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Exporting, Employment, and Skill Upgrading

EVIDENCE FROM PLANT LEVEL DATA IN THE KOREAN MANUFACTURING SECTOR

Chin Hee Hahn, Chang-Gyun Park

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Abstract

EXPORTING, EMPLOYMENT, AND SKILL UPGRADING: EVIDENCE FROM PLANT LEVEL DATA IN THE KOREAN MANUFACTURING SECTOR

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This paper examines the role of exports in skill upgrading in the Korean manufacturing sector during the 1990s utilizing a unique plant-level panel data set. The empirical results indicate the important role of exports on relative employment on skilled versus unskilled workers. The main findings are as follows. Firstly, this paper documents the significant degree of skill upgrading that occurred during the 1990s in the Korean manufacturing sector. Secondly, a large part of the increase in the aggregate non-production employment share was due to the "within" effect, rather than the "between" effect. This tendency becomes stronger when we use plant-level, rather than industry-level data. Thirdly, most of the "within" changes were accounted for by the skill-upgrading of exporters, especially those exporters that were either R&D active or large. This is suggestive of the positive interactive effects between exporting and R&D expenditure in skill upgrading. Fourthly, regression analysis shows that both the "within" and "between" components of skill composition changes at plant level are strongly and positively correlated with exporting activities, while R&D expenditure is correlated only with the "within" components.

JEL classification: F16 (Trade and labour market interactions).

Keywords: Trade, employment, wages, inclusive growth.

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The ICITE project is being implemented under the auspices of a team at OECD. Douglas Lippoldt is the project manager and Secretary to ICITE. In relation to the ICITE working papers, Ania Jankowska and Monika Sztajerowska provided analytical, editorial and other substantive inputs, and Katjusha Boffa and Jacqueline Maher provided secretarial and administrative support. The OECD ICITE team is based in the Development Division, headed by Michael Plummer, and under the direction of Raed Safadi, OECD Deputy Director for Trade and Agriculture, and Ken Ash, OECD Director for Trade and Agriculture.

The OECD ICITE team gratefully acknowledges the quality of the submissions received from the working paper authors. The papers have benefitted from comments and other support from ICITE partner organisations (especially members of the ICITE Steering Committee), the Working Party of the OECD Trade Committee and other national experts, participants at the three ICITE regional conferences held during 2011 in Africa, Asia and Latin America, and other parts of the OECD (especially the Directorate for Employment, Labour and Social Affairs). Their contributions helped the authors and the OECD to further develop these papers and other aspects of the ICITE project.

This paper has been developed as an input to the ICITE project. The views expressed are those of the author(s) and do not necessarily reflect those of the OECD, OECD member country governments or partners of the ICITE initiative.

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Executive Summary

The increase in employment of skilled relative to unskilled labour, accompanied by the rise in skilled wage premium, is a global phenomenon; these changes have been observed in both OECD and developing countries for the past decades. Korea has been no exception in this regard. Kim (2007) shows that since the mid 1990s, especially after the 1997-98 financial crisis, the wage gap between high and low income workers has been consistently increasing. Researchers attributed the widening wage gap to increased returns to education and an increase in relative demand for high skilled workers. As is well known, trade and skill-biased technical change (SBTC) have received attention as a possible cause, and there is a large body of literature on this issue. While it is generally accepted that SBTC is an important part of the story, many authors suggest that there still remains much to be learned about the role of trade: the exact mechanism through which trade casts its impacts on labour market, and possible interaction between trade and SBTC, for example.

This paper aims to examine empirically the effect of exporting on employment and skill upgrading, utilizing a unique plant-level panel data on Korean manufacturing for the period 1990-1998. Furthermore, in an effort to clarify the mechanism, we examine the role of firm level R&D investment in shaping the relationship between exporting on one hand and employment and skill intensity on the other. Specifically, the main questions raised in this paper are as follows: Does exporting increase employment? Are the effects different between skilled and unskilled employment? Are these effects, different across firm size classes and industries, if at all?

Considering the case of Korea, the following observations further motivate this paper. Firstly, since the late 1980s or early 1990s, aggregate manufacturing employment has been declining not only as a share of total employment but also in absolute terms. A widening disparity between skilled and unskilled employment and wages has occurred in this context. Secondly, while the employment share of manufacturing has declined, the value added share of manufacturing has remained stable from the late 1980s up until recently. Consequently, the manufacturing sector exhibited a rapid increase in labour productivity. This seems to suggest the potentially important role of technical progress in the declining manufacturing employment share. Thirdly, since the 1990s, the employment-creating effect of manufacturing exports decreased significantly, while the manufacturing export growth rate increased slightly, over the previous decade. Nam (2008) uses input-output based approach and shows that employment created by export production for the manufacturing sector grew at an annual rate of 5.0% during 1975-1990, but at -2.2% during 1990-2000. Although various factors might underlie this phenomenon, it is likely that technological factors, such as labour-saving or skill-biased technical progress, have played a role in the changes in exports-employment relationship. Taken together, these observations further motivate this paper's objectives.

The core analysis in this paper examines the role of exports in skill upgrading in the Korean manufacturing sector during the 1990s utilizing a unique panel data set with rich information on all individual plants employing five or more workers. Considering the vital

role of exports in economic development and industrial change in Korea, we believe that the Korean experience may offer an excellent opportunity to investigate the impacts of exports on the labour market.

The empirical results indicate that exporting has important effects on the labour market, particularly on relative employment of skilled versus unskilled workers. The main findings are as follows. Firstly, this paper documented that a significant degree of skill upgrading occurred during the 1990s in the Korean manufacturing sector. Two indicators of skill composition, the ratio of non-production employment to total employment and the proportion of the wage bill paid to non-production workers out of total wage bill, increased to a considerable degree at the aggregate and individual plant levels. Secondly, a large part of the increase in the aggregate non-production employment share was due to the "within" effect (i.e. shifts within a plant or industry), rather than the "between" effect (i.e. shifts between plants or industries). This tendency became stronger when we used the plant-level data, rather than the industry-level data. Thirdly, most of "within" changes were accounted for by skill-upgrading of exporters, especially those exporters that are either R&D active or large. This might indicate some positive interactive effects between exporting and R&D expenditure in accounting for the within-plant increase in skilled employment shares. Fourthly, regression analysis offers even stronger evidence indicating that exports stimulated the skill upgrading process. Both the "within" and "between" components of skill composition changes are shown to be strongly and positively correlated with exporting activities, while R&D expenditure is correlated only with "within" components.

Taken together, this paper suggests that exporting promoted the employment of the skilled workers but had a less beneficial effect on the unskilled workers in the Korean manufacturing sector since the 1990s when Korea's economy accelerated its pace of globalisation. Possible interaction between exporting and firm's skill mix choice strengthens skill upgrading. Considering the possibility that imports as well as outward FDI had a negative effect on the relative demand for unskilled workers, it is plausible that globalisation process as a whole benefited skilled workers but had an adverse effect on the employment of unskilled workers.

One obvious policy implication from this study is that trade liberalization, or the globalisation process in general, strengthens the case for active labour market policy, particularly because even current or would-be exporters might respond by changing their skill mix in such a way as to disadvantage unskilled workers. In such an environment, policies that aim to protect unskilled employment might have only a limited effect or even be counter-productive. Another policy implication is that trade liberalization should be pursued as a part of an overall growth strategy. The evidence in this paper shows that firms' exporting activity, R&D investments, skill upgrading processes, and the widening disparity between skilled and unskilled workers are all inter-related. This suggests that various policies that separately address each of these processes – for example, trade liberalisation, strengthening the general social protection system, or innovation – need to be coordinated within the broader framework of an overall growth strategy.

1. Introduction

The increase in employment of skilled relative to unskilled labour, accompanied by the rise in skilled wage premium, is a global phenomenon; these changes have been observed in both OECD and developing countries for the past decades. Korea has been no exception in this regard. Kim (2007) shows that since the mid 1990s, especially after the 1997-98 financial crisis, the wage gap between high and low income workers has been consistently increasing. Researchers attributed the widening wage gap to increased returns to education and an increase in relative demand for high skilled workers. As is well known, trade and skill-biased technical change (SBTC) have received attention as a possible cause, and there is a large body of literature on this issue.[2] While it is generally accepted that SBTC is an important part of the story, many authors suggest that there still remains much to be learned about the role of trade: the exact mechanism through which trade casts its impacts on labour market, and possible interaction between trade and SBTC, for example.

This paper aims to examine empirically the effect of exporting on employment and skill upgrading, utilizing a unique plant-level panel data on Korean manufacturing for the period 1990-1998.[3] Furthermore, in an effort to clarify the mechanism, we examine the role of firm level R&D investment in shaping the relationship between exporting on one hand and employment and skill intensity on the other. Specifically, the main questions raised in this paper are as follows: Does exporting increase employment? Are the effects different between skilled and unskilled employment? Are these effects, different across firm size classes and industries, if at all?

Considering the case of Korea, the following observations further motivate this paper. Firstly, since the late 1980s or early 1990s, aggregate manufacturing employment has been declining not only as a share of total employment but also in absolute terms. A widening disparity between skilled and unskilled employment and wages has occurred in this context.[4] Secondly, while the employment share of manufacturing has declined, the value added share of manufacturing has remained stable from the late 1980s up until recently. Consequently, the manufacturing sector exhibited a rapid increase in labour productivity. This seems to suggest the potentially important role of technical progress in the declining manufacturing employment share.[5] Thirdly, since the 1990s, the employment-creating effect of manufacturing exports decreased significantly, while the manufacturing export growth rate increased slightly, over the previous decade.[6] Nam (2008) uses input-output based approach and shows that employment created by export production for the manufacturing sector grew at an annual rate of 5% during 1975-1990, but at -2.2% during 1990-2000. Although various

2. See Hoeckman and Winters (2005) for a survey of the related literature.

3. This data set is comprised of survey data covering all Korean manufacturing and mining plants employing five or more workers

4. There is a wide perception that the disparity between skilled and unskilled labour has even widened after the financial crisis in the late 1990s, and has persisted until present. KDI (2010) recognizes that "dualism" in the labour market between regular and temporary workers is one of the important recent policy issues to be addressed, though it does not explicitly deal with the disparity between skilled and unskilled.

5. Hahn (2010) shows that new product introduction accounts for a large part of manufacturing shipment growth during the 1990s.

6. Since the 1997-98 financial crisis, the ratio of exports to GDP has become higher than in the pre-crisis period.

factors might underlie this phenomenon,[7] it is likely that technological factors, such as labour-saving or skill-biased technical progress, have played a role in the changes in exports-employment relationship. Taken together, these observations further motivate this paper's objectives.[8]

Since Katz and Murphy (1992) showed that relative supply shifts were not big enough to adequately account for widening wage inequality during 1980s, researchers have tried to locate factors affecting relative demand for high-skilled workers. The demand side stories can be mainly divided into two categories; increases in the demand for goods produced intensively with high skill labour, which are often associated with increases in international trade, and skill-biased technical change (Bernard and Jensen, 1997). We take heterogeneous firm trade theories, such as Melitz (2003) and Bustos (2005), as providing a broad theoretical framework for the empirical analysis.[9] These models view exporting as an investment activity requiring sunk entry costs on the part of firms. Thus, more productive firms self-select themselves into exporting and become larger in size compared with less productive non-exporters. So, for example, the Melitz (2003) model, which is based on a single homogenous unit of labour, implies that exporting has a positive employment effect. Bustos (2005) allows for the interaction between exporting and skill mix choice and shows, under some reasonable parameter restriction, that less productive firms produce for domestic market and choose less skill intensive technology, more productive firms choose to export using the same technology, and even more productive firms choose to export and use more skill intensive technology. Then she analyzes the differential effects of reduced trade cost on firms' choices of skill mix depending on exporting status. Based on these two theories, it is expected that exporting is likely to be associated with an increase in a firm's employment. It is also likely to be associated with the increase in skilled employment. However, the effect of exporting on unskilled employment is somewhat ambiguous. It would depend on how much exporting affects firm size (employment), how exporting affects the technology investments, and how much these technology investments affect skill mix.[10]

Motivated by such considerations, this paper examines the role of international trade in the skill upgrading process in the Korean manufacturing sector during the 1990s. Section 2 provides the empirical discussion and Section 3 the conclusions.

7. Nam (2008) does not analyze its causes but conjectures that technical progress in production activities, shifts in commodity composition of exports, and firms' choices of factor intensity in response to rapidly rising wage rates are likely to be among the responsible factors.

8. Although this paper focuses on exporting, it does not preclude the possibility that other aspects of globalisation, such as importing, FDI, foreign outsourcing, immigration, are also important factors underlying the labour market developments.

9. Melitz (2003) is the first paper which formally showed that trade liberalization can lead to aggregate productivity growth even if there is no change in firm-level productivity. We do not provide a detailed explanation on the main features of these theoretical models. Instead, we briefly discuss what these theories imply for the relationship between exporting and employment, and its composition. Related theoretical models include Yeaple (2005) and Aw, Roberts, and Xu (2009).

10. If we consider capital as an additional factor of production and allow for the choice of capital intensity, then the effect of exporting on employment would become more complex than outlined as above.

2. Empirics on skill upgrading in the Korean manufacturing sector in the 1990s

The decomposition

Following Bernard and Jensen (1997), we first construct two measures to capture the levels of high skilled labour relative to low skilled labour: i) the ratio of non-production workers to total employment and ii) the wage bill for non-production workers relative to the total wage bill. We then decompose the changes in these two ratios into between industry or plant movements and within industry or plant movements.

The decomposition is conducted according to the following basic formulae:

$$\Delta NPL = \sum_{i=1}^{I}(\Delta L_i)(\overline{NPL_i}) + \sum_{i=1}^{I}(\Delta NPL_i)(\bar{L}_i) \quad (1)$$

$$\Delta NPW = \sum_{i=1}^{I}(\Delta W_i)(\overline{NPW_i}) + \sum_{i=1}^{I}(\Delta NPW_i)(\bar{W}_i) \quad (2)$$

where L_i is the share of total employment in industry or plant *i* and NPL_i the share of non-production workers in industry or plant *i*. In addition, Δ indicates the time difference and the upper bar means the time average of the corresponding variable. The first term in (1) is the change in employment share of industry or plant *i* weighted by the average share of non-production workers in the industry or plant. It approximates the contribution to the increase in the aggregate non-production employment share due to reallocation of employment across industries or plants. The first term is called the "between" effect in the literature. A net positive "between" effect implies that the share of total employment at industries or plants with higher-than-average non-production worker ratios has increased. In other words, positive overall "between" effect means that there have been employment shifts toward industries or plants whose average skill level is relatively higher. On the other hand, the second term in (1) is the change in the share of non-production workers in industry or plant *i* weighted by average share of total employment of the corresponding industry or plant. It represents the contribution to the increase in the aggregate non-production employment share of changes in the proportion of non-production employment within the industry or plant. So, the second term is dubbed as the "within" effect to distinguish it from the "between" effect. A net positive "within" effect results from increased non-production worker ratios, or skill upgrading, in industries or plants with higher than average employment shares. Similarly, we can decompose the change in the share of wage bill paid to non-production workers into "between" and "within" effects with the same procedure as (1) after replacing employment with wage bill. W_i is the share of total wage bill of industry or plant *i* and NPW_i the share of the wage bill paid to non-production workers in industry or plant *i*. A net positive "between" effect in (2) indicates that the shares of the total wage bill have increased in industries or plants with higher-than-average proportion of non production wages, and a net positive "within" effect can be associated with the increase in the proportion of wage bill paid to non production workers in industries or plants with higher- than-average share of wage bills.

The "between" and "within" effects have been associated with different aspects of relative demand for inputs. Since the "between" movements are related to changes of employment across industries or plants, they could be primarily associated with shifts in product demand. Of course, it is also possible to observe changes in the "between" component if other factors, such as technological change, drive reallocation of labour force across industries or plants. Bearing this possibility in mind, however, we stick to the interpretation, for the moment, that the majority of changes in the "between" component could be attributable to changes in product demand. Nevertheless, it should be noted that whether the "between" effect reflects

mainly product demand shifts, rather than technological factors, is an empirical issue. Later in this paper, we test whether this interpretation is appropriate in Korea's case.

On the other hand, changes in the "within" component conventionally have been attributed to changes in technology or demand for skilled labour within an industry or a plant rather than changes in product demand. However, we note that there are several reasons that this interpretation might not be entirely warranted. Firstly, the "within" component could also reflect changes in product demand rather than different choice of technology or skill mix, particularly for industry level analysis. In an industry level analysis, the "within" effect could be initiated by exogenous shifts of consumer preference from one product to another product or, more importantly, by trade-induced reallocation of labour across firms within industries. Recent heterogeneous firm trade theories, such as Melitz (2003), show that increased trade or more liberalized trade may cause an increase in the aggregate productivity by reallocating resources from less to more productive firms within industries. Then, if firms that are more productive are also those that employ higher proportions of skilled labour, it is possible that the "within" effect in an industry level analysis reflects product demand changes associated with international trade, rather than skill biased technical change. Even in plant (or firm) level analysis, one cannot prelude the possibility that changes in the "within" effect result from a compositional change, arising from changes in consumer taste or trade liberalization. [11] Secondly, even in the case where the "within" effect arose due to the skill biased technical changes, if those skill-biased technical changes have interactions with the increased trade or more liberalized trade, then interpretation of the "within" effect becomes less clear. For example, if international trade or more liberalized trade gives firms with higher productivity an opportunity to choose and invest in a more skill-intensive production technology and reduce average variable cost, then the "within" effect might reflect this firms' skill upgrading process.[12] Considering this possibility, the interpretation of the "within" effect may not be straightforward *ex ante*: it is also an empirical issue that needs to be examined.

Data

The data set for this study is the unpublished plant-level census data underlying the *Survey of Mining and Manufacturing* in Korea. Our data set covers the period from 1990 to 1998 and includes all plants with five or more employees in 580 manufacturing industries classified at KSIC (Korean Standard Industrial Classification) five-digit level.[13] The data set is in unbalanced panel form reflecting frequent exits and entries. According to Table 1, the number of plants observed each year steadily increased from 68 690 in 1990 to 97 130 in 1996 and dropped by almost 5 000 in 1997 due to the foreign exchange crisis.

In each year the survey reports several important variables especially relevant to our study such as the number of non-production and production workers, the total wage bill paid to both production and non-production workers. Unfortunately, our data set does not provide detailed information on demographic and socio-economic compositions of the labour force at the plant level to conduct further in-depth analysis but includes information on the number of workers belonging to two categories; production and non-production workers. Following previous research such as Berman, Bound and Griliches (1994), Machin (1994), and Bernard and

11. Bernard, Redding, and Schott (2009) show that international trade can trigger resource reallocation across products within a firm.

12. See Bustos (2005), for example, for a theory along this line. If there exist interactions between trade and skill biased technical progress, the interpretation of the "between" effect also becomes ambiguous.

13. In the Annex, we add some of our decomposition results for the period 1999-2003.

Jensen (1997), we regard these two categories of workers as representing low skilled and high skilled workers to facilitate the decomposition described in (1) and (2).[14]

Table 1. Employment and Wage Bill in the Korean manufacturing sector: 1990-97

Unit: Person, Million KRW

Year	Number of plants	Total workers	Non-production	Production	Total wage bill	Non-production	Production
1990	68690	2951893	701851 (0.2378)	2250042 (0.7622)	19532300	5592167 (0.2863)	13940133 (0.7137)
1991	72213	2853563	720343 (0.2524)	2133220 (0.7476)	22830419	6735912 (0.2950)	16094507 (0.7050)
1992	74679	2734179	704997 (0.2579)	2029182 (0.7421)	25234409	7638439 (0.3027)	17595970 (0.6973)
1993	88864	2804591	754112 (0.2689)	2050479 (0.7311)	28834306	9039673 (0.3135)	19794633 (0.6865)
1994	91372	2848789	771047 (0.2707)	2077742 (0.7293)	32791213	9889262 (0.3016)	22901917 (0.6984)
1995	96202	2865221	800121 (0.2793)	2065100 (0.7207)	37844431	11494509 (0.3037)	26349922 (0.6963)
1996	97130	2811974	775896 (0.2759)	2036078 (0.7241)	42327601	13115744 (0.3099)	29211857 (0.6901)
1997	92138	2618792	739138 (0.2822)	1879654 (0.7178)	41489165	13261271 (0.3196)	28227894 (0.6804)

Notes

1) The table is constructed based on *Survey of Mining and Manufacturing* which includes all manufacturing and mining plants with five or more employees.

2) Numbers in parentheses are the proportion of workers or wage bill in non-production and production jobs.

Table 1 reports the number of plants, the number of production and non-production workers, and total wage bill paid to production and non-production workers each year. We can point out two important trends in Table 2. First, even though the number of plants was constantly increasing over the 1990s, the size of the manufacturing sector was shrinking when measured in terms of total employment. This is consistent with the fact that the share of the manufacturing sector in total employment had decreased significantly from 27.2% in 1990 to 21.4% in 1997. While the size of workforce in the manufacturing sector decreased, the total wages manufacturing sector paid to its workers increased by more than 100% from 1990 to 1997. Therefore, salary per worker in the manufacturing sector had increased by almost 140% during the period in nominal terms. Second, the shares of non-production workers, measured in the number of workers or wage bill, steadily increased over the 1990s, indicating that there had been shift of labour force toward high skilled sector over the 1990s.

Our data set includes detailed information on exporting activities of plants. The Survey asks each establishment to report the value of products shipped for export, which includes direct exports as well as indirect exports shipped to other exporters or wholesalers for export. In addition, it also includes information on the value of production, value of total shipments, the number of products produced, expenditure on research and development, and tangible fixed investments.

14. An alternative way to define skilled and unskilled workers is to use information on workers' occupational categories, which is not available in the dataset we use here.

Table 2. Changes in shares of non-production workers: Decomposition of employment and wages

	Employment			Wages		
	Between	**Within**	**Total**	**Between**	**Within**	**Total**
Industry (five-digit)	1.2822	0.6605	1.9427	0.8635	0.5049	1.3684
Industry (four-digit)	1.0802	0.8628	1.9430	0.6529	0.7156	1.3685
Continuing plants	0.7540	1.0071	1.7611	0.5695	0.4911	1.0806

Decomposition: changes in shares of employment and wages of skilled labour

We examine changes in employment and wages of two types of workers: non-production and production workers. These two categories are assumed to be associated with high skilled and low skilled labour respectively. Table 2 reports the changes in employment and wage shares of non-production workers during the period 1991-1997 for four- and five-digit industries and individual plants. The most notable trend we find from the Table is that skill upgrading in Korean manufacturing sector advanced in a significant pace during the 1990s. At five-digit industry level, the share of non-production workers rose at an annual rate of 1.90% and the share of wage bill paid to non-production workers at 1.37%. In the case of the United States, the comparable figures are 0.39% and 0.54%, respectively (Bernard and Jensen, 1997). The result seems to be fairly robust to aggregation level of industries since we obtain almost the same magnitude of changes in both employment and wages at four-digit classification of industries.

Another notable feature we can highlight from Table 2 is that the employment share of non-production workers increased 0.57% per year faster than the wage share. From the result, one may infer that the wage inequality between the two labour types, non-production and production workers, has been narrowed in Korean manufacturing sector during the 1990s. This observation does not seem to be consistent with the conventional belief that increased demand for skilled labour was mainly due to skill biased technical change or that product demand shift may have resulted in labour market conditions more favourable to high skilled labour. However, we can offer alternative explanations while retaining explanations based on demand side stories. In the case of Korean manufacturing during the 1990s, a more satisfactory explanation of the increase in relative employment of the skilled labour should be based on both demand and supply shifts. For example, relaxed restriction on admission quota for colleges in the early 1980s enabled a large cohort of college graduates to enter labour market beginning from the early 1990s and may have at least partially offset the pressure on wages of high skilled labour by demand increase. Another possible explanation is based on differences in job tenure. According to Table 2, a significant share of the changes in employment from production to non-production workers occurred through reallocation of workers across industries. If high skilled workers were reallocated to new industries, they were relatively young with shorter job tenure than low skilled workers staying at the same industries; thus, a large expansion of non-production employment could be accompanied by less significant increase in wages shares. Therefore, in order to identify more clearly the factors underlying the movements of employment and wage shares for non-production workers in the Korean manufacturing sector, further exploration with micro-level data on worker characteristics is necessary.

In order to get an idea of the sources of the shift in employment and wages toward high skilled labour, we begin by examining the "between" and "within" components of the

employment and wage share of non-production workers based on industry level analysis. Roughly speaking, we find a larger role of "between" effects than "within" effects in explaining the aggregate increases in non-production employment and wage shares. For the employment share based on five-digit industries, the "between" component played the dominant role with a contribution of 1.28 percentage points, while the "within" component contributed 0.66 percentage points per year. The story is slightly different in the case of wage bills. Although the contribution from the "between" component, which is 0.86 percentage points per year, was larger than that of the "within" component, which is 0.50 percentage points, the difference is no longer significant. At four-digit level, we find that the contribution of the "between" component was considerably reduced both in employment and wages of non-production workers. In the case of the non-production employment share, however, the "between" component is larger than the "within" component, while in the case of wage share, the reverse is true now.

Overall, the difference between wage and employment shares seems to be driven mostly by the between industry shifts of workers and wages, whereby workers shifted across industries faster than wages. Our results are in stark contrast with Bernard and Jensen (1997) which reports larger role for "within" effects. Examining changes in shares of employment and wages of non-production workers in the US manufacturing sector during 1979 and 1987, they reported that the wage share of non-production workers grew far faster than employment share and that the majority of these changes were attributable to within industry effects.

To investigate the origin of changes in employment and wage shares at industry level, we make use of plant level data explained in the previous section. Since our data set, the *Survey of Mining and Manufacturing*, contains all plants with five or more employees, the sample changes substantially due frequent to entry of new plants and exit of dying ones. We include only those plants that had existed during the entire period from 1991 to 1997 resulting in a sample of 27 246 plants. This may introduce some potential data problems such as survivorship bias. Survivorship bias points out the possibility that a balanced panel approach may distort the whole picture when skill compositions of exiting and entering plants are significantly different from the existing ones. Bearing the limitations of our analysis in mind, we examine the results of plant level decomposition in the last row of Table 2. Although at plant level the annualized growth rate of aggregate employment and wage share of non-production workers are somewhat smaller than those based on industry level data, the differences are not large.

The plant level decomposition yields different results for the contribution of "within" and "between" components to total changes. While at industry level the "between" component is mainly responsible for skill upgrading in terms of employment share, the "within" component now becomes more important at plant level. For wage bill, the "between" movements still play a more important role than the "within" component, but the relative contribution of the "within" component among the total change increased significantly. This is also in sharp contrast with Bernard and Jensen (1997), who find that using plant level data significantly increases relative contribution from "between" effect for the United States. These results imply that, in Korea's case, one might reach different conclusions on the relative importance of "between" and "within" effects depending on whether industry or plant level datasets are used. In this paper, we prefer to put more weight on the plant level analysis which provides us with more detailed information on the sources of aggregate skill upgrading.

Exports, size, R&D and skill-upgrading

To help understand the possible role of various economic factors in skill upgrading in the Korean manufacturing sector during the 1990s, we perform decompositions using plant

characteristics as the basis of further categorization. Considering data availability, we focus on three aspects of plant characteristics: exporting status, R&D activity, and plant size proxied by total employment. We conduct two types of analyses below: industry-level-like analyses as in the first row of Table 2 (further disaggregation of industries based on plant characteristics) and plant level analyses as in the last row of Table 2 (sub-grouping of plants based on plant characteristics). For industry-level-like analyses, we use the same unbalanced panel data underlying industry-level analysis reported in Table 2 for comparability. Similarly, we use the balanced plant panel data for plant level analyses.

The following plant classification scheme is used for these analyses. We classify all plants in the sample into sub-categories according to their status in the initial year. So, for those plants that appear both in 1991 and 1997, if the export value at the initial year, which is 1991, is positive, it is classified as an exporter. For those plants that are observed in either 1991 or in 1997 only, plants with positive export value in the corresponding year are classified as exporters. The same classification rule is applied for R&D expenditure and size. As for size, we categorize all plants with more than 250 employees as large plants and the others as small plants. For industry-level-like analyses, we aggregate these plant data into sub-groups of industries at five-digit level based on the plant characteristics. So, when we use plant export status as a criterion, for example, there are two sub-industries—exporter and non-exporter—for each five-digit industry. Here, each five-digit exporter industry is an aggregation of all exporting plants in that industry.

Table 3 shows the results from the industry-level-like analyses, which decompose the changes in employment and wage shares from 1991 to 1997 into "between" and "within" components by export, size and R&D expenditure, respectively. The first three rows in Table 3 show the decomposition of aggregate annualized increases in employment and wage shares of skilled workers into "between" and "within" effects, with the contributions from non-exporters and exporters shown. The "between" component contributed 0.76 percentage points per year to total employment, while the "within" component contributed 1.18 percentage points per year. Compared with Table 2, the "within" effects became relatively larger. Similar changes in the results are observed in the case of aggregate non-production wage shares.

To examine the role of exporters in skill upgrading process, we look at the contributions of exporting industries to "between" and "within" increases. The second and third rows of Table 3 report the changes for non-exporters and exporters, respectively. At first glance, the contribution of exporters to the aggregate skill upgrading seems relatively small relative to non-exporters: 0.14 and 1.80 percentage points, respectively. However, the seemingly small role of exporters masks a large positive contribution to the "within" effects offset by a large negative contribution to the "between" effects. So, while non-exporters play a major role in the positive "between" effect, it is the exporters that play a major role in the "within" effect: exporters account for about 90% of the aggregate "within" effect. A similar phenomenon is observed in the decomposition of the aggregate increase in the skilled wage shares.

For R&D expenditure, the majority of "between" changes can be attributed to industries with no R&D expenditure, and the "within" changes to industries with positive R&D expenditures. The pattern was preserved when we turned our attention to wage share of non-production workers. Moreover, we found similar patterns when we examine changes in employment and wage shares by size of plants. Among industries with small plants employing up to 250 workers, 92% of skill upgrading in terms of employment share, 1.63% out of 1.77% was due to the expansion of industries with higher than average ratios of non-production workers and 86% of the increase in wage share, 1.26% out of 1.47% was attributed to

"between" effects. For industries with large plants, skill upgrading was exclusively due to the "within" effects both in employment and wages.

Reallocation of employment and wages within industries was more pronounced than between industries among industries comprised of large plants that export and have positive R&D expenditures. In the Korean manufacturing sector, exporters are, in general, larger and more likely undertake investment on research and development than non-exporters. Therefore, it not surprising to find significant correlation in results from analysis based on exporting status, R&D investment, and size. To sum up, the industry-level-like analyses show that a large part of the aggregate increases in employment and wage shares of skilled workers in the Korean manufacturing sector are due to the "within" effects, and that the "within" effect is driven mostly by the changes that occurred at large, exporting, R&D-investing plants. Table 4 further confirms this interpretation.

Table 3. Industry Characteristics and Skill Upgrading

	Employment			Wages		
	Between	**Within**	**Total**	**Between**	**Within**	**Total**
All industries	0.7559	1.1802	1.9361	0.4082	0.9549	1.3631
Non-exporter	1.6887	0.1085	1.7972	1.4193	0.2306	1.6499
Exporter	-0.9328	1.0717	0.1389	-1.0110	0.7242	-0.2868
All industries	0.9143	1.0161	1.9304	0.5383	0.8206	1.3589
R&D = 0	0.6583	0.3397	0.9980	0.3634	0.3428	0.7062
R&D > 0	0.2560	0.6763	0.9323	0.1749	0.4777	0.6526
All industries	0.9334	1.0952	2.0286	0.6125	0.8793	1.4918
Small	1.6303	0.1390	1.7693	1.2632	0.2079	1.4711
Large	-0.6969	0.9561	0.2592	-0.6506	0.6713	0.0207

Table 4. Exporting and skill upgrading: Industry level decomposition

		Employment			Wages		
		Between	**Within**	**Total**	**Between**	**Within**	**Total**
Non-exporter	R&D=0	1.4166	0.1007	1.5173	1.1155	0.2131	1.3286
	R&D>0	0.2178	0.0415	0.2593	0.2578	0.0454	0.3032
	Small	1.6004	0.0714	1.6718	1.2402	0.1888	1,4290
	Large	0.0248	0.0647	0.0895	0.1379	0.0585	0.1964
Exporter	R&D=0	-0.9139	0.3872	-0.5267	-0.8614	0.2311	-0.6303
	R&D>0	0.0117	0.6402	0.6519	-0.1035	0.4328	0.3293
	Small	-0.0813	0.1751	0.0938	-0.0704	0.1111	0.0407
	Large	-0.7451	0.8819	0.1368	-0.7864	0.5706	-0.2158

In Table 4, we report the interaction of export and R&D activities or size class of industries by applying the decomposition for sub-groups based on exporting status and R&D or size. The increase in employment share was most significant among small non-exporters and R&D inactive non-exporters. Most of the gains resulted from "between" effects, 1.60% out of 1.67% and 1.42% out of 1.52%, respectively. We have already pointed out that the "within" component was the main driving force in skill upgrading among exporters. The "within" effects were especially conspicuous when exporters were relatively large and actively involved in R&D investments. Changes in wage shares showed patterns similar to

those of employment. The "between" components were dominant among non-exporters and "within" components among exporters. "Within" effects among exporters were further strengthened if they were accompanied by R&D investments and size. The biggest wage gain was found in small non-exporters for whom majority of the gain came from increased share of total wage bill by industries with higher than average non-production worker ratios. The most significant gain in "within" effects was found among large exporters with more than 250 employees.

The results from the industry level analyses provide us with evidence that while industries comprising non-exporting plants achieved significant skill upgrading in terms of both employment and wage bill of non-production workers, industries including exporting plants attained skill upgrading mainly through rebalancing their technological mix toward high skilled jobs within an industry. In addition, other industry characteristics such as R&D investments and size reinforced the impacts of export-orientation for the "within" component of skill upgrading.

We now turn our attention to plant level decompositions to examine the roles of export and other plant characteristics in the changing skill mix in the Korean manufacturing sector in the 1990s. The results from plant level analysis are reported in Table 5 and Table 6. The first row in Table 5 reports the breakdown of annual growth into "between" and "within" components for plants classified according to export status. The "between" component contributed 0.75 percentage points per year to total employment and the "within" component 1.01 percentage points per year. This is almost the same result as Table 3. However, the relative contributions by plants with different export status were considerably different. The 45% of total increase in employment share, 0.79% out of 1.76%, was explained by growth of employment share of exporters. The proportion of employment share growth explained by exporters was merely 7.2%, 0.14% out of 1.94%, in industry level analysis. In addition, the dominance of exporters in the "within" effect and non-exporters in "between" effect was preserved in Table 5. For wage share, the order of effect magnitude is reversed though the difference is not large. Unlike the industry level analysis, the "between" component, with a growth rate of 0.59% per year, accounts for a larger portion out of total changes in wage share than the "within" component, that showed a growth rate of 0.49% per year. On the contrary, the dominance of exporters in the "within" effect and non-exporters in the "between" effect was still observed.

Plants with positive R&D expenditure contributed more to both the "within" and "between" changes in employment share. Consequently, 89% of the growth of the employment share, 1.57% out of 1.76%, was attributed to plants actively involved in R&D investments. The same pattern was also observed in wage share of non-production workers. As far as R&D is concerned, plants with positive R&D expenditure were the main engine driving the skill upgrading process in Korean manufacturing sector during the 1990s.

Next, we discuss the results of decompositions by plant size. The "between" component was more important than the "within" components for small plants but the "within" component explained the majority of changes in employment and wage shares for large plants. In addition, large plants were mainly responsible for "within" changes and small plants for "between" changes, which is the same pattern found in the industry level analysis. Since large firms are more likely to participate in the export market and invest in R&D, it is again not surprising to find these patterns from analysis based on classification by exporting status, R&D investment, and size.

Now, we examine the interaction of plant characteristics by applying the decomposition for sub-groups based on exporting status and R&D or size. The results are reported in Table 6. The contribution to the increase in the employment share of non-production workers was

largest among small non-exporters and R&D active exporters. For the former group, majority of gain was due to the "between" effects, while for the latter group 60% of total gain in employment share was explained by the "within" effects.

If we focus our attention on the contributions to the "within" effect, which is the major source of the aggregate skill upgrading, we find that most of the "within" effect comes from exporters that are either R&D active or large. That is, our results indicate that there might be some positive interactive effects between exporting and R&D expenditure in accounting for the within-plant increase in skilled employment shares. Changes in wage shares show similar patterns. We think that this is the most interesting result arising from the decomposition analysis.

Our data set allows us to extend the analyses in this section into the period from 1999 to 2003. We report the results for the employment share in the Annex. Since information on R&D expenditure by each plant is not available for the period, we drop R&D expenditure from the analysis. Except for some minor differences, the overall pattern of decompositions did not change.

Table 5. Plant characteristics and skill upgrading

	Employment			Wages		
	Between	**Within**	**Total**	**Between**	**Within**	**Total**
All plants	0.7540	1.0071	1.7611	0.5894	0.4912	1.0806
Non-exporter	0.7788	0.1968	0.9756	0.8105	0.1600	0.9705
Exporter	-0.0248	0.8103	0.7854	-0.2211	0.3312	0.1101
All plants	0.7540	1.0071	1.7611	0.5894	0.4912	1.0806
R&D = 0	-0.1738	0.3680	0.1942	-0.2208	0.1579	-0.0629
R&D > 0	0.9278	0.6391	1.5669	0.8103	0.3332	1.1435
All plants	0.7540	1.0071	1.7611	0.5894	0.4912	1.0806
Small	1.0825	0.2916	1.3741	0.9297	0.2218	1.1515
Large	-0.3285	0.7155	0.3870	-0.3402	0.2693	-0.0709

Table 6. Exporting and skill upgrading: Plant level decomposition

		Employment			Wages		
		Between	**Within**	**Total**	**Between**	**Within**	**Total**
Non-exporter	R&D = 0	0.2779	0.1698	0.4477	0.2066	0.1092	0.3158
	R&D > 0	0.5009	0.0270	0.5279	0.6040	0.0507	0.6547
	Size=0	0.8418	0.1958	1.0376	0.7449	0.2003	0.9452
	Size=1	-0.0630	0.0010	-0.0620	0.0656	-0.0403	0.0253
Exporter	R&D = 0	-0.4517	0.1982	-0.2535	-0.4274	0.0487	-0.3787
	R&D > 0	0.4269	0.6121	1.0390	0.2063	0.2825	0.4888
	Size=0	0.2407	0.0958	0.3365	0.1847	0.0216	0.2063
	Size=1	-0.2656	0.7145	0.4489	-0.4058	0.3096	-0.0962

Technology, product demand and exports

In this section, we present some evidence on the determinants of share changes in the Korean manufacturing sector during the 1990s. We examine two competing hypotheses on the driving force behind the skill upgrading; demand shift and technology change. We specify our empirical model as;

$$\Delta Share_i^k = \alpha^k + \beta_1^k \Delta\left(\frac{R\&D}{Sales}\right)_i + \beta_2^k \Delta(Sales)_i + \gamma' x_i + \varepsilon_i^k \quad (3)$$

where *i* indicates the plant and *k* either "between" or "within" component. The dependent variable $\Delta Share_i^k$ represents the annual percentage contribution of each plant's "between" or "within" component to the change in the aggregate employment and wage ratios. Changes in the plant's R&D expenditure to sales ratio are used as the technology variable and changes in total sales as the demand variable. Additional control variables are the change in capital-labour ratio, the employment in the initial year, the age of the plant, and five-digit industry dummies

The estimation results for employment and wage share changes are reported in Tables 7 and 8, Model I, Model II, Model V, and Model VI. First, change in the R&D variable has no impacts on skill upgrading between plants since the estimated coefficients are statistically insignificant both in employment and wage share equations. However, R&D investment induces plants to rebalance the skill mix within plants so that both employment and wage shares of non-production workers increase. Second, coefficients for change in sales are positive and strongly significant for both "between" and "within" components of employment as well as wage share changes. Combining the impacts of "between" and "within" components, we may conclude that demand shifts seem to have important impacts on skill upgrading of manufacturing sector in Korea during the 1990s. Third, the explanatory power of the model significantly differs for the "between" and "within" specifications. R^2 for models for the between component are surprisingly high with 0.31 for employment and 0.28 for wages after controlling for industry effects. However, R^2 for models for "within" component are moderate with 0.09 for employment and 0.06 for wages after controlling for industry effects. Finally, other control variables such as changes in capital-labour ratio and total employment in the initial year have statistically significant explanatory power in all cases but have opposite impacts on "within" and "between" effects. In sum, technology, while significantly related to within plant changes in wage and employment, did not appear to contribute to "between" movements. Changes in total sales representing demand shift, on the other hand, are positively and significantly correlated with both "between" and "within" movements.

To examine the role of exports, we divide value of total sales into values of domestic and export shipments and modify the regression specification (3) as follows.

$$\Delta Share_i^k = \alpha^k + \beta_1^k \Delta\left(\frac{R\&D}{Sales}\right)_i + \beta_2^k \Delta(Domestic\ Sales)_i + \beta_3^k \Delta(Export)_i + \gamma' x_i + \varepsilon_i^k \quad (4)$$

The results are reported in Tables 7 and 8 as Model III, Model IV, Model VII, and Model VIII.

The most striking result is that once we divide the source of demand shift into domestic and foreign changes, it turns out that two different sources had opposite impacts on "between" movements. While shifts of foreign demand were positively correlated with both "between" and "within" movements, domestic demand was negatively correlated with the "within" component. The result highlights the role of exports in the skill upgrading process. Increases in demand for high skilled products especially due to increasing exports were the most important factor driving increases in shares of employment and wage bill for non-production workers in Korean manufacturing sector during the 1990s.

Table 7. Determinants of employment share changes

	Dependent variable: between change				Dependent variable: within change			
	Model I	**Model II**	**Model III**	**Model IV**	**Model V**	**Model VI**	**Model VII**	**Model VIII**
Δ (R&D/Sales)	-0.1199 (0.7629)	-0.2213 (0.7388)	-0.1173 (0.7629)	-0.2523 (0.7274)	1.82*** (0.5788)	2.07** (0.5846)	1.91*** (0.5557)	2.18*** (0.5626)
Δ Sales	0.0148*** (0.0002)	0.0188*** (0.0002)			0.0028*** (0.0001)	0.0036** (0.0002)		
Δ Domestic Sales			0.0146*** (0.0003)	0.0208*** (0.0003)			-0.0041*** (0.0002)	-0.0036*** (0.0002)
Δ Export			0.0151*** (0.0004)	0.0159*** (0.0004)			0.0136*** (0.0002)	0.0138*** (0.0003)
Δ (K/L)	-0.5421*** (0.0646)	-0.4699*** (0.0628)	-0.5413*** (0.6466)	-0.4745*** (0.0627)	0.1247** (0.0491)	0.1625*** (0.0497)	0.1542** (0.0047)	0.1790*** (0.0478)
Employment 1991	-0.9308*** (0.0417)	-1.7500** (0.4472)	-0.9419*** (0.0430)	-1.6800** (0.0050)	0.4033*** (0.0316)	0.3246*** (0.0354)	0.0382 (0.0313)	0.0815** (0.0345)
Age	-13.69*** (0.1600)	-12.58*** (0.1640)	-13.63*** (0.1600)	-12.97*** (0.1630)	-0.8853 (1.2100)	0.2849 (1.2900)	1.1000 (1.1600)	1.6700 (1.2500)
Constant	0.2179*** (0.0262)	0.2133 (13.3000)	0.2179*** (0.0262)	0.2176 (1.3200)	0.7160 (1.9870)	-0.7380 (1.0500)	0.5090 (1.9700)	-0.2289 (1.0100)
Industry Dummy	No	Yes	No	Yes	No	Yes	No	Yes
Number of observations	27180	27180	27180	27180	27180	27180	27180	21780
R^2	0.2284	0.3149	0.2285	0.3174	0.0549	0.0871	0.1290	0.1546

*Note*s

1) The scales of estimated coefficients and their standard errors are adjusted to make the presentation simple. The numbers are comparable not across variables but across models.

2) Numbers in parenthesis are standard errors.

3) **: statistically significant at 5%, ***; statistically significant at 1%.

Table 8. Determinants of wage share changes

	Dependent variable: between change				Dependent variable: within change			
	Model I	**Model II**	**Model III**	**Model IV**	**Model V**	**Model VI**	**Model VII**	**Model VIII**
Δ (R&D/Sales)	0.6955 (0.8816)	0.6235 (0.8645)	0.6509 (0.8846)	0.5238 (0.8525)	1.81*** (0.6463)	1.89*** (0.6540)	1.89*** (0.6207)	2.00*** (0.6358)
Δ Sales	0.0164*** (0.0002)	0.0204*** (0.0002)			0.0012*** (0.0002)	0.0015*** (0.0002)		
Δ Domestic Sales			0.0198*** (0.0003)	0.02689*** (0.0003)			- 0.0526*** (0.0002)	- 0.0548*** (0.0003)
Δ Export			0.0111*** (0.0004)	0.0111*** (0.0004)			0.0114*** (0.0003)	0.0114*** (0.0003)
Δ (K/L)	-0.7597*** (0.0753)	-0.6793*** (0.0735)	0.7742*** (0.0750)	-0.6941*** (0.0072)	0.1933*** (0.0055)	0.2309*** (0.0556)	0.2211*** (0.0532)	0.2468*** (0.0541)
Employment 1991	-1.56*** (0.0485)	-2.61*** (0.0523)	-1.38*** (0.0498)	-2.39*** (0.0522)	0.5486*** (0.0353)	0.5829*** (0.0396)	0.2053*** (0.0354)	0.3481*** (0.0389)
Age	-11.69*** (1.8600)	-8.94*** (1.9100)	-12.66*** (1.8500)	-10.19*** (1.8900)	-2.02 (1.3500)	-0.4240 (1.4500)	-0.1525 (1.3200)	0.9096 (1.4100)
Constant	0.2186*** (0.0305)	0.1835 (1.5500)	0.2196*** (0.0304)	0.1975 (1.5300)	0.2500 (2.2180)	-0.2535 (1.1700)	0.0560 (0.2156)	-0.4033 (1.1400)
Industry Dummy	No	Yes	No	Yes	No	Yes		
Number of observations	27180	27180	27180	27180	27180	27180	27180	27180
R^2	0.1928	0.2758	0.1993	0.2958	0.0298	0.0591	0.0837	0.1110

Notes

1) The scales of estimated coefficients and their standard errors are adjusted to make the presentation simple. The numbers are comparable not across variables but across models.

2) Numbers in parenthesis are standard errors.

3) **; statistically significant at 5%, ***; statistically significant at 1%.

3. Conclusion

In this paper, we examined the role of exports in skill upgrading in the Korean manufacturing sector during the 1990s utilizing a unique panel data set with rich information on all individual plants employing five or more workers. Considering the vital role of exports in economic development and industrial change in Korea, we believe that the Korean experience may offer an excellent opportunity to investigate the impacts of exports on the labour market.

The empirical results indicate that exporting has important effects on the labour market, particularly on relative employment of skilled versus unskilled workers. The main findings are as follows. Firstly, this paper documented that a significant degree of skill upgrading occurred during the 1990s in the Korean manufacturing sector. Two indicators of skill composition, the ratio of non-production employment to total employment and the proportion of the wage bill paid to non-production workers out of total wage bill, increased to a considerable degree at the aggregate and individual plant levels. Secondly, a large part of the increase in the aggregate non-production employment share was due to the "within" effect, rather than the "between" effect. This tendency became stronger when we used the plant-level data, rather than the industry-level data. Thirdly, most of "within" changes were accounted for by skill-upgrading of exporters, especially those exporters that are either R&D active or large. This might indicate some positive interactive effects between exporting and R&D expenditure in accounting for the within-plant increase in skilled employment shares. Fourthly, regression analysis offers even stronger evidence indicating that exports stimulated the skill upgrading process. Both the "within" and "between" components of skill composition changes are shown to be strongly and positively correlated with exporting activities, while R&D expenditure is correlated only with "within" components.

Taken together, this paper suggests that exporting promoted the employment of the skilled workers but had a less beneficial effect on the unskilled workers in the Korean manufacturing sector since the 1990s when Korea's economy accelerated its pace of globalisation. Possible interaction between exporting and firm's skill mix choice strengthens skill upgrading. Considering the possibility that imports as well as outward FDI had a negative effect on the relative demand for unskilled workers, it is plausible that globalisation process as a whole benefited skilled workers but had an adverse effect on the employment of unskilled workers.

One obvious policy implication from this study is that trade liberalization, or the globalisation process in general, strengthens the case for active labour market policy, particularly because even current or would-be exporters might respond by changing their skill mix in such a way as to disadvantage unskilled workers. In such an environment, policies that aim to protect unskilled employment might have only a limited effect or even be counter-productive. Another policy implication is that trade liberalization should be pursued as a part of an overall growth strategy. The evidence in this paper shows that firms' exporting activity, R&D investments, skill upgrading processes, and the widening disparity between skilled and unskilled workers are all inter-related. This suggests that various policies that separately address each of these processes – for example, trade liberalization, strengthening the general social protection system, or innovation – need to be coordinated within the broader framework of an overall growth strategy.

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Annex Tables

Annex Table 1. Changes in shares on non-production employment, 1999-2003

	Employment Share		
	Between	**Within**	**Total**
Industry (five-digit)	0.8770	0.6836	1.5606
Industry (four-digit)	0.5514	0.8857	1.4371
Plant	0.3536	1.4882	1.8418

Annex Table 2. Industry characteristics and skill upgrading, 1999-2003

	Employment		
	Between	**Within**	**Total**
All plants	-0.2619	1.2894	1.0275
Non-exporter	1.1191	0.0151	1.1342
Exporter	-1.3810	1.2743	-0.1067
All plants	0.1863	0.6625	0.8488
Small	1.1085	0.2745	1.3830
Large	-0.9222	0.3880	-0.5342