# The Effects of Temporary Foreign Worker Program in Korea:

# Overview and Empirical Assessment

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## I. Introduction

Traditionally, foreign labor inflow into Korea has been rare and, hence, issues on foreign workers did not draw much attention. Even in recent years, foreign labor accounts for only a small portion of total labor force in Korea. Estimated stock of migrant workers in Korea as of 2000 is only 1.3% of total labor force which is similar to Japan (1.3%), but lower than other East Asian countries, such as Taiwan (2.4%) and Hong Kong (8.0%).[1] Although it is not directly comparable, average foreign-born population in OECD countries amounts to 6.9% out of total population in 1998.[2]

However, since the early 1990s the inflow of foreign unskilled workers into Korea has been increasing at a rapid pace. In particular, the increase of illegal overstayers significantly outpaced the overall inflow of foreign unskilled workers for most of the period. Against this background, foreign unskilled labor has become an important issue in recent policy debates in Korea. Until now, the debates on foreign unskilled worker policy seem to have been centered on the administrative issues, such as how to improve recruiting procedures and how to prevent dislocation of foreign unskilled workers, etc.

Unfortunately, concerns on the long-term policy stance itself seem to have been overshadowed by the issue of improving regulatory framework. Those who are in favor of importing foreign unskilled workers often argue that it is not worthwhile to debate on the necessity of foreign unskilled workers in the Korean society. They suggest that main policy agenda on this issue should be how to improve the managerial aspect of the existing system. Under these circumstances, most previous literature on cross-border migration in Korea deals with the labor market issue and is concentrated on policy

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1  Table 1 from Athukorala (2003)
2  Table 2 from Coppel et al (2001).

issues of the regulatory framework of foreign workers. Yoo and Lee (2002) examines recent trends and status of low-skilled foreign workers and discusses the advantages of employment permit system vis-à-vis industrial trainee system.[3] Seul (1999) covers socio-economic issues such as discrimination and unfair treatment of foreign workers. Kang (1995) addresses the problems with industrial trainee system for foreign workers. However, these studies do not have a formal analysis of economic consequences of foreign labor inflows in Korea. In our view, however, empirical assessment of this issue is indispensable in order to establish appropriate long-term policy stance.

This study aims to make an empirical assessment of the effect of foreign labor on the Korean economy. In the first part of this study, we describe historical development and institutional structures of foreign unskilled worker policy in Korea. A particular attention will be paid to the economic and social environment behind changes in institutional structures. In the second part, trends and patterns of foreign labor inflow into Korea will be briefly documented, including industrial distribution of foreign workers.

In the third part, we will try to assess the economic consequences of foreign labor inflows on the natives in Korea. In doing so, we first review existing theoretical frameworks that would be helpful for understanding host country effects of migration, such as Borjas (1995), Heckscher-Ohlin model and its variants as described in Trefler (1997). After that, we will try to assess empirically the labor market effect of industrial trainees employing methodologies similar to Altonji and Card (1991).

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3  See Section II for detailed description of these systems.

## II. Policies for Foreign Unskilled Workers[4]

Korea allowed the official inflow of foreign unskilled workers beginning from the early 1990s. Since then, the institutional framework for Korean foreign unskilled worker policy has mainly rested upon the Industrial Trainee System. In 2003, however, the Korean government introduced the Employment Permit System in an effort to improve the overall regulatory framework. Thus, these two systems are main elements of the regulatory framework as of now, although a gradual transition from the former to the latter is expected in the future. In this section, we focus on these two systems and provide a historical overview and a brief assessment of the Korean foreign unskilled worker policies.

### 1. *Industrial Trainee System*

Korea has traditionally closed doors to foreign unskilled workers, which owes, at least in part, to the ethnic homogeneity of the population in Korea. Specifically, Korean Immigration and Emigration Law did not allow foreign unskilled workers to enter Korea for employment purposes. However, the atmosphere has changed since the late 1980s. Several factors might have contributed to this change. First, the Korean economy had experienced rapid economic growth and the resulting rise in wages relative to other less developed neighboring countries provided the pressures for foreign labor inflows into Korea. Also, the economic boom during the period from 1986 to 1988 added to this pressure (Table 1). Second, there were changes in labor supply conditions. The labor market entry of the baby-boomers, who were born between late 1950s and early 1970s, was coming to an end by the late 1980s. Also, the educational level of Korean workers

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4 Policies for foreign skilled workers including recent issues related with GATS Mode 4 are another important research topic. But we will not discuss about Korea's policy towards skilled foreign labor here

rose rapidly during the 1980s; the share of college graduates in the population of 25 years or over rose from 7.7% in 1970 to 14.1% in 1990.[5] These changes in labor supply condition, together with the rapid wage growth of domestic workers (Figure 1), made it hard for domestic small- and medium-sized enterprises (SMEs) to employ domestic workers, especially in industries that are losing international comparative advantage. Finally, the globalization of production of major Korean firms brought about a need to train foreign workers from overseas branches in their Korean factories (Yoo 2003).[6]

Under these changing circumstances, a series of requests were made by businesses to legalize import of foreign workers. Although the labor unions were opposed to these requests, the Korean government responded to these changes by introducing Industrial and Technical Training Program in November of 1991. This program was originally intended for inviting and training of foreign workers employed at overseas Korean companies.[7] The training period is normally 6 months but extendable up to a maximum of one year.[8] Although the objective of this program was not employment but training, it enabled *de facto* employment of foreign unskilled workers for the first time in Korea (Yoo and Lee 2002). This program, however, could not satisfy the demand of SMEs that are most in need of cheap foreign labor. Since this program was applicable to those firms that either had foreign subsidiaries or exported equipment or technology, the practical beneficiaries of this program were likely to be large firms. In response to the criticism to this program on the one hand and the growing illegal employment on the

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since it's beyond the scope of this paper.

[5] It further rose to 24.3% in 2000. Data from National Statistical Office homepage.

[6] Uh(1999) argues that the inflow of foreign manual workers into Korea in the 1990s can be explained by decreasing numbers of young workers, feminization of the labor force, the ageing of the workforce, and the rapid improvement of labor quality.

[7] Another objective of this program was to expedite exporting of equipment and technology.

[8] Since 1994, the normal training period became one year with maximum training period of two years.

other, in September of 1992 the government allowed SMEs in 10 3-D industries[9] to utilize this program that have not investment or technology relationship with foreign partners. Through this measure, ten thousand foreign workers were allowed entry into Korea as trainee.

This measure paved the way for the introduction of the Industrial Trainee System in November of 1993, which could be understood as an expanded application of the Industrial and Technical Training Program. In this system, the training period was extended from 6 months to one year with the possibility of extension up to additional one year. Industrial Trainee System explicitly targets SMEs in the manufacturing sector that are experiencing "labor-shortage" problem. Thus, with the introduction of this system, foreign unskilled worker policy in Korea takes shape of a SME policy. Specifically, certain types of SMEs were given higher priority to be selected as training firms.

The policies for foreign unskilled workers and the quota for foreign industrial trainees are decided by the Committee for Foreign Workers' Policy, which is chaired by the Prime Minister and composed of related ministers. The administration of the training system, such as the selection of the countries of origin and the quotas allocated to each country, is carried out by the Office for Small Business of the government.

This system promoted substantially the inflow of foreign unskilled workers into Korea, which is reflected in the increase of eligible industries and of the size of quota. The number of manufacturing industries (KSIC two-digit) eligible for this system increased from 10 to 21, which again increased to 22 in 1996. In later years, not only

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[9] These industries include dyeing, plating, heat treatment, foundry, machinery, shoes, glass, leather, electricity and electronic industries.

SMEs in manufacturing but also qualified firms in construction, fishery, and agriculture became eligible for this system. The quota for industrial trainees was established in 1993 and gradually increased in later years. It was initially set at 20,000 and increased to 30,000 in 1994, to 50,000 in 1995, to 80,000 in 1996, and to 85,500 in 2002.[10]

After five years of operation of the Industrial Trainee System, the government introduced the so-called Employment-cum-Training System in September of 1997. In April of 2000, this system is implemented. By this system, trainees who finish two years of training period and have specified qualifications are allowed to work for additional one year with a status of a legal "employee".

To some extent, the introduction of this system was an inevitable consequence of the Industrial Trainee System. On the one hand, it was partly a response to the criticism on the Industrial Trainee System. For example, foreign workers could not be protected adequately by labor laws, although they were *de facto* employees. On the other hand, many host firms did not want to terminate the relationship with the trainees who had work experience with them and acquired desirable skills. With the introduction of this system, foreign unskilled workers who entered Korea as trainees were allowed to stay with employee status.

In December of 2001, the Industrial Trainee System and the Employment-cum-Training System were modified towards the direction of increasing the inflow of foreign unskilled workers. That is, the "two years' training and one year's employment" system was changed to "one year's training and two years' employment". This change would have an effect of doubling the number of foreign unskilled workers that can enter Korea as trainees.

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[10]  Yoo and Lee (2002).

## 2. Introduction of Employment Permit System

Before the introduction of the Employment Permit System in July of 2003, the core element of Korea's foreign unskilled worker policy was the Industrial Trainee System. As described above, this system evolved in the direction of facilitating the inflow of foreign unskilled workers. Undoubtedly, the inflow of foreign workers benefited SMEs in 3D industries that were experiencing difficulties in finding domestic workers.

However, the Industrial Trainee System has been subject to various criticisms ever since it was introduced. First, there was an issue on the labor standards of the industrial trainees stemming from their legal status. As noted above, although this system allowed entry of foreign unskilled workers as trainees, it was not in reality a training system and was not administered as such. It is widely known that foreign workers imported through this system did not receive practically any formal training before they were placed to work.

Because they were legally trainees not employees, however, they were not provided the level of protection that would have been given to legal employees. Specifically, in early years, industrial trainees were not protected by any of the major social insurance schemes. In February of 1995, the government tried to improve the situation and mandated that industrial trainees be covered by industrial accident compensation insurance and health insurance. At that time, some articles of the Labor Standard Act-- such as prohibition of forced labor, prohibition of violence, adherence of working hours, etc.-- were also made to be applicable to industrial trainees. Also, the wages of the industrial trainees were made to be subject to the Minimum Wage Law in July of 1995.

Nevertheless, as long as industrial trainees were trainees not employees, they were

not as well protected as domestic employees. It was even pointed out that industrial trainees are even less protected than undocumented workers in some respect; while the industrial trainees could not receive retirement pay while undocumented workers could.[11] Against this background, it has often been suggested that industrial trainees have to be protected as employees.

Second, the Industrial Trainee System was criticized as contributing to the rapid increase of illegal workers. Many trainees became illegal workers after their visa expired and some trainees moved to other factories without permission during the training period. Park (1996) reports that 32.4% (16,637 persons) of total industrial trainees have been dislocated as of end of June, 1996. Yoo and Lee (2002) also reports that 57.6% (63,515 persons) of total industrial trainees (110,250 persons) have been dislocated as of December, 2001. Major reason behind dislocation of industrial trainees was considered to be lower wages of industrial trainees compared with those of undocumented workers.[12] In short, the Industrial Trainee System was criticized as providing an environment where illegal employment is better than legal training. This factor, combined with high entry costs for trainees and lax law enforcement on illegal workers, might have stimulated dislocation of industrial trainees, at least during the initial stages.

Third, various criticisms have been raised about administrative procedure of the system. These include lack of transparency and market principle in trainee selection and

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[11] One interesting point to note, however, is that industrial trainees are better protected than domestic vocational trainees by social insurance schemes and labor-related laws (Yoo and Lee, 2001). Thus, the criticisms on the labor standards of industrial trainees should be understood as criticisms on the nature of the Industrial Trainee System—that is, this system was used as a device to import foreign unskilled workers as employees, not as trainees.

[12] See Park (1996) and Yoo and Lee (2001). However, Lee and Kim (1997) provide some evidence that, although wage level of trainees might have been low in early stages, it is likely to became close to market wages by 1996. They explain this phenomenon as an arbitrage by dislocation.

placement procedure, limited capability of the administrative authority, insufficient monitoring system, and so on. In the early years, for example, recruiting agencies in sending countries were fully in charge of selecting industrial trainees. This procedure was criticized as lacking market forces and giving rise to an unduly high brokerage fee and, hence, an increase of illegal workers. In December of 2001, this procedure was revised such that industrial trainees are randomly selected among the pool recommended by foreign recruiting agencies. To take another example, lack of bargaining between potential employers and trainees on 'employment conditions' was pointed out to be responsible for low wages of the trainees and their dislocation.[13]

Against this background, the Employment Permit System was introduced in August of 2003, which was implemented beginning from August 2004. This system aims at supplying foreign workers to SMEs as well as protecting them as legal 'employees'. In fact, there were several failed attempts to introduce this system before 2003. Expectedly, opposing voices came from SMEs employing industrial trainees and some government ministries, such as Ministry of Commerce, Industry and Energy (MOCIE) and Small and Medium Business Administration (SMBA). Their main concern was that the Employment Permit System would increase costs to SMEs that were the main beneficiaries of the trainee system. Of course, there was also a suggestion that giving 'employee' status to foreign unskilled workers by itself would not lead to a substantial increase in wages (Lee and Kim, 1997). Lee and Kim argue that wages of foreign unskilled workers would be affected more by the administrative procedure of the Employment Permit System and by the strength of the enforcement of law on illegal workers. The most important factors which led to the introduction of the Employment

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[13]  Yoo (2003). However, see footnote 10.

Permit System, however, seem to have been the labor standard issue as well as the increase of illegal workers, which were considered to be associated with the Industrial Trainee System.[14]

The Law on Employment of Foreign Workers[15] stipulates several principles as its core elements, such as non-discrimination against foreign workers (Article 22)[16], employer's responsibility to make efforts to employ domestic workers before employing foreign workers (Article 6). This law contains measures to deal with problems of illegal workers and labor standards of foreign workers, such as the responsibility of employers to have foreign workers insured against emigration and delinquency of wage payment (Article 13 and 23). Also, foreign workers to which this law is applied are allowed to stay in Korea up to maximum of three years, and to change jobs up to three times within that period under certain circumstances.

In sum, the above review of Korea's foreign unskilled worker policy suggests the following three points as its key features. First, the institutions of foreign unskilled worker policy in Korea seem to have evolved in the direction of promoting inflow of foreign unskilled workers, ever since the introduction of Industrial and Technical Training Program in 1991. In March of 2004, the government announced a plan to introduce 79,000 additional foreign workers this year through various systems mentioned above, which will substantially increase the stock of foreign unskilled workers in Korea. Second, with increasing foreign unskilled workers, Korea has moved towards giving more protection to foreign unskilled workers as employees. Third, the

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[14] To what extent the introduction of Employment Permit System will help reduce the number of illegal workers seems, however, unclear.

[15] This law was announced in August 16, 2003.

[16] Article 22 states that "Employers should not discriminate against foreign workers unfairly on the grounds that they are foreign workers."

current institutional structure underlying Korea's foreign unskilled worker policy is quite complicated. In particular, new systems were introduced without replacing the old system. For example, the Employment Permit System was simply added to the institutional framework that existed previously, although gradual transition is expected in the medium- to long-run.

## III. Overview of Foreign Labor Inflows in Korea

The purpose of this section is to briefly review various aspects of actual foreign labor inflows into Korea using two data sets. The first data set was taken directly from "*Yearbook of Migration Statistics*," published by Ministry of Justice every year. This data set contains information on foreign workers such as their legal status in Korea, home countries and geographic and industrial distribution of foreign workers. The second set of data we employed in the paper is "*Report on Small and Medium Business Survey*," published by Korea Federation of Small and Medium Business. This data set reports information on SME's employment structure including the number of industrial trainees by industry.

### 1. Foreign Workers by Legal Status

Foreign workers in Korea can be divided into three categories. The first group is the foreign workers who possess official employee visa. Before the Employment-cum-Training System was implemented in 2000, most of employee visa was issued to professional and technical workers (with visa type E1 through E7)[17]. A new type of visa

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[17] The type of visa is as follows: E1 - Professors, E2 - Language Instructors, E3 - Researchers, E4 - Technology Instructors, E5 - Professionals, E6 – Artists and Enternainers, E7 - Other Specific Activities. Unlike the industrial trainees with visa type E8, there exist no management control by the government for these workers. Most of E1-E7 visa holders are allowed to stay in Korea for two years, but the renewal of

(E8) was issued to eligible foreign workers for additional one year who have finished two years of training period with the introduction of the Employment-cum-Training System in 2000. The trend of foreign workers with these employee visas is shown in the first panel in Table 2-a. Although foreign workers with visa type E1 through E7 has increased continuously (except for 1998 when the financial crisis hit the Korean economy), the increasing trend of E8 visa holders is more dramatic: they consist of almost half of all official employee visa holders in 2002.

The second group of foreign workers is the industrial trainee visa holders who are being trained in domestic companies through Industrial Trainee System as described in the previous section. Under this category, there are two ways to be legitimate trainees in Korea: one is through the Industrial and Technical Training Program (ITTP) and the other through Industrial Trainee System (ITS). The trends of foreign workers of this sort are shown in the second panel of Table 2-a. The industrial trainee visa holders outnumbered those with official employee visa throughout the period. In 2002, the number of industrial trainee visa holders is more than twice as many as that of employee visa holders.

In the third panel of Table 2-a, the trend of overstayers is shown.[18] The number of overstayers is increasing rapidly every year except for 1999 and in 2002, they consist of 72.9% out of total foreign workers in Korea. Recently, these increasing illegal foreign stayers became severe social problem the government has to resolve, which provided one of the rationales for introducing the Employment Permit System as discussed

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the visa is relatively easier than industrial trainees.

[18] Note that these figures represent foreigners who overstayed the duration of their visa, not illegal workers. All of them are 'potential' illegal workers, but obviously not all of them are actually employed. Since it is impossible for statistical office to count actual illegal workers, one has to be cautious in interpreting these figures.

above.[19]

// insert Table 2-a //

In Table 2-b, industrial distributions of foreign overstaying workers are shown. Most of male workers are working in manufacturing (42%) and construction industry (31%), while most of female overstayers are employed in hotels and restaurant industry (37%) followed manufacturing (27%).

// insert Table 2-b //

## 2. Foreign Workers by Country of Origin

The countries of origins of foreign workers are summarized in Table 3-a through 3-d. In these tables, top ten countries are ranked by highest number of foreign workers in 2002 for each category. First, Table 3-a shows country of origin of employee visa holders (E1-E7). As was expected, most of visa holders are coming from developed countries such as U.S., Canada, Japan, U.K., New Zealand, and Australia. The other countries include Russia, Philippines, and China and most of the employee visa holders from these countries are artist or entertainers (visa type E6).

Second, the country distribution of E8 visa holders (employees after industrial training) and of industrial trainee visa holders are shown in Table 3-b and 3-c, respectively. Not surprisingly, all of them came from less-developed countries in the East Asian region. As described in the previous section, the Korean government decides the total number of these types of foreign workers and the level of quota for each

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[19] It is very costly for the government to find and deport every illegal foreign worker. Thus, the government sets a special period for voluntary repatriation by the illegal foreign workers although its effectiveness has not been satisfactory.

country.[20] In both cases, China (including Korean-Chinese), Vietnam, Indonesia and Philippines are sending more than 75% of total foreign workers of these types. In the case of illegal stayers as well (Table 3-d), these countries take highest ranks in 2002, more than 70% of total illegal stayers in Korea.

// insert Table 3-a to 3-d //

### 3. Foreign Workers by Industry

For industrial distribution of foreign workers, we have two different data sources. One is the number of visa issuance for industrial trainees by industry in each year (from *Yearbook of Migration Statistics* published by Ministry of Justice), which gives us the *flow* number of industrial trainees by industry. These are shown in Table 4, categorized by Korea Standard Industrial Classification (KSIC). The industries with more than 5% of total visa issuance for industrial trainees as of 2002 are textile manufacturing (KSIC 17), rubber and plastic manufacturing (KSIC 25), manufacture of fabricated metal products (KSIC 28), manufacture of other machinery and equipment (KSIC 29), manufacture of electrical machinery (KSIC 31), manufacture of electronic components, radio, TV and communication equipment (KSIC 32) and manufacture of motor vehicles, trailers and semi-trailers (KSIC 34). Among these, textile-manufacturing industry (KSIC 17) has been absorbing the most of the visa issuance for industrial trainees in almost every year (13.2% in 2002), which was followed by communication equipments (KSIC 32, 10.1% in 2002).

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[20] The size of total quota of foreign workers are decided annually by Foreign Worker Policy council according to domestic needs for foreign workers and economic situation. And this quota is allocated across countries considering diplomatic relations with each foreign country.

The other data set that contains the industrial distribution of industrial trainees is *Report on Small and Medium Business Survey*, published by Korea Federation of Small and Medium Business. This data provides the actual *stock* of industrial trainees employed by SME's according to industrial classifications. Table 5 presents the ratios of industrial trainees compared to other domestic workers by industry. For manufacturing total (at the bottom of the table), the ratio of foreign industrial trainees to total employment is 4.8% and the ratio of industrial trainees to production workers is 7.4% in 2001. In the same year, the ratio of industrial trainees to low-skilled production workers is 14.6% and the ratio of industrial trainees to temporary workers is 30.5%. The share of industrial trainees out of total workers employed by SME's is increasing continuously. And again, textile industry is the one that recorded the highest ratios in all cases.

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## IV. Effects of Foreign Unskilled Workers in Korea

### 1. Review of Theoretical Frameworks

In this subsection, we will provide a brief overview of theoretical frameworks that could be used to analyze the economic impacts of labor migration on the receiving countries. As we will see below in more detail, theoretical predictions on the impact of labor migration rely upon the specifications of each model. Thus, it would be an empirical question whether and to what extent labor migration is beneficial or harmful to the natives of the receiving country. Nevertheless, reviewing alternative theoretical discussions on this issue will be of great help in logically understanding the underlying mechanisms of labor migration and in interpreting the empirical results that we obtain in

the next subsection.

Traditionally, economic analyses (both theoretical and empirical) on the impact of migration have been conducted from the viewpoint of the host country and thus the main attention has been paid to the potential adverse effects of immigration on the receiving economy: immigrants could be harmful to the native workers by taking their jobs away and lowering wage rates. It was Borjas (1995) who correctly pointed out that immigration could create not only costs but also benefits to the receiving economy and thus whether immigrants are a "boon or bane" depends on the their relative magnitudes. When the benefits created by immigration outweigh the losses, it is said that there exists 'immigration surplus'.

This implies that in order to understand the impacts of labor migration more appropriately, it is not enough to analyze the factors that are competing with the immigrant workers. Rather, general equilibrium framework is more adequate in which distributional consequences of immigration between the natives who gain and lose can be taken into account. In this regards, when we explain alternative theoretical frameworks in what follows, we will focus on the existence and the extent of immigration surplus under several general equilibrium models.[21]

### 1.1. Specific Factor Model

The specific factors model is the one that frequently used in international trade theory as a short-run version of the Heckscher-Ohlin model. This model can be used to succinctly demonstrate how labor migration generates immigration surplus.[22]

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[21] Theoretical discussions in this subsection draw heavily upon Borjas (1995), Fiedberg and Hunt (1995), Trefler (1997), and Davis and Weinstein (2002).

[22] The original model on immigration surplus by Borjas (1995) considered only one industry where labor demand curve is downward sloping and labor supply curve is perfectly inelastic. His exposition was

Suppose that there are two industries ($X$ and $Y$) and three kinds of input factors ($L$, $K_X$, and $K_Y$). $L$ is labor that can be commonly used in both industries (i.e., perfectly mobile across industries) while $K_X$, and $K_Y$ are industry-specific capital that can be used only in one industry (either in industry $X$ or $Y$, respectively). This initial situation can be depicted as in Figure 2-(a). The downward sloping line $VMPL_X$ is value of marginal product of labor in industry X that is read from the origin $O_X$.[23] Since labor can be used in both sectors (i.e., labor is fully mobile across industries), the equilibrium of this economy is point $E$. At this point, the equilibrium wage rate is $w$ at which there is no incentive for labor to mover across industries. The value of total product generated by industry $X$ is then the trapezoid area below the line $IE$. This value of total product in industry $X$ is distributed between labor and specific factor as follows: the rectangular area $O_X L_X E w$ goes to labor and the triangular area ($IEw$) to the specific factor.

Now, suppose immigrant labor by the amount of $M$ has arrived (Figure 2-(b)). This event is equivalent to the increase of labor endowment in this economy, which shifts the origin for industry $Y$ to $O'_Y$ by $M$. In turn, the $VMPL_Y$ schedule is displaced to the right by the same amount. Thus, the curve $VMPL'_Y$ contains information equivalent to the previous one, but with reference to the new origin. The rise in the labor endowment causes the economy to move from the initial equilibrium $E$ to $E'$. Consequently, the nominal wage rate will be declined to $w'$ and immigrant workers will be allocated between industry $X$ and $Y$ by the amount of $M_X$ and $M_Y$, respectively.

Now we can analyze the changes of welfare states of each factor in industry $X$. First,

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expanded to the specific factors model with two industries by Trefler (1997). In terms of theoretical results and their implications, these two models are essentially identical. Here the specific factors model will be used to explain immigration surplus as Trefler (1997).

[23] Our explanation will focus only on industry X since by symmetry between industry $X$ and $Y$ it is easy to see what is taking place in industry Y.

the migrant labor will *obtain* wage bill of *w'M$_X$*. Second, the native labors (who compete with the migrant workers) will *lose*: their nominal wage bill will decline from *wL$_X$* to *w'L$_X$*. Their lost income *(w – w')L$_X$* will be transferred to specific factor. Third, the specific factor's income will *increase* to the triangular area of *IE'w*. The increased amount of specific factor's income comes from two parts. The first part is transferred income from labor *((w – w')L$_X$)*. The second one is the shaded triangular area below *VMPL$_X$* line. This shaded area is 'immigration surplus' which was generated by immigrant workers, but does not belong to them. This immigration surplus belongs to specific factor due to the complementary between immigrant workers and specific factor.

// insert Figure 2 //

In sum, in the case of specific factors model immigration surplus is always positive and accrues to specific factor. In addition to this migration surplus, specific factor gains extra income transferred from native labor. On the other hand, due to the competition between native labor and immigrant workers, reduced wage rate makes native labor worse off.

### 1.2. Heckscher-Ohlin Model with Modified Factor Price Equalization

As described before, the specific factors model is a short-run model in the sense that specific factors are immobile across industries. In this setting, immigration is unambiguously beneficial to the natives' welfare although there exists distributional issue between native labors and specific factors. In this subsection, we will examine whether the immigration surplus still exists in the long run by examining the most commonly used international trade model, namely the Heckscher-Ohlin model.

One of the four components of Heckscher-Ohlin model is factor price equalization

theorem, which is very useful in analyzing immigration surplus in the Heckscher-Ohlin framework.[24] Factor price equalization states that given identical technology and free trade across countries, factor prices in all countries will be equalized. In this simplest form of factor price equalization, however, there is nothing to be analyzed on the impact of migration: equalized factor prices across countries imply that there is no economic reason for migration to occur between countries. However, it is still possible to analyze the impact of migration (regardless of its motivation). Without loss of generality, suppose that there are only two countries, Korea and China in the world. Now suppose that Chinese unskilled labor arrived in Korea. By Rybczynski theorem[25] in each country, Korea will increase the production of unskilled-labor intensive goods while China will reduce it. But under the standard Heckscher-Ohlin assumption of identical constant-returns-to-scale technology, the world output level of the unskilled-labor intensive goods is unaltered and thus there is no change in world price level.[26] In turn, this implies that factor prices do not change from the level before the immigration occurred. In this case, the welfare states of each factor do not change and immigration surplus is zero.

However, as Helpman (1998) has noted, even casual evidence suggests that full factor price equalization does not hold. In a widely cited and pioneering study, Trefler (1995) showed that both theoretically and empirically factor price differences across countries are proportional to productivity differences across countries. In other words,

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[24] The other three components of Heckscher-Ohlin model are Heckscher-Ohlin theorem, Rybczynski theorem, and Stolper-Samuelson theorem. We will not describe details of each theorem here. Instead, we will explain the theorem in the main text below whenever we need it.

25 Rybczynski theorem states that if a country experiences an increase in the supply of one factor, it will produce more of the product intensive in that factor and less of the other.

[26] In other words, the increased amount of unskilled-labor intensive goods in Korea is exactly the same as the decreased amount in China.

he modified factor price equalization theorem by allowing factor price differences up to (Hicks-neutral) technology differences and found that this theoretical modification works very well empirically.[27] In this situation, the underlying source that causes productivity differences across countries is critical in theoretically analyzing the impact of migration.

Suppose that this productivity difference is an attribute of labor workers (e.g., due to low education). Then any worker will have the same level of productivity no matter which country this worker lives in. In this case, there is no incentive to migrate as before and thus no impact of migration. On the other hand, if the productivity difference is an attribute of the country (e.g., due to inferior institutional infrastructure) then a worker who migrates into a country with higher productivity will earn more, which generates an incentive to migrate. Then what are the impacts of this migration under Heckscher-Ohlin framework? Again, the first effect comes from Rybczynski theorem. Suppose unskilled Chinese workers migrate into Korea and become more productive (by the difference of productivity between China and Korea). Note that when we measure the immigrant workers with productivity-adjusted efficiency units, the number of unskilled workers in the world is now bigger than that before the migration.[28] Then by Rybczynski theorem, the world output of unskilled-labor intensive goods will increase which will in turn reduce the relative price of this goods: i.e., terms of trade of unskilled-labor intensive goods will be aggravated (terms of trade effect). The second effect is due to Stolper-Samuelson theorem. The price decline of unskilled-labor

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[27] For example, if Korea's productivity is twice as high as China's productivity, Korean worker's wage rate is also twice as high as that of Chinese workers.

[28] For example, suppose that Korea's productivity is twice as high as China's productivity. If one Chinese worker migrates into Korea, then he must be counted as "two" unskilled workers in productivity-adjusted efficiency unit.

intensive goods will decrease the real wage rate of unskilled labor while increase that of skilled labor. [29]

In sum, in Heckscher-Ohlin model with modified factor price equalization, the immigration of unskilled labor will affect the welfare states of each factor and the channel of this effect is the changes in terms of trade. The sign of immigration surplus in this case will depend on their relative magnitudes.

### 1.3.Ricardian Model

The Ricardian model with a continuum of goods, originally developed by Dornbusch, Fischer and Samuelson (1977), was used by Trefler (1995) and Davis and Weinstein (2002) to illustrate the effects of migration in order to focus on its terms of trade effect. [30] In this Ricardian model, there exist only one factor and perfect specialization on each good in which the factor price equalization needs not to hold and thus we can concentrate only on the terms of trade effect of migration.

Suppose that there are three goods in the economy and that $A_i$ and $A_i^*$ represent the unit of labor needed to produce one unit of good $i$ (where $i=1,2,3$) in home and foreign country, respectively (hereafter, asterisk implies foreign country). Suppose that the ratio of this unit of labor between home and foreign country is given by

$$A_1/A_1^* < A_2/A_2^* < A_3/A_3^*$$

That is, home country has the highest comparative advantage in producing good 1. Now suppose that initially home country produce goods 1 and 2 and foreign country produce

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29  Stolper-Samuelson theorem states that an increase in the relative price of one good will increase the factor price that this good intensively uses in production and reduce other factor prices both in real and nominal terms.

[30]  More detailed description of the model in the context of migration can be found in Bhagwati, Panagariya, and Srinivasan (1998) as well. Here we will provide a brief sketch of the model.

only good 3. Then by zero profit condition the followings must hold in the home country at the initial equilibrium:

$$wA_1 = p_1 \qquad wA_2 = p_2 \qquad wA_3 > p_3$$

where $w$ represents the wage rate and $p_i$ the price of good $i$. In other words, for goods 1 and 2 unit labor costs must be equal to the good's price and for good 3 the former is greater than the latter so that it is unprofitable to produce good 3 in home country.

Now suppose that a group of migrant workers move from foreign country to home country. Since these immigrant workers have to be accommodated in producing good 1 and good 2 in home country, excess supply of these goods in the world market will occur, which will reduce their price level, $p_1$ and $p_2$. This is the supply side effect of migration. At the same time, increased labor in home country and decreased labor in foreign country implies that home country's export will decrease while its import will increase.[31] This will result in trade deficit of home country and the trade balance can be recovered by a decline in its wage $w$, which lowers its demand for imports and raises its supply of exports. This is the demand side effect of migration. In order for the home country to remain producing good 1 and good 2 (i.e., for $wA_1 = p_1$ and $wA_2 = p_2$, to hold even after migration), this demand side effect (decrease in $w$) must be proportionate to the supply side effect (decrease in $p_1$ and $p_2$).

On the other hand, the exact opposite will take place in the foreign country that produces only good 3 before and after migration. With reduced labor force, its supply of good 3 will be short of its demand, which will increase its price level $p_3$. Reduced labor force in foreign country will lead to trade surplus (due to increase of export and

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[31]  This is because Cobb-Douglas preference is assumed.

decrease of import), which has to be corrected by the increase of its wage rate $w^*$. Since $w^* A_3^* = p_3$ must hold, the increase of $w^*$ must be proportionate to the increase of $p_3$.

Now it is clear what the welfare implication of the immigration in home country. The real wage of home country with respect to good 1 and good 2 is unchanged, since $w / p_1$ and $w / p_2$ does not change (in both cases the numerator and denominator will decline by the same proportion). However, the real wage of home country with respect to good 3 has declined: from the analysis above we know that $w$ has decreased and $p_3$ has increased, which means that $w / p_3$ has decreased.

In sum, with Ricardian model migration will change the terms of trade in a way that it would hurt the natives' welfare. The immigration surplus in this setting is always negative. In Ricardian model, the determinant of trade flows is comparative advantage driven by technological differences. Intuitively, the technological advantage in producing a good generates a kind of monopoly power. The migration inflow will erode this monopoly power, which is the underlying reason of negative immigration surplus.

### 1.4. Remarks

We began this subsection by stating that in order to appropriately understand the impact of immigration, general equilibrium approach is adequate since it can take into account distributional consequences of immigration. Since immigration creates both benefits and costs simultaneously, it is needed to assess these two opposite effects to decide whether immigration is bane or boon to the host country. As described above, various theories can shed lights on this issue very clearly. However, empirical assessment of this immigration surplus is very challenging. Most of the previous empirical literature investigates whether unskilled labors were hurt by immigration and

neglected the changes of other input factors' welfare state.[32] To our knowledge, only two empirical studies have tried to assess overall immigration surplus under the general equilibrium framework: Borjas (1995) and Davis and Weinstein (2002).

Although it is not impossible to calculate immigration surplus following their methodologies, we suspect that it may not be worthwhile to do so in the context of this paper. Basically, the general equilibrium theories which empirical works of Borjas (1995) and Davis and Weinstein (2002) were based on were specific factors model and Ricardian model, respectively. As we have already seen above, specific factors model always gives rise to positive immigration surplus while in the case of Ricardian model immigration surplus is always negative. Therefore, the empirical conclusion on whether immigration surplus is negative or positive would be dependent upon which model we are adopting in the empirical assessment.[33] In this case, it is natural to decide which model (and its assumptions) is more appropriate in describing the reality of the Korean case. We will leave this issue for the future research topic as it goes beyond the scope of this paper.

In this regards, when we assess the economic consequence of immigration in Korea in the next subsection, we will focus on the labor market outcomes instead of trying to assess overall immigration surplus. Nevertheless, the theoretical discussions provided in this subsection would help in understanding and interpreting the empirical results that obtained in what follows. Now we turn to the empirical assessment of labor market consequences of migration in Korea.

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[32] Examples include Goldin (1994), LaLonde and Topel (1991), and Altonji and Card (1991).

[33] Another reason that we didn't calculate the immigration surplus was the empirical methodologies are not well established yet. As Borjas (1995) stated, his method was just a "back-of-the-envelope" calculation to provide the magnitude of immigration surplus relative to national income.

## 2. Labor Market Effects of Industrial Trainees

In this section, we assess the effects of foreign industrial trainees on labor market outcomes of less skilled natives. From the viewpoint of the economy as a whole, what matters most in formulating immigration policy stance towards the inflow of foreign unskilled workers would probably be the effect on the welfare of Korean nationals. In practice, however, one of the most controversial aspects of the immigration policy debates has been whether and to what extent the foreign unskilled workers harms unskilled natives. Although there exist several theoretical frameworks to analyze this issue, empirical analysis of the actual impacts has been relatively scarce, especially on Korea. Moreover, the actual impacts could vary across countries depending on the magnitude of the inflow or the institutional details, for example.

In this study, we focus on Industrial Trainee System in Korea, and empirically examine the effects of foreign industrial trainees introduced through this system on unskilled Korean workers in manufacturing industries. Although the Industrial Trainee Program was intended *ex ante* to provide unskilled foreign workers to SMEs in industries experiencing "labor shortages", in our view, there exists the possibility that certain subgroups of native workers find themselves working in a similar industry as the industrial trainees *ex post*. Similarly, the complementarity or subsitutability between foreign industrial trainees and less skilled native workers is an empirical issue. In this study, we first document industry distribution of natives and industrial trainees and examine whether industrial trainees tend to work in the same labor market as particular groups of natives. We then examine mainly two aspects of labor market outcomes of unskilled natives in this study—whether less skilled natives has been displaced by foreign industrial trainees and whether and to what extent the wages of less skilled

natives has been depressed.

Methodologically, we closely follow Altonji and Card (1991). However, while Altonji and Card used regional variations of immigration densities to examine labor market outcomes of unskilled natives in the U.S., we use industry variations of employment density of industrial trainees. Primary reason for using industry variations in employment of industrial trainees is that information on industrial trainees along regional line is not available. Accordingly, we modified the methodologies by Altonji and Card (1991) in some of the analyses below.

## 2.1 Industry Distributions of Native Employees and Foreign Industrial Trainees

In the analysis below, we use information on the number of industrial trainees by KSIC two-digit manufacturing industries for each year during the 1997-2002 period from *Report on Small and Medium Business Survey*. Information on characteristics and labor market outcomes of native employees for the same industries and time periods are available from *Survey Report on Wage Structure*, which is based on the survey on establishments with 10 or more employees.[34] Since there are no industrial trainees for three industries[35] among the 23 two-digit manufacturing industries, we use 20 industries in the analysis. We consider less skilled natives, so that the native workers included in the analysis are those with at most high school diploma,[36] and between ages of fifteen and sixty four.

We divided our native workers into 6 subgroups according to sex and three

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[34] Since 2001, the report covers establishments with five or more employees. To maintain consistency of our sample, we dropped information from establishments with less than 10 employees.

[35] These are tobacco (KSIC 16), refined petroleum products (KSIC 23), and Recycling (KSIC 37).

[36] In Survey Report on Wage Structure, information on education of employees is available as a categorical variable and college dropouts, for example, are classified as high school graduates.

occupational groups, which are high-skilled, semi-skilled, and low-skilled.[37] Here, high-skilled workers comprise managers, professionals, technicians, clerks, service and sales workers, and skilled agricultural, forestry and fishery workers. Semi-skilled workers comprise craft workers, machine operators and assemblers, while low-skilled workers are manual workers.[38]

Table 6 describes characteristics of native workers. Average age of less skilled native workers in our sample is about 35 to 37. Within the same sex category, the average age of low-skilled workers are the highest. The youngest group is the semi-skilled workers for male and the high-skilled workers for female. Average years of schooling of less skilled native workers are 10.9 in 1997 and 11.1 in 2002.[39] For each sex, average years of schooling and wages are highest in high-skilled, followed by semi-skilled and low-skilled workers.

// insert Table 6 //

Table 7 shows the share of industrial trainees in total employees (native less skilled employees plus industrial trainees) for each industry, as well as industry distributions of industrial trainees and native groups for 1997 and 2001. In 1997, average employment share of industrial trainees in 20 manufacturing industries was 2.84 per cent which rose

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[37] It may cause confusion since we already defined less skilled workers above, so it would be worthwhile to make clear the distinction between less skilled and low skilled workers. To make a comparison with foreign industrial trainees, we first restrict our sample of native workers to the 'less skilled' workers defined by workers with at most high school diploma. And then, these less skilled workers are divided into three categories according to its occupational code, high-skilled, semi-skilled and low-skilled. Thus, less skilled are actually less educated workers and low skilled are defined by its occupational position.

[38] In terms of one-digit occupation code by Korean Standard Classification of Occupations (before revision in 2000), high-skilled workers cover code 1 to 6, semi-skilled workers cover code 7 and 8, and low-skilled workers cover code 9.

[39] In calculating years of schooling, we considered primary school complete, middle school complete, and high school complete as having 6, 9, and 12 years of education, respectively. Since high school dropouts are considered as middle school complete, for example, average years of schooling calculated in this way is biased downward.

to 5.73 percent in 2002. Industries with high intensity of industrial trainees are relatively labor intensive industries, such as textile, rubber and plastic, pulp and paper. Industries with low intensity of industrial trainees are relatively high capital or skill intensive industries, such as food processing, automobile, chemical products, communication equipment. Broadly similar patterns are observed in 2001, although there were some changes in individual industry ranking in industrial trainee intensity. The correlation between intensities of industrial trainee in 1997 and in 2001 is 0.5.

//insert Table 7 //

Industry distribution of industrial trainees is broadly similar to those of native workers, indicating that industrial trainees tend to work in the same labor market as less skilled native workers. The correlation between industry distributions of industrial trainees and total less skilled native workers is rather strongly positive at 0.60 in 1997 and at 0.57 in 2001. In terms of employment distribution, industrial trainees are most directly competitive with female semi-skilled, female high-skilled, and male semi-skilled in 1997. Employment distributions of male and female low-skilled workers are the least similar to that of industrial trainees in 1997. In 2001, these patterns change in an interesting way. In 2001, male semi-skilled workers turn out to be among the least competitive with industrial trainees. In addition, the employment distribution of female semi-skilled workers became less correlated with industrial trainees. The fact that employment distributions of semi-skilled workers became more dissimilar to that of industrial trainees over time might suggest the possibility that semi-skilled workers moved out from industries where industrial trainees are concentrated.[40] By contrast, there were slight increases in the correlations between employment distributions of

industrial trainees and other native groups.

Following Altonji and Card (1991), we proceed to analyze the effect of industrial trainees on a particular less skilled native group in an alternative way, by summarizing the overlap in the industry distribution of the native group with that of industrial trainees into a single index. The idea is that the effect of a new inflow of industrial trainees on a native group will be larger when the inflow is concentrated on industries where employment of that native group is concentrated. Let $S_{Ni}$ denote the share of the native group N in the $i^{th}$ industry, and $E_i$ the initial level of total employment in industry I. Let $\Delta E$ and $\Delta E_i$ represent the total number of new inflow of industrial trainees and the number of that inflow into industry i, respectively. Then, the average growth of labor supply due to the inflow of industrial trainees experienced by the native group N is

$$\sum_i S_{Ni} \frac{\Delta E_i}{E_i}$$

Suppose that industry distribution of new inflow of industrial trainees is the same as the industry distribution of existing industrial trainees, so that $\Delta E_i = S_{Ii}\Delta E$ where $S_{Ii}$ is the share of existing industrial trainees in industry i. Then, it can be shown that the average growth of labor supply experienced by the native group N is $\beta \times (\Delta E/E)$, where

$$\beta = \frac{S_{NI}S_{Ii}}{S_i}$$

and $S_i$ is the share of all workers in industry i and E is the level of total employment in labor market. The labor market competition index, $\beta$, can be more or less than unity, depending on the degree of overlap between industry distributions of industrial trainees and the native group.

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[40] We will examine this issue in more detail below.

Table 8 shows the measured labor market competition index for 6 native groups. Overall, estimates of the index of labor market competition are not much different from one for any native groups for any year. It is lowest at 0.84 in 1998 for female low-skilled and highest at 1.14 in 2000 for male low skilled. This suggests that the effects of the inflow of industrial trainees are not noticeably different across native groups, if at all. However, there do exist some differences in the degree of labor market competition across native subgroups. The index is relatively low for male and female high-skilled workers for all years, compared with other native groups. This might suggest that high-skilled workers are most isolated from the competition from industrial trainees. For male low-skilled and female semi-skilled workers, the index is relatively high and remains equal to or slightly above one. Although estimates of labor market competition index are not very much different across native groups, they change over time in an interesting way for some native groups: male semi-skilled. For male semi-skilled workers, the index *decreases* over time, suggesting the possibility that male semi-skilled workers were displaced by industrial trainees.[41] We examine this issue in more detail below.

//insert Table 8 //

## 2.2. Displacement of Unskilled Natives

In order to examine whether certain groups of native workers were displaced by the inflow of industrial trainees, we examine two issues. First, for each 20 manufacturing industries, we examine whether a certain native group lost its relative employment share over time, controlling for the change in its total employment share. Then, we examine

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[41] For female low-skilled workers, the index increases over time. In order to see whether this phenomenon is related to the inflow of industrial trainees, see our discussion below.

whether the patterns of changes in relative employment share of native groups are correlated across industries with the intensity of industrial trainees. Let $E_{Ni,t}$ denote the employment of native group N in industry i at year t, and let $E_{i,t}$ represent the corresponding total employment in industry i. Also, let $E_{N,t}$ and $E_t$ represent the total employment of native group N and total employment at time t. Then, for each industry and native group, the change in employment share over time for native group N, after controlling for the change in its total employment share, can be measured as follows.

$$\frac{E_{Ni,t}/E_{i,t}}{E_{Ni,0}/E_{i,0}} \div \frac{E_{N,t}/E_t}{E_{N,t}/E_0}$$

Here, the subscript 0 represent the base year which is 1997 in our analysis. If this ratio is equal to one, it indicates that a native group N maintained its employment share over time in industry i, controlling for the change in the total employment share of that group. On the other hand, if this ratio is less than one, then it indicates that the native group lost its employment share in industry i. Table 9 displays the ratio for each manufacturing industries for the period from 1997 to 2001, with boldfaced letters denoting values larger than one.

Table 9 shows that industry patterns of changes in relative employment shares differ across native groups. That is, industry factors do not dominate the changes in relative employment shares of native groups. For example, male high-skilled workers experienced the largest increase in relative employment share in pulp and paper, leather and shoes, and textiles, while male semi-skilled workers experienced the largest increase in relative employment share in publishing and printing, office and computing machinery, and non-ferrous metal. In the case of female low-skilled workers, top three industries where there were the largest gains in relative employment are wood and wood

products, other machinery and equipment, and rubber and plastic. Industries with the increase in relative employment share for at least four out of six native groups are only three: office and computing machinery, electrical machinery, and precision instrument. Among these three industries, office and computing machinery and precision instrument experienced relatively large expansion in total employment during this period.

//insert Table 9 //

In order to determine whether the changes in relative employment share of native groups are related to the industrial trainees, we examined correlations across industries between changes in relative employment share and intensities of industrial trainee, by native groups. Here, for each industry, changes in relative employment share for each year is measured against the base year 1997, and the intensities of industrial trainees for each year is measured as the fraction of industrial trainees in total employment in that year.

//insert Table 10 //

//insert Figure 3//

In Table 10, the correlation coefficients for male semi-skilled workers turned out to be negative and significant for most of the time periods considered. That is, semi-skilled workers lost their relative employment share in industries that are intensive in industrial trainees(See also Figure 3). In Table 8, we already discussed that employment distribution of semi-skilled workers became more dissimilar over time to that of industrial trainees. These findings together suggest the possibility that male semi-skilled native workers have been displaced by industrial trainees. An alternative interpretation of this evidence might be that semi-skilled workers lost their relative employment share

in industries that are shrinking over time. However, the correlation between total employment growth (column 7 in Table 9) and changes in relative employment share of the semi-skilled (column 2 in Table 9) is close to zero.

For male and female low-skilled workers, the correlations between intensities of industrial trainees and changes in relative employment share are positive for various time periods. However, they are not significantly different from zero, except for year the 2000. We have discussed above that the labor market competition index between female low-skilled and industrial trainees increased over time. One interpretation of this result might be that the industrial trainees and female low-skilled workers are complementary. However, this interpretation does not receive strong support from Table 10 at the least. For other native groups, none of the correlations are significantly different from zero, except for female semi-skilled workers in 2000. For female semi-skilled workers, however, the signs of the correlation coefficients vary over time.

Overall, we find some evidence that male semi-skilled workers are the group that is likely to have been displaced by industrial trainees. Although there were some signs suggesting that male and female low-skilled workers gained relative employment share in industries intensive of industrial trainees, they were not strong enough to support complementarity between industrial trainees and low-skilled workers.

### 2.3 Effect on Wages

In this section, we examine the effect of industrial trainees on wages of less-skilled native workers. Specifically, we run regressions of wages of the six less skilled native groups in 20 manufacturing industries on the fraction of industrial trainees in total industry employment and other control variables. We present cross-section regressions

for each year from 1997 to 2001 as well as first-differenced regressions. Our methodology is similar to Altonji and Card (1991). They examined the effects of immigrants on the labor market outcome variables in the U.S., utilizing cross-city variations in immigration fraction. In this study, we focus on cross-industry variations in intensities of industrial trainees for two reasons. First, information on the regional distribution of industrial trainees was not available for this study. Second, the industrial trainees were allocated across industries through quotas set annually by the government. Also, the industrial trainees, who can stay in Korea up to a maximum of three years, were not allowed to change their employers and, hence, their industries for the period covered in our analysis. So, any effect of industrial trainees on wages of less-skilled native workers is most likely to show up at the industry labor market.

*Construction of Variables*

The dependent variable in our regressions is the industry-specific mean of wages for each native group which is not accounted for by differences in age and educational composition of less skilled native workers across industries. Specifically, for six native groups for each year, we regressed logarithms of wages of workers on dummy variables for KSIC two-digit industries, third order polynomial in age, dummy variables for education, and interactions of age and education. We used the estimated coefficients on industry dummy variables as our measure of industry-specific mean wages adjusted for the differences in age and education of workers across industries.

The main explanatory variable is the fraction of industrial trainees in total employment in an industry, where total employment is the sum of native workers and industrial trainees. Following Altonji and Card (1991), we also include two control

variables: average age and average years of education of native workers for each industry and native group. One rationale behind the inclusion of these variables is that there might be externalities associated with education or age within native groups and industries.[42]

*Regression Equation*

The regression equation for our cross-section analysis is as follows.

$$\hat{W}_{Ni} = X_{Ni}\beta + F_i\gamma + e_{Ni}$$

Here, $\hat{W}_{Ni}$ is the adjusted mean wage in logarithm for native group N in industry I, $X_{Ni}$ is the vector of control variables, $F_i$ is the fraction of industrial trainees, and $e_{Ni}$ is the error term.

One possible econometric issue in the above cross-section specification is that the fraction of industrial trainees and the error term might be correlated. As well known, the Korean government allocated quotas for industrial trainees across industries considering the needs of the businesses. Also, we already discussed that the actual inflow of industrial trainees were relatively concentrated on low-wage labor intensive manufacturing industries, which are likely to be particularly experiencing "labor shortages". Under these circumstances, the estimated coefficient on the fraction of industrial trainees might be biased downward.

In order to address this issue, we also estimated the following first-differenced equations.

$$\Delta\hat{W}_{Ni} = \Delta X_{Ni}\beta + F\Delta_i\gamma + \Delta e_{Ni}$$

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[42] Altonji and Card (1991) also use these variables as controls for similar reasons.

where Δ denotes "changes over time". By first-differencing, we can eliminate any bias introduced by industry-specific fixed effects that are correlated with the fraction of industrial trainees and the adjusted wages of native workers.

*Results*

The cross-section regressions were ran on the data pooled over six sex/occupation native groups for each year from 1997 to 2001. In order to estimate the first-differenced equation, we measured changes in variables between 1997 and 2001. In the regressions reported in Table 11, we included native group dummy variables and interactions of group dummy variables with average age and years of education as additional controls.

//insert Table 11 //

The cross-section regressions show that wages of natives are negatively and significantly correlated with the fraction of industrial trainees, except for year 2000. As we discussed above, however, it might be hasty to interpret this result as suggesting that industrial trainees lowered wages of less skilled Korean workers. In the first-differenced result, the coefficient on the fraction of industrial trainees is negative but became insignificant and much smaller in magnitude: one percentage point increase in the fraction of industrial trainees decreases, if at all, wages of less skilled Korea workers by roughly 0.14 percent.[43] The estimated coefficient, which is insignificant, is much smaller than that reported by Altonji and Card (1991) for the U.S.; they report that one percentage point increase in immigrant fraction decreases wages of natives by roughly one percent. Also, the small and insignificant coefficient from the first-differenced

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[43] We also estimated one-year first-differenced regressions, which are not reported, but we could not find any significant effect of industrial trainees on wages of less skilled Korean workers.

regression suggest that the negative and significant coefficient from the cross-section regressions largely reflect the bias introduced from the government's quota allocation procedure for industrial trainees. That is, industrial trainees were allocated toward industries which are low-wage and labor-intensive.

In sum, we could not find any strong evidence suggesting that the inflow of foreign industrial trainees decreased wages of less-skilled Korean workers. However, we cannot exclude the possibility that our first-differenced regressions might still produce biased estimates. This possibility arises if transitory fluctuations in industry-specific business conditions are correlated with new inflows of industrial trainees. In so far as the government's quota allocation process were not flexible enough to fully reflect the short term changes in business conditions, it could be conjectured that the bias is not likely to be very serious. Nevertheless, there do exist such a possibility. In addition, we cannot exclude the possibility that, while industrial trainees did not significantly affect wages of less-skilled natives as a whole, they affected the wages of a specific group of natives. Further study seems necessary in this regard.


## VI. Concluding Remarks

In this study, we made a brief overview of major temporary worker programs and the actual inflow of foreign workers, and analyzed the effects of temporary foreign workers on the Korean economy. We discussed that temporary foreign worker programs in Korea have evolved in the direction of legalizing foreign unskilled workers and that the size of those programs became larger over time. In addition, it was documented that Korea has been increasingly integrated with other East Asian countries, particularly in

terms of unskilled labor mobility. In fact, most of foreign unskilled workers who have filled the labor-shortage in manufacturing sector come from East Asian region including China, Indonesia, Vietnam, Philippines, Bangladesh and Thailand. Thus from the viewpoint of the Korean economy, the importance of East Asia as a source of foreign labor cannot be exaggerated. With regard to the labor market impacts of foreign industrial trainees, this study provided some evidence suggesting that some group of Korean workers—male craft workers, machine operators and assemblers—might have been displaced by industrial trainees. However, we could not find any noticeable effects on wages of native groups.

Korea's temporary foreign worker policy is currently under transition; although recently introduced Employment Permit System was simply added on top of existing Industrial Trainee System. Also, growing problems of illegal workers poses challenges for the overall temporary foreign worker programs. Thus, in order to promote cross-border labor mobility at both regional and global level and reap the greatest mutual benefits out of it, we need a policy scheme which can minimize potential adverse consequences of temporary foreign worker inflow and which is also sustainable in the long term. In this regard, we believe that international cooperation in designing and implementing foreign labor policy has an important role to play.

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**Table 1. Summary Statistics on Recent Economic Trend in Korea**

|  | Real GDP Growth Rate (%) | Inflation Rate (%) | Trade Surplus (billion US dollar) | Service Sector Employment (%) | Unemployment Rate (%) |
|---|---|---|---|---|---|
| 1988 | 10.5 | 7.1 | 8.9 | 50.9 | 2.5 |
| 1989 | 6.1 | 5.7 | 0.9 | 52.3 | 2.6 |
| 1990 | 9.0 | 8.6 | -4.8 | 54.4 | 2.4 |
| 1991 | 9.2 | 9.7 | -9.7 | 56.4 | 2.4 |
| 1992 | 5.4 | 6.2 | -5.1 | 58.5 | 2.5 |
| 1993 | 5.5 | 4.8 | -1.6 | 61.7 | 2.9 |
| 1994 | 8.3 | 6.3 | -6.3 | 63.3 | 2.5 |
| 1995 | 8.9 | 4.5 | -10.1 | 64.5 | 2.1 |
| 1996 | 6.8 | 4.9 | -20.6 | 66.1 | 2.0 |
| 1997 | 5.0 | 4.4 | -8.5 | 67.7 | 2.6 |
| 1998 | -6.7 | 7.5 | 39.0 | 68.2 | 7.0 |
| 1999 | 10.9 | 0.8 | 23.9 | 68.7 | 6.3 |
| 2000 | 9.3 | 2.3 | 11.8 | 69.0 | 4.1 |
| 2001 | 3.1 | 4.1 | 9.3 | 70.2 | 3.8 |
| 2002 | 6.3 | 2.7 | 10.3 | 71.5 | 3.1 |
| 2003 | 3.1 | 3.6 | 15.0 | 72.1 | 3.4 |

*Source : National Statistics Office*

**Table 2-a: Foreign Workers by Legal Status**

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Employee Visa** | 3,766 (5.7) | 5,264 (6.8) | 8,177 (6.1) | 13,314 (6.3) | 14,636 (5.8) | 11,140 (6.4) | 12,592 (5.6) | 18,056 (5.8) | 28,195 (6.3) | 40,485 (8.0) |
| ▪ **E1~E7** | 3,766 (5.7) | 5,264 (6.8) | 8,177 (6.1) | 13,314 (6.3) | 14,636 (5.8) | 11,140 (6.4) | 12,592 (5.6) | 15,620 (5.0) | 18,511 (4.1) | 21,876 (4.3) |
| ▪ **E8** | | | | | | | | 2,436 (0.8) | 9,684 (2.2) | 18,609 (3.7) |
| **Trainee Visa** | 8,048 (12.1) | 24,050 (31.0) | 42,717 (31.9) | 68,020 (32.3) | 90,369 (35.7) | 64,212 (36.8) | 78,945 (34.8) | 104,839 (33.6) | 100,344 (22.4) | 96,857 (19.1) |
| ▪ **for ITTP** | | | | | | 19,769 (11.3) | 21,774 (9.6) | 26,095 (8.4) | 25,830 (5.8) | 27,502 (5.4) |
| ▪ **by ITS** | | | | | | 44,443 (25.4) | 57,171 (25.2) | 78,744 (25.2) | 74,514 (16.6) | 69,355 (13.7) |
| **Illegal Stayers** | 54,505 (82.2) | 48,231 (62.2) | 83,133 (62.0) | 129,063 (61.3) | 147,948 (58.5) | 99,369 (56.9) | 135,333 (59.7) | 188,995 (60.6) | 320,019 (71.3) | 369,696 (72.9) |
| ▪ **Registered** | | | 14,883 (11.1) | 24,861 (11.8) | 32,890 (13.0) | 25,133 (14.4) | 29,220 (12.9) | 39,803 (12.8) | 64,813 (14.4) | 80,457 (15.9) |
| ▪ **Unregistered** | 54,505 (82.2) | 48,231 (62.2) | 68,250 (50.9) | 104,202 (49.5) | 115,058 (45.5) | 74,236 (42.5) | 106,113 (46.8) | 149,192 (47.8) | 255,206 (56.9) | 289,239 (57.0) |
| **Total** | 66,319 (100.0) | 77,545 (100.0) | 134,027 (100.0) | 210,397 (100.0) | 252,953 (100.0) | 174,721 (100.0) | 226,870 (100.0) | 311,890 (100.0) | 448,558 (100.0) | 507,038 (100.0) |

*Note*: 1. Numbers in parentheses are the ratio compared to total in each year.
    2. ITTP and ITS represent "Industrial and Technical Training Program" and "Industrial Trainee System", respectively.
*Source*: "Yearbook of Migration Statistics," various issues, Ministry of Justice

**Table 2-b. Distribution of Foreign Overstaying Workers by Industries**

(Unit: Number of Persons, %)

| Industry | Persons | | | Ratio | | |
|---|---|---|---|---|---|---|
| | Total | Male | Female | Total | Male | Female |
| Total | 249,883 | 163,315 | 86,568 | 100 | 100 | 100 |
| Agriculture and Forestry | 2,506 | 1,903 | 603 | 1.00 | 1.17 | 0.70 |
| Fishing | 120 | 95 | 25 | 0.05 | 0.06 | 0.03 |
| Mining and Quarrying | 530 | 448 | 82 | 0.21 | 0.27 | 0.09 |
| Manufacturing | 92,453 | 68,896 | 23,557 | 37.00 | 42.19 | 27.21 |
| Electricity, Gas and Water Supply | 374 | 308 | 66 | 0.15 | 0.19 | 0.08 |
| Construction | 56,275 | 50,162 | 6,113 | 22.52 | 30.71 | 7.06 |
| Wholesale and Retail Trade | 1,040 | 719 | 321 | 0.42 | 0.44 | 0.37 |
| Hotels and Restaurants | 38,762 | 6,445 | 32,317 | 15.51 | 3.95 | 37.33 |
| Transport | 377 | 321 | 56 | 0.15 | 0.20 | 0.06 |
| Post and Telecommunications | 11 | 9 | 2 | 0.00 | 0.01 | 0.00 |
| Financial Institution and Insurance | 10 | 2 | 8 | 0.00 | 0.00 | 0.01 |
| Real Estate and Renting and Leasing | 31 | 26 | 5 | 0.01 | 0.02 | 0.01 |
| Business Activities | 4,150 | 3,199 | 951 | 1.66 | 1.96 | 1.10 |
| Public Administration and Defense; Compulsory Social Security | 2 | 1 | 1 | 0.00 | 0.00 | 0.00 |
| Education | 49 | 20 | 29 | 0.02 | 0.01 | 0.03 |
| Health and Social Work | 119 | 51 | 68 | 0.05 | 0.03 | 0.08 |
| Recreational, Cultural and Sporting Activities | 86 | 59 | 27 | 0.03 | 0.04 | 0.03 |
| Other Community, Repair and Personal Service Activities | 5,488 | 3,608 | 1,880 | 2.20 | 2.21 | 2.17 |
| Private Households with Employed Persons | 9,624 | 455 | 9,169 | 3.85 | 0.28 | 10.59 |
| Extra-Territorial Organization and Bodies | 1 | 0 | 1 | 0.00 | 0.00 | 0.00 |
| No-Reply and Errors | 37,875 | 26,588 | 11,287 | 15.16 | 16.28 | 13.04 |

*Source*: Department of Justice.

**Table 3-a: Foreign Workers with Employee Visa (E1~E7) by Country of Origin**

(Units: number of persons, %)

| | U.S. | Canada | Russia | Philippines | Japan | U.K. | New Zealand | China | Australia | India | Other Countries | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1993 | 1,909 (50.7) | 173 (4.6) | 65 (1.7) | 355 (9.4) | 437 (11.6) | 163 (4.3) | 35 (0.9) | 26 (0.7) | 75 (2.0) | 35 (0.9) | 493 (13.1) | 3,766 (100.0) |
| 1994 | 2,621 (49.8) | 383 (7.3) | 139 (2.6) | 474 (9.0) | 545 (10.4) | 203 (3.9) | 31 (0.6) | 115 (2.2) | 92 (1.7) | 39 (0.7) | 622 (11.8) | 5,264 (100.0) |
| 1995 | 4,084 (49.9) | 1,056 (12.9) | 173 (2.1) | 532 (6.5) | 856 (10.5) | 247 (3.0) | 39 (0.5) | 165 (2.0) | 139 (1.7) | 56 (0.7) | 830 (10.2) | 8,177 (100.0) |
| 1996 | 5,939 (44.6) | 2,729 (20.5) | 333 (2.5) | 698 (5.2) | 1,014 (7.6) | 502 (3.8) | 49 (0.4) | 347 (2.6) | 209 (1.6) | 116 (0.9) | 1,378 (10.4) | 13,314 (100.0) |
| 1997 | 5,854 (40.0) | 3,219 (22.0) | 447 (3.1) | 940 (6.4) | 1,265 (8.6) | 488 (3.3) | 93 (0.6) | 383 (2.6) | 233 (1.6) | 161 (1.1) | 1,553 (10.6) | 14,636 (100.0) |
| 1998 | 4,191 (37.6) | 1,991 (17.9) | 464 (4.2) | 995 (8.9) | 817 (7.3) | 335 (3.0) | 60 (0.5) | 361 (3.2) | 208 (1.9) | 113 (1.0) | 1,605 (14.4) | 11,140 (100.0) |
| 1999 | 4,039 (32.1) | 1,985 (15.8) | 921 (7.3) | 1,761 (14.0) | 862 (6.8) | 367 (2.9) | 95 (0.8) | 387 (3.1) | 270 (2.1) | 120 (1.0) | 1,785 (14.2) | 12,592 (100.0) |
| 2000 | 3,368 (21.6) | 2,466 (15.8) | 1,861 (11.9) | 2,227 (14.3) | 1,048 (6.7) | 544 (3.5) | 405 (2.6) | 634 (4.1) | 433 (2.8) | 216 (1.4) | 2,418 (15.5) | 15,620 (100.0) |
| 2001 | 3,547 (19.2) | 3,219 (17.4) | 2,340 (12.6) | 2,042 (11.0) | 1,056 (5.7) | 749 (4.0) | 710 (3.8) | 707 (3.8) | 618 (3.3) | 331 (1.8) | 3,192 (17.2) | 18,511 (100.0) |
| 2002 | 4,220 (19.3) | 4,002 (18.3) | 2,744 (12.5) | 1,851 (8.5) | 1,087 (5.0) | 995 (4.5) | 959 (4.4) | 947 (4.3) | 853 (3.9) | 585 (2.7) | 3,633 (16.6) | 21,876 (100.0) |

*Note*: Numbers in parentheses are the ratio compared to total in each year　　　　*Source*: "Yearbook of Migration Statistics," various issues, Ministry of Justice

**Table 3-b: Foreign Workers wit Visa Type E-8 (Industrial Trainee Employment) by Country of Origin**

(Units: number of persons, %)

| | Vietnam | Korean-Chinese | China | Indonesia | Philippines | Bangladesh | Pakistan | Nepal | Uzbekistan | Sri Lanka | Other Countries | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 415 | 196 | 323 | 390 | 255 | 173 | 0 | 89 | 34 | 31 | 530 | 2,436 |
| | (17.0) | (8.0) | (13.3) | (16.0) | (10.5) | (7.1) | (0.0) | (3.7) | (1.4) | (1.3) | (21.8) | (100.0) |
| 2001 | 1,374 | 1,670 | 1,620 | 1,853 | 1,086 | 785 | 296 | 410 | 131 | 113 | 346 | 9,684 |
| | (14.2) | (17.2) | (16.7) | (19.1) | (11.2) | (8.1) | (3.1) | (4.2) | (1.4) | (1.2) | (3.6) | (100.0) |
| 2002 | 3,429 | 3,272 | 2,682 | 2,637 | 2,229 | 1,221 | 895 | 674 | 466 | 398 | 706 | 18,609 |
| | (18.4) | (17.6) | (14.4) | (14.2) | (12.0) | (6.6) | (4.8) | (3.6) | (2.5) | (2.1) | (3.8) | (100.0) |

*Note*: Numbers in parentheses are the ratio compared to total in each year

*Source*: "Yearbook of Migration Statistics," various issues, Ministry of Justice

**Table 3-c: Foreign Workers with Trainee Visa by Country of Origin**

(Units: number of persons, %)

| | China | Korean-Chinese | Indonesia | Vietnam | Philippines | Bangladesh | Thailand | Uzbekistan | Sri Lanka | Pakistan | Other Country | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1993** | 2,426 (30.1) | 1,885 (23.4) | 512 (6.4) | 353 (4.4) | 1,721 (21.4) | 134 (1.7) | 530 (6.6) | 53 (0.7) | 298 (3.7) | 22 (0.3) | 114 (1.4) | 8,048 (100.0) |
| **1994** | 6,128 (25.5) | 4,317 (18.0) | 1,477 (6.1) | 2,612 (10.9) | 4,844 (20.1) | 1,255 (5.2) | 289 (1.2) | 45 (0.2) | 1,168 (4.9) | 375 (1.6) | 1,540 (6.4) | 24,050 (100.0) |
| **1995** | 11,031 (25.8) | 6,613 (15.5) | 3,323 (7.8) | 5,544 (13.0) | 7,982 (18.7) | 2,675 (6.3) | 376 (0.9) | 788 (1.8) | 1,623 (3.8) | 723 (1.7) | 2,039 (4.8) | 42,717 (100.0) |
| **1996** | 16,309 (24.0) | 8,112 (11.9) | 9,496 (14.0) | 10,167 (14.9) | 9,270 (13.6) | 6,213 (9.1) | 1,055 (1.6) | 919 (1.4) | 2,807 (4.1) | 953 (1.4) | 2,719 (4.0) | 68,020 (100.0) |
| **1997** | 22,209 (24.6) | 10,334 (11.4) | 13,456 (14.9) | 13,296 (14.7) | 11,011 (12.2) | 7,830 (8.7) | 1,759 (1.9) | 2,090 (2.3) | 3,614 (4.0) | 1,510 (1.7) | 3,260 (3.6) | 90,369 (100.0) |
| **1998** | 17,513 (27.3) | 8,956 (13.9) | 9,456 (14.7) | 7,948 (12.4) | 5,822 (9.1) | 5,635 (8.8) | 1,359 (2.1) | 1,854 (2.9) | 2,342 (3.6) | 1,033 (1.6) | 2,294 (3.6) | 64,212 (100.0) |
| **1999** | 16,599 (21.0) | 15,160 (19.2) | 13,274 (16.8) | 9,779 (12.4) | 7,396 (9.4) | 6,554 (8.3) | 1,555 (2.0) | 2,058 (2.6) | 2,183 (2.8) | 1,338 (1.7) | 3,049 (3.9) | 78,945 (100.0) |
| **2000** | 21,768 (20.8) | 19,967 (19.0) | 15,963 (15.2) | 14,816 (14.1) | 9,934 (9.5) | 7,476 (7.1) | 2,601 (2.5) | 3,165 (3.0) | 2,447 (2.3) | 0 (0.0) | 6,702 (6.4) | 104,839 (100.0) |
| **2001** | 22,362 (22.3) | 19,396 (19.3) | 13,398 (13.4) | 14,045 (14.0) | 9,062 (9.0) | 8,027 (8.0) | 2,719 (2.7) | 2,811 (2.8) | 2,299 (2.3) | 2,168 (2.2) | 4,057 (4.0) | 100,344 (100.0) |
| **2002** | 23,366 (24.1) | 17,502 (18.1) | 14,050 (14.5) | 12,332 (12.7) | 8,221 (8.5) | 7,406 (7.6) | 3,335 (3.4) | 2,633 (2.7) | 2,206 (2.3) | 1,745 (1.8) | 4,061 (4.2) | 96,857 (100.0) |

*Note*: Numbers in parentheses are the ratio compared to total in each year.  *Source*: "Yearbook of Migration Statistics," various issues, Ministry of Justice

**Table 3-d: Illegal Stayers by Country of Origin**

(Units: number of persons, %)

| | Korean-Chinese | China | Philippines | Vietnam | Indonesia | Bangladesh | Thailand | Mongolia | Uzbekistan | Pakistan | Other Country | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1993** | 21,387 (39.2) | 1,272 (2.3) | 8,831 (16.2) | 42 (0.1) | 102 (0.2) | 5,868 (10.8) | 712 (1.3) | 4 (0.0) | 5 (0.0) | 1,512 (2.8) | 14,770 (27.1) | 54,505 (100.0) |
| **1994** | 17,093 (35.4) | 2,056 (4.3) | 7,614 (15.8) | 221 (0.5) | 127 (0.3) | 5,244 (10.9) | 1,305 (2.7) | 124 (0.3) | 13 (0.0) | 2,276 (4.7) | 12,158 (25.2) | 48,231 (100.0) |
| **1995** | 25,706 (30.9) | 10,771 (13.0) | 10,327 (12.4) | 1,565 (1.9) | 455 (0.5) | 5,548 (6.7) | 2,071 (2.5) | 640 (0.8) | 134 (0.2) | 2,926 (3.5) | 22,990 (27.7) | 83,133 (100.0) |
| **1996** | 32,073 (24.9) | 18,547 (14.4) | 14,602 (11.3) | 4,410 (3.4) | 1,312 (1.0) | 9,610 (7.4) | 6,276 (4.9) | 3,457 (2.7) | 436 (0.3) | 5,455 (4.2) | 32,885 (25.5) | 129,063 (100.0) |
| **1997** | 29,858 (20.2) | 27,864 (18.8) | 13,909 (9.4) | 6,389 (4.3) | 2,353 (1.6) | 9,033 (6.1) | 8,200 (5.5) | 7,644 (5.2) | 1,921 (1.3) | 5,935 (4.0) | 34,842 (23.6) | 147,948 (100.0) |
| **1998** | 26,188 (26.3) | 29,440 (29.6) | 6,404 (6.4) | 3,713 (3.7) | 1,200 (1.2) | 7,462 (7.5) | 2,372 (2.4) | 5,550 (5.6) | 1,086 (1.1) | 3,098 (3.1) | 12,954 (13.0) | 99,467 (100.0) |
| **1999** | 42,169 (31.2) | 26,629 (19.7) | 9,213 (6.8) | 5,127 (3.8) | 1,865 (1.4) | 10,884 (8.0) | 6,853 (5.1) | 10,613 (7.8) | 3,265 (2.4) | 4,286 (3.2) | 14,429 (10.7) | 135,333 (100.0) |
| **2000** | 57,348 (30.3) | 38,277 (20.3) | 12,890 (6.8) | 7,786 (4.1) | 3,191 (1.7) | 14,475 (7.7) | 12,449 (6.6) | 13,088 (6.9) | 4,933 (2.6) | 6,054 (3.2) | 18,504 (9.8) | 188,995 (100.0) |
| **2001** | 89,471 (28.0) | 67,692 (21.2) | 23,377 (7.3) | 22,117 (6.9) | 16,073 (5.0) | 21,671 (6.8) | 18,447 (5.8) | 15,805 (4.9) | 8,103 (2.5) | 7,960 (2.5) | 29,303 (9.2) | 320,019 (100.0) |
| **2002** | 100,769 (27.3) | 81,779 (22.1) | 26,148 (7.1) | 25,849 (7.0) | 23,620 (6.4) | 23,207 (6.3) | 21,529 (5.8) | 14,056 (3.8) | 8,987 (2.4) | 8,024 (2.2) | 35,728 (9.7) | 369,696 (100.0) |

*Note*: Numbers in parentheses are the ratio compared to total in each year          *Source*: "Yearbook of Migration Statistics," various issues, Ministry of Justice

**Table 4: Visa Issuance for Industrial Trainees by Industry**

(Units: number of persons, %)

| KSIC | Industry | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|---|---|---|---|
| 05 | Fishing | 0 (0.0) | 218 (0.4) | 934 (2.1) | 172 (0.7) | 302 (0.6) | 580 (1.4) | 391 (1.7) | 1,415 (3.9) |
| 12 | Mining of Non-metallic Minerals, Except Fuel | 1,265 (2.7) | 1,345 (2.6) | 1,118 (2.5) | 464 (1.9) | 1,061 (2.2) | 928 (2.2) | 494 (2.1) | 869 (2.4) |
| 15 | Manufacture of Food Products and Beverages | 0 (0.0) | 965 (1.9) | 1,915 (4.2) | 905 (3.8) | 1,697 (3.5) | 1,801 (4.2) | 1,191 (5.0) | 1,639 (4.5) |
| **17** | **Manufacture of Textiles, Except Sewn Wearing apparel** | **11,786 (24.8)** | **9,044 (17.6)** | **8,832 (19.6)** | **7,221 (30.0)** | **10,326 (21.0)** | **8,805 (20.7)** | **4,598 (19.4)** | **4,834 (13.2)** |
| 18 | Manufacture of Sewn Wearing Apparel and Fur Articles | 1,651 (3.5) | 1,422 (2.8) | 1,810 (4.0) | 534 (2.2) | 2,552 (5.2) | 1,179 (2.8) | 739 (3.1) | 563 (1.5) |
| 19 | Tanning and Dressing of Leather, Manufacture of Luggage and Footwear | 2,703 (5.7) | 1,862 (3.6) | 1,566 (3.5) | 670 (2.8) | 1,310 (2.7) | 851 (2.0) | 576 (2.4) | 533 (1.5) |
| 20 | Manufacture of Wood and of Products of Wood and Cork, Except Furniture | 330 (0.7) | 648 (1.3) | 434 (1.0) | 162 (0.7) | 577 (1.2) | 404 (0.9) | 241 (1.0) | 307 (0.8) |
| 21 | Manufacture of Pulp, Paper and Paper Products | 682 (1.4) | 817 (1.6) | 753 (1.7) | 372 (1.5) | 963 (2.0) | 783 (1.8) | 416 (1.8) | 698 (1.9) |
| 22 | Publishing, Printing and Reproduction of Recorded Media | 287 (0.6) | 300 (0.6) | 229 (0.5) | 109 (0.5) | 298 (0.6) | 295 (0.7) | 117 (0.5) | 1,171 (3.2) |
| 23 | Manufacture of Coke, Refined Petroleum Products and Nuclear Fuel | 22 (0.0) | 13 (0.0) | 30 (0.1) | 14 (0.1) | 23 (0.0) | 6 (0.0) | 19 (0.1) | 7 (0.0) |
| 24 | Manufacture of Chemicals and Chemical Products | 1,312 (2.8) | 1,202 (2.3) | 1,251 (2.8) | 527 (2.2) | 1,255 (2.6) | 877 (2.1) | 495 (2.1) | 907 (2.5) |
| **25** | **Manufacture of Rubber and Plastic Products** | **2,378 (5.0)** | **3,017 (5.9)** | **2,890 (6.4)** | **1,603 (6.7)** | **4,177 (8.5)** | **3,633 (8.5)** | **1,862 (7.9)** | **2,770 (7.6)** |
| 27 | Manufacture of Basic Metals | 1,381 (2.9) | 1,648 (3.2) | 1,407 (3.1) | 542 (2.3) | 1,617 (3.3) | 1,301 (3.1) | 663 (2.8) | 1,270 (3.5) |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 28 | **Manufacture of Fabricated Metal Products, Except Machinery and Furniture** | **2,514 (5.3)** | **3,467 (6.8)** | **2,344 (5.2)** | **1,286 (5.3)** | **3,313 (6.8)** | **2,956 (6.9)** | **1,394 (5.9)** | **2,539 (6.9)** |
| 29 | **Manufacture of Other Machinery and Equipment** | **2,199 (4.6)** | **2,694 (5.2)** | **1,797 (4.0)** | **889 (3.7)** | **2,662 (5.4)** | **2,498 (5.9)** | **1,011 (4.3)** | **2,478 (6.8)** |
| 30 | Manufacture of Computers and Office Machinery | 131 (0.3) | 119 (0.2) | 159 (0.4) | 43 (0.2) | 134 (0.3) | 273 (0.6) | 71 (0.3) | 261 (0.7) |
| 31 | **Manufacture of Electrical Machinery and Apparatuseses n.e.c.** | **2,994 (6.3)** | **3,796 (7.4)** | **3,019 (6.7)** | **1,341 (5.6)** | **1,835 (3.7)** | **1,812 (4.3)** | **1,298 (5.5)** | **1,910 (5.2)** |
| 32 | **Manufacture of Electronic Components, Radio, TV and Communication Equipment and Apparatuses** | **1,983 (4.2)** | **2,502 (4.9)** | **3,138 (7.0)** | **1,276 (5.3)** | **3,583 (7.3)** | **4,211 (9.9)** | **1,973 (8.3)** | **3,706 (10.1)** |
| 33 | Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks | 436 (0.9) | 584 (1.1) | 441 (1.0) | 256 (1.1) | 516 (1.1) | 447 (1.0) | 300 (1.3) | 373 (1.0) |
| 34 | **Manufacture of Motor Vehicles, Trailers and Semitrailers** | **5,426 (11.4)** | **8,160 (15.9)** | **5,956 (13.2)** | **2,966 (12.3)** | **4,954 (10.1)** | **3,844 (9.0)** | **1,758 (7.4)** | **2,961 (8.1)** |
| 35 | Manufacture of Other Transport Equipment | 355 (0.7) | 161 (0.3) | 162 (0.4) | 119 (0.5) | 156 (0.3) | 224 (0.5) | 161 (0.7) | 425 (1.2) |
| 36 | Manufacture of Furniture; Manufacturing of Articles n.e.c. | 1,875 (3.9) | 1,377 (2.7) | 980 (2.2) | 1,000 (4.2) | 3,677 (7.5) | 825 (1.9) | 331 (1.4) | 729 (2.0) |
| 37 | Recycling | 99 (0.2) | 65 (0.1) | 74 (0.2) | 40 (0.2) | 195 (0.4) | 207 (0.5) | 68 (0.3) | 116 (0.3) |
| 45 | General Construction | 112 (0.2) | 106 (0.2) | 492 (1.1) | 336 (1.4) | 186 (0.4) | 516 (1.2) | 802 (3.4) | 1,399 (3.8) |
| | Others | 5,637 (11.9) | 5,792 (11.3) | 3,360 (7.5) | 1,220 (5.1) | 1,702 (3.5) | 3,324 (7.8) | 2,674 (11.3) | 2,722 (7.4) |
| | Total | 47,558 (100.0) | 51,324 (100.0) | 45,091 (100.0) | 24,067 (100.0) | 49,071 (100.0) | 42,580 (100.0) | 23,643 (100.0) | 36,602 (100.0) |

*Note*: Numbers in parentheses are the ratio compared to total in each year.     *Source*: "Yearbook of Migration Statistics," various issues, Ministry of Justice

**Table 5-a: SMEs' Employment of Industrial Trainees by Industry**

(Unit: %)

| KSIC | Industry | Ratio of Industrial Trainees to Total Employment | | | | | Ratio of Industrial Trainees to Production Workers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1997 | 1998 | 1999 | 2000 | 2001 | 1997 | 1998 | 1999 | 2000 | 2001 |
| 15 | Manufacture of Food Products and Beverages | 1.4 | 1.1 | 1.7 | 3.3 | 4.4 | 2.1 | 1.9 | 2.9 | 5.5 | 7.1 |
| **17** | **Manufacture of Textiles, Except Sewn Wearing apparel** | **5.2** | **5.0** | **7.4** | **8.6** | **7.7** | **7.2** | **6.7** | **10.4** | **11.9** | **10.5** |
| 18 | Manufacture of Sewn Wearing Apparel and Fur Articles | 1.0 | 0.6 | 2.2 | 2.4 | 5.4 | 1.5 | 0.8 | 3.4 | 3.7 | 8.2 |
| 19 | Tanning and Dressing of Leather, Manufacture of Luggage and Footwear | 2.3 | 1.6 | 3.4 | 2.4 | 4.1 | 3.2 | 2.3 | 5.2 | 3.4 | 5.9 |
| 20 | Manufacture of Wood and of Products of Wood and Cork, Except Furniture | 1.8 | 1.7 | 2.1 | 8.1 | 3.6 | 2.6 | 2.3 | 3.5 | 11.8 | 5.1 |
| 21 | Manufacture of Pulp, Paper and Paper Products | 3.0 | 2.1 | 2.3 | 6.0 | 3.3 | 4.4 | 3.3 | 3.6 | 8.8 | 4.8 |
| 22 | Publishing, Printing and Reproduction of Recorded Media | 1.2 | 0.3 | 0.6 | 2.2 | 1.6 | 1.8 | 0.5 | 1.0 | 3.5 | 2.7 |
| 24 | Manufacture of Chemicals and Chemical Products | 2.5 | 1.7 | 2.1 | 3.1 | 3.1 | 4.7 | 3.2 | 4.1 | 5.9 | 5.4 |
| **25** | **Manufacture of Rubber and Plastic Products** | **4.3** | **3.8** | **5.7** | **10.1** | **7.0** | **6.3** | **5.7** | **8.2** | **15.1** | **10.4** |
| 26 | Manufacture of Other Non-metallic Mineral Products | 3.2 | 2.0 | 3.7 | 5.5 | 4.2 | 4.6 | 3.1 | 5.7 | 8.5 | 6.4 |
| 27 | Manufacture of Basic Metals | 4.0 | 3.2 | 3.0 | 6.0 | 4.0 | 5.9 | 4.8 | 4.8 | 8.8 | 6.0 |
| **28** | **Manufacture of Fabricated Metal Products, Except Machinery and Furniture** | **2.3** | **1.9** | **5.3** | **6.9** | **6.2** | **3.5** | **2.9** | **7.8** | **10.4** | **9.3** |
| 29 | Manufacture of Other Machinery and Equipment | 1.6 | 1.3 | 1.5 | 3.7 | 3.4 | 2.5 | 2.2 | 2.5 | 6.1 | 5.4 |
| 30 | Manufacture of Computers and Office Machinery | 2.7 | 0.9 | 3.5 | 4.2 | 2.3 | 4.2 | 1.5 | 5.7 | 6.5 | 4.0 |
| 31 | Manufacture of Electrical Machinery and Apparatuseses n.e.c. | 1.8 | 1.3 | 1.5 | 3.7 | 3.1 | 3.0 | 2.2 | 2.5 | 6.2 | 5.0 |
| 32 | Manufacture of Electronic Components, Radio, TV, Communication Equipt., Apparatuses | 2.7 | 2.0 | 2.9 | 4.6 | 3.4 | 4.0 | 3.1 | 4.6 | 7.2 | 5.5 |
| 33 | Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks | 2.4 | 2.1 | 2.2 | 6.4 | 3.3 | 3.6 | 3.3 | 3.5 | 11.0 | 5.5 |
| 34 | Manufacture of Motor Vehicles, Trailers and Semitrailers | 2.7 | 3.5 | 3.1 | 5.8 | 4.5 | 4.0 | 5.4 | 4.8 | 8.9 | 6.9 |
| 35 | Manufacture of Other Transport Equipment | 2.2 | 1.1 | 2.3 | 3.4 | 2.0 | 3.3 | 1.8 | 3.5 | 5.3 | 3.1 |
| 36 | Manufacture of Furniture; Manufacturing of Articles n.e.c. | 1.9 | 1.3 | 3.2 | 2.9 | 7.3 | 3.0 | 2.1 | 5.4 | 4.9 | 10.7 |
| | Total Manufacturing | 2.6 | 2.1 | 3.3 | 5.2 | 4.8 | 3.9 | 3.2 | 5.2 | 8.1 | 7.3 |

*Source*: "Report on Small and Medium Business Survey," various issues, Korea Federation of Small and Medium Business

**Table 5-b: SMEs' Employment of Industrial Trainees by Industry**

(Unit: %)

| KSIC | Industry | Ratio of Industrial Trainees to Low-skilled Production Workers | | | | | Ratio of Industrial Trainees to Temporary Workers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1997 | 1998 | 1999 | 2000 | 2001 | 1997 | 1998 | 1999 | 2000 | 2001 |
| 15 | Manufacture of Food Products and Beverages | 2.9 | 2.9 | 4.2 | 7.5 | 9.1 | 10.3 | 6.1 | 9.4 | 17.2 | 20.1 |
| **17** | **Manufacture of Textiles, Except Sewn Wearing apparel** | **18.0** | **16.6** | **25.1** | **26.2** | **20.4** | **32.9** | **38.9** | **39.5** | **44.0** | **48.0** |
| 18 | Manufacture of Sewn Wearing Apparel and Fur Articles | 3.0 | 2.0 | 8.2 | 8.7 | 17.4 | 9.3 | 5.0 | 11.7 | 16.9 | 26.2 |
| 19 | Tanning and Dressing of Leather, Manufacture of Luggage and Footwear | 5.1 | 4.3 | 9.2 | 5.7 | 9.4 | 21.1 | 15.2 | 23.4 | 26.9 | 36.9 |
| 20 | Manufacture of Wood and of Products of Wood and Cork, Except Furniture | 4.7 | 4.3 | 7.2 | 18.3 | 9.0 | 16.8 | 23.9 | 9.2 | 43.0 | 32.4 |
| 21 | Manufacture of Pulp, Paper and Paper Products | 8.6 | 7.3 | 7.0 | 17.5 | 9.5 | 33.2 | 20.5 | 17.9 | 43.1 | 29.7 |
| 22 | Publishing, Printing and Reproduction of Recorded Media | 3.8 | 2.3 | 3.4 | 10.5 | 12.3 | 21.1 | 3.3 | 5.2 | 29.8 | 21.8 |
| 24 | Manufacture of Chemicals and Chemical Products | 10.2 | 8.2 | 9.5 | 13.5 | 10.4 | 25.6 | 18.3 | 18.6 | 23.8 | 35.0 |
| **25** | **Manufacture of Rubber and Plastic Products** | **12.4** | **11.0** | **14.4** | **25.0** | **18.2** | **32.6** | **31.2** | **38.3** | **44.1** | **36.9** |
| 26 | Manufacture of Other Non-metallic Mineral Products | 8.8 | 6.4 | 11.1 | 16.1 | 11.9 | 34.7 | 19.1 | 31.9 | 38.2 | 34.5 |
| 27 | Manufacture of Basic Metals | 14.0 | 11.8 | 12.0 | 17.4 | 13.0 | 34.2 | 27.4 | 18.1 | 42.3 | 31.7 |
| **28** | **Manufacture of Fabricated Metal Products, Except Machinery and Furniture** | **8.4** | **7.3** | **18.0** | **21.3** | **18.1** | **19.3** | **14.9** | **32.9** | **35.2** | **34.0** |
| 29 | Manufacture of Other Machinery and Equipment | 8.7 | 7.5 | 7.9 | 16.1 | 16.7 | 16.6 | 11.7 | 12.0 | 20.0 | 24.4 |
| 30 | Manufacture of Computers and Office Machinery | 8.2 | 3.2 | 11.8 | 14.1 | 7.8 | 31.4 | 7.1 | 21.4 | 30.0 | 17.8 |
| 31 | Manufacture of Electrical Machinery and Apparatuseses n.e.c. | 5.5 | 5.8 | 6.1 | 12.4 | 10.7 | 11.7 | 8.5 | 8.3 | 19.6 | 20.4 |
| 32 | Manufacture of Electronic Components, Radio, TV, Communication Equipt., Apparatuses | 7.4 | 5.9 | 9.0 | 13.0 | 9.8 | 19.9 | 13.9 | 16.6 | 28.3 | 25.9 |
| 33 | Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks | 6.1 | 8.5 | 6.5 | 22.0 | 11.4 | 25.5 | 17.5 | 16.7 | 30.1 | 32.2 |
| 34 | Manufacture of Motor Vehicles, Trailers and Semitrailers | 7.8 | 13.4 | 10.9 | 17.0 | 14.6 | 27.8 | 24.8 | 24.6 | 30.2 | 26.5 |
| 35 | Manufacture of Other Transport Equipment | 7.8 | 5.7 | 6.6 | 11.3 | 8.4 | 14.4 | 9.5 | 15.6 | 21.4 | 16.1 |
| 36 | Manufacture of Furniture; Manufacturing of Articles n.e.c. | 6.8 | 4.9 | 10.7 | 9.7 | 22.2 | 10.2 | 8.6 | 15.5 | 15.7 | 41.4 |
| | Total Manufacturing | 8.1 | 7.6 | 11.4 | 16.2 | 14.6 | 21.3 | 16.4 | 20.8 | 29.8 | 30.5 |

*Source*: Korea Federation of Small and Medium Business

**Table 6: Descriptive Statistics for Native Workers**

(Units: %, number of persons)

| Demographic and Economic Characteristics | Year | Groups by Sex/Occupation | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | | Male High-Skilled | Male Semi-Skilled | Male Low-Skilled | Female High-Skilled | Female Semi-Skilled | Female Low-Skilled | |
| Age | 1997 | 36.5 | 34.9 | 45.0 | 27.5 | 36.1 | 41.0 | 35.2 |
| | 2001 | 38.2 | 36.5 | 42.9 | 29.1 | 37.6 | 41.9 | 36.7 |
| Education | 1997 | 11.8 | 11.1 | 10.0 | 11.5 | 9.9 | 9.0 | 10.9 |
| | 2001 | 11.7 | 11.3 | 10.5 | 11.6 | 10.4 | 9.7 | 11.1 |
| Logarithm of Yearly regular earnings | 1997 | 14.1 | 13.9 | 13.8 | 13.5 | 13.4 | 13.4 | 13.8 |
| | 2001 | 14.2 | 14.1 | 13.9 | 13.7 | 13.6 | 13.6 | 14.0 |
| The number of workers | 1997 | 264,520 | 872,645 | 48,249 | 159,245 | 445,202 | 35,306 | 1,825,167 |
| | 2001 | 248,412 | 820,783 | 42,932 | 139,837 | 382,336 | 53,800 | 1,688,100 |

**Table 7: Distribution of Natives and Industrial Trainees**

A. Year 2001

(Unit: %)

| KSIC | Industry | % Industrial Trainee 1997 | % Industrial Trainee 2001 | % of All Industrial Trainees in Industry 2001 | Male High-Skilled | Male Semi-Skilled | Male Low-Skilled | Female High-Skilled | Female Semi-Skilled | Female Low-Skilled | All |
|------|----------|------|------|------|------|------|------|------|------|------|------|
| 36 | Manufacture of Furniture; Manufacturing of Articles n.e.c. | 3.24 | 11.94 | 6.33 | 2.85 | 2.78 | 3.15 | 3.26 | 3.05 | 0.86 | 2.84 |
| 18 | Manufacture of Sewn Wearing Apparel and Fur Articles | 1.58 | 10.44 | 9.51 | 3.33 | 1.27 | 2.52 | 8.99 | 12.06 | 9.66 | 4.96 |
| 25 | Manufacture of Rubber and Plastic Products | 5.50 | 10.19 | 10.50 | 5.09 | 6.24 | 12.52 | 4.84 | 3.73 | 8.58 | 5.62 |
| 17 | Manufacture of Textiles, Except Sewn Wearing apparel | 6.57 | 9.77 | 17.34 | 8.30 | 7.87 | 10.15 | 8.68 | 15.56 | 5.84 | 9.74 |
| 28 | Manufacture of Fabricated Metal Products, Except Machinery and Furniture | 3.49 | 9.50 | 11.55 | 7.14 | 8.28 | 5.39 | 4.15 | 3.83 | 8.31 | 6.69 |
| 20 | Manufacture of Wood and of Products of Wood and Cork, Except Furniture | 3.04 | 6.76 | 0.92 | 0.43 | 1.04 | 1.48 | 0.50 | 0.50 | 0.36 | 0.77 |
| 19 | Tanning and Dressing of Leather , Manufacture of Luggage and Footwear | 3.21 | 6.23 | 2.14 | 2.67 | 1.25 | 0.86 | 3.44 | 2.70 | 1.38 | 1.96 |
| 15 | Manufacture of Food Products and Beverages | 1.61 | 6.22 | 6.65 | 5.34 | 4.01 | 14.11 | 6.70 | 7.17 | 25.71 | 6.09 |
| 33 | Manufacture of Medical, Precision and Optical Instruments, Watches | 3.90 | 5.68 | 1.58 | 1.81 | 1.17 | 0.36 | 2.34 | 2.36 | 0.76 | 1.60 |
| 29 | Manufacture of Other Machinery and Equipment | 2.28 | 5.60 | 8.71 | 11.70 | 10.78 | 3.82 | 9.77 | 3.86 | 5.50 | 8.92 |
| 26 | Manufacture of Other Non-metallic Mineral Products | 3.41 | 4.85 | 2.93 | 3.24 | 4.51 | 7.23 | 3.98 | 1.04 | 2.33 | 3.49 |
| 31 | Manufacture of Electrical Machinery and Apparatuseses n.e.c. | 2.19 | 4.61 | 3.82 | 5.11 | 4.29 | 4.04 | 4.62 | 5.92 | 4.70 | 4.81 |
| 21 | Manufacture of Pulp, Paper and Paper Products | 4.19 | 4.32 | 1.65 | 2.57 | 2.65 | 3.11 | 2.23 | 0.90 | 2.95 | 2.23 |
| 30 | Manufacture of Computers and Office Machinery | 4.04 | 3.34 | 0.70 | 1.54 | 0.69 | 0.53 | 2.62 | 1.88 | 0.51 | 1.23 |
| 34 | Manufacture of Motor Vehicles, Trailers and Semitrailers | 1.56 | 3.27 | 4.96 | 7.34 | 12.95 | 6.03 | 3.14 | 4.71 | 2.32 | 8.93 |
| 22 | Publishing, Printing and Reproduction of Recorded Media | 1.59 | 3.02 | 1.19 | 3.57 | 2.16 | 4.10 | 4.41 | 0.84 | 2.41 | 2.31 |
| 24 | Manufacture of Chemicals and Chemical Products | 1.99 | 2.54 | 2.30 | 6.02 | 5.91 | 5.93 | 6.75 | 2.79 | 8.40 | 5.37 |
| 27 | Manufacture of Basic Metals | 3.16 | 2.45 | 2.21 | 5.46 | 8.22 | 6.60 | 3.22 | 0.50 | 0.25 | 5.36 |
| 32 | Manufacture of Electronic Components, Radio, TV and Communication Equipt. | 1.58 | 1.94 | 4.36 | 13.15 | 8.12 | 5.71 | 14.56 | 26.10 | 8.28 | 13.41 |
| 35 | Manufacture of Other Transport Equipment | 0.85 | 1.07 | 0.65 | 3.33 | 5.83 | 2.35 | 1.81 | 0.48 | 0.89 | 3.67 |
| | Total: 20 industries | 2.84 | 5.73 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Correlation Coefficient. | | | 0.50 | | 0.49 | 0.42 | 0.55 | 0.49 | 0.47 | 0.42 | 0.57 |

B. Year 1997

(Unit: %)

| KSIC | Industry | % Industrial Trainee 1997 | - | % of All Industrial Trainees in Industry 1997 | % of Natives in Industry | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Male High-Skilled | Male Semi-Skilled | Male Low-Skilled | Female High-Skilled | Female Semi-Skilled | Female Low-Skilled | All |
| 17 | Manufacture of Textiles, Except Sewn Wearing apparel | 6.57 | - | 21.73 | 5.56 | 7.01 | 9.02 | 8.33 | 15.41 | 7.89 | 9.03 |
| 25 | Manufacture of Rubber and Plastic Products | 5.50 | - | 9.93 | 5.91 | 5.51 | 4.58 | 4.26 | 3.95 | 1.79 | 4.98 |
| 21 | Manufacture of Pulp, Paper and Paper Products | 4.19 | - | 3.33 | 1.73 | 2.84 | 5.35 | 1.37 | 1.22 | 3.04 | 2.23 |
| 30 | Manufacture of Computers and Office Machinery | 4.04 | - | 0.99 | 0.89 | 0.35 | 0.35 | 1.17 | 1.15 | 0.13 | 0.69 |
| 33 | Manufacture of Medical, Precision and Optical Instruments, Watches | 3.90 | - | 1.90 | 1.53 | 0.97 | 1.63 | 1.54 | 1.95 | 1.31 | 1.37 |
| 28 | Manufacture of Fabricated Metal Products, Except Machinery and Furniture | 3.49 | - | 8.40 | 7.74 | 8.08 | 6.91 | 6.35 | 4.08 | 3.95 | 6.79 |
| 26 | Manufacture of Other Non-metallic Mineral Products | 3.41 | - | 5.67 | 4.87 | 5.43 | 14.00 | 3.82 | 2.02 | 10.56 | 4.70 |
| 36 | Manufacture of Furniture; Manufacturing of Articles n.e.c. | 3.24 | - | 3.61 | 3.09 | 3.01 | 1.66 | 3.51 | 3.43 | 4.01 | 3.15 |
| 19 | Tanning and Dressing of Leather , Manufacture of Luggage and Footwear | 3.21 | - | 2.52 | 2.14 | 1.61 | 1.87 | 2.00 | 3.76 | 0.42 | 2.23 |
| 27 | Manufacture of Basic Metals | 3.16 | - | 4.57 | 3.45 | 6.27 | 5.25 | 2.62 | 0.75 | 2.99 | 4.10 |
| 20 | Manufacture of Wood and of Products of Wood and Cork, Except Furniture | 3.04 | - | 1.10 | 1.04 | 1.21 | 0.49 | 0.96 | 0.81 | 0.08 | 1.02 |
| 29 | Manufacture of Other Machinery and Equipment | 2.28 | - | 7.75 | 12.08 | 12.48 | 4.48 | 8.74 | 4.56 | 1.11 | 9.73 |
| 31 | Manufacture of Electrical Machinery and Apparatuseses n.e.c. | 2.19 | - | 3.97 | 5.60 | 4.31 | 2.89 | 4.94 | 7.21 | 2.34 | 5.18 |
| 24 | Manufacture of Chemicals and Chemical Products | 1.99 | - | 4.10 | 6.73 | 5.89 | 8.32 | 9.07 | 3.76 | 9.02 | 5.89 |
| 15 | Manufacture of Food Products and Beverages | 1.61 | - | 3.38 | 5.36 | 3.97 | 14.24 | 7.95 | 6.76 | 32.57 | 6.02 |
| 22 | Publishing, Printing and Reproduction of Recorded Media | 1.59 | - | 1.55 | 4.77 | 2.30 | 4.05 | 5.30 | 1.51 | 3.24 | 2.79 |
| 32 | Manufacture of Electronic Components, Radio, TV and Communication Equipt. | 1.58 | - | 5.77 | 11.73 | 6.09 | 5.49 | 11.66 | 18.66 | 8.69 | 10.50 |
| 18 | Manufacture of Sewn Wearing Apparel and Fur Articles | 1.58 | - | 3.12 | 4.44 | 1.57 | 1.66 | 9.21 | 13.92 | 3.12 | 5.70 |
| 34 | Manufacture of Motor Vehicles, Trailers and Semitrailers | 1.56 | - | 5.48 | 7.75 | 15.07 | 4.83 | 5.38 | 4.55 | 2.67 | 10.08 |
| 35 | Manufacture of Other Transport Equipment | 0.85 | - | 1.12 | 3.61 | 6.05 | 2.94 | 1.81 | 0.55 | 1.06 | 3.81 |
| | Total: 20 industries | 2.84 | - | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Correlation Coef. | | | | | 0.40 | 0.44 | 0.39 | 0.44 | 0.52 | 0.11 | 0.60 |

*Sources:*

"Survey Report in Wage Structure", 1997, 2001, Ministry of Labor.

"Report on Small and Medium Business Survey, 1997, 2001, Korea Federation of Small and Medium Business.

**Table 8: Estimated Index of Labor Market Competition between Immigrants and Natives**

(Unit: %)

| Year | Groups by Sex/Occupation | | | | | |
|------|----------------------|----------------------|---------------------|------------------------|------------------------|-----------------------|
|      | Male High-Skilled | Male Semi-Skilled | Male Low-Skilled | Female High-Skilled | Female Semi-Skilled | Female Low-Skilled |
| 1997 | 0.95 | 0.98 | 1.06 | 0.96 | 1.04 | 0.92 |
| 1998 | 0.94 | 0.99 | 1.00 | 0.92 | 1.05 | 0.84 |
| 1999 | 0.91 | 0.96 | 1.00 | 0.96 | 1.08 | 0.98 |
| 2000 | 0.97 | 0.97 | 1.14 | 0.93 | 0.97 | 1.04 |
| 2001 | 0.95 | 0.93 | 1.07 | 1.01 | 1.06 | 1.12 |

*Source:* authors' calculation

**Table 9: Relative Growth of Employment Shares of Natives, 1997-2001**

(Unit: %)

| KSIC | Industry | Relative Change in Employment Share | | | | | | Employment Growth[a] |
|---|---|---|---|---|---|---|---|---|
| | | Male High-Skilled | Male Semi-Skilled | Male Low-Skilled | Female High-Skilled | Female Semi-Skilled | Female Low-Skilled | |
| 15 | Manufacture of Food Products and Beverages | 0.97 | 0.98 | 0.96 | 0.82 | **1.03** | 0.77 | -0.48 |
| 17 | Manufacture of Textiles, Except Sewn Wearing apparel | **1.38** | **1.04** | **1.04** | 0.96 | 0.93 | 0.68 | 0.80 |
| 18 | Manufacture of Sewn Wearing Apparel and Fur Articles | 0.81 | 0.88 | **1.64** | **1.05** | 0.93 | **3.34** | -3.02 |
| 19 | Tanning and Dressing of Leather , Manufacture of Luggage and Footwear | **1.41** | 0.88 | 0.52 | **1.95** | 0.82 | **3.72** | -4.24 |
| 20 | Manufacture of Wood and of Products of Wood and Cork, Except Furniture | 0.54 | **1.13** | **4.00** | 0.68 | 0.82 | **5.51** | -7.68 |
| 21 | Manufacture of Pulp, Paper and Paper Products | **1.53** | 0.96 | 0.60 | **1.67** | 0.76 | **1.00** | -1.92 |
| 22 | Publishing, Printing and Reproduction of Recorded Media | 0.92 | **1.15** | **1.24** | **1.02** | 0.68 | 0.91 | -6.09 |
| 24 | Manufacture of Chemicals and Chemical Products | **1.01** | **1.13** | 0.80 | 0.84 | 0.84 | **1.05** | -4.05 |
| 25 | Manufacture of Rubber and Plastic Products | 0.75 | 0.98 | **2.37** | 0.99 | 0.82 | **4.15** | 2.37 |
| 26 | Manufacture of Other Non-metallic Mineral Products | 0.91 | **1.14** | 0.71 | **1.42** | 0.70 | 0.30 | -8.61 |
| 27 | Manufacture of Basic Metals | **1.26** | **1.04** | 1.00 | 0.98 | 0.54 | 0.07 | 4.65 |
| 28 | Manufacture of Fabricated Metal Products, Except Machinery and Furniture | 0.91 | **1.01** | 0.77 | 0.64 | 0.92 | **2.06** | -0.73 |
| 29 | Manufacture of Other Machinery and Equipment | **1.05** | 0.94 | 0.93 | **1.22** | 0.92 | **5.39** | -3.22 |
| 30 | Manufacture of Computers and Office Machinery | **1.01** | **1.15** | 0.89 | **1.30** | 0.95 | **2.30** | 13.24 |
| 31 | Manufacture of Electrical Machinery and Apparatuseses n.e.c. | 0.99 | **1.08** | **1.51** | **1.01** | 0.89 | **2.18** | -3.12 |
| 32 | Manufacture of Electronic Components, Radio, TV and Communication Equipt. | 0.90 | **1.07** | 0.84 | **1.00** | **1.12** | 0.77 | 4.36 |
| 33 | Manufacture of Medical, Precision and Optical Instruments, Watches | **1.03** | **1.04** | 0.19 | **1.31** | **1.04** | 0.50 | 2.44 |
| 34 | Manufacture of Motor Vehicles, Trailers and Semitrailers | **1.08** | 0.98 | **1.43** | 0.67 | **1.18** | 1.00 | -4.45 |
| 35 | Manufacture of Other Transport Equipment | 0.99 | **1.03** | 0.85 | **1.07** | 0.93 | 0.90 | -2.76 |
| 36 | Manufacture of Furniture; Manufacturing of Articles n.e.c. | 0.96 | 0.96 | **1.97** | 0.97 | 0.93 | 0.22 | -2.18 |

*Note:* [a] An average employment growth rate of all industries is –1.19.
*Sources* : authors' calculation

**Table 10: Correlation Coefficients between Industrial trainee and**

**Change in Relative Employment Share, 1998-2001**

(Unit: %)

| Year | Groups by Sex/Occupation | | | | | |
|---|---|---|---|---|---|---|
| | Male High-killed | Male Semi-Skilled | Male Low-Skilled | Female High-Skilled | Female Semi-Skilled | Female Low-Skilled |
| 1998 | 0.28 | -0.40 | 0.10 | 0.21 | 0.04 | 0.15 |
| 1999 | -0.33 | -0.12 | 0.07 | -0.14 | -0.01 | 0.12 |
| 2000 | -0.17 | -0.72 | 0.52 | -0.09 | -0.45 | 0.61 |
| 2001 | -0.18 | -0.48 | 0.36 | -0.12 | 0.07 | 0.29 |

*Source :* authors' calculation

**Table 11: Regression Results: Effects of Industrial Trainee on the Wages of Natives**

| | Cross-sectional | | First-Differenced | |
|---|---|---|---|---|
| | | Estimated coefficient | | Estimated coefficient |
| Year | | (Standard error) | Year | (Standard error) |
| 1997 | | -1.431 | | |
| | | ( 0.661 ) | | |
| 1998 | | -1.583 | | |
| | | ( 0.741 ) | | |
| 1999 | | -1.185 | 1997-2001 | -0.146 |
| | | ( 0.464 ) | | ( 0.361 ) |
| 2000 | | 0.062 | | |
| | | ( 0.261 ) | | |
| 2001 | | -1.187 | | |
| | | ( 0.271 ) | | |

*Note:* All equations included subgroup-specific intercepts, the average education and age of the subgroup in each industries (with subgroup-specific coefficients).
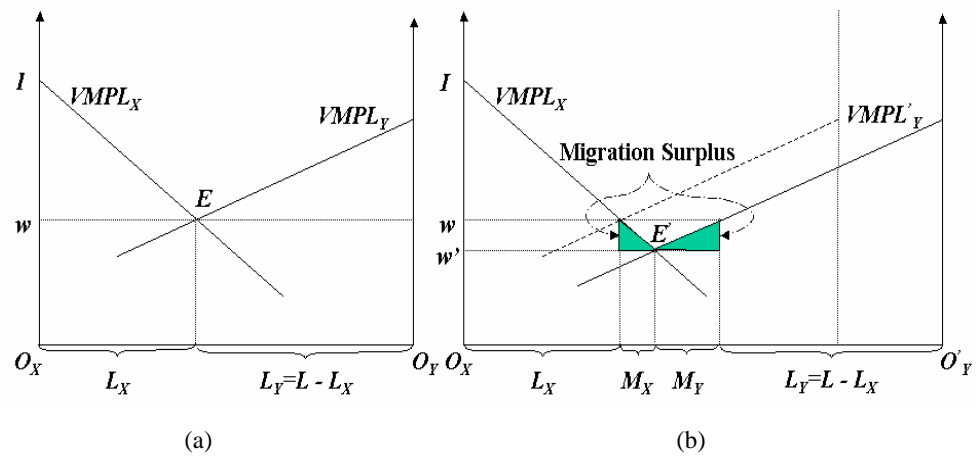
**Figure 1. Growth Rates of Nominal and Real Wage**
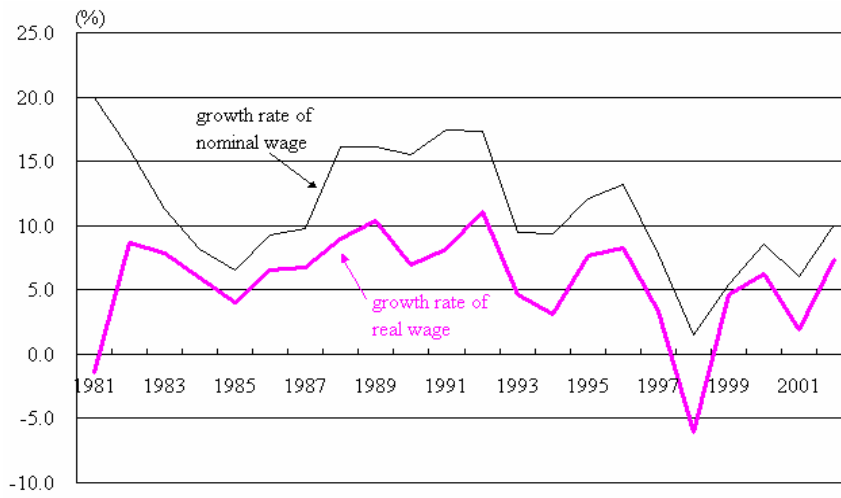


*Source: National Statistics Office*
*Note: The growth rate of real wage was calculated by subtracting inflation rate measured*
*    by CPI from the growth rate of nominal wage.*

**Figure 2: Specific Factors Model and Migration Surplus**



(a)                                                     (b)

**Figure 3: Correlation between Intensity of Industrial trainee and**
**Change in Relative Employment Share**
(Male Semi-Skilled Workers Group, 2000)