Job Reallocation and Worker Reallocation in the ICT sector

Cheon, Byung-you (Korea Labor Institute)
Kim, Ki-hun (Korea Labor Institute)

I. Introduction

In the aftermath of the 1997 economic crisis, the information and communication industry and industries utilizing related technology, usually referred to as "the ICT sector", made a significant contribution to job creation in the Korean economy. The Korean government, for its part, swiftly responded by implementing policies to boost the ICT sector to generate more jobs. However, the over-investment in the global ICT industry and the resulting slump in recent years are increasingly undermining job security in this sector. The uncertain, variable, and fast-changing nature of the industry is also attributable to the growing job uncertainty. Even so, the ICT sector remains as the key to the dynamic economic growth and as the main driver of job creation in the Korean economy. ICT is becoming an important tool for creating 'more and better jobs'.

In the meantime, the information and communication technology, characterized by rapid pace of change, flexible production methods and a broad range of products, is further increasing the flexibility of the ICT labor market. On top of that, 'creative destruction', or the creation and termination of establishments, is rapidly in progress in the ICT sector. This is another factor making jobs more volatile, causing frequent worker reallocation in the labor market.

Elimination of excess jobs can be painful, but in an evolving economy unproductive jobs need to be constantly replaced by more productive ones. This observation can also be applied in the case of worker reallocation. If too many workers leave their current jobs, human capital indispensable to those specific jobs can be lost, thus eroding economic performance. However, a reasonable level of worker reallocation is crucial to efficiently match workers with the right positions. But it is not easy to estimate the optimum level of job reallocation or the size of worker reallocation. We can only find out what kind of conditions will bring about the right level of reallocation by analyzing the relationship between job reallocation and worker reallocation.

This research aims to find clues on how the labor market will evolve amid the transition into a digital economy by analyzing the characteristics of job reallocation driven by the dynamic change of creative destruction and their implications on the labor market and especially on worker reallocation. In particular, this research attempts to give a comprehensive analysis on job reallocation by establishing the 『Panel Data on Both Employers and Employees』, thus taking part in the worldwide research trend on job reallocation.

II. The Concept of the Analysis Index and Data

The analytic concept of 'jobs' is defined on the basis of an analysis on job reallocation within each business unit. Jobs refer to 'employment positions filled by workers in each business unit' and represent 'the relationship or union between the worker and the employer'. Therefore, job

reallocation is measured as employment reallocation in individual business unit. Employers, which experienced a growth in employment between the terms *t-1* and *t*, are considered to have created jobs, and employers with decreased employment are considered to have reduced jobs. We will examine this job reallocation in individual business units in relation to worker reallocation.

With regards to worker reallocation, let us start by defining 'total turnover' and 'gross worker flows'. Total turnover (TT) includes all cases of creation and destruction in worker-employer relationship. In other words, it is the sum of total hiring (TH) and total quits (TQ). On the other hand, gross worker flows or total worker reallocation (WR) measures worker reallocation in terms of the number of employees. That is, WR denotes the number of employees whose workplace and status have changed (H+Q) from term *t-1* to *t*. Changed workplace means working for a different employer, and changed status refers to transitions from being employed to unemployed or vice versa.

$$TT \geq WR \geq JR$$
$$TT = TH + TQ$$
$$WR = H + Q$$
$$JR = JC + JD$$

TT denotes the total number of labor market transitions, and WR denotes the total number of people who participated in that transition. In this case, job-to-job movements trigger twice the number of movements than other movements, such as job-to-unemployment transitions. If two employees change jobs and employers, the result is two Hs, two Qs and two turnovers. But if two workers change unemployment and employment status, the result is one H, one Q and two turnovers. Moreover, if the movement is reversed, there will be a discrepancy between TT and WR. In other words, if a worker who quit his job is newly employed for all the time between term *t-1* and *t*, the result for TT will be two while the result for WR will be zero. Therefore, 'TT-WR' can be considered as an index of job-to-job movements assuming no temporary dismissal and recall took place. In general, the Labor Ministry's calculation of Q rate and H rate in its 『Monthly Labor Statistics』 is based on the concept of TT rather than WR. When conducting a comparison study on the relationship between job reallocation and worker reallocation, analysis will be based on WR rather than on TT.

Meanwhile, the annual change rate of each index was taken by calculating the average of change rates in individual business units, weighted in terms of the number of employees. The change rates in each business are the results of each index divided by the average number of employees from *t-1* to *t*. For example, if the number of cases where an employee was with an employer at *t-1* but not at *t* is Q, and where an employee was not with an employer at *t-1* but with the employer at *t* is H, then the Worker Reallocation Rate (WRR) is H+Q divided by the average number of employees.

Worker reallocation can be divided into one part that comes from job reallocation and the other part that comes from reallocation of workers within given positions. Worker reallocation deriving from job reallocation due to employer heterogeneity is related to different distributions of available jobs according to employers. The change in spatial distribution of labor demand including growth and decline of markets, corporate and industrial restructuring, changes in the domestic and overseas competition structure, and regional changes in business environment and labor cost are thought to be the factors that cause the first type of reallocation.

The second type of reallocation that stems from reallocation of workers within given positions is

related to job matching issues coming from career-building, changing one's location and job discontent. It is also related to entering and leaving the labor market due to health, education, childcare and housework issues. Particularly, in cases related to job matching, employers repeat firing and hiring while maintaining the overall employment level to change the skills composition of the workforce, or employees leave their existing jobs and find a new job. This second part also includes reallocation arising from employee's life-cycle choices such as the initial entering of the labor market, and leaving the labor market due to retirement or disability.

As we reviewed earlier, the sum of job creation rate and job destruction rate is Job Reallocation Rate (JRR). Therefore, we can say that the JRR part of WRR denotes worker reallocation due to job reallocation, and WRR-JRR represent reallocation due to job matching issues and employer's life-cycle choices.[1]

However, we need to take note that JRR is the maximum level of worker reallocation directly resulting from changes in employment opportunities. In other words, it is the maximum number of people that must 'directly' move due to job reallocation. This is because there are cases where an employee loses his job from an employer reducing its workforce but finds a new job from an employer increasing its workforce within the sample period. This case will be calculated twice in JRR (once in job creation rate and once in job destruction rate).

However, we also need to take note that the job reallocation index we are using represents the minimum job reallocation. This is because of the following reasons. First, it does not reflect the job replacement within a business. For example, even if the number of jobs has not changed during the sample period, jobs for certain occupations or positions can increase while jobs for others decrease. Second, it cannot measure reversed job allocation within the sample period. In other words, it does not reflect cases where an employer increases and reduces jobs to the original level within the sample period.

Furthermore, not all job reallocation represents structural changes in labor demand. For instance, let us assume that a worker well matched to a job resigns because of personal reasons, but his employer did not replace that job judging that the productivity of the new matching is far too low. In this case, the job reallocation has the feature of both the job matching and job reallocation. But in practice, this case will be calculated as worker reallocation arising from job reallocation.

However, there is a large data limit to make an accurate analytical index that categorizes worker reallocation by each individual factor. And also, the above-mentioned limits are not thought to change the overall trend of worker reallocation dramatically. Thus, this research will consider JRR as a part of WRR caused by change in labor demand.

In addition, WRR-JRR will be examined with the concept of Churning Flow Rate (CFR). Churning means withdrawing loyalty from others. In other words, it is the cancellation of employment contract between the employee and the employer. If a company, which cut 5% of the workforce, has 5% of workforce leaving jobs, the CFR will be zero. However, if 8% of its workforce leaves the job, then CFR will be 3%.

---

[1] WRR increases with the increase in measurement period, while JRR decreases with the increase in measurement period. With WRR, H and Q will be added over time, but in the case of JRR, temporary jobs created and destroyed within the measurement timeframe will not be included in the calculation.

$$CF = H+Q-(JC+JD) = H-JC+Q-JD = RH+RS$$

CF can be understood with the concept of Replacement Hiring (RH) and Replacement Separation(RS). CF is twice as large as RH. RH is total hiring minus hiring due to job reallocation, and RS is total separation minus separation due to job destruction. CF is the sum of RH and RS. At the level of individual companies, CF is twice as large as RH or RS, and RH equals RS. Let us have a closer look. RH is separation of expanding companies and hiring of shrinking companies. Let us take an example of an employer increasing jobs. Assume that this employer increased five jobs. However, if hiring was done 20 times, then 15 hirings were made to replace separation. In this case, job destruction is zero, and separation 15 times. Separation in companies with increasing jobs is regarded as CF that prompt hiring in excess of job creation. In the same method, hiring in companies with decreasing jobs is CF to replace separation in excess of job destruction. As a result, CF is twice as large as RH or RS.

Therefore, if we classify separation by reason, there is separation arising from net change in employment($|\Delta E|$), separation due to worker reallocation among companies and industries while the employment level remains steady(EJR)[2] and separation due to employees quitting assuming the employment level remains steady. The latter is RS. This is the part that is not affected by employment changes, changes in the production structure of the economy, or the creation and destruction of companies. It mainly occurs in the process of settling wrong job matching.

Even if the employment level remains the same, there are often cases where employers no longer like certain employees and workers no longer like their jobs. As a result, worker reallocation will exceed job reallocation. We are going to analyze whether separation was caused by companies trying to change the optimum level of employment, or whether it is the result of employers and employees canceling their employment contracts and finding new job matching. This CF issue will be examined in more detail in the next chapter.

Meanwhile, the data we use in this paper is 『Employment Insurance DB』 of the Ministry of Labor. We formed the panel data on employers and employees by combining and reorganizing the 'Employer DB', the 'Career DB' that shows worker reallocation among employment insurance beneficiaries and the 'Register DB' that contains individual characteristics of the beneficiaries. 『Employment Insurance DB』 provides information on 21 million job spells of some 13 million people since July 1995. It also covers some 1.05 million employers including terminated establishments as of January 2002.

However, because the 『Employment Insurance DB』 is administrative data related to application of employment insurance, it may exaggerate job reallocation and worker reallocation. That is because it may reflect changes in administrative variables rather than economic activities. Creation and destruction of employers is especially difficult to measure accurately. Even if a business undergoes ownership change or M&A without being created nor destroyed, it can be regarded as creation or destruction of a business.

Tattara and Valentinin (2002) note that if we remove job creation due to ownership change, 5% of total hiring and separation are reduced. Statistics Sweden also deals with employers that show over 25% of yearly employment change separately in order to enhance the quality of administrative data. Persson (1998) used demographic methods to track employers and found out 'false creation of establishments' and 'false closing of establishments'. For example, even if the ID of two employers are different, when over 50% of workers in company A in the year *t* are

---

[2] As examined earlier, JR equals net change in employment rate plus EJR ($JR = |\Delta E| + EJR$).

employed in company B in the year *t+1* and over 50% of people in company B come from company A, company A and B are the same[3]. By tracking Swedish companies with this demographic method, Persson (1998) identified that among 1.1 million, only 825,000 remained and 25% did not qualify. However, Piekkola and Bockerman(2000) criticized that Persson's method rules out too many creation and destruction of usually small establishments, and noted that the 'false creation' and 'false destruction of establishments' do not affect job reallocation dramatically[4].

This research also tracked 'false creation' and 'false destruction of establishments' in the 『Employment Insurance DB』 by utilizing the demographic method. We identified about 20,000 establishments among 650,000 per year were 'false creation' and 'false destruction' according to Persson's categorization. However, most of these establishments were small firms and many of them had changed addresses. Therefore, this research identified only the establishments with 50 or more employees and with the same domicile from the ones that meet Persson's criteria as 'false creation' and 'false destruction'. The figure was about 880, and most of them derived from changes in ownership. If the domicile was changed, we regarded them as new startups. We regarded them as destruction and creation according to movement in location.

The Employment Insurance project covered only establishments with 30 or more employees before 1998, but after that, it was expanded to include all employers. As a result, many employers were included in 『Employment Insurance DB』 in 1998, and this can lead to many cases where the date of business establishment[5] is different from the date of joining the employment insurance. Therefore, this research analyzed cases that occurred after 1999, and excluded instances where the gap between the two dates are over 30 days. For establishments that had been in place for a long time but had recently joined the employment insurance, including them might exaggerate the number of employees over time.

---

[3] The tracking method of employers using demographic method is as follows. First, let us consider the following two conditions.

Condition A: Nij/Nj>0.5

Condition B: Nij/Ni>0.5

i= first year, j= second year. Ni is the number of workers in company X in the first year, and Nj is the number of workers in company Y in the second year. If condition A and B are both satisfied, X and Y, although with different IDs, are treated as one company. If neither of the conditions are met, it is regarded as complete closing or a completely new startup. Meanwhile, with regards to the disappeared ID, if A is met only, the cause of destruction is regarded as dispersal, and if B is met only, the cause is regarded as merger into a larger unit. With regards to the new ID, if A is met only, the cause of creation is regarded as dispersal, and if B is met only, the cause is regarded as a result from mergers. For more detail, see Persson (1998).

[4] Albaek and Sorensen (1998) also regard establishments as going concerns if they satisfied the following conditions. (1) Same owners and same business content, (2) same owners and same employees, (3) same employees and same industry and (4) same employees and same domicile. Same employees in (2) mean at least 30% of employees remaining in the first year, or over 30% of employees in the second company are filled by existing employees. In (3) and (4), it means at least 30% of employees remaining in the first year, or over 30% of employees in the second company is filled by existing employees. See Annex 4 of Davis et al(1997) with regards to data issues on utilizing the administrative data.

[5] The 『Employment Insurance DB』 does not have direct information on the establishment date, thus the first job creation date for each business was regarded as the establishment date.

This study will not only analyze the job reallocation itself, but also analyze it in relation to worker reallocation. 『Employment Insurance DB』 includes not only employer related information but also detailed data on individuals' hiring and separation, thus providing an accurate information on worker reallocation. The main research theme of this chapter is analyzing the relationship between job reallocation at the employer level and worker reallocation at the individual employee level.

III. Job Reallocation and Worker Reallocation

1. Job Reallocation

Existing researches identify large-scale job reallocation, in and around the manufacturing sector in particular. According to the summary on past researches by Davis and Haltiwanger (1999), job creation rate can range from 6.0% to 14.8%, and job destruction rate from 5.8% to 12.5% depending on the sector or the sample unit. With a job creation rate of 9.75% and job destruction rate of 10.34%, Korea loses one and gains one out of every 10 jobs per year.

Table-1 shows the yearly trend of job creation and destruction from 1999 to 2001 calculated by using the data in 『Employment Insurance DB』. We have to consider that Korea underwent rapid economic fluctuations in the aftermath of the economic crisis, and thus job reallocation was extremely volatile. In particular, after the economic crisis, the manufacturing sector experienced a big rebound in 1999, and the ICT sector led an economic boom in 2000, but the economy dramatically slowed down in 2001. These unique circumstances must be taken into account when looking at Table-1.

First, as in the existing researches, we observed large-scale job reallocations in both the manufacturing sector and the ICT sectors. Notably, the size of job reallocation in the ICT manufacturing sector is 1.2 times of that in the manufacturing sector, and the ICT service sector 1.6~2.0 times of that in manufacturing. JRR, the sum of job creation and destruction rates, is only 23~27% for manufacturing, but 38~52% for the ICT service sector. Some may argue that the percentages are higher in the ICT sector because it is a service industry. However, although the data are not shown in a table in this research, our analysis confirmed that other service industries do not have higher job reallocation rates than the ICT service industry. In addition, the ICT manufacturing industry also shows 27~34% of job reallocation rate, slightly higher than the overall manufacturing industry. In the case of ICT sector, we can see that the size of job reallocation caused by changes in demand and technology is higher than in other industries.

<Table-1> Job Creation and Destruction

(Unit: %)

		JCR			JDR			NET			JRR	EJR
		Startu	Expa	Subto	Extin	Contr	Subto	New	Existi	Total		
Manufacturing	1999	5.1	12.0	17.1	3.1	6.9	10.0	2.0	5.1	7.1	27.2	20.0
	2000	4.9	9.8	14.8	3.3	6.9	10.2	1.6	2.9	4.5	25.0	20.5
	2001	3.9	6.5	10.4	2.9	9.8	12.7	1.0	-3.3	-2.3	23.1	20.8
ICT Manufacturing	1999	5.3	18.8	24.2	2.3	7.7	10.0	3.0	11.2	14.2	34.1	20.0
	2000	5.1	15.7	20.8	2.1	6.1	8.2	3.0	9.6	12.6	29.1	16.4
	2001	3.1	6.9	10.1	2.6	14.7	17.3	0.5	-7.8	-7.2	27.4	20.2
ICT Service	1999	9.9	19.0	28.9	7.7	8.3	15.9	2.2	10.7	13.0	44.8	31.9
	2000	21.0	19.3	40.3	2.3	9.4	11.7	18.7	9.9	28.6	52.0	23.4
	2001	9.5	10.9	20.3	5.0	13.4	18.5	4.4	-2.6	1.8	38.8	37.0

Note: JCR= Job Creation Rate, JDR=Job Destruction Rate, NET=Net Job Increase Rate
JRR=Job Reallocation Rate, EJR=Excess Job Reallocation Rate

On the other hand, the Excess Job Reallocation Rate (EJR), or the difference between the total Job Reallocation Rate and the Net Reallocation Rate of the manufacturing sector is relatively consistent in the 20% level. However, in the ICT service sector, the numbers are relatively high, and fluctuate rather significantly in the range of 23 37%. This shows that the simple rise and fall of the demand is not the only factor that affects the employment rate of a particular industry of sector. Rather, rapid technological changes add to the heterogeneity among establishments, and as a result, massive job reallocation takes place irrespective to the changes in employment levels.

Employment decreased in absolute terms in 2001. However, job creation in the manufacturing sector in this very year exceeded 10%, and the number was as high as 18.5% in the ICT service sector when net employment increased by a mere 1.8% in 2001. This shows that large-scale job creation and destruction occurs regardless of economic situations. It also shows that heterogeneity among establishments in terms of job reallocation is high in Korea as well.

We could try looking at the job creation rate and the destruction rate separately. In the case of the manufacturing sector, job creation rate ranges between 10.4 17.1% and the destruction rate between 10.0 12.7%. On the other hand, the ICT service sector has a job creation rate of 20.3 28.9% and a destruction rate ranging between 11.7 18.5%. The numbers are 10.1 24.2% and 8.2 17.3%, respectively, for the ICT manufacturing sector.

Job creation through business establishment accounts for approximately 30% of the total job creation rate in the manufacturing sector and is a bit higher in the ICT service sector with 30 50%. Closing down of establishments accounts for 30% and 20 50%, respectively, of the total job destruction rates in the manufacturing sector and the ICT service sector. These figures are quite high when compared to the 15% and 23% contribution rates of establishing or closing establishments to the total job creation rate and destruction rate, respectively, in the US manufacturing sector (Davis et al) or the 14% and 16% in the Swedish manufacturing industry. In 2001, the proportion of business startups and closings in total job reallocation rate was 29.4% in the manufacturing sector and 38.8% in the ICT service sector. However, the rate is as low as 20.8% in the ICT manufacturing sector. In other words, the contribution of business startups or closings on job reallocation of the ICT manufacturing sector is relatively low. This seems to reflect one of the distinctive characteristics of the Korean ICT manufacturing sector. That is, the Korean ICT manufacturing sector is dominated by large conglomerates that control much of the job

reallocation. Considering this, we can conclude that job reallocation due to the creation or destruction of establishments accounts for a significant portion of job reallocation.

Of course, we need to take into account that there are certain limitations in the accuracy of data on job creation or destruction due to business startups or closings. Error rates may be high in the administrative data, and the final numbers can also vary greatly depending on how the administrative data were processed, or the size of the establishments included in the survey. As was pointed out by Davis and Haltiwanger (1999), in the case of business creation and destruction, sample design, sample period, the level of observation (firm or business), and how well the tracked information are linked are some of the factors that determine the data quality. However, we believe that all potential causes of variations or errors in job reallocation due to incorrect definition of scope for startups and closedowns have been minimized in this research. The scope of this research does include all establishments with one or more worker, but as was mentioned before, all those with more than 30 days' discrepancy between the date of business establishment and the date employment insurance subscription was initiated were excluded. Furthermore, if a business had workers in term t, had zero workers in term t+1, and had workers again in the following term, the business was not considered to have been destroyed but scaled-down. For such reasons, we believe that the possibility of over-estimating business creation or destruction is quite low. In other words, we believe it is quite within reason to conclude that the contribution of business startups and closedowns to job creation and destruction is relatively higher in Korea than in other nations and that the rate is particularly high in the ICT sector[6].

2. Simultaneous Hiring and Separation

Next, we should consider the following issues on the relationship between job reallocation and worker reallocation. Are there simultaneous hiring and separation just as there are simultaneous job creation and destruction? In other words, do establishments cutting down payrolls hire new workers, and do separations take place in establishments expanding their workforces? What percentage of worker reallocation is related to job reallocation? If worker reallocation is higher in the ICT industry than in the manufacturing industry, then we may attempt to identify the probably cause. Is this due to job reallocation caused by business changes, or is it due to the churning flow that occurs in the process of resolving incomplete job matching caused by differences in worker separation or the HR policy of the employer?

Against this backdrop, an analysis of the relationship between job reallocation and worker reallocation would enhance our understanding on worker reallocation previously focused on the demand side. Many previous studies on worker reallocation tended to regard job flow and worker flow at the same level. However, Abowd et al. (1999), Hamermesh et al. (1996) and Lane et al. (1996) have already identified the fact that employers cutting back on the number of employees also hire new workers, and that business expanding their work force also fire workers.

Abowd et al (1999) reported that, in France during the period of 1987 1990, one job creation was equivalent to two separation and three new hiring, and that one loss of job in a year was the same as two new separation and one new recruitment. Abowd and colleagues also discovered that a business can adjust its employment level by modifying its hiring rate rather than its separation rate, and that quite a number of hiring and separation occurs simultaneously even when the differences in skills are controlled. Hamermesh et al(1994) also showed that half the new hiring takes place in firms where employment does not increase, and that half the separation occurs in firms where employment does

6) In particular, business creation and destruction are not instantaneous occurrences. Since plants/factories have a tendency to be created small and die small, they cannot be overlooked in terms of evolution of employment. For example, when regarded in 5 year terms, the contribution of business creation and discontinuation of business is twice as high compared to when considered in one-year terms.

not fall. Also, most of the firing is done in the firms that are also hiring, and worker flow within firm is less than that among firm.

According to <Table-5>, the Korean manufacturing sector has a Total Turnover Rate (TTR) in the 80% level whereas the figures are over 100% in the ICT service sector. The fact that the numbers are this high even when the 『Employment Insurance DB』 does not include daily workers, once again confirms the common understanding that worker reallocation rates are very high in Korea.

<Table-5> Trends of Major Indices on Worker Reallocation

	Year	TTR	WRR	CFR	HR	QR	C/H	D/Q	JRR/ WRR	CFR/ WRR
Manufacturing	1999	87.8	59.5	32.4	33.3	26.2	51.4	38.2	45.6	54.4
	2000	89.2	59.4	34.4	32.0	27.4	46.2	37.3	42.1	57.9
	2001	76.9	53.1	30.0	25.4	27.7	40.9	45.8	43.4	56.6
ICT Manufacturing	1999	102.9	69.7	35.6	42.0	27.8	57.6	35.9	49.0	51.0
	2000	104.9	69.0	39.9	40.8	28.2	51.1	29.2	42.1	57.9
	2001	81.2	57.7	30.3	25.3	32.5	39.9	53.3	47.5	52.5
ICT Service	1999	127.1	78.5	33.7	45.7	32.8	63.2	48.6	57.1	42.9
	2000	144.8	88.0	36.0	58.3	29.7	69.1	39.5	59.1	40.9
	2001	102.0	72.4	33.6	37.1	35.3	54.7	52.4	53.6	46.4

Meanwhile, the WWR, or the worker reallocation rate, is in the 50% level in the manufacturing sector, 60% level in the ICT manufacturing sector, and in the 70% level in the ICT service sector. In other words, job matching is taking place or being resolved for a total of 50 jobs in the manufacturing sector, 60 jobs in the ICT manufacturing sector, and 70 jobs in the ICT service sector, out of every 100 jobs.

Worker Reallocation Rate (WRR) can be broken down into Hire Rate (HR) and Quit Rate (QR). In the manufacturing sector, the hiring rate ranges from 25% to 33%, and the separation rate from 26% to 27%. The numbers range 37 45% and 30 35%, respectively, in the ICT service sector. In the case of the manufacturing sector in 2001, when the number of jobs decreased significantly, the hiring rate exceeded 25%. In the same year, the number of jobs on the market increased by a mere 1.8% in the ICT service sector, and yet, the hiring rate was over 37% of the entire labor force. This shows that hiring and separation occurs simultaneously in Korea just as in other nations.

However, the degree of simultaneous hiring and separation is relatively low in Korea when compared to other countries, or when comparing the figures between economic upturns or downturns, or when comparing the relative ratio of hiring and separation in expanding and contracting business. Let's take a deeper look into this area.

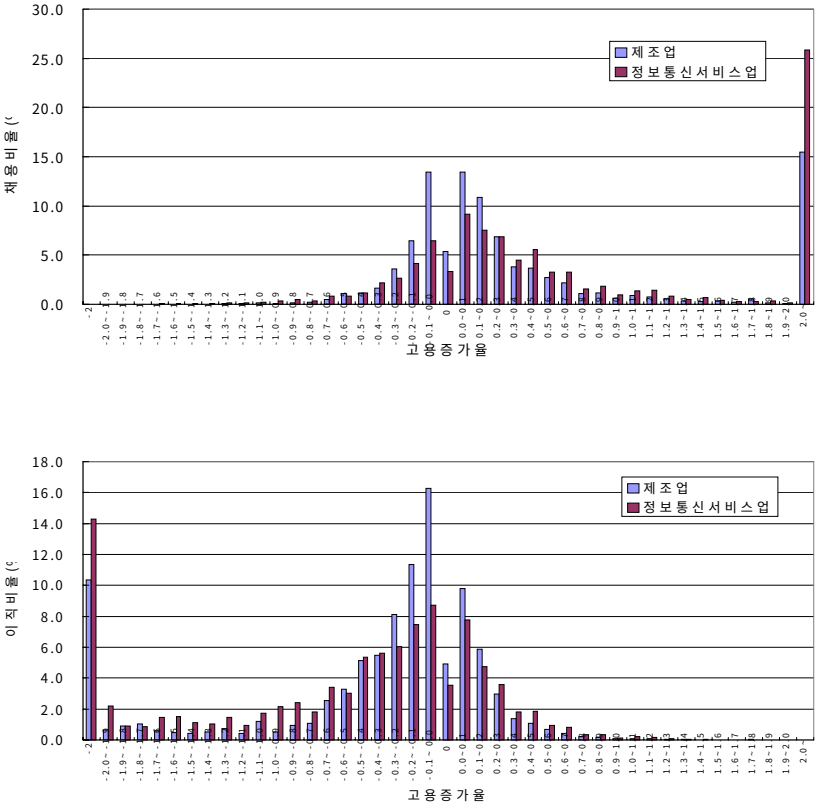
In the manufacturing sector in 2001, about 34% of all hiring (8.7 out of 25.4) was done by establishments that were not increasing employment, and 28.2% of all separation occurred in expanding establishments. As for the ICT service industry, 25.9% of all hiring took place in establishments cutting down employment, and about 25% of total separation occurred in establishments in the process of increasing their payrolls.

Compared to the results produced by Hammermesh et al (1994), the rate of simultaneous hiring and separation are low. However, comparison to the results from Albaek and Sorenson (1998) says that the numbers are not that small. Considering that fact that data from the former study rely on a limited number of samples while that latter is more

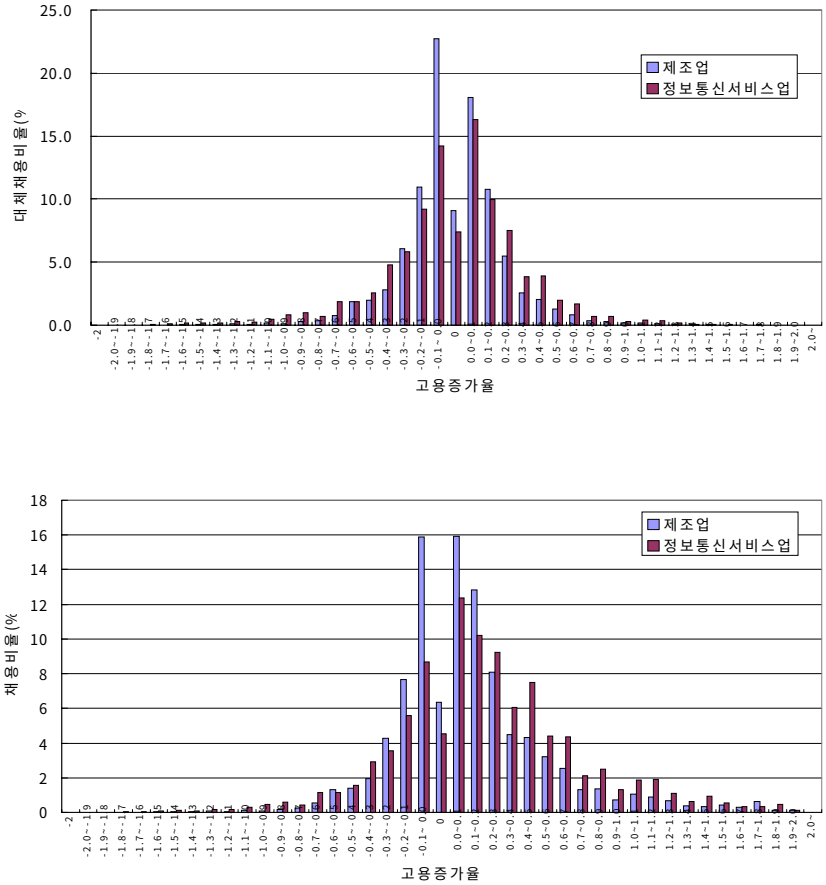
systematic and organized, a comparison, if any, should be done with the latter study. Therefore, we could say that though simultaneous separation and hiring do occur in Korea, the rate is low in the ICT manufacturing sector. In the ICT service sector, hiring is more prevalent in expanding establishments, and separation in contracting establishments. When considering that simultaneous hiring and separation can be taken to mean that there is a fairly large amount of replacement hiring or churning flow, we can conclude that churning flow is relatively limited in the ICT industry.

Such findings are supported by the distribution of hiring and separation in accordance to employment increase as shown in [Figure 3-3], [Figure 3-4], and <Table-7>. In the ICT service industry, hiring rate is higher in establishments with high job creation rate, and separation rate higher in job-destroying establishments.

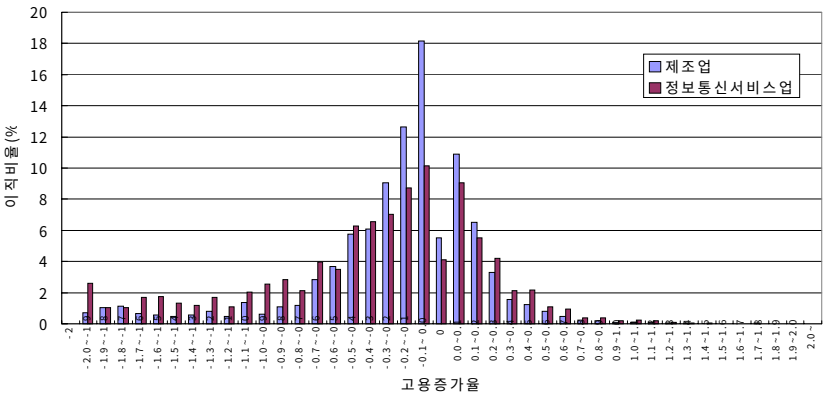
[Figure 3-3] Hiring and Separation Rates due to Increase in Employment



[Figure 3-4] Hiring and Separation Rates due to Increase in Employment (Excluding Created or Destroyed Establishments)



[Figure 3-4] Hiring and Separation Rates due to Increase in Employment (Excluding Created or Destroyed Establishments)



<Table-6> Ratio of Hiring and Separation by Employment Growth Rate

<All Establishments/Concerns>

		[-2, -1]	[-1, -0.2]	[-0.2, 0]	0	[0, 0.2]	[0.2, 1]	[1, 2]
Hiring	Manufacturing	0.3	8.4	19.9	5.4	24.3	22.0	19.6
	ICT Services	0.7	8.8	10.6	3.4	16.7	27.8	32.0
Separatio	Manufacturing	17.4	27.1	27.6	4.9	15.6	7.0	0.3
	ICT Services	27.5	29.9	16.2	3.5	12.5	9.9	0.6
Replace	Manufacturing	0.6	14.3	33.7	9.1	28.8	13.0	0.6
	ICT Services	1.7	19.4	23.4	7.4	26.3	20.7	1.2

<Going Concerns>

		[-2, -1]	[-1, -0.2]	[-0.2, 0]	0	[0, 0.2]	[0.2, 1]	[1, 2]
Hiring	Manufacturing	0.4	10.0	23.5	6.4	28.8	26.0	4.9
	ICT Services	1.0	11.8	14.3	4.5	22.5	37.5	8.3
Separation	Manufacturing	7.8	30.2	30.8	5.5	17.4	7.9	0.3
	ICT Services	15.4	34.8	18.9	4.1	14.6	11.5	0.7
Replacement	Manufacturing	0.6	14.3	33.7	9.1	28.8	13.0	0.6
	ICT Services	1.7	19.4	23.4	7.4	26.3	20.7	1.2

In the case of manufacturing industry, though recession causes an overall decrease of hiring, it can be seen that hiring increases in contracting establishments. On the other hand, suspension also increases in these establishments. When the economy is in a downturn, a higher number of workers leave establishments cutting down the number of employment, and this seems to be pressuring the employers to hire more workers. Such a trend is also evident in the ICT manufacturing sector and the ICT service sector, though in relatively lesser degrees. Persson (1998) has shown that a similar condition was noted in Sweden as well. When both hiring and separation rate increases in workplaces cutting down employment, the hiring is a form of replacement hiring, and this implies that the size of churning flow is substantial.

However, such replacement hiring or churning were relatively limited in Korea during the post-crisis period. This shows that hiring for job creating far exceeded replacement hiring. In the manufacturing sector, the economic situation deteriorated in 2000 over 1999 and worsened further in 2001 than in 2000. As for the ICT sector, 2000 was a boom year, and 2001 a recession. Examination of the hiring in these industries during the time period shows that more hiring is done by establishments increasing employment in the good economic years, whereas separation rates are higher in contracting establishments during the downturn. Thus, it could be said that worker reallocation is lead by the hiring activities.

Trends and data also show that worker reallocation tends to decrease during economic slowdowns. Total turnover rate (TTR), worker reallocation rate, and churning flow rate (CFR) all decreased significantly during the downturn in 2001. This trend is common in both the manufacturing sector and the ICT industry. It is because the market-adaptive characteristics of worker reallocation rates are controlled more by hiring than by separation. That is, separation rate remained fairly consistent throughout the three years whereas hiring was quite sensitive to economic conditions. Abowd et al (1999) report similar findings, showing that when firms adjust their employment level to economic conditions, they rely more heavily on hiring than on separation.

In conclusion, simultaneous hiring and separation, or replacement hiring and churning, also occur in Korea.

However, they occur to a lesser extent in Korea compared to other nations, and to an even lesser degree in the ICT industry. When the economic climate is good, though separation also occurs in expanding establishments, hiring tend to lead worker flow, and when the economy slows, separation leads the flow, though hiring, too, does occur to a certain extent in contracting establishments. Such observation shows that in Korea, worker flow is also usually led by employers. In other words, voluntary worker separation to expanding establishments in search for better working conditions during economic upturns or voluntary separation from contracting establishments during downturns are weaker factors than the employers' decision and action of increasing employment in expanding establishments during upturns and reducing employment in contracting establishments during downturns. Such trends are more prominent in the ICT industry.

The above results are slightly different from that of the study conducted by Albaek and Sorensen (1998) in Denmark. Albaek and Sorensen (1998) analyzed the economic-related characteristics of worker flows and concluded that worker flows are led by workers who voluntarily undergo separation during economic upturns in an effort to secure better jobs rather than by employers or establishments trying to upgrade their workforce during down turns.

3. Analysis of Demand Change Factors and Job-Matching Factors

As was observed above, the fact that worker flow is more under the control of employers than of workers means that a larger portion of worker flows is attributable to job flows.

Previous studies conducted by foreign researchers show that much of worker flows is attributable to demand-side factors. Davis and Haltiwanger (1999) summarized the results from previous studies and concluded that total turnover was 25% quarterly and 37% annually, and that job flows can be accountable for approximately 35% to 46% of work flows. Though job flow rates are lower in the manufacturing sector than in the service industry, accountability for worker flows was higher. The major findings from the analysis of the relationship between job flow and work flow are summarized in <Table-7>.

According to <Table-5>, job creation rate over hiring rate (C/H) was between 41-51% in the manufacturing industry and 54-69% in the ICT service industry. Job destruction rates over quit rates (D/Q) was 38-45% in the manufacturing sector and 40-52% in the ICT service sector. Compared to analysis results from other nations, the proportion of worker flows in job flow is relatively high.

<Table-7> Results from Previous Studies on the Relationship between Job Reallocation and Worker Reallocation

Researchers	Subject of the Study	Standard Period	Results
Anderson and Meyer (1994)	All American Establishme	Quarter	Hiring rate is three times the job creation rate Total Separation Rate is 3 times the job destruction rate
Davis and Haltiwanger (1996)	American Manufacturers		Churning flow rate accounts for approximately 36-53% of total worker reallocation rate
Hamermesh et al. (1996)	All Netherlands	Year	Hiring and separation is three times the job creation and destruction rate
Albaek and Sorensen (1998)	Danish Manufacturers	Year	Job creation is 42% of hiring (48% during economic upturns, 37% during downturns). Job destruction is 48% of job separation (33% during economic upturns)
Lagarde et al. (1995)		Year	Hiring and separation is three times the job creation and destruction rate
Anderson (1997)	Swedish Manufacturers		26 42% of worker reallocation is caused by job restructuring among manufacturing plants
Lane et al (1996)	US		Job reallocation rate is 58% of worker reallocation rate in the manufacturing sector and 50% in the private sector
Burgess et al (1994)	Manufacturing	Quarter	Job reallocation rate is 13%. The quarterly sum of hiring and separation rate is 24%

The Churning Flow Rate (CFR), which represents the excess worker flow than is necessary to satisfy job flows, is slightly higher in the ICT industry. However, that of the manufacturing sector is quite similar, as both are at the 30% level. A churning flow rate in the vicinity of 30% is not low. However, the level of worker flow itself is pretty high in Korea, and the proportion of the churning flow rate in relation to the total worker flow is around 55% in the manufacturing sector and between 40% and 45% in the ICT service sector.

Compared to other countries studied, the proportion of job flow in worker flow is relatively high in Korea. However, the absolute value of the churning flow rate is definitely not of a low level in Korea. This shows that the Korean labor market is highly volatile regardless of the job flow level. Therefore, we can say that not only is the relative ratio of worker flow, caused by rapid demand fluctuation in the labor market, high, but that the absolute level of worker flow that results from job matching is also high.

As for the manufacturing sector and the ICT industry, the churning flow rate of the ICT industry is slightly higher. However, the difference between the two industries is not significant. Meanwhile, worker flow rate is much higher in the ICT industry than in the manufacturing sector. Therefore, the proportion of worker flow, caused by job flow, is higher in the ICT service sector and that of the churning flow rate higher in the manufacturing sector.

Under the premise that the manufacturing sector and the ICT sector were at their respective peaks in 1999 and 2000, and that business was bad for both sectors in 2001, job creation rate accounts for a higher portion of total employment in the manufacturing industry during the good years, and a lower portion in the slower years. On the other hand, job destruction take up a lesser proportion of total separation in the good years and a higher portion in the bad years. Overall, the effect of job flow in worker flow seems to be quite neutral. In other words, when economy is brisk, there is a lot of hiring due to job creation, and a lot of separation due to job destruction when the economy is in recession.

And though the correlation is somewhat weak, churning flow rates seem to be adjust itself to the pace of the economy. This implies that worker flow is more influenced by the hiring and firing of establishments according to varying economic conditions than by the voluntary separation of workers.

The above observations imply that, if there are any differences between the ICT industry and the manufacturing sector in terms of worker flow, the more likely cause would be demand-side factors than the difference in the mechanism of the respective labor markets or the job matching structure. In other words, the different job flow structures of the two industries, caused by different growth rates or technology-related changes, has more to do with the difference in worker flows than the behavior of employers and workers in the labor market.

In the case of Burgess et al (2000), worker reallocation rate varies greatly among industries. The researchers report the reason to be the different methods used to reevaluate job matching in the respective industry[7]. However, such an explanation is not suitable for Korea.

IV. Analysis of the Determinant Factors for Job Reallocation and Worker Reallocation

In this section, we will investigate the factors that determine the difference of job flows and worker flows at business units through a regression analysis. Also, we will analyze if the determinant factors differ between the manufacturing sector and the ICT industry. Such analyses are necessary because it can be argued that differences in job reallocation rates, worker reallocation rates, and churning flow rates between the manufacturing industry and the ICT service sector are attributable to the difference in business size or distribution of length of business rather than on industry-specific technological, structural characteristics.

1. A Theoretical Examination of the Determinant Factors of Job Reallocation Rate

First, let's go over the theoretical arguments involving the determinant factors of the job reallocation rate, of which there are quite a few. First, an important pair of variables that affect job reallocation and worker reallocation are the size of a business and its length of business. In 1931, Robert Gibrat announced the Law of Proportional Effect. Gibrat's Law states that the growth rate of an firm has nothing to do with the firm's current size or past growth history. Since then, this theory has been the subject of numerous discussions and empirical studies.

In particular, the Firm Learning and Selection Model and the Vintage Capital Theory of Jovanovic present theoretical implications that counter Gibrat's Law. Let's take a look at the Jovanovic's (1982) Life-Cycle Model and the Passive Learning and Selection Process Model. In its first few years of business, an firm is challenged with uncertainties of efficiency and cost parameters. However, as time passes, the firm manages to gather information about its investment, learning about its efficiency after production starts. Consequently, the most efficient firms grow and continue, whereas the less efficient ones are reduced or ousted from the market. Establishments with longer histories are less likely to be exited from the market as they have passed the initial learning and selection process, and job reallocation rates are lower. According to the model of Jovanovic (1982), younger firms tend to grow faster than older ones. The model also implies that growth dispersion is the highest in young, small-scaled firms. That is to say that the size and history of a business are inversely proportional to net job creation rate and job

7) Arai and Heyman (2000) observed that churning flow rate is low in the case of regular workers, which implies that the rate of inappropriate job matching is low for these workers. If the cost of worker flow is high, efforts would be made for proper job matching, and prudent employment policies would be used when hiring

reallocation rate.

The Vintage Capital Theory states that the sunk costs related to installing new capital for technological advancement or a unique shock induce job reallocation that exceeds the net employment change. In other words, the life-cycle of the capital is closely related to that of a business, and job reallocation rates are greater in the initial phase of capital introduction. The capacity and technology in the model presented by Caballero (1994) also includes sunk costs. When firms first enter the market, they are equipped with a certain portion of the capacity needed for long-term survival. This percentage is lower in small-scale firms because they are less efficient and more likely to be exited by the market than their larger counterparts. In the second phase, firms start adjusting their capacity to a level more befitting a long term business. As a result, small-scale firms grow faster than the larger firms, and there is an inverse correlation between the initial size and growth rate. Also, growth dispersion decreases as the firm grows. Size and history of the firm also displays an inverse correlation with net job creation rate and job reallocation rate.

Bockerman (1999) reported that job reallocation rate can be expected to be lower in larger establishments since they have the ability to smooth out unusual disturbances occurring at smaller units. This implies that large-scale firms are not merely a collection of smaller establishments.

However, some argue that the inverse relationship between corporate size or history and growth is at least partially due to the sample selection bias. According to this argument, firms that are slow to grow are more likely to be ousted from the market, and as a result, the estimated growth rate of the surviving firms becomes biased. Therefore, it looks as if the smaller firms grow relatively faster than the larger firms. However, many studies show that, even if sample selection bias can be controlled, it is still difficult to find empirical evidence that supports Gibrat's Law. This means that Gibrat's Law is hard to be applied to small-scale establishments. (Hart & Oulton 1996, Audretsch et al. 1999. Mata 1994, Dunne & Hughes 1994)

For example, Evans (1987) managed to keep the sample selection bias in check and analyzed the American manufacturing industry to discover that corporate history and size was inversely proportional to growth rate. Even when the probability of a firm's survival is taken into consideration and the firm is presupposed to survive, the relative growth rate of the firm decreased as its size and length of business increased. Hall (1987), Evans (1987a, b), Dunne et al. (1989a, b) also concluded that even if net increase in employment offsets the effect of the corporate size, growth tended to slow down as the firm became older. Caves (1998) reviewed numerous previous studies and summarized that many of the studies confirm the inverse relationship between corporate size and employment growth rate.

The wage level and wage-related policies of a business may also affect job reallocation rates. First of all, the higher the average wage, the lower the total turnover rate is expected to be. Average wage can be seen as reflecting the corporate-specific human capital of each business; as such resources tend to maintain employment relationships despite various disturbing factors.

The relationship between a business's wage policy or wage flexibility and job reallocation was examined repeatedly in the process of comparing the labor markets in Europe and the United States, and particularly, in the course of analyzing the employment effect of the Swedish collective wage policy. Bertola and Rogerson (1996) analyzed that the reason job reallocation rates are similar in Europe and the United States is because wage compression in the European states boosts the employer-led job reallocation[8]. The researchers also showed that an increase in wage dispersion among industries leads to a decline in job reallocation rates among industries. However,

---

employees for regular positions. However, this would be done at the expense of the non-regular workers.

8) They analyzed that though there is not much difference between Europe and the United States in terms of job reallocation rate, the European Dismissal Prevention System such as the employment stability system and the institutional mechanism that determines wage levels are some of the factors that explain the big difference in employment rates.

Andersson (1999) analyzed the Swedish manufacturing industry and reported that no evidence supporting the hypothesis that large wage compression is the reason for high job reallocation rates could be found. Wage distribution did not affect job reallocation rates greatly, nor did an increase in inter-division or intra-division wage distribution lead to a decline in job reallocation rates. He discovered a close correlation between job reallocation and total productivity increase rate and asserted that, if economic changes are excluded, the most important factor explaining job reallocation is an increase in productivity.

Whether or not a business is part of an firm composed of multiple business units can also affect job reallocation rates. There is currently a debate going on as to whether the fact a firm is composed of multiple business makes a difference in innovation and growth, and if it induces higher employment growth and job reallocation rates. Young, single-business firms implementing innovation in terms of product, service, process, and market start off their operations shouldering a substantial amount of risk, with higher future profits in mind. These firms withdraw, expand, or prosper as they learn their relative position and competitiveness in the market. Single-unit establishments run by the owners have higher risks, and respond swiftly to detected problems or opportunities. As a result, these establishments are characterized by high employment growth and job reallocation rates (Jovanovic, 1982)

On the other hand, establishments that form a part of the multiple-business firm are usually operated by professional managers, are risk averters, and have a limited financial liability. Meanwhile, life-style establishments are operated in a more stable environment with minimum risk until the day the owners retire, without much interest in growth. In contrast, most of the multiple-business firms are incorporated and accountable for limited financial liability, which allows them to operate in a higher risk environment. According to the Theory of Industrial Organization, limited liability companies have both a higher growth rates and higher death rates (Stiglitz and Weiss, 1981, Harhoff, Stahl, and Woywode, 1998). The empirical study conducted by Burgess, Lane and Mckinney (2001) reports that the rate of job reallocation is higher in specialized plants than in diversified plants.

2. A Theoretical Examination of the Determinant Factors for Churning Flows

As was mentioned previously, job flow refers to the creation and extinction of jobs resulting from the expansion or contraction of establishments. The term worker flow is used to describe the activity of workers moving in and out of jobs. Worker flow is composed of a section that can be described as the direct result of job flow, and a portion that exceeds job flow. The difference between the two is the churning flow. Churning flow is the sum of Replacement Hires (RH) or Replacement Separation (RS), and the two factors are the same in individual firms.

Churning at a business level occurs due to ‘simultaneous hiring and firing by the employer’ or when ‘workers quite their job or are replaced’. In other words, churning flow occurs because of workers churning employers or employers churning workers, the latter of which has the purpose of upgrading the quality of labor or modifying a job’s skill set. Churning is attributable to the employer heterogeneity or the job match heterogeneity. Churning reflects all the process of an employer and a worker of a particular job reevaluating the match of that job, a worker reconsidering one’s position, and an employer reevaluating the number of jobs he or she wants to offer. In that sense, churning can be seen as a reevaluation of job matching. The worker reevaluates the existing job through separation, and the employer does the same through simultaneous hiring and firing.

Therefore, when hiring and separation occur simultaneously in and around a certain number of jobs, we could say that an employer-led reevaluation of the existing job, or a worker-led reevaluation that results in the replacement of quits, is involved. Such reevaluation is an investment decision in which the cost of partner-switching and the resulting benefits are weighed. If job matching is an experience good rather than an inspection good, the reservation matching value level can only be assessed after the matching is done. Workers would be evaluating the working

conditions, and the employers the capability and motivation of the hired workers. Whether or not this matching should be sustained is a point that will be pondered continuously by both parties. Churning flows occur when either party of the contract changes one's partner while maintaining status quo (the worker still has a job, or the employer maintains the current level of employment).

According to the theory or efficiency wages, a high churning flow rate means that a large part of the separation is due to mismatching of jobs, which is attributable to a poor personnel policy of the employer. Or, it may be the result of the employer's attempt to upgrade the skill level of the workforce, or introduce a change in the skill composition of his labor force by separating low-skilled workers and hiring new, skilled workers.

Such churning flows can be the result of random mismatches or a continuous balancing condition. Burgess et al (2000) shows that churning flow is a phenomenon that occurs continuously to certain employers, not a response to random mismatches among various employers. In other words, churning flow is a balancing condition related to the series of optimal personnel policies of firms.

The churning rate can vary according to employer and time. The inter-business difference of churning rates in a cross-sectional view comes from the employer's personnel policy and the sum of the change in job matching values and related statistical processes. The environmental parameters affecting the personnel policy of an employer include turnover costs, nature of the technology, skill requirements, and managerial matching ability. The turnover costs can be particularly high for some employers and may encourage them to work for proper hiring and job matching, thus reducing the churning rate.

Establishments with low turnover costs may choose to hire or fire just about anybody while maintaining a consistent employment level. Some influencing factors would be just how much skill can be detected by the employer before hiring, or the extent to which the employer must change the required skill or technology. To some employers, it might be worthwhile to keep injecting new blood into the workforce. The ability to select well-matched applicants may also differ across establishments.

One of the key factors that determine the churning rate would be the adjustment costs. The higher the turnover cost, the lower the rate of job flows (Buechemann, 1993). Hamermesh (1993) also highlighted the role of adjustment costs. 'Efficiency wages' or 'implicit contract' can bring down job flows by reducing the adjustment costs. The 'Insider-Outsider Theory' also states that existing employees increase the flow costs in demand-monopolizing firms operating with firm-specific human resources, thus suppressing job flows. In particular, such theories regard job flows as the response to differences in industrial structure or corporate size itself. In other words, adjustment costs or an implicit contract between employer and employee may vary between industries or firms because different skill requirements or production processes are involved.

Theories on efficiency wages and implicit contracts imply that establishment size affects job reallocation rates. Therefore, large-scale establishments usually have internal labor markets and can replace the inter-company movements with intra-company movements. They also have a higher rate of survival, and can afford to pay a relatively high wage and suppress separation. Moreover, such establishments can selectively hire workers with low potential for separation and thus maintain long-term employment. Therefore, the larger the company is, the lower the churning flow rate. Also, if firms can equip themselves with more effective ways of judging job-seeking applicants as the years pass, the churning flow rate would become inversely proportional to the firm's length of business.

Meanwhile, labor unions could contribute to lowering churning flows through voice effects and wage effects. If a particular establishment has a labor union, it may be able to guarantee a high level of wage through the union and minimize churning flows.

3. Regression Analysis Results

On the basis of the above theoretical considerations, there are a few hypotheses we would like to test.

First, would the ICT industry differ from other industries in terms of job reallocation rate or churning flow rate even when size, length of establishment (history), and other firm-specific characteristics are controlled? If the differences are there despite the fact that the establishment characteristics are kept in check, then the probably causes of the differences would be industrial characteristics such as the technological features and market environments.

Second, it would be worthwhile to reexamine the relationship between job flows and worker flows previously established with a series of samples. In other words, we would like to validate and see if churning flows occur more in establishments with high job flow rates. How do they differ between the ICT industry and the manufacturing industry?

Third, what is relationship between wage level or wage flexibility and job flows or churning flows? Does wage level or wage distribution affect job flows or churning flows? How do the factors differ in the ICT industry and the manufacturing industry?

Fourth, is churning flow rate a one-time occurrence than happens randomly among establishments, or is it a regular, balancing occurrence that reflects certain differences among establishments? What is the churning flow rate like in the ICT sector and the manufacturing industry?

In order to empirically analyze the above hypotheses, we need to have indices on job reallocation at establishment levels. However, we could not obtain such data and therefore, the absolute value of net employment growth will replace job reallocation at establishment levels, which reflects the relative change of worker reallocation. Meanwhile, as was examined previously, the churning flow rates(CFR) and total worker reallocation rates (WRR) calculated for each individual establishment were also included in the analysis.

Therefore, the dependent variables of the regression model are net employment growth rate(NEG), the job reallocation rate=the absolute value of the employment growth rate(ABS(NEG)), total worker turnover rate(WRR), and churning flow rates (CFR). Independent variables include the natural log of the number of employees at a establishment(LSIZE), the natural log of business years(LFAGE), whether or not there are multiple establishments in the firm(MULTI), existence of labor unions(UNION1), average wage level of the establishment(WMT), wage distribution(WDT), and industrial dummies(NS4 = IT service industries, NS3 = IT manufacturing industries, NS2= heavy and chemical industries, NS1= light industries, FINC=financial industries, FINC=finance, BSERV=business service, TRANS=transporation, SALE=sales, CONST=construction). Since we believe that job reallocation rates or worker reallocation rates are affected by the proportional differences between corporate size and length of establishment in a linear fashion, the log of size and length of establishment were included in the function. Since only going concerns were included in the analysis, new startups or closedowns were excluded, along with their dummy variables. The Employment Insurance DB does not track progressive wage level of individuals but only the wage at the time of employment. Therefore, the wage or wage distribution included in this study involves the wage at the time of employment for the workers hired between January of 1999 and January of 2002. Meanwhile, the churning flow rate determinant model uses the lagging variable of the churning flow rates from two previous years in order to examine the continuity of the rates. Other factors that determine job reallocation and worker reallocation include changes in demand, capital intensity, labor productivity, and ratio of low-wage workers, but they had to be left out due to limited data availability.

Analysis was limited to the 2001 data. We tried pooling the three year data from 1999 and 2001 for analysis but the results were not much different, and we therefore present only the analysis results from the 2001 data in order to examine the effect of the lagging variable. The number of employee at each establishment was used as the weight factor in order to prevent over-reflecting the small-scale establishments in the analysis.

The results of the regression analysis are summarized in <Table-9> <Table-12>.

<Table-9> Results from the Regression Analysis on Job Reallocation and Worker Reallocation (All Industries, All Sizes)

Dependent Variables	NEG	ABS(NEG)	WRR	CFR	CFR
INTERCEP	0.120987(19.780)***	0.316148(63.556)***	1.151947(164.994)***	0.835800(147.441)***	0.398167(51.525)***
LSIZE	0.007437(10.019)***	-0.003358(-5.562)***	-0.028256(-33.348)***	-0.024898(-36.192)***	-0.003957(-5.358)***
LFAGE	-0.050708(-31.626)***	-0.068967(-52.892)***	-0.126388(-69.060)***	-0.057422(-38.643)***	-0.059310(-32.075)***
MULTI	-0.018818(-6.814)***	0.032416(14.435)***	0.008478(2.690)***	-0.023938(-9.354)***	-0.012705(-4.976)***
UNION1	-0.038217(-13.455)***	-0.005857(-2.536)**	-0.092496(-28.529)***	-0.086639(-32.913)***	-0.029673(-11.542)***
WMT	0.003141(10.630)***	0.000369(1.534)	-0.008063(-23.909)***	-0.008431(-30.793)***	-0.002508(-6.898)***
WDT	-0.000870(-7.142)***	-0.000463(-4.668)***	0.001950(14.014)***	0.002412(21.356)***	-0.002152(-6.167)***
NS4	-0.094441(-15.343)***	0.088960(17.772)***	-0.013782(-1.962)**	-0.102742(-18.011)***	-0.070416(-11.101)***
NS3	-0.120149(-20.834)***	0.084570(18.033)***	-0.037271(-5.662)***	-0.121841(-22.797)***	-0.054485(-9.960)***
NS2	-0.048370(-10.954)***	0.017742(4.941)***	-0.098329(-19.509)***	-0.116072(-28.363)***	-0.025596(-5.947)***
NS1	-0.059669(-12.124)***	0.038430(9.601)***	-0.028537(-5.080)***	-0.066967(-14.682)***	-0.018495(-3.882)***
FINC	-0.019790(-3.426)***	0.083628(17.800)***	-0.074212(-11.254)***	-0.157840(-29.481)***	-0.035435(-6.534)***
BSERV	-0.037997(-7.664)***	0.048251(11.967)***	0.134380(23.745)***	0.086128(18.744)***	0.082339(16.852)***
TRANS	-0.033564(-6.469)***	0.000618(0.147)	-0.024087(-4.067)***	-0.024705(-5.137)***	0.000894(0.179)
SALE	-0.035918(-6.869)***	0.043543(10.240)***	-0.007704(-1.291)	-0.051247(-10.575)***	-0.017288(-3.354)***
CONST	-0.096368(-15.617)***	0.063626(12.679)***	0.025211(3.579)***	-0.038414(-6.717)***	0.000744(0.123)
CFR_1					0.401251(86.325)***
CFR_2					0.181756(39.474)***
JCR					-0.103638(-13.329)***
JDR					-0.194485(-37.821)***
R-square	0.0388	0.0840	0.2768	0.2419	0.4848
N	73166	73166	73166	73166	41632

<Table-10> Results from the Regression Analysis on Job Reallocation and Worker Reallocation (All Industries, All Sizes)

Dependent Variable = ABS(NEG)

	10-29 Workers	30-99 Workers	100-499 Workers	Over 500 Workers
INTERCEP	0.392025(28.636)***	0.385783(17.609)***	0.200236(5.847)***	0.185240(2.561)***
LSIZE	-0.024088(-5.584)***	-0.017079(-3.338)***	0.019511(3.149)***	-0.005133(-0.650)***
LFAGE	-0.078914(-44.403)***	-0.068504(-28.666)***	-0.069161(-16.687)***	-0.036212(-2.710)***
MULTI	-0.012183(-2.320)**	0.010501(2.072)**	0.017479(2.804)***	0.060940(3.410)***
UNION1	0.007902(1.183)	-0.009601(-1.636)	-0.018318(-2.795)***	-0.003563(-0.207)***
WMT	0.004421(9.671)***	0.001184(2.188)**	-0.001217(-1.804)*	0.000111(0.053)***
WDT	-0.000913(-3.397)***	-0.000193(-0.622)	0.000152(0.434)	-0.000556(-0.806)***
NS4	0.096283(13.706)***	0.061460(6.213)***	0.072742(4.590)***	0.090656(1.966)***
NS3	0.070432(9.057)***	0.046921(5.046)***	0.101713(7.197)***	0.106038(2.708)***
NS2	0.007970(1.455)	-0.000843(-0.120)	0.024208(2.217)**	0.028460(0.900)***
NS1	0.014000(2.378)**	0.003339(0.444)	0.042525(3.618)***	0.088794(2.286)***
FINC	-0.031189(-3.202)***	-0.000281(-0.026)	0.038057(2.137)**	0.136397(3.900)***
BSERV	0.001537(0.261)	0.039871(5.110)***	0.067898(5.764)***	0.095663(2.525)***
TRANS	0.013129(1.677)*	-0.022659(-2.539)**	0.021829(1.882)*	0.019462(0.511)***
SALE	0.018139(3.113)***	0.019723(2.331)**	0.027370(2.053)**	0.098437(2.491)***
CONST	0.017179(2.820)***	0.028010(2.795)***	0.064345(3.471)***	0.104840(2.100)***
R-square	0.0743	0.0746	0.0915	0.0523
N	46964	19564	6215	909

Dependent Variable = CFR

	10-29 Workers	30-99 Workers	100-499 Workers	Over 500 Workers
INTERCEP	0.543071(23.352)***	0.430567(18.124)***	0.400325(11.025)***	0.355003(5.052)***
LSIZE	-0.032926(-5.000)***	0.006575(1.260)	-0.003874(-0.630)	-0.007356(-1.052)
LFAGE	-0.054275(-17.116)***	-0.074449(-25.323)***	-0.069831(-14.695)***	-0.044080(-3.224)***
MULTI	0.024215(3.520)***	-0.007813(-1.515)	-0.008881(-1.434)	-0.010620(-0.675)
UNION1	0.017003(2.128)**	-0.004213(-0.714)	-0.025466(-3.934)***	-0.039911(-2.627)***
WMT	-0.001921(-2.335)**	-0.004849(-6.838)***	-0.004148(-4.480)***	0.000078632(0.034)
WDT	0.002690(3.278)***	0.001237(1.653)*	0.000045195(0.051)	-0.005273(-2.579)**
NS4	-0.036106(-3.008)***	-0.021928(-1.995)**	-0.058726(-3.488)***	-0.087613(-2.130)**
NS3	-0.030390(-2.780)***	-0.008778(-0.926)	-0.000378(-0.027)	-0.111231(-3.171)***
NS2	-0.039486(-5.171)***	-0.012529(-1.706)*	-0.018666(-1.627)	-0.020524(-0.720)
NS1	-0.026150(-3.221)***	-0.004569(-0.584)	0.006505(0.534)	-0.049274((-1.398)
FINC	-0.058745(-3.877)***	-0.049928(-4.298)***	-0.037139(-2.072)**	-0.031474(-1.008)
BSERV	0.006344(0.761)	0.050654(6.157)***	0.077415(6.190)***	0.143280 4.108)***
TRANS	-0.009927(-0.868)	0.017209(1.778)*	0.036619(2.969)***	-0.043826(-1.318)
SALE	-0.009833(-1.186)	0.012951(1.471)	-0.000015371(-0.001)	-0.040471(-1.138)
CONST	0.038307(4.545)***	0.024620(2.425)**	0.047016(2.546)**	-0.057711(-1.292)
CFR_1	0.295994(47.427)***	0.358799(48.684)***	0.430361(33.913)***	0.433468(11.954)***
CFR_2	0.134500(22.867)***	0.154422(22.616)***	0.214350(17.089)***	0.173043(4.417)***
JCR	-0.265790(-19.967)***	-0.174887(-13.820)***	-0.141064(-7.112)***	-0.023722(-0.435)
JDR	-0.267162(-36.069)***	-0.249038(-28.261)***	-0.235924(-15.744)***	-0.092201(-2.740)***
R-square	0.2409	0.3163	0.5020	0.5157
N	20037	15535	5550	824

<Table-11> Results from the Regression Analysis on Job Reallocation and Worker Reallocation (By Industry)

Dependent Variable =ABS(NEG)

	Light Industries	Heavy Industries	ICT Manufacturing	ICT Services
INTERCEP	0.264358(21.086)***	0.299997(43.109)***	0.428558(22.100)***	0.564602(27.604)***
LSIZE	-0.000043(-0.019)	-0.013486(-12.844)***	-0.004921(-1.789)*	-0.011427(-3.143)***
LFAGE	-0.056279(-15.004)***	-0.044742(-18.570)***	-0.085305(-14.052)***	-0.105228(-14.068)***
MULTI	0.041687(6.953)***	0.016502(4.174)***	0.012597(1.152)	-0.005662(-0.333)
UNION1	-0.015565(-2.473)**	-0.004114(-1.104)	0.144245(13.296)***	0.047100(2.394)**
WMT	0.005305(6.417)***	0.002976(5.692)***	-0.000573(-0.478)	-0.003818(-4.213)***
WDT	-0.001914(-7.057)***	-0.000146(-0.487)	0.000760(1.672)*	0.000876(2.465)**
R-square	0.0434	0.0729	0.0921	0.1182
N	10546	17432	3655	4135

Dependent Variable = CFR

	Light Industries	Heavy Industries	ICT Manufacturing	ICT Services
INTERCEP	0.401006(25.556)***	0.268866(17.512)***	0.504346(18.676)***	0.529162(12.830)***
LSIZE	-0.014689(-6.455)***	-0.018867(-11.251)***	-0.029405(-10.871)***	-0.028373(-6.185)***
LFAGE	-0.062170(-13.899)***	-0.024721(-5.499)***	-0.050485(-7.348)***	-0.066441(-6.219)***
MULTI	0.000849(0.150)	-0.016529(-2.859)***	0.011154(1.109)	-0.019599(-1.020)
UNION1	0.013730(2.308)**	-0.062438(-11.319)***	-0.040791(-4.090)***	-0.005335(-0.241)
WMT	0.002391(2.479)**	0.011501(12.590)***	-0.002317(-1.645)	-0.001169(-0.698)
WDT	-0.002716(-3.361)***	-0.007047(-7.455)***	0.000541(0.476)	-0.003475(-1.881)**
CFR_1	0.299279(30.242)***	0.300432(27.229)***	0.367224(18.584)***	0.326740(13.776)***
CFR_2	0.253009(25.228)***	0.166368(16.156)***	0.130758(7.432)***	0.133941(5.570)***
JCR	-0.122348(-7.199)***	-0.045309(-2.208)**	-0.121074(-3.635)***	-0.133112(-3.409)***
JDR	-0.222982(-21.431)***	-0.073899(-5.420)***	-0.314929(-18.005)***	-0.206020(-8.613)***
R-square	0.3936	0.3154	0.5488	0.3815
N	6684	11038	2246	1349

<Table-12> NET EMPLOYMENT GROWTH RATES Determinant Model (By Industry)

Dependent Variable = NEG

	Light Industries	Heavy Industries	ICT Manufacturing	ICT Services
INTERCEP	-0.019372(-1.295)	0.073302(8.592)***	0.080843(3.262)***	-0.013890(-0.499)
LSIZE	0.015758(5.908)***	0.002196(1.706)*	-0.009737(-2.770)***	-0.001669(-0.337)
LFAGE	-0.054702(12.222)***	-0.046227(-15.651)***	-0.045071(-5.810)***	-0.039438(-3.874)***
MULTI	-0.016561(-2.315)**	-0.024545(-5.064)***	0.021935(1.569)	0.009813(0.425)
UNION1	-0.020979(-2.793)***	0.011177(2.447)**	-0.153527(-11.074)***	-0.019882(-0.742)
WMT	0.008244(8.358)***	0.003827(5.972)***	0.005162(3.373)***	0.006914(5.607)***
WDT	-0.001754(-5.422)***	-0.001710(-4.659)***	-0.001590(-2.739)***	-0.001601(-3.308)***
R-square	0.0308	0.0269	0.1000	0.0276
N	10545	17431	3654	4134

Analysis of all the industry in general shows that the size of the establishment increases the employment growth

rates(NEG). Even when the number of employee was not used as a weight factor, similar tendency was observed, signaling that establishment size would influence the NEG to the positive direction if the various establishment characteristics are under control. On the other had, the length of an establishment was found to be reducing the net employment growth rates. When the length of establishment was excluded from the regression analysis, the effect of size is negative (-). This implies that there may be a correlation between size and length of establishment, but that the length of establishment has a more bigger effect on NEG than establishment size[9].

However, as shown in <Table 12>, for the ICT industry, establishment size either shows an inverse relationship with NEG, or appears to be an insignificant factor. In the case of the ICT industry, Gibrat's Law, which states that establishment size has nothing to do with NEG, seems to be supported.

Meanwhile, establishment size and length of history appear to have a significant (-) effect on job reallocation rate(ABS(NEG)), total turnover rate(WRR), and churning flow rate(CFR). As was discussed in relation to the aforementioned theories, establishment size and length of establishment seem to be reducing job flows and work flows through various routes.

When manufacturing industry and the ICT sector are compared, the regression value of establishment length to job flow rates appears to be relatively greater in the latter industry. This seems to imply that, in the ICT sector, job creation and destruction is more intense in the initial years of establishment[10].

The multi-establishment variables had the effect of reducing the NEG, increasing the job reallocation rate, and lowering the churning flow rate. This observation seems to be closely correlated with the fact that intra-firm separation to different establishments was also regarded as job reallocation. In other words, NEG may not be that high in multiple-establishment firms, but job flow among the establishments is quite active. Also, churning flow rate is low because the churning in separation or hiring can be taken care of by job restructuring or reallocation within the establishments in the firm. Therefore, we cannot say for certain that multiple-establishment firms are indeed adopting risk-taking growth strategies. However, it is quite clear that business restructuring through worker reallocation among establishments is in progress.

In terms of industries, the dummy variable of whether a firm is a multiple-establishment type or not didn't have a statistically significant effect on the job reallocation rates or the churning flow rates in both the ICT manufacturing and service sectors. In the ICT industry, both the multiple-establishment type and the single-establishment type firms appear to be competing squarely under similar market conditions and technology structures[11].

Labor unions generally reduces the NEG and churning flow rate but do not appear to have significant influence on job flows. In particular, the effect of labor unions on churning flow rates appears to greater if the establishment is larger. The voice effect of labor unions appears to be preventing over-separation in contracting establishments, and the wage effect seems to be preventing the over-hiring in expanding establishments. These effects are more prominent in large-scale establishments. As for industries, the effects are the most prevalent in the heavy industries and the ICT manufacturing sector. Meanwhile, labor unions and job reallocation do not seem be much correlated.

---

9) The simple correlation between business size and length is about –0.4, and that between size and NEG –0.5, and –0.14 between business length and NEG.

10) Haltiwanger and Krizan (1999) also states that in the manufacturing industry of the US, length of business is more important than size in creating jobs. Most of the small-scale establishments are still young and new to the market. Therefore, Haltiwanger and Krizan (1999) sees the role of the smaller establishments in job creation to be the representation of the new or young establishments.

11) The percentage of establishments that belong to a firm with the multiple-business structure accounts for 11% of all establishments in the heavy or light industries, 9% in the ICT manufacturing sector, and 4% in the ICT service industry.

Next, see the wage effect. The net employment growth rates were higher in establishments that pay high wages when hiring. The effect of average hiring wage appeared not to have a significant effect on job flows. However, establishments with high average hiring wage had significantly less churning flows. If average hiring wage is to reflect the overall average wage level, then like the wage effect of labor unions, firm-specific rents can be considered to be suppressing the churning in hiring or separation. However, this trend is not observed in large-scale establishments with 500 or more employees or in the heavy industries. The fact that firm-specific rents is provided in forms other than wages, or is not reflected in the hiring wage because of a deferred wage system would be the likely reason.

The sample deviation of wages can be one indicator of wage flexibility. Wage dispersion reduces the net employment growth rate and job reallocation rate and increases the churning flow rates. Though wage flexibility does not contribute to the net increase in job spells, it does bring down the necessity of employment flexibility. As was pointed out by the work of Haltiwanger and Vodopivec (2002), one reason wage dispersion increases the churning flow rate could be the fact that expansion of wage dispersion induces worker flow in the low-wage, low-skill labor group.

The standard deviation of wages in the ICT industry does not appear to have a significant relationship with the job reallocation rate, which means that the need for wage flexibility does not decrease simply because wage flexibility is high. The indices of wage and wage dispersion appear to be very insignificant when examined by size and industry. The measuring error of the data we use seems to be a major issue affecting the wage index[12].

Next, let's examine the effect of job creation and destruction on churning flow rates. Both the job creation rate and job destruction rate have negative (-) regression coefficients. A negative regression coefficient for the job creation rate means that churning separation in expanding establishments is decreasing, leading to a decrease in replacement hiring. This means that expanding establishments are keeping the workers who would have quit otherwise (by reallocating them to new jobs) to deal with increased labor demands. A negative regression coefficient for job destruction means that churning hiring in expanding establishments is decreasing, resulting in less replacement separations. Contracting establishments replace the positions that become available as workers separate with workers who lost their jobs due to the contraction, thus dealing with reduced labor demand. This coincides with the contents we reviewed in the previous <Table>, which shows that churning flow does not always increase proportionately in establishments with high job creation rates or when the economy picks up. This is in contrast to the results from the analysis on the determinant factors for replacement hiring rates conducted by Albaek and Sorensen (1998).

The regression coefficient for large-scale establishments in the heavy industry is (-), but the value itself is not that great. This means that the churning flow rates or replacement hiring rates in establishments with steady employment and that of the establishments with big fluctuation in employment do not vary greatly. In the heavy industry, separation would increase when job spells increase, and hiring would also pickup when there are less jobs.

This was not quite what was expected. The result shows that worker separation in large heavy-industry firms is not affected by firm level employment growth. According to the queuing model of Akerlof et al.(1988), workers in low-paying factories separate when the economy is good, whereas workers in the high-wage factories are not affected by economic factors. Jovanovic and Moffitt (1990) also reported that new entrants in small-scale establishments have high match-values, whereas experienced worker have high match-values in larger establishments.

---

12) Since『Employment Insurance DB』only provides hiring wages, we tried correlating the data with those from the 『Basic Research on Wage Structures』in estimating the average wage of workers in general, as well as the standard deviation of wages. The results were not all that different from the analysis results presented here.

However, these hypotheses did not hold their own in Korea in 2002. Previously, workers in small-scale establishments tended to move to large-scale establishments or to other small and medium firms. However, this practice seems to have been changing at least partially since the Asian financial crisis. It also seems to be reflecting the efforts made by large heavy-industry companies trying to replace their human resources composition as they expand or contract employment massively after the financial crisis. This seems to be in line with the conclusion drawn by Burda and Wyplosz (1994) who stated that when the economy slows, bad matches are ousted in an effort to swiftly upgrade the quality of a company's human-resources composition. Since most of the workers in the large heavy-industry firm are highly specialized, transition from a disappearing job to the position of the workers who would have left otherwise is not easy, and this also seems to be part of the reason the hypotheses did not hold.

Next, let's consider the continuity of churning flow rates. In case of pure mismatch of jobs not related to the firm or industrial characteristics, the churning flow rate does not display any continuity. The lagging indicator variable of the explanatory variable was included to examine the issue of continuity.

Let's first go over <Table 15> which divided the churning flow rate into four percentile and compared it against the data from the previous year and the year before that. The Table classifies the establishments into four percentile in order of the churning flow rate and shows how the distribution changes in one or two years time. If churning flow is a random occurrence, then there should be equal distribution of establishments across the cells.

<Table-13> The Distribution of Continuity for Churning Flow Rates

<All Industries>

(1999-2000)

	1	2	3	4	total
1	6514 13.19	3359 6.80	1646 3.33	824 1.67	12343 25.00
2	3254 6.59	4201 8.51	3214 6.51	1652 3.35	12321 24.96
3	1742 3.53	3117 6.31	4224 8.56	3305 6.69	12388 25.09
4	872 1.77	1652 3.35	3110 6.30	6686 13.54	12320 24.95
Total	12382 25.08	12329 24.97	12194 24.70	12467 25.25	49372 100.00

Note: In order of Churning Flow Rate, from high to low in the order of 1 to 4.

(2000-2001)

	1	2	3	4	Total
1	6527 13.21	3403 6.89	1578 3.19	871 1.76	12379 25.05
2	3284 6.65	4314 8.73	3003 6.08	1732 3.51	12333 24.96
3	1705 3.45	3331 6.74	3981 8.06	3187 6.45	12204 24.70
4	842 1.70	1764 3.57	3183 6.44	6707 13.57	12496 25.29
Total	12358 25.01	12812 25.93	11745 23.77	12497 25.29	49412 100.00

(1999-2000)

	1	2	3	4	Total
1	6072 12.31	3345 6.78	1802 3.65	1117 2.26	12336 25.00
2	3294 6.68	4160 8.43	2942 5.96	1919 3.89	12315 24.96
3	1889 3.83	3403 6.90	3836 7.77	3251 6.59	12379 25.09
4	1083 2.19	1893 3.84	3145 6.37	6193 12.55	12314 24.96
Total	12338 25.00	12801 25.94	11725 23.76	12480 25.29	49344 100.00

<Manufacturing Sector>

(1999-2000)

	1	2	3	4	Total
1	2873 12.70	1531 6.77	790 3.49	399 1.76	5593 24.71
2	1510 6.67	1928 8.52	1478 6.53	780 3.45	5696 25.17
3	866 3.83	1510 6.67	1965 8.68	1448 6.40	5789 25.58
4	416 1.84	701 3.10	1415 6.25	3020 13.35	5552 24.53
Total	5665 25.03	5670 25.06	5648 24.96	5647 24.95	22630 100.00

(2000-2001)

	1	2	3	4	Total
1	2841 12.56	1559 6.89	842 3.72	418 1.85	5660 25.02
2	1547 6.84	1839 8.13	1497 6.62	783 3.46	5666 25.04
3	832 3.68	1511 6.68	1868 8.26	1439 6.36	5650 24.97
4	438 1.94	753 3.33	1456 6.44	3001 13.26	5648 24.96
Total	5658 25.01	5662 25.03	5663 25.03	5641 24.93	22624 100.00

(1999-2000)

	1	2	3	4	Total
1	2628 11.62	1486 6.57	938 4.15	540 2.39	5592 24.72
2	1571 6.94	1792 7.92	1438 6.36	891 3.94	5692 25.16
3	928 4.10	1563 6.91	1819 8.04	1476 6.52	5786 25.58
4	530 2.34	819 3.62	1466 6.48	2737 12.10	5552 24.54
Total	5657 25.01	5660 25.02	5661 25.02	5644 24.95	22622 100.00

<ICT Service Sector>

(1999-2000)

	1	2	3	4	Total
1	149 11.10	88 6.56	60 4.47	38 2.83	335 24.96
2	87 6.48	105 7.82	97 7.23	45 3.35	334 24.89
3	62 4.62	95 7.08	92 6.86	89 6.63	338 25.19
4	29 2.16	59 4.40	79 5.89	168 12.52	335 24.96
Total	327 24.37	347 25.86	328 24.44	340 25.34	1342 100.00

(2000-2001)

	1	2	3	4	Total
1	139 10.35	105 7.82	53 3.95	30 2.23	327 24.35
2	105 7.82	104 7.74	84 6.25	54 4.02	347 25.84
3	58 4.32	74 5.51	115 8.56	81 6.03	328 24.42
4	34 2.53	53 3.95	84 6.25	170 12.66	341 25.39
Total	336 25.02	336 25.02	336 25.02	335 24.94	1343 100.00

(1999-2000)

	1	2	3	4	Total
1	141	88	69	36	334
	10.51	6.56	5.15	2.68	24.91
2	96	89	87	62	334
	7.16	6.64	6.49	4.62	24.91
3	55	98	105	80	338
	4.10	7.31	7.83	5.97	25.21
4	43	61	75	156	335
	3.21	4.55	5.59	11.63	24.98
Total	335	336	336	334	1341
	24.98	25.06	25.06	24.91	100.00

Comparison of data from 1999 and 2000 shows that establishments with identical percentile amounts to nearly 45%. If those with only one percentile difference are included, the percentage goes up to as high as 80%. The symmetrical relationship does not change between 1999 and 2000, or between 2000 and 2001. This shows that churning flow rates remain almost unchanged despite differences in economic climates. In case of Korea, the churning flow rate is establishment-specific and seems to be fairly consistent, showing resilience to economic changes. Pearson's χ^2 and Kendall's tau-b are all significant at 1%.

The regression analysis results also show that the churning flow rate of the previous term is very closely related to that of the following term. Though it is not included in the present report, the R-square amounts to the 70% level if a model reflecting the fixed effect is used in the CFR analysis. This finding supports the hypothesis and analysis of Burgess et al (2000) who reported that the churning flow rate is a very balanced occurrence that reflects the individual specificity of a establishment. If one firm always has a very high churning flow rate and one firm a continuously low rate, both of which are within one narrowly defined industry, then it can be deduced that the two firms have different personnel policies. The differences in personnel policies are due to fundamental elements such as technology, skill, and cost structure.

V. Summary

One of the key findings of the present study is that job reallocation rate is very high in the Korean ICT industry, and that the rate has a relatively large effect on the labor market. This implies that job reallocation and the dynamic changes of in and around establishments should be actively considered in labor market studies and in establishing related policies.

The results of the analysis on the ICT industry and the manufacturing sector can be summarized as follows.

First, though the present study only analyzed the period following the Asian financial crisis, the job reallocation rate of the ICT industry is very high. The rate in the ICT industry following 1999, after the financial crisis, was 1.2 times the average of the overall manufacturing industry, and that of the ICT service industry 1.6 to 2.0 times higher. Even when all the establishment characteristics are controlled, the job reallocation rate of the ICT industry is still the highest, and this seems to reflect the heterogeneity among establishments within the industry. In other words, there are establishments that increase employment even during recession, and when establishments contract, they do it in massive scales. This implies that the ICT industry has a tendency to embrace the creative destruction process more

actively.

Second, the relationship between job flow and worker flow of Korea shows that separation does occur in job-creating firm and hiring in job-destroying firm. Such simultaneous hiring and separation, or replacement hiring, do occur along with churning flow, but to a lesser degree than in other nations, and to a much lesser extent in the ICT service industry. We believe it is because employer-led hiring and separation generally lead worker flow. Therefore, the ratio of job flow in total worker flow is relatively higher than in other countries, and the ratio in the ICT service sector is even higher.

If all establishment-related characteristics are put under control, the churning flow rate in the ICT industry appears to be quite low. This shows that worker heterogeneity within the ICT industry is relatively low even though heterogeneity between establishments may be high. It also implies that most of the worker reallocation is done to adjust establishment size, and that the amount of worker reallocation that needs to be dealt with regardless of establishment size adjustments are relatively small.

Third, in the ICT industry, establishment size was found to have an inverse correlation, or a statistically insignificant relationship, with net job growth. In the case of other industries, establishment size contributed towards the increase of net job growth when other factors were under control. Also, job creation and destruction in the ICT industry seems to be more intense in the initial years of establishment, thus raising the job reallocation rate.

Fourth, in the ICT industry, both multiple-establishment firms and single-establishment firms compete with similar technological characteristics within business environments, and do not display a big difference in terms of job flow and churning flow.

References

Kim, H.W.(2000), 「Changes in job reallocation and productivity of Korean Manufactuyring Industries」, Seoul Institute of Economic and Social Studies. SIES Working Paper.

Cheon, B.Y(2001), 「Venture Policies and Job Creaion」, 『Digital Economy and Human Resources』, Korea Labor Institute.

Abowd, John M., Corbel, Patrick, and Kramarz, Francis, "The Entry and Exit of Workers and The Growth of Employment: An Analysis of French Establishments", *The Review of Economics and Statistics*, 1999(May), Vol. 81, No. 2, 170-187.

Abowd, John M., "The Entry and Exit of Workers and The Growth of Employment: An Analysis of French Establishments", *The Review of Economics and Statistics*, 1999(May), Vol. 81, No. 2, 170.

Albaek, Karsten and Bent E. Sorensen, "Worker Flows and Job Flows in Danish Manufacturing 1980-91", the *Economic Journal*, 1998(November), Vol. 108, 1750-1771.

Andersson, Fredrik, "Job Flows in Swedish Manufacturing 1972-1996", 1999(October).

Belzil, Christian, "Job Creation and Job Destruction, Worker Reallocation, and Wages", *Journal of Labor Economics*, 2000 (April); Vol. 18, No. 2, 183-203.

Bertola, G. and R. Rogerso, "institutions and Labor Reallocation'", *European Economic Review*, 1997, 1147-1171.

Boeri, Tito, "Is Job Turnover Countercyclical?", *Journal of Labor Economics*, 1996(October), Vol. 14, No. 4, 603-625.

Burda, Michael, and Charles Wyplosz, "Gross Worker and Job Flows in Europe", *European Economic Review*, 1994(June), 1287-1315.

Burgess, S., J. Lane and David D. Stevens, "Churning Dynamics: An Analysis of Hires and Separations at The Employer Level", *Labour Economics*, Vol. 8, No. 1, 2001(January).

Burgess, Simon, Land, Julia, and David Stevens, "Job Flows, Worker Flows, and Churning", *Journal of Labor Economics*, 2000, Vol. 18 No. 3, 473-502.

Caballero, Ricardo J. and Mohamad L. Hammour, "The Cleansing Effect of Recessions", *The American Economic Review*, 1994(December); Vol. 84, No. 5, 1350-1368.

Davis and Haltiwanger, "Driving Forces and Employment Fluctuations", *NBER working paper 5775*, 1996.

Davis and Haltiwanger, "Measuring Gross Worker and Job Flows, in Manser and Topel eds.", *Labor statistics measurement issues*(University of Chicago Press), 1998.

Davis, Haltiwanger and Schuh, Job Creation and Destruction, MIT press, 1996.

Davis, Steven J. and John Haltiwanger, "Gross Job Flows", in O. Ashenfelter and D. Card(eds.), *Handbook of Labor Economics*, 1999, Volume 3b(Elsevier).

Davis, Steven J. and John Haltiwanger, "Gross Job Creation, Gross Job Destruction, and Employment Reallocation", *The Quarterly Journal of Economics*, 1992(August); Vol. 107, No. 3, 819-63.

Foote, Christopher L., "Trend Employment Growth and The Bunching of Job Creation and Destruction", *The Quarterly Journal of Economics*, 1998(August), Vol. 113, No. 3, 809-34.

Foster, Haltiwanger and Krizan, "Aggregate Productivity Growth : Lessons from Microeconomic Evidence", NBER working paper 6803, 1998.

Haltiwanger, John C., and Scott Schuh, "Gross Job Flows Between Plants and industries", *New England Economic Review*, 1999(March/April), 41-64.

Hamemesh, Daniel S., Hassink, Wolter H. J., and Jan C. Van Ours, "New Facts About Factor-Demand Dynamics: Employment, Jobs and Workers", *Nber Working Paper No.4624*, 1994 (January).

Hamermesh and Pfaan, "Adjustment Costs in Factor Demand", *Journal of Economic Literature 34(3)*, 1996.

Hart, Peter E. and Nicholas Oulton, "Job Creation and Destruction in the Corporate Sector: the Relative Importance of Births, Deaths and Survivors", *NIESR Discussion Paper No.134*, 1998(January).

Haskel, Jonathan, "Job Creation and Destruction", *Economica*, 1998(February); Vol. 65, No. 257, 154-6.

Jovanovic, "Selection and the Evolution of Industry", *Econometrica 50(3)*, 1982.

Mortensen, D. T. and C. A. Pissarides, "Technological Progress, Job Creation and Job Destruction", *Centre for Economic Performance Discussion Paper*, 1995(September), Revised 1997(January).

Mortensen, Dale T. and Christopher A. Pissarides, "Job Creation and Job Destruction in The Theory of Unemployment", *The Review of Economic Studies*, 1994(July), Vol. 61, No. 208, 397-415.

Mumford, Karen, and Peter N. Smith, "Job Reallocation and Average Job Tenure: Theory and Workplace Evidence From Australia", *Centre for Economic Performance Discussion Paper No.360*, 1997(July).

Persson, Helena, "Job and Worker Flows in Sweden 1986-1995: Who Gets The New Jobs and Who Looses The Old Jobs?", *Paper for The international Symposium on Linked Employer- Employee Data*, 1998(May).

Salvanes, Kjell G., "Employment Policies At the Plant Level: Job and Worker Flows for Heterogeneous Labour in Norway".

Schuh and Robert K. Triest, "Job Reallocation and the Business Cycle: New Facts For An Old Debate", in Fuhrer and

Schuh(ed.)(1998), Beyond Shocks: What Causes Business Cycles?, *Conference Series* No. 42, 1998, FRB of Boston, 1998.

Tattara, Giuseppe and Marco Valentini, "Who Is First to Sit Down, Who Is Left Standing When the Music Stops?" 2002.