THE EMPLOYMENT STRUCTURES OF SPACE AGENCIES IN THREE REGIONS AND IMPLICATIONS FOR COMPETITIVENESS

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Abstract. While space organizations are present worldwide, dominant organizations are NASA in the US, ESA in Europe and JAXA in Japan. Each of these organizations has a high budget, which is a strong indicator of its political, economic and scientific dominance in the field.

We investigate the flexibility of these agencies' employee structures and show how their competitiveness is affected by those structures. We develop propositions on regular vs. non-regular employment, on long-term employment and on job security and conclude that, in the short run, it is difficult for ESA to compete against the more flexible hire-and-fire structure at NASA and against Japan's developed non-regular employee system mentality, which is employed at JAXA. However, the European system has visible advantages in the long run. Implications for organizations are discussed.

Keywords:Corporate Governance, Job Security, Space Organization, Strategic Decision
JEL Classification: G34, L14, M51, R41

1 Introduction

The financial and non-financial burdens of keeping and attracting talented employees are enormous (Harris & Brannick, 1999). As pointed out, "A good firm has good employees," and this observation is particularly true for space organizations, as they are under considerable pressure to bring excellent results. There are several reasons for the fierce competition in this industry, some direct and some indirect. In particular, direct reasons include national prestige, military power and political power, while indirect reasons include the survival of the orbital launcher industry (through national operators), technology improvements (which could have positive external effects on other industries) and employment retention or creation (through the existence of space agencies and their suppliers).

This research considers the basic research, concept and definition phases for NASA in the US, ESA in Europe and JAXA in Japan. We use a knowledge-based view of the firm, combined with the national cultural differences postulated by Hofstede (1980, 2001), to illustrate how all three regions differ to some extent in terms of their fundamental cultural characteristics. Our detailed theoretical approaches and discussions on different employment structures are available upon request. The second section introduces the space agencies of the three regions in order to develop three propositions in the third section. After a discussion of these propositions, we draw conclusions.

2 Space Agencies and Their Employment Structures

This section introduces three space agencies, one each from the US, Europe and Japan, in support of our discussion in the next section on propositions related to the employment systems.

Typically, space agencies are responsible for the basic research, concept and definition phases of most space-related projects. Basic research covers areas such as fundamental research, with programs that can span several years or decades. The concept phase includes the preparation of a conceptual design and a system analysis. During the definition phase, system specifications, an assessment of political restrictions, and advanced development of high-risk items are completed. Table 1 lists the key facts about the space agencies from the US, Europe and Japan. The full context

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of case studies for these three organizations can be found in Goehlich and Bebenroth (2008).

Table 1: Comparison of Key Facts About Three Space Agencies

Key Facts	USA	Europe	Japan
Name of Agency	NASA	ESA	JAXA
Year Founded	1958	1975	2003
Budget (in USD)	$18,7 B (2010)1	$5,4 B (2010)2	$2,5 B (2010)4
Number of Staff	23 0001	22003	16005

Source: 1NASA (2010a), 2ESA (2011a), 3ESA (2011b), 4JAXA (2010), 5JAXA (2011)

NASA employs over 23 000 civil servants at nine centers, the headquarters, the NASA Shared Services Center and the Jet Propulsion Laboratory. NASA's FY 2010 budgetary resources totaled $18,7 billion. (NASA, 2010a)

Around 2200 staff members work for ESA, including scientists, engineers, information technology specialists and administrative personnel (ESA, 2010, 2011b). ESA's headquarters is located in Paris, where policies and programs are decided. ESA has six other locations, in Cologne, Madrid, Darmstadt, Frascati, Noordwijk and Harwell, each of which has different responsibilities. ESA also has liaison offices in Belgium, the US and Russia; a launch base in French Guiana and ground/tracking stations in various parts of the world (ESA, 2011a). ESA's budget for 2010 was $5,4 billion (ESA, 2011a). ESA operates on the basis of geographic return; that is, it invests in each member state through industrial contracts for space programs an amount more or less equivalent to each country's contribution (ESA, 2011a).

JAXA had around 1600 regular staff members as of fiscal year 2009, not including domestic and overseas researchers, graduate students and staff from the private sector (JAXA, 2011). JAXA, whose 2010 budget was $2,5 billion (JAXA, 2010), underwent a drastic reduction of staff in the last decade; since then, increased focus has been put on the International Space Station (ISS) program. In order for Japan to ensure the continuous development of highly advanced technologies as well as the implementation of JAXA's vision (JAXA, 2005), the Japanese space agency seeks to secure and sustain its human resources.

3 Propositions About Space Agencies

From our theoretical research and research on the employment structure of the three space agencies, we developed propositions concerning (1) regular vs. non-regular employment, (2) long-term vs. short-term employment, and (3) job security vs. job insecurity. We argue that, based on the knowledge- and resource-based views of the firm, a long-term employment strategy increases agency's knowledge and so its competitiveness.

Regular vs. Non-regular Employment

The three regions differ in their cultural characteristics and in their employment style. In Japan, non-regular employment is heavily practiced in the space industry. Non-regular employees work on a contractual basis, so they do not know whether they will remain in this industry or whether they will have to switch to another industry to remain employed. On the opposite side of the spectrum, European organizations have a strategy of reducing the number of non-regular employees. Even though there has been a recent small increase in the number of non-regular employees, its proportion is still small compared to that in Japan. ESA runs many internal initiatives (e.g., training and development of current staff, knowledge sharing, orientation of young graduate trainees) and external initiatives (e.g., exchanges with other industries and secondments,

coverage in the media, job fairs and promotional campaigns) that "help to ensure the continuity and availability of a highly qualified and motivated workforce that will, in turn, play a critical role in strengthening the position of ESA in the European space sector" (Walsh, Donzelli, Danesy & Bonnefoy, 2008, p. 55). However, related to ESA's internal challenges, experienced staff is not always able to provide on-the-job training to the extent necessary for inexperienced staff to obtain skills and competencies required to perform the job.

The US space agency is closer to the European system than to the Japanese system in terms of a regular employment system; however, in the US even regular employees can be laid off easily because pressure from the unions is weak and because many employees seem to accept a more flexible style. A job-hopper who switches firms frequently may receive higher remuneration after every hop, so a change to a new firm can increase power and lead to a higher salary. NASA's key employment principle is illustrated by its statement concerning the "hire-and-fire" mentality: "Term and temporary hiring authorities [are]: (…) among the most important of the human resources strategies the Agency plans to use in addressing competency issues. NASA is committed to moving to a more flexible and scalable workforce as a means of responding to the evolving nature of workforce requirements. Nonpermanent appointments, especially term appointments, provide an excellent method of obtaining skills without the long-term commitments made to permanent employees." (NASA, 2006, p. 30). This discussion leads us to proposition 1:

Proposition 1: The European space organization has a relatively high proportion of regular employees, while Japan has many non-regular employees (Figure 1). The US comes in the middle in the number of regular employees, but it has a faster fire mentality. In all, the European organization faces hardship in the short run but should see long-run advantage against Japan and the US from its employment structure.

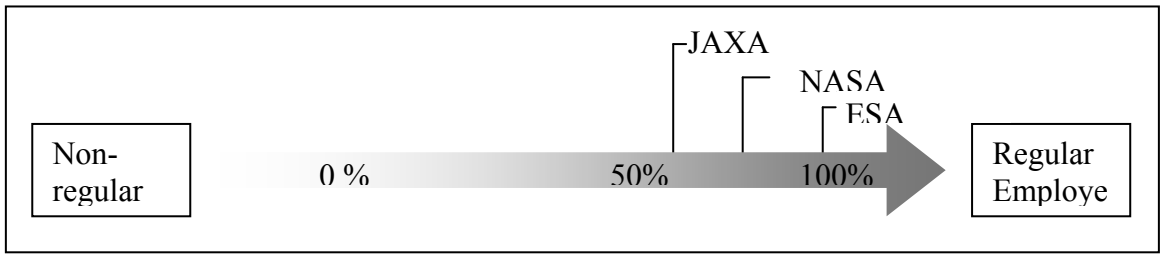

Figure 1: Illustration of Proposition 1

Long-term vs. Short-term Employment

Koller (2002) argues that the aerospace industry, like all key industries that handle advanced technology, requires constant updating and that attention has to be paid to both the employees who enter the workforce and existing employees. Grimshaw, Rhoades and Williams (2004) complement this statement with the observation that, historically, technicians have come into the space industry with a technical aviation background and supplemental training from their employers. Therefore equipped with a shortage of employees, space organizations need to invest heavily in training for new employees. Put differently, the more short-term employees a space agency keeps, the more the organization suffers from inefficiency and increases risk for itself in the long run in terms of adequate staffing.

It could be argued that every employee would like to stay as long as possible in a given organization. However, US citizens tend to be more short-term oriented than some in other cultures and may prefer a shorter stay at a given organization. A key principle that underlies NASA's workforce strategy is that "NASA must have a more

flexible workforce with sufficient 'bench strength' to respond effectively to mission, programmatic, and budget changes as well as demographic and labor market fluctuations. As these changes occur, the agency must be able to adjust quickly to address staffing needs or skill imbalances. This is difficult to achieve within the constraints of the rules and processes governing permanent civil service employment. For that reason, NASA must evolve to a more appropriate blend of permanent and nonpermanent civil servants" (NASA, 2006, p.7).

Japanese – at least regular employees – enjoy long-term, permanent contracts. JAXA's Vision 2025 describes an approach that, among others, could be vigorously pursued to strengthen JAXA's human resources in an effective and efficient manner: "JAXA will take concrete steps to secure staff resources of high quality, pursue strategic staff placement and strengthen staff resources through training in an organized and systematic manner that would be necessary for the implementation of the Vision" (JAXA, 2005, p. 67).

European employees are in the middle in terms of long-term versus short-term employment. Since Japanese people tend to be more risk-averse than Europeans are, they are also more concerned with sustaining a long career at a single organization. US employees tend to take more risk in terms of their employment, and Europe falls between them. Therefore, we arrive at proposition 2:

Proposition 2: Japanese JAXA employees are more uncertainty avoidant than US NASA employees are, with European ESA employees in the middle. These levels of uncertainty avoidance lead to a longer tenure for Japanese employees and a shorter one for US employees, with European employees in the middle (Figure 2).

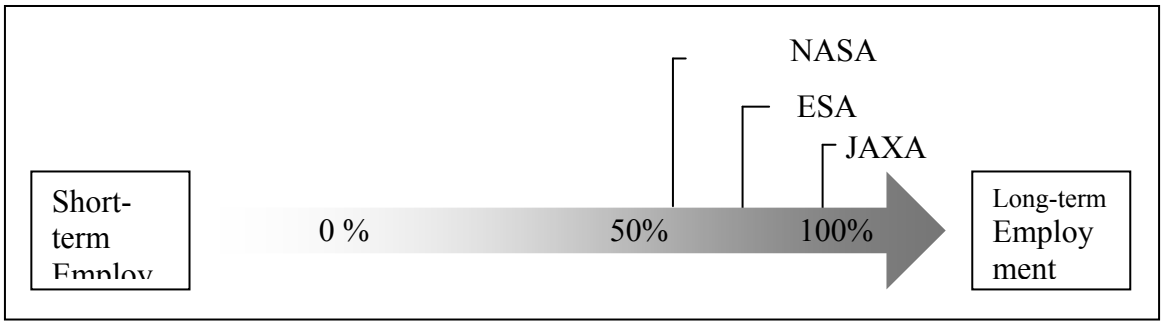

Figure 2: Illustration of Proposition 2

Job Security vs. Job Insecurity

Job security is often considered as one of the most fundamental issues for employees, and those in the space organization industry are no exception. Klandermans and van Vuuren (1999) distinguish between two types of job security: objective and perceived/subjective security. This paper refers only to the perceived/subjective type of job security – how employees feel about their job security – where a high unemployment rate leads to job security's having more importance (Carlin & Soskice, 1990).

The literature states that there is an inverse relationship between the rate of dismissals and subjective job security. In other words, the lower the actual dismissal rate is, the higher the employees' perceived job security is (D. Hübler & O. Hübler, 2010).

Lloyd (1999) shows that stronger regulations regarding employment increase individuals' subjective job security and improve workforce skills. In a study of the civil aerospace sector, Lloyd argues that a high supply of skills is necessary to compete effectively in high-quality production industries. While higher levels of objective job

security result in higher costs during recessions (when employees are retained), it results in reduced costs during boom periods because of lower expenditures for training of inexperienced members and lower recruitment costs, as fewer new employees must be hired.

For ESA in particular, selecting the appropriate candidate for a given position is a time-consuming process. ESA advertised 336 vacancies in 2006, 12 percent of which had to be re-issued mainly because of a lack of qualified candidates for the required specializations. Another reason for the lack of candidates was the requirement to maintain an appropriate balance of nationalities from ESA's member states, which reduces the initial pool of allowable candidates. (Walsh, Donzelli, Danesy & Bonnefoy, 2008)

ESA's Annual Report 2009 addresses the individual job security of its employees in recognizing "that the people who work for the Agency are its most valuable resource, and that their health and welfare are essential to achieving ESA's objectives. ESA is therefore committed to producing a caring and supportive working environment, which is conducive to the welfare of both staff and contractors, and enables them to develop their full potential" (ESA, 2010, p. 83).

Thus, ESA's official company documents tend to emphasize health and welfare issues, rather than job security. Concerning job security, we develop proposition 3:

Proposition 3: Japanese employees at JAXA are more sensitive to the need for job security than are their US counterparts at NASA, and European ESA employees are in the middle (Figure 3). The higher individual sensitivity to the need for job security should pay off for Japanese and European aerospace organizations in the long run.

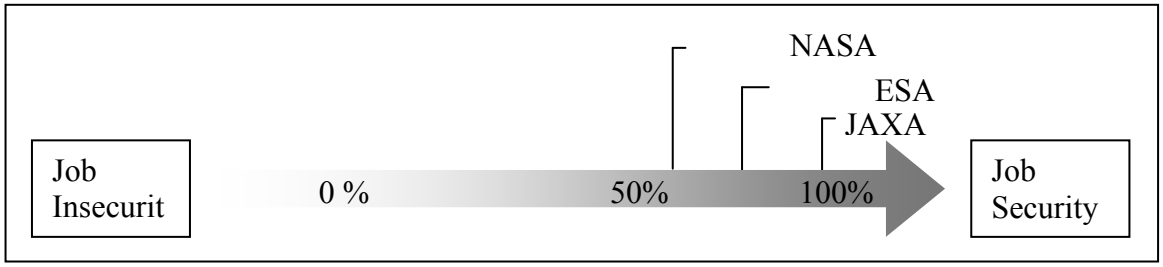

Figure 3: Illustration of Proposition 3

Conclusions

We investigated employment systems in the US, Europe and Japan to show their impact on space agencies.

In our first proposition about regular vs. non-regular employment, we point out that European ESA has disadvantages, as there are many regular employees. In contrast, American NASA states in their official documents that flexibility is required to allow employees to be laid off when needed, and Japanese JAXA can put employees in non-regular positions in order to increase their flexibility.

Our second proposition deals with long-term employment. It shows that, because of their low level of uncertainty avoidance, US employees can be considered short-term oriented. Japanese employees, on the other hand, can be considered long-term oriented.

In regard to job security, our third proposition points out that NASA's strategy uses the American mainstream employment system of giving employees low job security. One disadvantage that can result is job-hopping, which may lead to a lack of resources in that industry. Training costs are high, and if an expert leaves the industry, the chance of getting an equivalent employee is low. This issue is addressed in the specific documents that refer to NASA's employment strategy.

Our argument in this paper is that, in the long run, ESA may see benefits from the comparatively strict employment situation in which politicians and unions have placed it.

Figure 4 illustrates the implications of space agencies' competitiveness related to their employment structures. This result is based on the assumption that the only variable is the employment structure, while all other factors are fixed. Thus, this study shows how competitiveness may change over time based on the employment structure. Other factors that affect the competitiveness of space agencies, such as available budgets, technologies, political restrictions and stimulations, are not part of this study.

Our study is not without limitations. This study uses information about employment structures from three space agencies as a first attempt to shed light onto the industry's employment structures. Data other than official company reports were not obtained concerning specific problems for the industry, with its political and global implications. In addition, the few pieces of information obtained are from different sources, so a direct comparison was not possible. Furthermore, the types of contracts used by the three space agencies vary by region and agency, making direct comparison difficult. We were able to acquire more information from the European and US agencies than from the Japanese agency, which also limits our results.

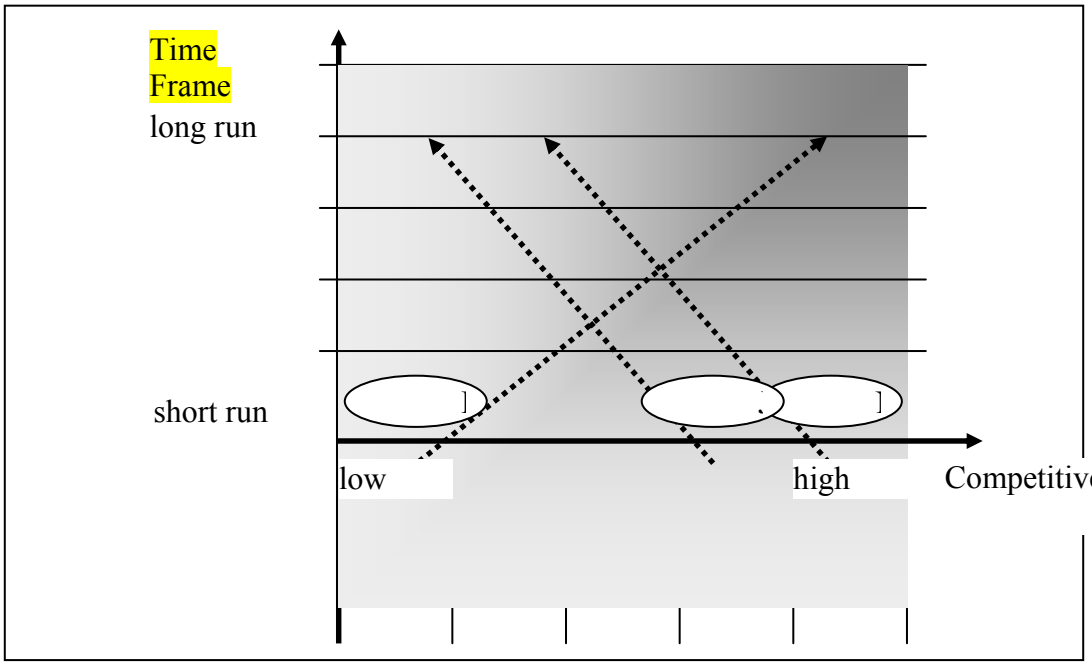

Figure 4: Illustration of Space Agencies Competitiveness Based on Employment Structure

In spite of these limitations, we hope to have shed some light onto an industry with a growing importance for the future.

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