38%	22%	N.S	19%	21%
Humanities, Economics and Law	47%	24%	N.S	6%	22%
Gender					
Men	39%	11%	N.S	24%	26%
Women	39%	20%	N.S	21%	20%
Total	39%	15%	N.S	22%	23%

Source: JD-Pro 2012 & Generation 2013, Calmand, Kobayashi, Nohara, 2018

Results exposed before are really different than those before which only consider a public/private repartition. In fact, in Japan as in France, there is the same figure of PhDs who are working as a researcher in a private company (around 20%). In Japan, PhDs from Math, Physic and Chemistry as those who are working in this sector, in France it is PhDs from engineering field. In France; a larger PhDs are employed in private sector without doing research activities (23% in France against 14% in Japan), the same result appear when we consider employment in public sector. If we consider that in Japan, a lot of PhDs can be employed in private educational organization, then PhD who work as an educational researcher is greater than in France (57% in Japan

against 39% in France). In Japan PhDs from Humanities, Economics and Law are more recruited as researcher in private educational organization. As the final result, we can assert that recruitment in academic sector (public or private) is maybe higher in Japan than in France.

Fixed-terms contract by sector repartition

Access to permanent position is a crucial issue when we consider PhDs transition on the labor market. In France as in Japan, part of fixed terms contract is higher in academic sector than in private sector. Considering PhDs who have research activities in both countries, non-stable positions are lower in the private sector than in academic (private or public in Japan). Graduates who work in private R&D have the smallest part of fixed terms contracts in France or in Japan. For Japan is especially low around 5%.

Table 7 : Fixed terms contract by sector, activities repartition among PhDs who are in employment three years after graduation

	JD-Pro 2012				
	Public Research	Public Non Research	Private HE Research	R&D	Private Non Research
Fields of studies					
Math, Physic and Chemistry	55%	15%	62%	3%	11%
Engineering field	36%	10%	70%	3%	7%
Biology	70%	27%	64%	14%	21%
Humanities, Economics and Law	44%	23%	45%	0%	24%
Gender					
Men	49%	18%	53%	4%	13%
Women	58%	19%	55%	12%	22%
Total	51%	18%	54%	5%	15%
	Génération 2013				
	Public Research	Public Non Research	Private HE Research	R&D	Private Non Research
Fields of studies					
Math, Physic and Chemistry	62%	23%	N.S	13%	7%
Engineering field	50%	32%	N.S	3%	2%
Biology	75%	53%	N.S	17%	24%
Humanities, Economics and Law	41%	38%	N.S	15%	13%
Gender					
Men	60%	38%	N.S	7%	6%
Women	53%	42%	N.S	12%	16%
Total	56%	41%	N.S	9%	10%

Source : JD-Pro 2012 & Generation 2013 , Calmand, Kobayashi, Nohara, 2018

In academic sector, in both countries, we find a high share of non-permanent positions three years after graduation. In Japan, in public academic sector, more than half of PhDs are not employed as a permanent researcher. In the private academic sector, this share is equivalent. In France, 56% of the PhDs who have left the educational system in 2013 and who are employed in academic sector have a fixed terms contract in 2016. In France as in Japan, graduates from Biology and Mathematics, Physics and Chemistry are those who are the most concerned by non-stable positions in public academic sector.

Conclusion

Exploratory comparison of Japan and French PhDs transition from thesis to labor market is a fruitful exercise for researchers that want to understand this process in an international perspective. Exhausting statistical data limitations, national labor market and doctoral training particularities, first results from this research work shows rather similitudes than differences. If PhDs from Japan are less concerned by unemployment situations in their early professional careers than those from France, in both countries they faced difficulties to access permanent positions in academic sector (public and private in Japan) and most of them have fixed-terms contracts three years after graduation.

The comparison does not limit to entire population but also when fields of studies differences are taking in account. In fact, PhDs graduated in Biology, Mathematics, Physics and Chemistry experience more often these chaotic pathways in their early career. These results suggest that there is an international trend in these particular fields of studies characterized by a higher competition for access to permanent positions in academic sector.

There is also a common point in France and in Japan when considering PhDs transition from thesis to labor market. PhDs in Japan and in France integrate jobs in private organization in the same proportions. Only a fifth of them are employed as private R&D researchers at time of interviews. Contrary to those who integrate academic sector, in Japan as in France, PhDs who occupied these particular professional occupations are more concerned by long-terms contracts. Fewer research question need to be addressed in the future. The next steps of this work will focus on the role of doctoral training in the transition from thesis to labor market and also the satisfaction on the job.

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