

# **Trade and labor market vulnerability in Indonesia, Korea, and Thailand**

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## Introduction

Does trade liberalization make workers more vulnerable? Though somewhat controversial, there is evidence to suggest that openness to international trade tends to raise national income.<sup>1</sup> An open trade policy may also have social costs, for instance through lower wages or displacement from formal to informal sector employment. Also, it is often said that a liberal trade regime exposes the economy to external shocks from global markets and that workers producing traded goods and services might be hurt by this volatility. Because of this, groups in civil society have raised concerns that countries' increasing reliance on trade may have hurt the poor disproportionately, through greater job uncertainty and earnings insecurity. For East Asian countries that are closely integrated into world markets, and becoming more so, examining whether this concern indeed relies on solid grounds should have crucial implications in three policy areas: trade, labor markets, and social safety nets.

Very little research has been done on the vulnerability of workers to shocks in global markets. Within the large literature on wage inequality and wage differentials in relation to trade liberalization, only a handful of studies—mostly on Latin American economies perhaps because macro-economic volatility appears to be structurally higher there — examine trade, volatility, and insecurity in the labor market, most of them taking changes in employment as the indicator of vulnerability.

The literature suggests that trade liberalization has only a small impact on aggregate employment. Papageorgiou, Choksi, and Michaely (1990) find that by and large, trade liberalization did not significantly raise unemployment in the 19 countries they examined. Revenga (1994) finds that Mexico's trade reform of 1985-88 reduced employment modestly, but did not reduce wages. Cox Edwards and Edwards (1996) find that Chile's trade liberalization of the 1970s affected workers' duration of unemployment, but that its effect was small relative to those of other variables, and declined over time. Currie and Harrison (1997) find that during trade liberalization between 1984 and 1990 in Morocco, changes in import tariffs and quota coverage had no impact on aggregate employment. Using rotating panel household surveys, Arango and Maloney (2002) find some evidence of higher incidence of involuntary separation, mostly among skilled workers, in sectors that are opening to trade in Mexico and Argentina, but the impact is transitory.

One concern has been that trade liberalization may make the demand for labor more elastic. Issues of worker insecurity and economic openness in Latin America are summarized in De Ferranti and others (2000), which finds that wage volatility is affected more by inflation than by openness, and that in Argentina, Bolivia, Chile, Peru, and Brazil, wages became more stable in the 1990s. Although job turnover rates increased and informal sector employment rose, unemployment was stable over the period 1970-90, and there was no evidence of a higher probability of unemployment nor of longer unemployment spells. Fajnzylber and Maloney (2000) find no evidence in Chile, Colombia, and Mexico that trade liberalization has increased workers' insecurity.

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<sup>1</sup> Frankel and Romer (1999); Irvin and Tervio (2002). For a critical view see Rodriguez and Rodrik (1999).

This chapter is a first attempt to investigate the topic in an East Asian context. The analysis is conducted on three East Asian countries: Indonesia, Korea, and Thailand. We seek to determine whether workers' earnings and working hours have become more volatile as countries have liberalized their trade regimes. Because no data are available with which to test that hypothesis directly, we follow a twofold approach. First, we ask whether output and average wages became more volatile as the economies became more open. Second, we check whether there are signs that workers are more vulnerable to falling into poverty in sectors and industries that are highly exposed to world markets than in those that are less exposed.

Section 1 looks at what happened to the growth and volatility of output and wages as the economies became more open. Section 2 examines the dynamics of earnings and employment across sectors and industries with different degrees of exposure to trade and hence to external shocks over time. Finally, section 3 explores more formally the relationships between trade intensity and workers' vulnerability to falling into poverty. Our findings for all three countries yield similar conclusions, so for brevity we present only selected examples.<sup>2</sup>

### **Overview of trade liberalization and labor market volatility**

Throughout this chapter, we examine the relationship between trade liberalization and vulnerability by comparing two time periods: one in which the economy was more closed and one in which it was more open. The periods covered in the three countries differ depending on data availability. For Indonesia and Thailand we use labor force surveys; and for Korea we use both the establishment surveys (known as occupation wage surveys) and the labor force surveys. The labor force data cover every year from 1991 to 2000 for Thailand, 1986-2001 for Indonesia, and 1976 and 1981-2000 for Korea.

We also compare workers' experiences according to the sectors and industry groups in which they work, since these have different degrees of exposure to world markets. For each country, our sector definitions are governed by the source data. We exclude agriculture, fishery, and forestry from our tradable sector because of data constraints.<sup>3</sup>

In Korea, we have three broad sectors: manufacturing, construction, and social services; and "others", which include public utilities, wholesale/retail trades, transport, communications, and financial services.<sup>4</sup> In Indonesia, industry classification is restricted to a few categories and we therefore only have two sectors: manufacturing and non-tradables; the latter include all non-manufacturing and non-primary industries.<sup>5</sup> In

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<sup>2</sup> Detailed and comprehensive findings for Korea, Thailand, and Indonesia, respectively, are available from the authors upon request.

<sup>3</sup> The sample of wage workers in the primary sector in the labor force surveys of Thailand and Indonesia is small, and it is not possible to isolate precisely agriculture from other activities in the income of rural self-employed. In Korea, we work primarily with the establishment survey since the labor force survey does not contain wage information and the establishment survey does not include the primary sector.

<sup>4</sup> For Korea, we are able to break up services into the strictly non-tradable construction, social, and communal services; and non-tradable industries that may depend on trade activity and are categorized as "others".

<sup>5</sup> Services, retail/wholesale, transport, and communications.

Thailand and Korea, within the manufacturing sector we define groups of industries that have differing degrees of exposure to trade, measured on the basis of the share of trading volume (exports and imports) in their output.<sup>6,7</sup>

The main question explored in this section is whether changes in trade regimes in the three economies under study were accompanied by changes in the volatility of various aggregate output and labor market indicators. Before we proceed, however, we need to be certain that the three economies were indeed more open in the 1990s than in the 1980s, as commonly believed. Hence we start by checking whether the usual structural measures such as tariff rates, non-tariff barriers, and tariff revenue conform to this view.

### *Measures of trade liberalization*

All the economies examined in this study were already open in the early 1970s<sup>8</sup>, but they have become continuously more open since then. Table 1 shows the average import tariffs in manufacturing during the 1980s and 1990s, and their rates of reduction from one decade to the next. In manufacturing, the average tariff dropped by 26 percent in Indonesia, by 42 percent in Korea, and by 8 percent in Thailand. In the category of duty called “most favored nation status rate,” the reductions were even bigger.

**Table 1: Average import tariffs (i.e., applied duty rates), and rate of change in tariffs between 1980s and 1990s**

<b>Manufacturing</b>	<b>Indonesia</b>	<b>Korea</b>	<b>Thailand</b>
Average tariff (applied duty rate) during 1980s	24.23	18.74	39.04
Average tariff (applied duty rate) during 1990s	17.97	10.96	36.06
Rate of reduction (applied duty rate) (%)	25.84	41.50	7.64
Rate of reduction (%) (most-favored nation status rate)	45.65	46.31	22.46

*Source:* Simple average from United Nations Conference on Trade and Development (UNCTAD).

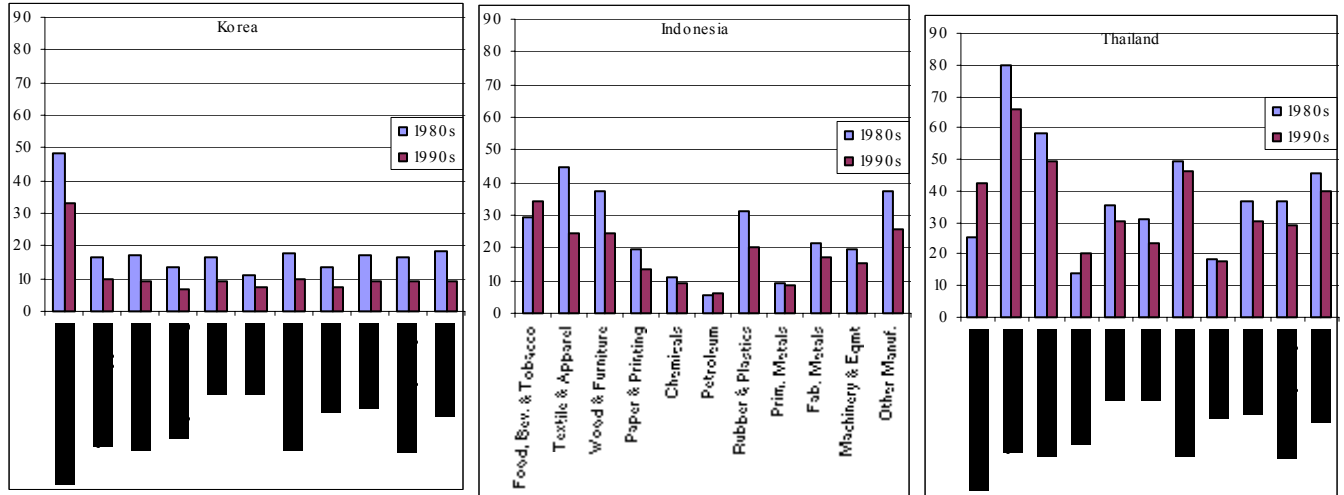
<sup>6</sup> We also examine the ranking by trade per worker, which gives very similar groupings. In Korea, the industries in the group of highest trade exposure include Textile & Apparel, Fabricated Metal, Machinery, and Others not elsewhere classified; those in the medium exposure are Wood, Chemical, and, Iron & Steel industries; and those in the low exposure are Food & Beverage, Paper, Petroleum, and Rubber & Plastic industries. In Thailand, the highest trade exposure group consists of chemical, primary metal, machinery, and other industries not elsewhere classified; the medium exposure consists of food, beverage, tobacco, textile, apparel, footwear, wood product, furniture, fabricated metals industries; and the low exposure group has paper product, petroleum, rubber and plastics.

<sup>7</sup> The Indonesian data do not permit a comparable breakdown. Before 1988, SAKERNAS, the Indonesian labor force surveys from which our data are taken, provided only a rough five-way classification of the sectors in which workers were employed: agriculture; manufacturing; trade; services; and other industries. Between 1989 and 2000, the sectoral classification was expanded from five categories to 18, but within manufacturing it provided for only four industry groups: food, beverages, and tobacco; apparel and textiles; wood products; and others.

<sup>8</sup> See for instance Sachs and Warner (1995).

What about import tariffs faced by specific industry groups? Figure 1 shows average import tariff rates in eleven industry groups within manufacturing. In all three countries, tariffs decreased noticeably in all these industries, with a few exceptions, from the 1980s to the 1990s.

**Figure 1: Decade averages of import tariffs for manufacturing industries, 1980s and 1990s**



Source: United Nations Conference on Trade and Development (UNCTAD).

Core nontariff barrier measures followed the same evolution (Table 2). They fell between 1989-94 and 1995-98 in all three countries, more or less at the same rate as tariffs. Changes in individual measures such as licensing, variable levies, and minimum pricing also generally suggest that these economies have become more open in practically all dimensions.

**Table 2: Core non-tariff barrier measures, 1989-99**

Countries	Core non-tariff barrier measures	
	1989-1994	1995-1998
Indonesia	53.6	31.3
Korea	50.5	25.0
Thailand	36.5	17.5

*Note:* Table shows the percentage of items with various types of nontariff barrier measures among all Standard International Trade Classification or Harmonized System (HS) 2-digit products. Core nontariff barrier measures comprise licensing, prohibition, quotas, and administered pricing. Non-auto licensing includes various forms of administrative approvals.

*Source:* Michalopoulos (1999).

That the preceding measures have been effective is confirmed by the evolution of import tax revenue. In all three countries in the 1980s and the 1990s these revenues fell as a proportion of total trading value as well as of total government revenue (Table 3), suggesting that these economies became effectively less protected. Korea's import tax revenue fell between the 1980s and 1990s, from about 16 percent of total revenue to about 8 percent. In Thailand, import revenue also fell substantially both in terms of total revenue and total import value. This evolution is much less pronounced for Indonesia, but that country's trade liberalization also proceeded on the export side, with export duties as a proportion of total tax revenue falling by more than half.

**Table 3: Decade average shares of import and export tax revenue in total government revenue and total trading, 1980-2000**

Country	Decade	Import duties as % of total import value	Import duties as % of govt. revenue
Indonesia	1980s	4.69	4.72
	1990s	3.7	4.52
Korea	1980s	8.36	16.39
	1990s	5.15	8.37
Thailand	1980s	12.24	21.14
	1990s	7.67	16.44

*Sources:* Trade Analysis and Information System of UNCTAD.

### ***Volatility of some aggregate indicators***

Did this increased openness make these economies more vulnerable to international shocks, with greater fluctuations in the growth of output and wages? The evolution of the observed volatility in the growth of GDP, manufacturing value added, and wages gives a first rough answer. Table 4 shows the volatility of GDP growth rates by decade, as measured by the coefficient of variation.<sup>9</sup> It shows that the 1990s—the decade of greatest openness (up to and excluding the financial crisis of 1997)—was not only less volatile than the 1980s, but in fact the least volatile of the last three decades. The same conclusion holds when considering the manufacturing sector only, which appears to be generally more volatile than the overall economy.

<sup>9</sup> Standard deviation of growth divided by the decade-average growth

**Table 4: Volatility of annual growth rates in GDP and value added in manufacturing, measured by coefficient of variation, 1970-96**

<b>Korea</b>	<b>Coefficient of variation of annual growth rates in</b>	
	<b>GDP</b>	<b>Manufacturing (value added)</b>
1970-1979	0.26	0.31
1980-1989	0.52	0.64
1990-1996	0.22	0.30

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<b>Thailand</b>	<b>Coefficient of variation of annual growth rates in</b>	
	<b>GDP</b>	<b>Manufacturing (value added)</b>
1970-1979	0.39	0.35
1980-1989	0.43	0.75
1990-1996	0.19	0.26

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<b>Indonesia</b>	<b>Coefficient of variation of annual growth rates in</b>	
	<b>GDP</b>	<b>Manufacturing (value added)</b>
1970-1979	0.16	0.34
1980-1989	0.40	0.55
1990-1996	0.10	0.10

*Sources:* Bank of Thailand, Bank of Korea, Bank of Indonesia.

Short-term adverse shocks are likely to be transmitted into fluctuations of earnings or/and employment. In effect, unemployment rates have been stable and uniformly low in all these economies as they become more open, and for Korea and Thailand, where sectoral unemployment rates are available, there are no significant differences among industries of varied intensity in trade.

Less unemployment volatility could have been achieved at the expense of more variability in wages. However, we find that in general the year-to-year fluctuation of wages was much less in the more open 1990s than it was in the previous decade. Moreover, we find no evidence that volatility of wages was greater in more trade-intensive industries. In Korea, for example, wages were significantly less volatile in the later, supposedly more open, period than in the earlier period, whereas industries with high trade exposure experienced less volatility in the later period and roughly the same volatility as other sectors in the first period. (Table 5).

**Table 5: Level and fluctuation of wage growth rates (men) by trade exposure groups: Korea, 1976-2000**

		<b>Low exposure</b>	<b>Medium exposure</b>	<b>High exposure</b>
Annual growth rate	1976-1987	0.022	0.020	0.018
	1988-1997	0.064	0.066	0.076
Standard deviation of growth rates	1976-1987	0.077	0.071	0.068
	1988-1997	0.038	0.054	0.038

*Note:* Low trade exposure: food and beverages, paper, petroleum, and rubber and plastics. Medium trade exposure: wood, chemical, iron and steel. High trade exposure: textile and apparel, fabricated metal, machinery, and others not elsewhere classified

*Source:* Wage Structure Survey (or formerly, Occupational Wage Survey).

The preceding aggregate evidence must be interpreted with caution. First, since volatility is evaluated for only quite a small number of years in each sub-period, the results may be strongly influenced by single observations. In particular, the economic shocks of the 1980s may be responsible for the higher volatility observed during that period, which therefore may not be fully comparable to the 1990s, when the crisis that occurred late in that decade is ignored. Second, while volatility is practically constant at the aggregate, or even at the industry, level it may have increased at the individual level. The stability of aggregate employment levels or average wage rates may actually hide an increased turnover rate among employees and higher variance of their earnings over time.

Studying workers' vulnerability to shocks requires panel data that follow individual workers over time. Unfortunately, the only panel data available are for Korea, and for too short a period to be really useful.<sup>10</sup> For the first stage of our approach here, reported in Section 2, we use synthetic panels, which are created by following cohorts of randomly selected individual workers over time in successive cross-sectional surveys. Cohort-cells in this synthetic panel are defined by workers' year of birth, gender, and educational attainment. As the resulting samples are small for some countries, it is sometimes necessary to use a more aggregate definition of cohorts.<sup>11</sup>

For the second stage of the analysis, reported in Section 3, we recover information on the dynamics of individual earnings from the observation of the time patterns of the mean and the variance of earnings in cohort cells. We then use that information to simulate the likely vulnerability of workers to poverty under a set of simplifying assumptions.

<sup>10</sup> Daewoo Economic Research Institute carried out the Korea Household Panel Survey from 1994 to 1998. The survey collected information on income, assets, expenditure, labor market, and other household and individual characteristics. There were no replacements of households, but the data covered split-off households due to marriage or other reasons. The survey is conducted through stratified random sampling by street blocks, and covers all Korean prefectures except Jeju-do. In 1994, there were about 3,500 households, and in 1998, about 2,200 households.

<sup>11</sup> The synthetic panels could be assembled for only a limited time period (except for Korea where establishment survey are available as early as in 1976, and its labor force surveys, in 1985). Because of this, it was not possible to compare systematically the 1980s and the 1990s, that is moderate vs. pronounced openness to trade, as before for the three countries. The comparison performed on sectors with high and low exposure to trade does not raise this difficulty.



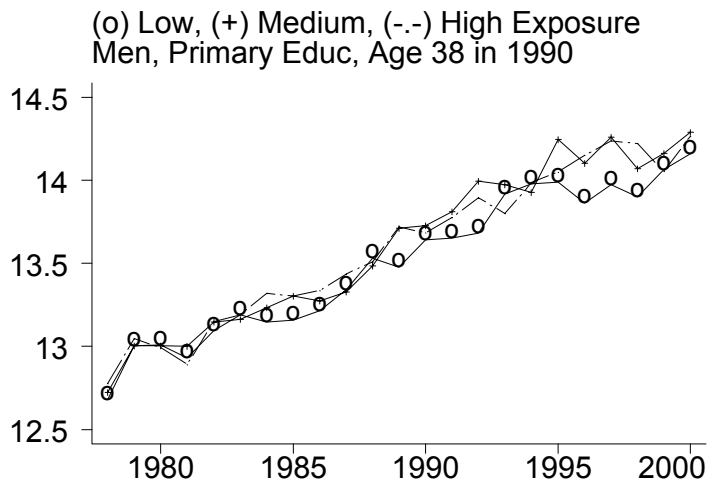
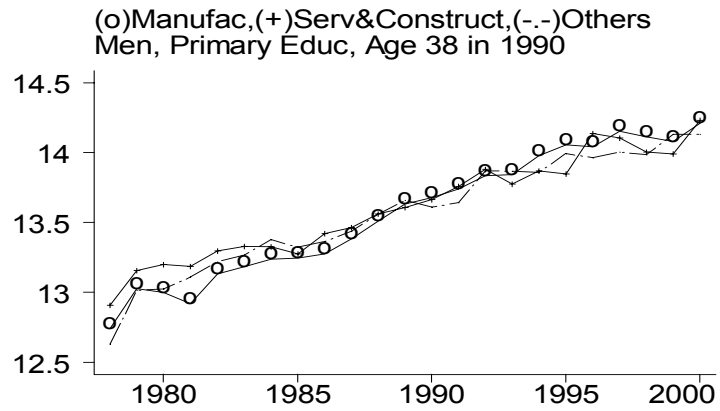
### **Trends in earnings and employment in synthetic panels**

In Korea and Indonesia, where longer time series data are available, we find that average real wages have been steadily rising since the early 1980s, except for a modest drop in Korea, and a sharper decline in Indonesia, respectively, associated with the 1997-98 financial crisis. In Thailand, average real wages have stayed quite constant between 1991 and 2001.

Figure 2 for Korea between 1976 and 2000 shows that this evolution is the same for a specific cohort and that trends do not differ between broad sectors nor across industries of varying trade intensity. The same feature is found for other cohorts and for Thailand (1991-2001) in Figure 3, and Indonesia (1986-2000) in Figure 4, respectively.

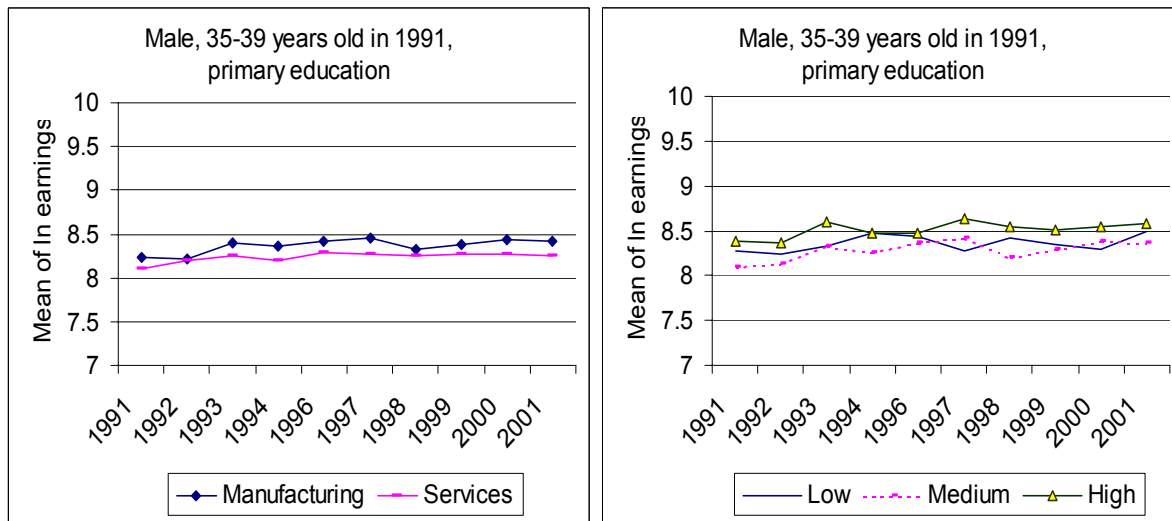
This similarity suggests that labor markets in the three countries are quite integrated, with no evidence of segmentation between tradable and non-tradable sectors or among industries with different degrees of exposure to trade. If the labor market is flexible and workers are mobile, then a shock that originates in the tradable sector will be transmitted to other sectors. In the case of Korea where series are longer, no noticeable change in trend seems to take place in the early 1990s when trade liberalization was taking place. Nor is there any sign of higher variability of growth rates.

**Figure 2: Average log of real wages of males by broad sectors (manufacturing; services and construction; and others) and by trade exposure (low, medium, and high exposure): Korea, 1976-2000**



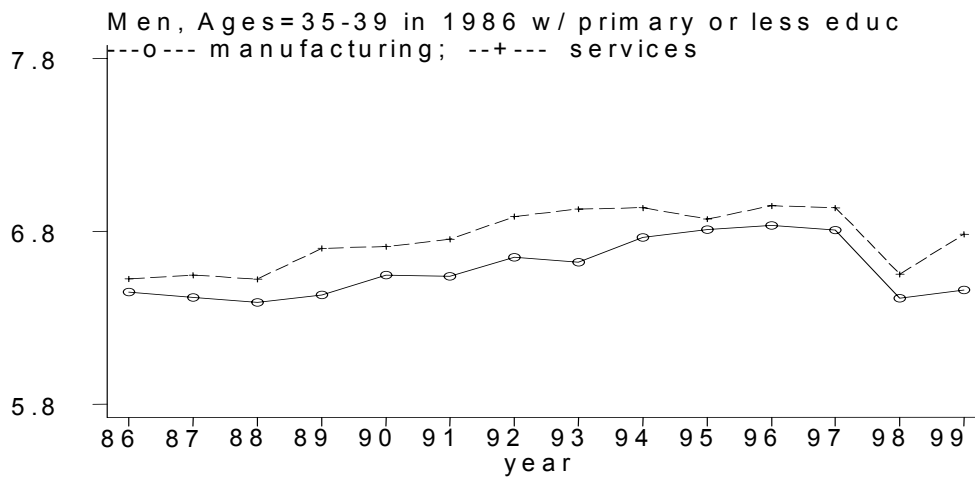
Source: Wage Structure Survey (formerly, Occupational Wage Survey).

**Figure 3: Average log of real wages of males by broad sectors (manufacturing and services) and by trade exposure (low, medium, and high exposure): Thailand, 1991-2000**



Source: Thailand Labor Force Surveys.

**Figure 4: Average log of real wages of males by broad sectors (manufacturing versus services): Indonesia, 1986-2000**



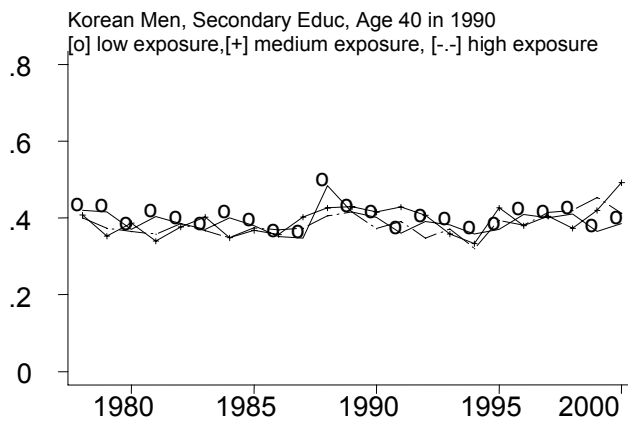
Source: Indonesia Labor Force Surveys (SAKERNAS)

Of course, it is quite possible that the steady and parallel trends in a cohort's mean wage hide a variability in individual earnings that increases over time or is very different across sectors. A simple way to check this is to examine whether the variance of individual earnings changes very much over time or differs markedly across sectors. If so, this could

correspond to some increase in the variance of transitory earnings, thus reflecting increased instability at the individual level.<sup>12</sup>

We find that the variance of (log) wages within cohort cells in the three countries does not show any rising trend, and that patterns are similar across the tradable and non-tradable sectors as well as across the industry groups with varying degrees of trade exposure. An example is given in Figure 5, which shows the evolution of the variance of (log) earnings in the 1950-born male cohort with secondary education in Korea between 1976 and 2000.

**Figure 5: Standard deviation of log real wages of a male cohort (born in 1950, with secondary education) in low, medium, and high trade exposure industries: Korea, 1976-2000**



*Source:* Wage Structure Survey (formerly, Occupational Wage Survey).

The preceding result appears to go against the finding in the pioneering work by Deaton and Paxson (1994). In an analogous cohort analysis in the US, the UK, and Taiwan, these authors found that the variance of the log of household consumption, income, and earnings tended to increase with the age of the household head.

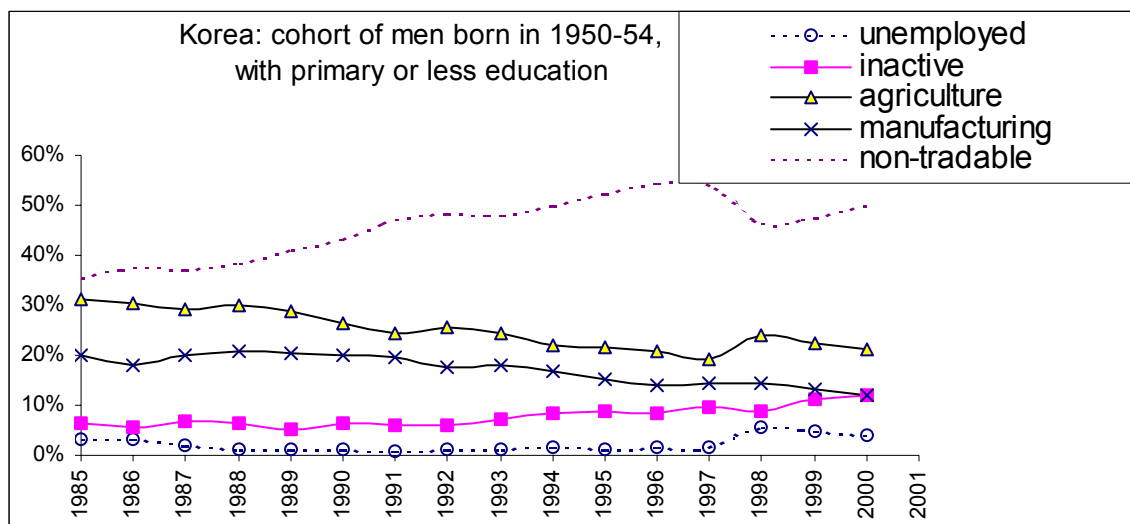
The discrepancy between the present result for Korea and their results for Taiwan, two very similar economies, might be more apparent than real, however. First, Deaton and Paxson also find that the variance of log earnings is extremely stable in Taiwan between ages 20 and 50 (and then doubles between age 50 and 65)—which is in full conformity with our results above. Second, our results for Korea refer to active wage workers, whereas Deaton and Paxson's data for Taiwan include changes in participation and in wage work status. Finally, it is also possible that a slightly increasing trend in inequality could be observed in the Korean data if cohorts with different educational levels were taken together, as in Deaton and Paxson.

<sup>12</sup> It is also known that the inequality of earnings tends to increase with age because the stochastic process behind individual earnings is close to a random walk, a substantial proportion of shocks being persistent.

Changes in labor market conditions possibly associated with more openness might have affected employment or working hours, rather than earning rates. But the next two figures suggest that this is not the case. In general, the distribution of employment status and of sector of employment within cohort-cell shows no noticeable trend change in the 1990s in comparison with the 1980s, except of course during the 1998 crisis.

For the 1950-54-born cohort of Korean men with primary or less schooling, for instance, the rising trend in the share of the non-tradable sector shows no discontinuity until 1998, and the same is true of the declining trend in agriculture and manufacturing (Figure 6). These trends may thus be seen as the reflection of the long-run process of change in the economic structure rather than the effect of a change in the trade regime. Likewise, the unemployment rate remains remarkably constant until the 1998 crisis. The inactivity rate increases somewhat a few years before the crisis, and this might be taken as hiding a slight increase in disguised unemployment, possibly imputable to the rising openness of the economy. However, the change in inactivity rate seems too modest to be of real concern.

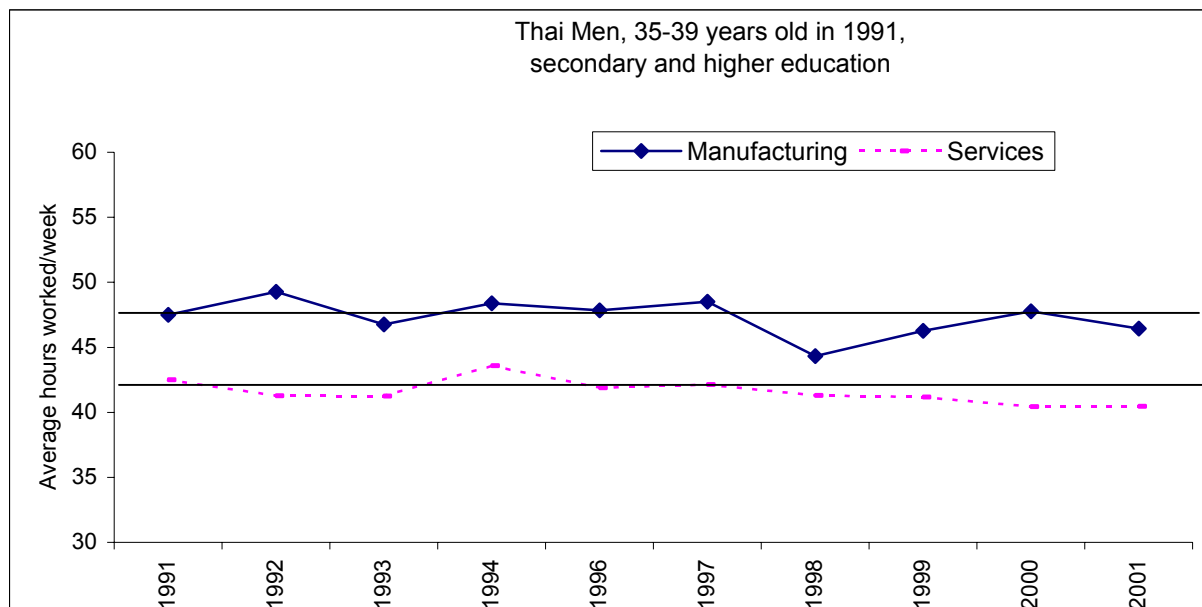
**Figure 6: Distribution of employment status and employment sectors of a male cohort (born in 1950-54, primary or less schooling): Korea, 1985-2001**



Source: Surveys of the Economically Active Population, Korea.

The evolution of average working hours within cohorts leads to the same conclusion: the absence of an openness effect. Due to data limitations, it is not possible to compare the 1980s and the 1990s in Thailand. For a cohort of educated men, no significant trend seems to be present in the 1990s until the 1998 shock (Figure 7). The evolution is similar in other cohorts. In most of them, it is true that working hours tend to be longer in trade-exposed manufacturing than in trade-protected services. But this seems to be true in many countries and is more suggestive of differences in the conditions of production than of differences in trade exposure. Within manufacturing, on the other hand, work hours do not differ according to the trade intensity of industries.

**Figure 7: Average monthly hours worked of a male cohort (born in 1951-1955, with secondary or more education) in manufacturing and services: Thailand, 1991-2000**



Source: Thailand Labor Force Surveys

In summary, looking at the evolution of labor market indicators for synthetic cohorts, we find no evidence of a systematic difference associated with the degree of exposure to trade, in any of the three countries studied. No systematic difference in workers' earnings or employment is found between the tradable and non-tradable sectors, nor among manufacturing industry groups according to trade exposure. And there is no evidence that trends in earnings or employment have changed, nor that working hours became more unstable as economies liberalized their trade policies during the 1990s.

#### **Indirect estimation of changes in workers' vulnerability to poverty from cross-sectional data**

A steady aggregate evolution of earnings and employment levels for the whole population or for cohorts of individuals may hide changes in the variability of conditions for individual workers. The share of employment in manufacturing or services may change steadily over time but there may be an increasing proportion of people switching among sectors or switching between employment and inactivity within a cohort. Likewise, average earnings may go up steadily pace while individual variability in earnings is increasing.<sup>13</sup>

To check whether there were changes in the variability of individual conditions in the labor market, and therefore in personal vulnerability to poverty, would ideally require panel data that would allow a sample of people to be followed over time. Unfortunately,

<sup>13</sup> Such an evolution is even consistent with a constant variance of relative earnings. It is sufficient that individuals within a cohort switch rank more and more frequently.

such data are seldom available in developing countries, and Thailand and Indonesia are no exception.<sup>14</sup>

To estimate the individual variability of earnings and the vulnerability of workers to having their earnings fall below a poverty threshold, this section uses an indirect method that is based on comparing successive cross sections. The idea is as follows. If it may be assumed that all individuals within a cohort face a stochastic earning process that has common characteristics, these characteristics may be recovered at the aggregate level, without observing actual earning paths. Observing the evolution of the mean and the variance of earnings within a cohort is sufficient to estimate the common characteristics of individual earning processes. On this basis, simple estimates of the probability of a worker observed in year  $t$  to fall into poverty in year  $t+1$  can be worked out.

Coming back to the issue of trade exposure, the problem is then to know whether the insecurity and uncertainty evaluated with the preceding technique changed between less liberal and more liberal time periods, as well as between industries of varying exposure to trade. This comparative estimation of vulnerability to poverty has been made for each of the three countries. For all countries we use a poverty threshold of 60 percent of the national median wage. Findings for the three countries are very similar, so only a typical selection is presented here.

### *A simple model*

The earnings,  $w_{it}$ , at time  $t$  of individual  $i$  belonging to cohort group  $j$  may be represented by the following equation:

$$(1) \quad \ln w_{it}^j = X_{it}^j \beta_t^j + \xi_{it}^j$$

where  $X_{it}$  is a set of characteristics that are not used in the definition of cohort group  $j$  – i.e different from age, gender and education. In addition, it is assumed that the unobserved residual term  $\xi_{it}^j$  follows a first order autoregressive process AR(1), that is

$$(2) \quad \xi_{it}^j = \rho^j \xi_{it-1}^j + \varepsilon_{it}^j$$

This is the simplest time-dependency assumption that can be made.<sup>15</sup>

In the absence of panel data, the dynamic equation cannot be estimated directly on individual level data. However, some indirect estimation is possible by considering successive observations of individuals in the same cohort, even though those individuals are not the same from a period to the next. Indeed, (2) implies that:

$$(3) \quad \sigma_{\xi_{it}^j}^2 = \rho^{j2} \sigma_{\xi_{it-1}^j}^2 + \sigma_{\varepsilon_{it}^j}^2$$

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<sup>14</sup> For Korea, there is the household panel survey collected by Daewoo Economic Research Institute, but the five-year period covered was too short for our analysis.

<sup>15</sup> A more general specification would also include a persistent component in the innovation term,  $\xi_{it}$ . Some implications of this specification are considered in Deaton and Paxson (1994).

where  $\sigma_{\xi_{jt}}^2$  is the variance of the residual term of the earning equation at time t and  $\sigma_{\epsilon_{jt}}^2$  is the variance of the innovation term during the same period in the dynamic equation (2). Both variances are evaluated for the whole cohort j of individuals observed at time t. The sequence of  $\sigma_{\xi_{jt}}^2$  is a time series. Estimating a standard autoregressive model on this series yields estimate of  $\rho^j$  and  $\sigma_{\epsilon_{jt}}^2$ . Of course, a crucial identifying assumption here is that the regression coefficient  $\rho^j$  is constant over time.

If the model is well specified and we have a long enough time series, then the estimated  $\hat{\rho}^j$  and  $\hat{\sigma}_{\epsilon_{jt}}^2$  should have the expected signs and orders of magnitude. In particular, it should be the case that  $0 < \hat{\rho}^j < 1$  and  $\hat{\sigma}_{\epsilon_{jt}}^2 > 0$ . However, if we do not get well-behaved estimates of  $\hat{\rho}^j$  and  $\hat{\sigma}_{\epsilon_{jt}}^2$  (for every t), then using alternative estimates of  $\rho^j$  lying in the confidence interval obtained in the original estimation may be necessary.<sup>16</sup> However, this seldom proved necessary.

With estimates of  $\rho^j$  and  $\sigma_{\epsilon_{jt}}^2$  it is now possible to simulate the dynamics of individual earnings, according to the model (1)-(2) above. Draw a value  $\hat{\epsilon}_{it+1}^j$  in the normal distribution with mean 0 and variance  $\sigma_{\epsilon_{jt+1}}^2$ . Substituting the draw,  $\hat{\epsilon}_{it+1}^j$ , into equation (2), and combining it with estimated  $\hat{\rho}^j$  of equation (3) and predicted  $\hat{\xi}_{it}^j$  from ordinary least squares in equation (1), yields an estimate  $\hat{\xi}_{it+1}^j$ . Substituting this value in (1) at time t+1 then gives the (log) earnings for individual in cohort j at time t+1, conditional on the earnings at time t, assuming exogenous changes in characteristics.

With the preceding reasoning, it can be seen that the probability for individual *i*, observed at time t, to receive earnings below a survival threshold,  $\underline{w}$  at time t+1, conditional on characteristics and earnings in period t is given by:

$$(4) \hat{v}_{it+1}^j = \Pr(w_{it+1}^j < \underline{w} | X_{it}^j, X_{it+1}^j, w_{it+1}^j) = \Phi \left( \frac{\text{Log}(\underline{w}) - X_{it+1}^j \hat{\beta}_{t+1}^j - \hat{\rho}^j [\text{Log}(w_{it}^j) - X_{it}^j \hat{\beta}_t^j]}{\sigma_{\epsilon_{jt+1}}^2} \right)$$

where  $\Phi(\cdot)$  denotes the cumulative density of the standard normal. Of course, this expression requires figuring out the characteristics of individual *i* at time t+1. Indeed,

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<sup>16</sup> Let us rewrite equation (3) as  $\sigma_{\xi_{jt}}^2 = a_j \sigma_{\xi_{jt-1}}^2 + b_j + u_t^j$  where  $\sigma_{\epsilon_{jt}}^2 = B_j + u_t^j$ . Let the OLS estimates of the two coefficients  $a_j$  and  $b_j$  be A and B. Two bad cases are possible. Scenario 1: Suppose that A is positive but some  $B_j + u_t^j$  are negative. Then we can try to find a value  $\rho^2 < A$  in the confidence interval of A such that all  $B_j + u_t^j$  are positive. Scenario 2: Suppose that OLS gives a negative A or a value that exceeds 1. In the first case, the best is to start with a small positive values of  $\rho^2$  in the confidence interval of A and proceed as in Scenario 1. In the second case, we would start with values below but close to  $\rho^2 = 1$  and proceed as in Scenario 1. Practically, A was never found significantly smaller than 0 or greater than 1 with standard tests – in theory non-stationarity tests of the Dickey-Fuller type should actually be applied to test  $A = 1$ .



$X_{it}^j$  is observed but  $X_{it+1}^j$  is not. Without a special reason to do otherwise, the simplest is to assume the same characteristics in time  $t$  and  $t+1$  except, of course, for age. Such an assumption should be satisfactory if the characteristics in  $X$  are truly exogenous.

According to the preceding formula, vulnerability—that is the probability of being below the earning poverty threshold in year  $t+1$  conditional on earnings in year  $t$ —depends on the following parameters: initial earnings, individual characteristics, changes in the returns to these characteristics, the persistence of earning shocks from a period to the next and, finally, the variance of these shocks. It was seen above that differences in trade regimes did not seem to be associated with differences in overall earning inequality. This may suggest either some of the previous parameters, or their distribution within cohorts remained more or less constant over time, or that compensating variations have taken place. No attempt is made to isolate the effect of each set of parameters on the evolution of vulnerability in what follows. Yet, the comparison of the evolution of the mean and the variance of earnings within the typical cohort with vulnerability as proxied by the preceding technique should be informative.

Two remarks are in order before examining the results. The first is that the preceding definition and estimation of vulnerability does not take into account employment mobility. Vulnerability is estimated for those individuals in a cohort who are employed in each period and thus ignores the part of vulnerability that is associated with losing one's job. It was seen above that net flows into unemployment did not seem to have increased because of the change in trade regime in the three countries under analysis. But gross flows may have become bigger. Not enough information is available to check this point.

The second remark has to do with the sectoral definition of employment. To compare vulnerability in sectors with different degrees of exposure to trade, it is tempting to apply the preceding technique to cohorts of individuals employed in the same sector. But, then the same proviso applies. The resulting proxy for vulnerability is valid insofar as inter-sectoral movements did not change substantially during the period under study. Again, the analysis above suggests that they did not, in net terms, but this is not necessarily inconsistent with increased vulnerability to poverty through forced mobility. Under these conditions, our findings must be interpreted cautiously.

### ***Findings***

Reasonable estimates of the parameters of the model were obtained for all countries. In particular, estimated persistence coefficients,  $\rho$ , in equation (2) range between 0 and 1, and generally significantly so, suggesting that earning shocks in the current period are actually transmitted to consecutive periods, but the effect of the shocks will eventually fade out.<sup>17</sup> For example, Table 6 presents the estimates of  $\rho^2$  for Indonesia. Cohorts are

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<sup>17</sup> This is in apparent contradiction with the finding by Deaton and Paxson (1994) applying a similar methodology to Taiwan (China) that shocks on household consumption expenditures – and implicitly income- tend to be persistent. Hence an increasing trend in the variance of log expenditures. The reason for the difference with the findings reported in this paper might be that we focus here on individual earnings

pooled to estimate the  $\rho^2$ . The estimated  $\rho^2$  ranges from 0.06 to 0.47. All of these  $\rho^2$  are statistically significantly greater than zero - the smallest t-statistic being 3.5- and less than one. An exception is female workers with secondary education working in the non-tradable sector for whom  $\rho^2$  is not significantly different from zero, the reason being the limited number of observations within these cohorts. Figure 8 presents the estimated rho for every birth cohort of workers in Korea. Estimated  $\rho$ 's range from 0.3 to 0.9 in most cohorts, the average being 0.74 among men and 0.59 among women.<sup>18</sup>

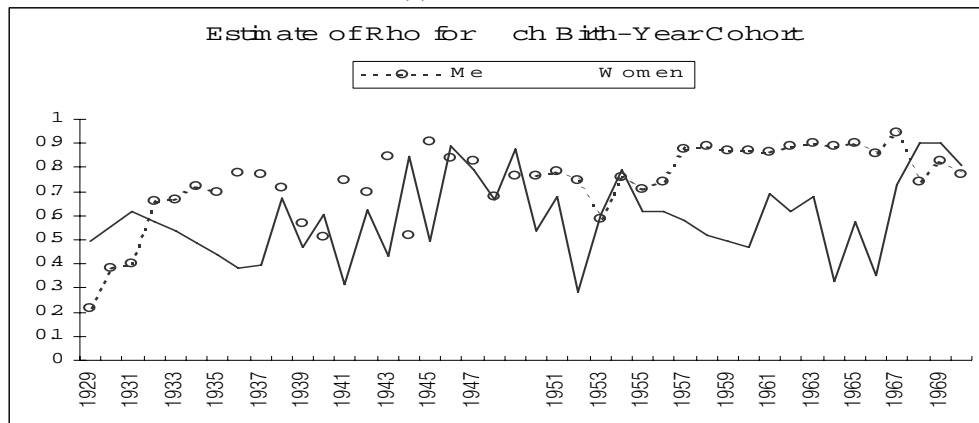
**Table 6 Estimated rho ( $\rho^2$ ) correlation of variance of residual earnings, Indonesia**

Education	Manufacturing		Non-tradable	
	Male	Female	Male	Female
Primary or less	0.3548	0.3746	0.4583	0.4098
Secondary	0.3547	0.3549	0.1841	0.0617
Tertiary	0.4124	---	0.2165	---

*Notes:* For female workers, tertiary education is categorized under secondary because there are not enough observations for those with tertiary education to treat them separately.

*Source:* Alatas (2002).

**FIGURE 8: ESTIMATED RHO (P), BY BIRTH-YEAR COHORT, KOREA, 1929-69**



*Source:* Wage Structure Survey (formerly, Occupational Wage Survey).

In Korea, workers' risks of falling into poverty differed rather little among the three sectors, and these differences narrowed over time. Differences among manufacturing industries with different degrees of trade exposure narrowed down too as vulnerability decreased. Remarkably, the drop in vulnerability was the most pronounced for the manufacturing sector, which has the highest exposure to trade (Figure 9). In the Korean manufacturing sector, vulnerability to relative poverty decreased until 1998 and increased again somewhat afterwards. Vulnerability may have slightly increased in services and construction a little before the crisis but it remained stable in the other sectors. It must be

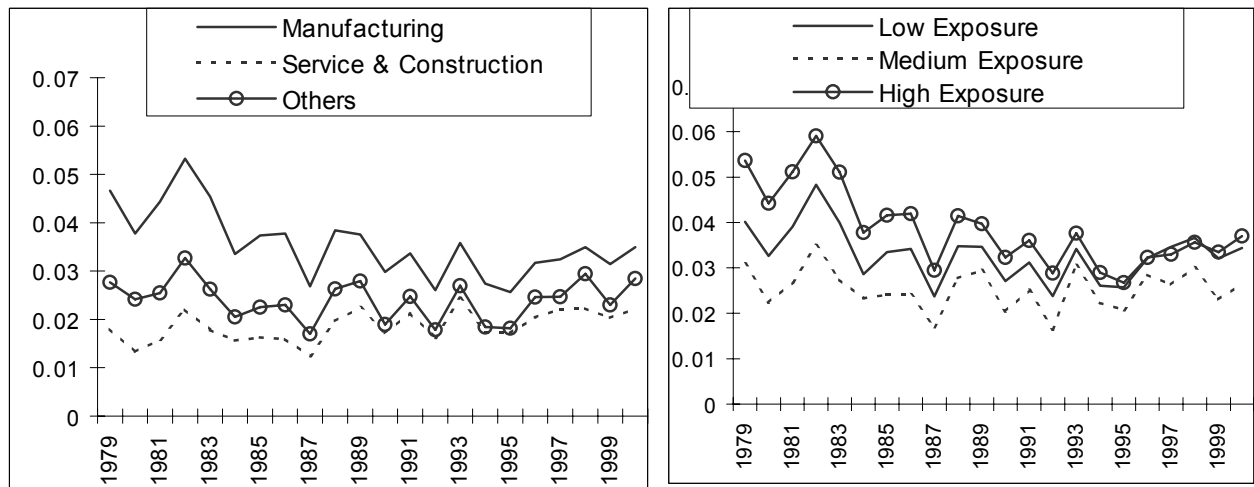
and wage earners rather than household consumption per capita. We therefore ignore shocks linked to the demographic composition of the household and labor supply.

<sup>18</sup> Note that  $\rho$  is the highest among the youngest cohorts for both men and women, reflecting the stronger persistence of earning changes taking place early in a worker's career.

stressed, however, that the extent of vulnerability is extremely limited, with an overall average of 3 percent—reflecting the very low inequality of individual earnings in Korea.

Overall growth in Korea and in the other two countries between the early 1980s and 1998 has been such that the strongly decreasing trend in absolute poverty hides any variation that might be due to more trade exposure.

**Figure 9: Vulnerability, by sectors and trade exposure groups: Korea, 1976-2000**

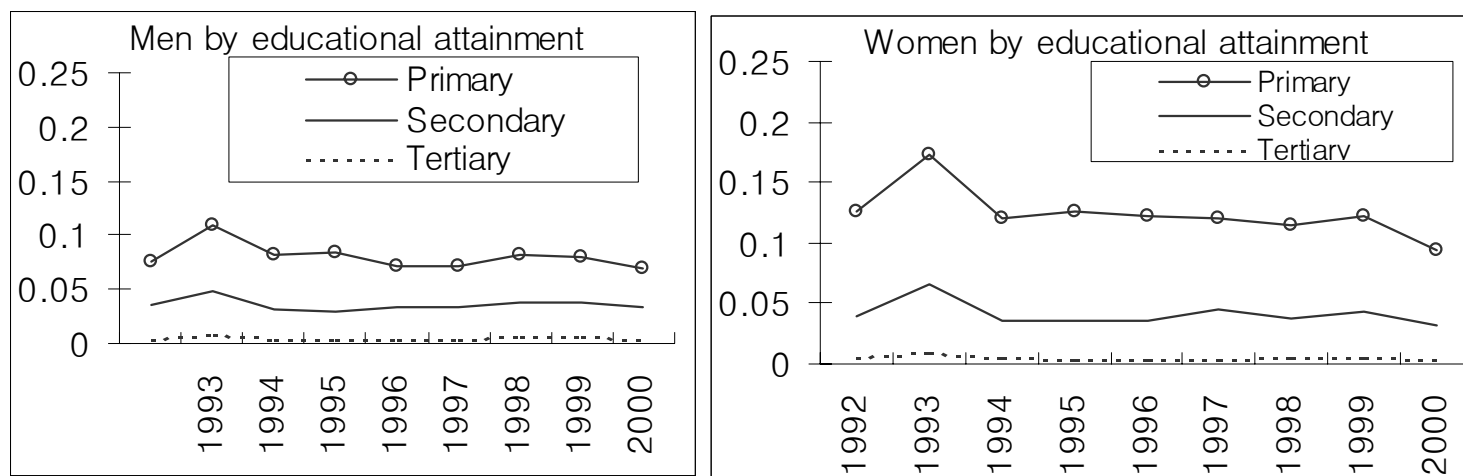


*Notes:* The figure shows the evolution of Korean workers' vulnerability as defined in year  $t$  by their conditional likelihood of earning less than the poverty threshold in year  $t+1$ , by sector of employment and, within manufacturing, by industries with different degrees of exposure to trade. The evolution is shown for the 21-year period 1979-2000 and for the average across all cohorts in each year of observation.

*Source:* Wage Structure Survey (formerly, Occupational Wage Survey).

In all three countries, not surprisingly, vulnerability tends to differ widely according to gender and educational attainment. As reflected in Figure 10 for Thailand and Table 7 for Indonesia, the expected earnings of women and people with little education are much below national averages. The vulnerability of less educated workers to poverty may be considerable, reaching 20 percent for male workers in Indonesia.

**Figure 10: Vulnerability by gender and educational attainment: Thailand, 1991-2000**



Source: Thailand Labor Force Surveys

**Table 7: Vulnerability by education, gender and sectors, Indonesia, 2001**

	Male		Female	
	Manufacturing	Non-tradable	Manufacturing	Non-tradable
Primary or less	0.1971	0.2147	0.3098	0.4076
Secondary	0.0890	0.1047	0.1552	0.1777
Tertiary	0.0050	0.0261		

Source: Alatas (2002).

In summary, we find no firm evidence to support a correlation between workers' vulnerability to sinking into poverty and periods of greater economic openness, nor between their vulnerability and their sectors of employment. Of course, this conclusion is conditional on the limitations of the indirect method used to evaluate vulnerability in this chapter. The analysis could have been strengthened if it were possible to take into account gross flows in and out of employment or across sectors of employment. Yet, evidence on net flows does not suggest significant differences across industries with different degrees of trade exposure. In any case, the differences in earnings security and vulnerability associated at any point of time with education or gender seem much larger than what could be imputed to trade openness. To reduce the overall vulnerability of workers to poverty it might be more efficient to tackle these disparities first.

### Conclusions

Checking whether trade liberalization is associated with greater earnings volatility or increased vulnerability of workers requires comprehensive panel data on individual employment status and earnings. In the absence of such data, only indirect evidence or indirect proxies for individual earning volatility and vulnerability may be used. This paper reviewed such evidence in the case of three East and South-East Asian countries where trade barriers were significantly lowered during the 1990s.

Indirect evidence reveals no significant change in year-to-year fluctuations in workers' earnings and employment after trade was further liberalized in the 1990s or in sectors that were more exposed to foreign competition. The mean and variance of earnings, and net

flows in employment, proved to be very similar in tradable and non-tradable sectors. We do not find any systematic differences in employment or earnings volatility. Neither does workers' vulnerability, as approximated using an original methodology developed in this chapter, seem to differ significantly across manufacturing industries with different degrees of exposure to trade. Our results in fact show that vulnerability to relative poverty—defined as 60 percent of the national median wage—seems to have declined over the last 10 to 20 years and that differences across sectors seem to have considerably narrowed down.

These conclusions may be criticized because they rely on very indirect evidence. In particular, it may be that the stability of net employment flows and the steady evolution of the mean and the variance of earnings behind the proxy used for vulnerability actually hide an increased instability for individual workers in the labor market. Again, to reach a definite conclusion would require panel data.

Before concluding, a point needs to be emphasized that reinforces the general findings in this chapter and at the same time suggests another more subtle way through which openness to trade may actually affect earnings volatility. This point has to do with the 1998 crisis. The apparent stability of net employment flows and the evolution of earnings and their variance in the decade or so preceding the 1998 crisis are meaningful precisely because this crisis corresponds to quite significant changes in practically all existing trends. Thus, the 1998 crisis shows that there *may be* some variability in all the indicators that were used in this chapter. The remarkable result is therefore that no systematic variation showed up at the time the three economies were becoming more open, or in the comparison across sectors with distinct exposures to trade. This finding seems indeed to confirm that opening up in the late 1980s and early 1990s did not have strong negative effects on poverty and vulnerability, whereas the 1998 crisis did have such effects. In turn, one may wonder whether it was openness that made that crisis much more serious than the various shocks that hit the three economies in the 1980s. If this were true, then it could be held that openness actually contributed to more individual vulnerability in East and South-East Asia through increased macroeconomic volatility, rather than through the interplay of modified microeconomic mechanisms. The question is open.

This being said, it is still justified to wonder why earnings and employment volatility or individual vulnerability did not increase when the three economies became more open 10 or 15 years ago. A possible reason is that, in the absence of systemic shocks like the one in 1998, an open economy is subject to a myriad of uncorrelated shocks that tend to cancel one another out thanks to a well functioning labor market, certainly a characteristic of the three economies under study. Another reason is that these Asian economies were already relatively open by the 1970s, and have actually been exposed to world markets and their fluctuations since then. Thus, the tariff reduction of the 1980s and 1990s may have had only negligible effects on domestic industries. As is well known, a country's tariff regime is a complex combination of step-function, multi-tier, and various types of percentage-quantity-barriers. Under these conditions it is extremely difficult to quantify the magnitude of additional exposure, that actually follows from an observed reduction in the average tariff rates.

While we find no obvious link between trade and vulnerability, the analysis in this chapter confirms that some workers are more vulnerable than others. Women workers are more vulnerable to falling into poverty, as are workers who have less schooling. This result reflects the dominant evidence in the literature that gender and skill have a strong discriminatory power in determining one's earnings. An important conclusion is that remedies to vulnerability to poverty must be sought more in education than in trade openness. A more open trade regime is unlikely to justify by itself the creation of effective safety nets. Such insurance systems may be justified independently, either because of the presence of a substantial proportion of unskilled workers with limited capacity to face adverse shocks or possibly because of an increased likelihood of a major macroeconomic or systemic crisis.

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