Foreign Direct Investment, Skills and Wage Inequality in East Asia

by

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April 2002

Paper to be presented at DESG conference in Nottingham, April 2002

Abstract:

Foreign Direct Investment can affect the level *and* dispersion of wages, but there is a lack of empirical work in this area. This paper tests for the effects of FDI on wages and wage inequality in five East Asian countries. Wage inequality has been low and decreasing in some but not all East Asian countries. Using ILO data for wages and employment by occupation, we do not find strong evidence that FDI reduced wage inequality in five East Asian countries over the period 1985-1998. Instead, controlling for domestic influences (wage setting, supply of skills) we find that FDI has raised wage inequality in Thailand. Because we also find that FDI raises the wages for both skilled and low-skilled workers, our findings should help to move debate from impact (does FDI work for development) to appropriate policies to use FDI (how can we make FDI work for all). We suggested that the education system in Thailand was not sufficiently prepared to absorb the effects of FDI. Countries wanting to develop on the basis of FDI should invest sufficient resources in good quality and appropriate human resources, or otherwise face the possibility that growth coincides with rising wage inequality.

Key words: East Asia, Foreign Direct Investment, Skills, Inequality

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1 Introduction

There is an important debate about the implications of increasing trade and foreign investment on national economies. However, while something of a consensus exists over the positive association between openness and growth (Rodrik, 2001), there is less agreement about who gains within societies. The region of East Asia appears to have achieved equitable growth with poverty reduction on the basis of stimulating exports and attracting Foreign Direct Investment (FDI). This paper argues that the evidence is not as clear-cut as it seems by showing that while FDI raised the income of low-skilled workers in East Asia it did not have the inequality reducing effect that conventional trade theory suggests.

Wood (1995; 1997) reviews the conventional wisdom that export-oriented industrialisation in East Asia promoted distributional equity. In this view trade allows the expansion of sectors that use the abundant factor of production intensively. The abundant factor in the 1970s and 1980s in many East Asia countries was low-skilled labour, and hence trade should have raised the demand for low-skilled labour.[1] Wood argued that this has probably happened. The effects on wage inequality can be considered less clear, partly because only a few studies control for domestic (supply) influences although 'in the open Asian economies and the Philippines … relative supply shifts could explain relative wage outcomes' (Robbins, 1996: 24). Furthermore, trade liberalisation in seven East Asian and Latin American countries was accompanied by an increase in relative wages and skill demand, in contrast to predictions based on traditional trade theory (Robbins, 1996).

This paper extends the analysis of wage inequality and openness in East Asian countries in two important ways. First, we include Foreign Direct Investment (FDI) as a determinant of relative wages, extending the supply and demand model in Katz and Murphy (1992) in the spirit of Feenstra and Hanson (1995), but then using a CES production technology. Secondly, we cover a more recent period from the middle 1980s to the middle and late 1990s using the ILO labour market databases, which have not been used before for this purpose. While considerable effort is required to make meaningful comparisons of ILO wage data *across countries* (Freeman and Oostendorp, 2000), we use the data to examine changes *within countries* over time.

This method of modelling the effects of FDI on factor rewards is a more direct approach than is commonly used in inequality studies based on correlation between Gini coefficients and other variables such as growth. Rather than moving from FDI – causing – growth – causing - inequality and differential factor rewards, we prefer to move from FDI – causing - skill specific technical change - explaining differential factor rewards and inequality. So rather than examining correlations between FDI and other variables such as growth, inequality or poverty (Jalilian and Weiss, 2001, is a good example for the ASEAN countries), we focus directly on the effects of FDI on underlying determinants of growth and measures of inequality with economic interpretations. It would be wrong to conclude *a priori* that FDI contributes automatically to poverty reduction because FDI raises average growth. It may well be that FDI causes growth for high-income workers but not for low-income workers, in

[1] By now educational achievements in certain East Asian countries (Singapore, Korea Hon Kong) more advanced than in certain developed countries. On the other hand, the same hypothesis would still apply to countries such as Thailand and the Philippines, also the subject of this paper.

which case a one-for-one relationship between (FDI-caused) growth and poverty reduction would not hold. Conversely, other factors behind growth such as primary education may actually help the poor more than proportionally. Section 2 provides a data overview on FDI, skills and inequality in East Asia. Section 3 reviews the evidence on the effects of FDI on wage inequality around the world. Section 4 presents the methodology used, while section 5 presents estimation results. Section 6 provides further explanations while section 7 contains the conclusions.

2 Foreign Direct Investment, Skills and Inequality in East Asia: an overview

This paper focuses on the relationships between FDI, skills and wage inequality in East Asia and covers three 'traditional' Asian tigers (Korea, Singapore and Hong Kong) and two new Asian tigers (Philippines and Thailand). This section presents and describes data on income inequality, skill formation, income of low-skilled workers and inward FDI in East Asian countries. GDP per capita varies widely from nearly US$ 4000 in the Philippines to over US$20,000 in Honk Kong and Singapore. Growth performances also vary, although it is generally argued that old and new Asian Tigers have achieved relatively rapid and equitable growth, on the back of growing openness. There is some disagreement over what type of policies, domestic or foreign, were responsible for achieving openness (see Rodrik, 1995 and Krueger, 1990). In practice, there will be a link between domestic and trade policies, with one type of policy reinforcing the other: without appropriate education policies a country cannot fulfil its export opportunities created by export promotion.

The region of East Asia is frequently seen as an example of low and stable income inequality, even when foreign exposure was high and rising, whether through exports or FDI. However, some of the countries we analyse in this paper have experienced relatively large changes in income inequality as measured by the Gini coefficients (see Table 1). The Gini coefficient rose by 4.5 points over the mid 1990s in the Philippines, rose by 5 points during the mid 1980s in Thailand and declined by 5.5 points over the decade to the early 1990s in Singapore. These are large variations when considering that Gini coefficients are usually within the 30 - 50 range and tend to change only slowly. More striking, perhaps, is that over this period of 20 years with relatively high growth, only Korea and Singapore experienced a sustained reduction in inequality whilst inequality rose in the Philippines and Thailand.

Table 1 Household income inequality: Gini coefficients (%)

	1980-1981	1983-1986	1988	1990-1991	1992-1994	1996-1998
Hong Kong	45.2	42	45			
Korea	38.6	34.5	33.6		31.0	29.5
Philippines		44.7	44.5	46.8	45.1	49.6
Singapore		43.3	42.0		37.8	
Thailand	45.3	50	49.3	51.3	53.1	50.8

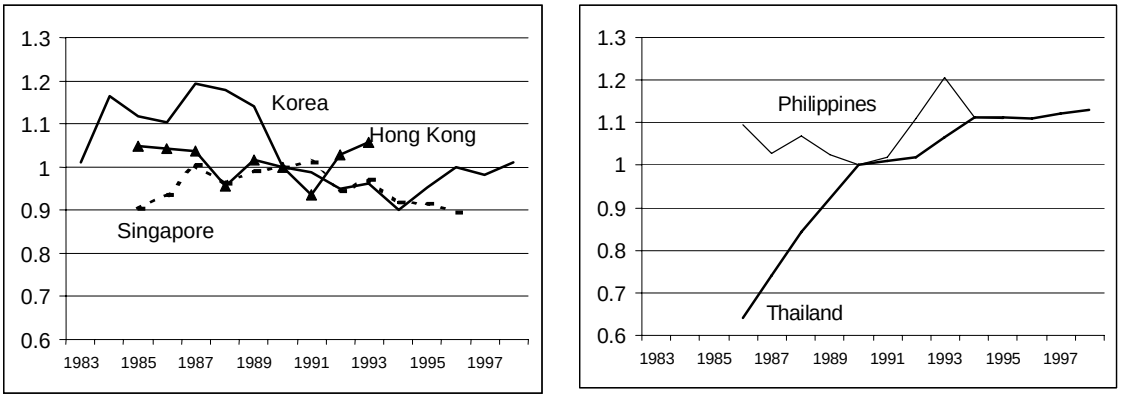
Sources: WIDER inequality database, Pasuk and Isra (2000)

As Gini coefficients are derived from household surveys, measured inequality may change from 'year to year' because of changes in survey design or coverage, even if underlying inequality is unaltered. Similarly, sudden shocks coinciding with the time of a survey should be reflected in a 'sudden' change in inequality. However, trends in

inequality over time should be robust to such factors. Changes in underlying income inequality arise from changes in incomes from different sources: wages and salaries, property income, transfers, farm profits and non-farm profits. Wages and salaries usually constitute the largest component of average incomes.[2] Within this category, it matters how earnings of less-skilled (typically poorer) workers change relative to more skilled (typically higher paid) workers.

We confine attention to changes in wage inequality, specifically between skilled and unskilled workers. For the more developed countries (Hong Kong and Singapore, and perhaps Korea), this should be quite representative of what is happening to inequality overall. In those countries where agriculture (farm profits) is a relatively high share of total employment (Thailand and the Philippines) or where informal employment is important, however, this may not be strongly correlated with trends in national inequality.

Chart 1 Wage inequality (skilled relative to low-skilled workers), (1990=1)



Sources: ILO database, Thailand household survey and own calculations (see appendix)

Chart 1 shows how wage inequality has developed in the five East Asian countries since the early 1980s. Wage inequality is measured by the wage of skilled workers relative to the wage of low-skilled workers. There are considerable data problems in obtaining good quality time series on wages by skill level. Here we use the available information contained in the ILO database on wage by occupation, discussed and used by Freeman and Oostendorp (2000). We divide occupations (up to a maximum of 160) into skilled and low-skilled workers and track the mean income of skilled and low-skilled occupations by country over time. We are interested in changes over time within countries rather than comparing levels across countries. The appendix discusses the details.

As Chart 1 shows relative wages were similar by the last observation as for the first observation in all countries except Thailand. Wage inequality rose initially but then declined in Korea (where it was was initially low), but remained roughly constant in

[2] This does not mean that this is so for all individuals or that changes in wage inequality are the most important source of changes in income inequality (e.g. the large increases in non-farm profits in the late 1980s raised income inequality in Thailand considerably).

Singapore and Hong Kong (where it was relatively high initially). Wage inequality rose slightly overall in the Philippines, and rose dramatically in Thailand.[3] While inequality rose in some countries, all countries achieved positive growth rates in the real wages of low-skilled workers (see Table 2). The rapid growth of incomes in low-skilled workers is also consistent with evidence of declines in poverty incidence (David *et al.*, 2000).

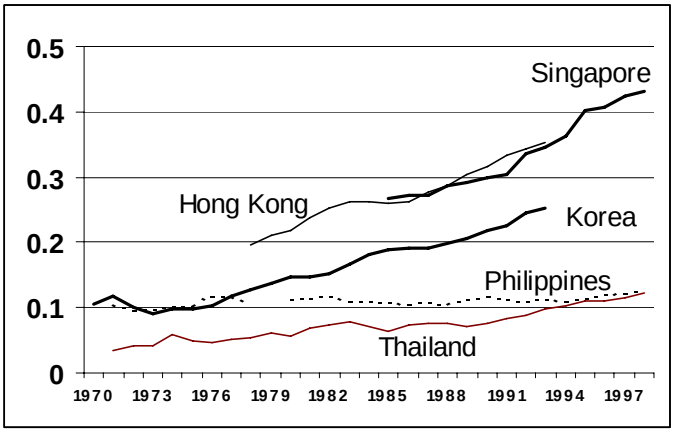
Table 2 Real wages of low-skilled workers (1990=1)

	First observation	1990	Last observation	Annual growth rate (entire period)
Hong Kong (1986-1994)	0.86	1	1.13	0.035
Korea (1983-1998)	0.67	1	1.37	0.051
Singapore (1985-1996)	0.9	1	1.22	0.031
Philippines (1985-1994)	0.98	1	1.05	0.008
Thailand (1986-1998)	0.97	1	1.28	0.023

Sources: ILO labour market database, World Development Indicators and own calculations (see appendix)

Wage inequality between skilled and low-skilled workers is the outcome of the interaction of supply and demand for skills and labour market institutions affecting wage-setting behaviour. As chart 2 shows, all countries have employed relatively more skilled workers over time, substituting for low-skilled workers. Singapore, Hong-Kong and Korea have had a similar and fast pace in the expansion of the share of skilled workers in formal employment. Thailand's pace accelerated in the late 90s. The Philippines' workforce hardly experienced skill-upgrading. Using marginal productivity analysis in traditional economic theory an expansion in the use of skills should have reduced wage inequality, if other factors did not influence the market for skills (the supply effect in Robbins, 1996). However, there are of course various factors that may affect the demand for skills (e.g. skill-biased technology), supply of skills (e.g. education) and wage setting factors (e.g. unionisation trends), which may ultimately affect wage inequality.

Chart 2 Share of skilled workers in total employment

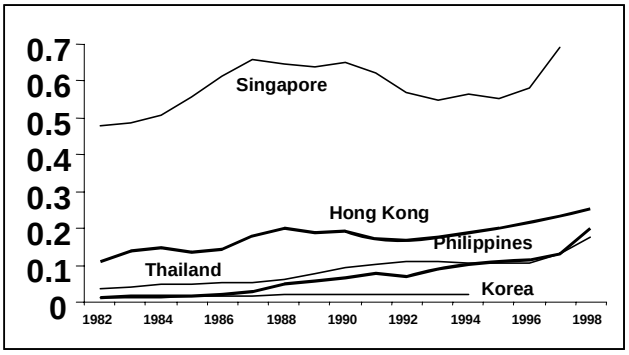


Source: ILO labour market database (see appendix)

[3] The data for Thailand is based on bi-annual Thai Household Survey, because the ILO database contains fewer observations over time. However, the strong widening of wage inequality can be observed using both databases.

This paper concentrates on how Foreign Direct Investment has affected the market for skills in East Asia. Chart 3 plots the stock of FDI as a ratio of nominal GDP.[4] The general trend has been upwards, with relatively large swings in Philippines and Thailand just before the Financial Crisis. Most of the five countries have also attracted large sums of FDI, with the notable exception of Korea, which restricted most inward FDI before the mid-1990s. FDI strategies differ amongst East Asians from restrictive in Korea to interventionist in Singapore and laissez faire in Hong Kong. The strategy of Thailand and the Philippines was in between that of Singapore and Hong Kong. The financial crisis inspired most East Asian countries (including Korea) to implement a more aggressive policy to attract FDI.

Chart 3 The stock of FDI as a ratio of nominal GDP



Source: Korea (IFS, stock), other countries (accumulating flows since 1970 using UNCTAD and national sources), see appendix

3 FDI and wage inequality: what does the evidence show?

Many governments, including those in East Asian, desire to attract Foreign Direct Investment for the effect it can have on productivity through technology and skills, on exports through access to networks, and on employment and the balance of payments. There is now an increased interest in examining the social effects of Foreign Direct Investment, notably on wage inequality and poverty (see Pasuk and Isra, 2000, for Thailand). This is also reflected in a small but growing literature that relates poverty and wage inequality with FDI. This section reviews the main findings of this literature. It will first address macro studies and then micro studies.

FDI and wage inequality: macro level

Most evidence on the relationship between inward FDI and wage inequality at the macro level is for developed countries. Blonigen and Slaughter (2001) find that multinational activity was not significantly correlated with skill upgrading within US

[4] The fixation at financial FDI flows can be misleading. A better measure is the stock of FDI, which is less prone to variation, and does capture the extent to which countries have access to a 'port of new ideas and technologies'.

manufacturing sectors over 1977-1994, but Te Velde (2001) finds evidence for a sector bias towards using skilled workers. Figini and Gorg (1999) find that FDI was associated with skill upgrading and increased wage dispersion in Irish manufacturing over 1979-1995 up to some point, while Taylor and Driffield (2000) find significant effects of FDI on wage dispersion in UK manufacturing.

As regards the evidence for developing countries, Feenstra and Hanson (1995) find that inward FDI increased the relative demand for skilled labour in Mexican manufacturing over 1975-1998. In some regions, FDI can account for over 50 per cent of the increase in the labour wage share in the late 1980s. Freeman *et al.* (2001) find no evidence for a consistent relationship between FDI and wage inequality in a large sample of developing countries. The macro evidence shows that FDI does not reduce but may increase wage inequality. However, it should be emphasised that the evidence available so far is thin and that most research covers wage inequality in the manufacturing sector and only over a recent period. We have not found specific macro-evidence for the East Asian countries we use in this paper.

Foreign ownership and wage inequality: micro level

Te Velde and Morrissey (2001) survey the empirical evidence on foreign ownership and wages at the micro level. They find that

- Foreign-owned firms pay more to their workers than local firms. Wage differentials can be up to 60 per cent (Indonesia), but more often are more modest.
- Studies that do not control fully for other effects (size, location, industry etc.) overstate the effect of foreign ownership on wages.
- Studies that distinguish between average wages in two separate skill categories find that wage differentials are greater for non-production (relatively skilled) workers than for production (less skilled) workers.

Differences in wage differentials by skill level are found in micro studies for several East Asian economies. Lipsey and Sjoholm (2001) examine wage differentials between foreign owned and local plants in a survey of over 14000 manufacturing plants in Indonesia in 1996. They find that foreign owned plants pay 12 per cent more to blue collar and 22 per cent more to white collar workers.

Matsuoka (2002) finds that the foreign-ownership wage premium for Thai manufacturing firms is higher for non-production workers than for production workers. These findings were based on 5122 manufacturing plants in 1996 and 2407 plants in 1998. Foreign owned firms paid 20 per cent more for non-production workers in 1996, and 8 per cent for production workers (respectively 28 and 12 per cent for 1998). Because labour productivity was not found to differ significantly by ownership (controlling for other factors), Matsuoka argued that wage differentials between foreign and local firms should be explained by labour market imperfections, with foreign multinationals dominating segmented labour market for particular skills. This implies that a higher wage premium for skilled workers in MNEs cannot be explained by the skill-specific technical change often associated with foreign ownership but by more effective bargaining by skilled workers.

Work on China mirrors the importance of segmented labour markets in determining how foreign ownership affects the wages of skilled and unskilled workers. Zhao (2001) examines wages in a sample of 5345 state owned firms and 188 foreign owned

firms taken from the Chinese economy as a whole in 1996. The returns to education and skills are twice as high in foreign owned firms as in state owned firms. It is argued that this is consistent with high labour mobility costs and the segmentation of the Chinese labour market into a privileged sector (state) and an unprivileged sector (non state). The Chinese use education to access the privileged sector. In order to poach skilled workers from the privileged sector foreign firms need to pay skilled workers more, while less skilled workers are available as a much lower or even negative wage premium.

Other work provides indirect evidence for the effects of foreign ownership on the returns to skill. Tan (2000) uses panel establishment data from Malaysian manufacturing and identified an increase over the period 1977-1995 period in the employment of highly skilled professionals, managers and technician workers (PTM). He finds support for the hypothesis that technological change proxied by total factor productivity growth (TFP) is skill-biased for the most highly skilled group of PTM workers. The skills-biased technological change hypothesis also finds strong empirical support using an alternative technology measure—use of new information and communications technologies (IT). Tan also found that foreign firms are more likely to be using most types of IT, followed by joint-ventures, then by local firms. This implies that foreign firms introduce technologies that are associated with skill-upgrading. This brings out a more general point that foreign ownership is often associated with skill-biased technical progress leading to faster growth but also to an improvement in the relative position of skilled workers.

4 Modelling the effects of Foreign Direct Investment on Wage Inequality

Foreign Direct Investment affects wage inequality through various routes. An obvious way to analyse the effects of FDI on the market for skills is in a supply and demand framework (e.g. Te Velde, 2002). In this section we focus on how this framework can provide equations that can be estimated to inform us about the effects of FDI on wage inequality.

The supply and demand framework can be represented by a two-factor CES production function with low-skilled labour (*U*) and skilled labour (*S*) following Katz and Murphy (1992).

$$f(U_t, S_t) = \left\{\lambda(\psi_{Ut}U_t)^{\rho} + (1-\lambda)(\psi_{St}S_t)^{\rho}\right\}^{\frac{1}{\rho}} \rho < 1 \qquad (1)$$

where $\varphi_{Ut} \equiv \ln \psi_{Ut}$ and $\varphi_{St} \equiv \ln \psi_{St}$ are functions of labour efficiency units, and the parameter $\rho < 1$. The labour efficiency index can be interpreted as accumulated human capital or the skill-specific technology level. The elasticity of substitution between *U* and *S* is $\sigma=1/(1-\rho)$. In neo-classical theory, the technology level changes exogeneously. However, it is perfectly possible to have shifts in the pattern of technical change, dependent on such factors as inward FDI. This is one way that FDI can affect the market for skills, and we model this below.

We let the labour efficiency indices (skill-specific technical progress) depend on an exogenous time trend, *t*, and the real stock of inward FDI as a per cent of GDP, *fdis*, (see Te Velde, 2000).

$$\varphi_{Ut} \equiv \ln \psi_{Ut}; \varphi_{Ut} = \gamma_{1U} t + \gamma_{2U}\, fdis; \varphi_{St} \equiv \ln \psi_{St}; \varphi_{St} = \gamma_{1S} t + \gamma_{2S}\, fdis \quad (2)$$

and using the first-order condition that factor productivity equals the real factor price we can derive a formula for the wage of skilled relative to low-skilled workers (skill-premium),

$$\ln\left(\frac{w_{St}}{w_{Ut}}\right) = \ln\left(\frac{1-\lambda}{\lambda}\right) - \frac{1}{\sigma}\ln\left(\frac{S_t}{U_t}\right) + \frac{\sigma-1}{\sigma}\gamma_1 t + \frac{\sigma-1}{\sigma}\gamma_2\, fdis_t + \varepsilon_t \qquad (3)$$

where α is a constant, $\gamma_1 = \gamma_{1S} - \gamma_{1U}$ and $\gamma_2 = \gamma_{2S} - \gamma_{2U}$. This equation can easily be interpreted. Wage inequality depends on a supply term (the more skilled workers that are employed the lower the returns to skill *ceteris paribus*), a time trend (skill biased technological progress implies higher return to skills) and FDI. If γ_2 is positive, inward FDI raises the relative wage of skilled workers and hence wage inequality.

The derivation of (3) in this paper emphasises the technology transfer aspect of FDI, but there are other routes through which FDI can affect the market for skills. *First*, the effects of FDI comprise a composition effect (foreign firms may have different skill intensities from domestic firms) pushing up the average skill intensity. Traditional trade theory (the Heckscher-Ohlin model) would suggest that FDI in developing countries with abundant low-skilled workers is located in low-skill sectors such as garments and simple assembly operations (see Wood, 1995, for the predictions of traditional trade theory for trade liberalisation and wage inequality). New trade models also based on Heckscher-Ohlin foundations consider cases where Transnational Corporations transfer activities abroad, which are less-skilled compared to the home average but more-skilled compared to the host-country average (Feenstra and Hanson, 1995). In addition, new trade models have been developed where TNCs locate abroad because of firm-specific assets (Markusen and Venables, 1997) and TNCs are assumed more skill intensive than local firms. The latter appears to be the case for FDI in relatively complex production processes and in particular sectors using above average skills (electronics, chemicals, etc.), bringing up the national average employment of skilled labour. This may have been the case in certain East Asian countries.

Secondly, FDI could induce faster productivity growth of skilled and/or low-skilled labour in domestic firms (spill-over effect).[5] *Thirdly*, the approach includes a potential sector bias of FDI, if FDI causes a relative expansion of skill intensive sectors, leading to a higher relative wages for skills (Te Velde, 2001). *Fourthly*, while the derivation of equation (3) assumes perfect competition, the same equation can be derived under a situation of imperfect competition, where FDI affects the relative bargaining position of skilled workers. In fact, other variables can be included that allow for imperfect wage-setting, such as a measure of the relative scarcity of skilled labour in (3) to allow for pressure on the relative wage of skilled workers if skilled labour is relatively scarce.[6] *Finally*, FDI may affect the supply of skills through

[5] The effects of FDI on growth at the macro-level is compelling (e.g. Borensztein *et al*, 1998), although the routes through which this occurs -composition or spillover effect – are less clear.

[6] Te Velde and Morrissey (2001) find that foreign ownership is associated with higher wages at individual worker level in five African countries, after controlling for other controls such as size, location and sector (and hours worked). However, skilled workers benefit much more than less-skilled workers (46 per cent versus 4 per cent). Two potential reasons were advanced: 1) foreign ownership is

training and contributions to general education (see Te Velde, 2002). Equation (3) combines all of these effects at the national level, and it can be expected that FDI has different effects in different countries.

While equation (3) estimates the effect of FDI on the relative wage of skills, it is often important to examine how FDI affects the absolute wage of low-skilled workers. For instance, it may be important to know whether FDI causes equitable growth. And if not, why not and what can be done about it. For this we can estimate a wage equation for each group of workers jointly with cross-equation restrictions imposed on σ. We thus estimate the following equations, with P a price deflator and Y is real GDP

$$\ln(\frac{w_U}{P})_t = \ln(\lambda) - \frac{1}{\sigma}\ln(\frac{U}{Y})_t + \frac{\gamma_{1U}(\sigma-1)}{\sigma}t + \frac{\gamma_{2U}(\sigma-1)}{\sigma}\, fdis_t + \varepsilon_{1t}$$
$$\ln(\frac{w_S}{P})_t = \ln(1-\lambda) - \frac{1}{\sigma}\ln(\frac{S}{Y})_t + \frac{\gamma_{1S}(\sigma-1)}{\sigma}t + \frac{\gamma_{2S}(\sigma-1)}{\sigma}\, fdis_t + \varepsilon_{2t} \quad (4)$$

This approach also assumes two factors of production, skilled and low-skilled workers. The effect of capital accumulation on skill-specific wages is captured by the time trend (we expect different coefficients on the time trend by level of skill based on the capital-skill complementarity hypothesis). It is possible to derive equations for skill-specific wage levels with three factors of production, but these would be very difficult to estimate, asking too much from the data we use in this paper.

By estimating equations (3) and (4) we can answer two important questions. First, we can test whether inward FDI leads to a rise in the relative wage of skilled workers, i.e. $\gamma_2 > 0$ in (3) or $\gamma_{2S} > \gamma_{2U}$ in (4). Secondly, we can test whether inward FDI raises wages and productivity of (low-) skilled workers in the absolute sense, i.e. $\gamma_{2S} > 0$ ($\gamma_{2U} > 0$) in (4). This leads to the following hypotheses

1	$\gamma_2 > 0$, $\gamma_{2S} > \gamma_{2U}$	$\gamma_{2U} > 0$	FDI raises skilled wages more than low-skilled wages, thereby raising inequality
2	$\gamma_2 > 0$, $\gamma_{2S} > \gamma_{2U}$	$\gamma_{2U} < 0$	FDI raises skilled wages and reduces low-skilled wages, thereby raising inequality
3	$\gamma_2 < 0$, $\gamma_{2S} < \gamma_{2U}$	$\gamma_{2S} > 0$	FDI raises low-skilled wages more than skilled wages, thereby reducing inequality
4	$\gamma_2 < 0$, $\gamma_{2S} < \gamma_{2U}$	$\gamma_{2S} < 0$	FDI raises low-skilled wages and reduces skilled wages, thereby reducing inequality

associated with skill-biased technology and 2) skilled workers in foreign firms are more effective in bargaining. In the specific case of Ghana it was found that foreign firms can afford to pay higher wages as they have lower capital costs, but since foreign firms are not more efficient, higher wages in foreign-owned firms in Ghana must reflect a rent-seeking (or bargaining) explanation.

Situations 1 and 3 are the most desirable from a poverty perspective. Only if FDI raises low-skilled wages can it help to alleviate poverty. Situations 1 and 2 are most desirable if one is concerned about reducing inequality. We will derive policy implications depending on which of these scenario's has occurred. If it is shown that FDI increases overall income, but also increases income inequality (e.g. 1), then this can move debate from overall impact of FDI to appropriate policies to use FDI.

5 Estimation results

This section contains the empirical results. It first discusses the effects of FDI on wage inequality, then the effects of FDI on skill-specific wages.

FDI and wage inequality

We estimate equation (3) for a panel of five countries (Hong Kong, Korea, Singapore, Philippines and Thailand). We use as much information over time as possible, and hence estimate an unbalanced panel using the OLS method adjusting the standard errors for heteroscedasticity.[7] Equation A in Table 3 imposes the same β (the inverse of the elasticity of substitution between skilled and low-skilled workers) across countries; tests indicate that this restriction is accepted by the data. We also impose similar time or technology trends but allow for country-specific fixed effects, thus allowing for different levels of technology. The elasticity of substitution is –(1/-0.35) = 2.8 which is above the average of estimates for some other countries (see Hamermesh, 1993; Robbins, 1996) but still within an acceptable range. This implies that a one per cent increase in the employment of relatively skilled labour reduces wage inequality by 2.8 per cent.[8]

Independent from the above substitution effect there has been an 'exogenous' increase in the relative wage. This can be due to many factors, such as skill-biased technological change raising the demand for and hence wages of skills (see Berman and Machin, 2000). The average trend indicates that there is an average increase of 2.3 per cent per annum in relative wages in the East Asia sample countries (compared to 3.3 per cent in the US, see Katz and Murphy, 1992). We then want to explain differences around this trend by other structural variables, such as trends in FDI and unionisation rates, which vary by country.

We thus include other determinants of skill-specific wages, including the log of the trade ratio, the unionisation rate and the log of the relative unemployment of skilled workers and the stock of FDI as a per cent of GDP. The limited number of degrees of freedom does not allow us to estimate country-specific effects for each of these

[7] The OLS approach assumes that relative employment is exogenous for relative wages, as is assumed in Katz and Author (1992). This may not always be realistic, in which case we would have to use suitable instruments. But this would involve using lagged variables as instruments thereby reducing the already few degrees of freedom. We have thus opted for OLS estimation, thereby realising that the coefficients may suffer from an endogeneity bias.

[8] This finding has implications for examining the effects of FDI and trade on wage inequality in countries that have experienced skill-upgrading. Amongst others, in countries with skill-upgrading, correlating FDI or trade with wage inequality without taking increased employment of skills into account would bias the results towards finding a negative relationship between FDI or trade and wage inequality.

variables. We therefore provided pooled estimates in the second column. As can be seen from the results the variables *trade* and *unionisation* are significantly related to wage inequality after controlling for supply effects with the expected sign, respectively positive and negative. The coefficient on the supply term in this equation is not well-determined, The pooled FDI effect is not significant, suggesting that there is no consistent relationship between FDI and wage inequality across countries. However, the overall effect is positive and it may be that there are significant positive and negative effects at individual country level. In fact, we argued that it can be expected that FDI has different effects in different countries, and hence we need to allow for country-specific FDI effects.

When we estimate the relative wage curve allowing for country-specific FDI and other effects, pooled to preserve degrees of freedom (column III), the effects of FDI appear to vary by country.[9] FDI appears to have reduced wage inequality in Hong Kong and Philippines. However, these effects disappear when testing for FDI effects using SBC values to choose amongst alternative panel specifications. But a positive and significant relationship between FDI and wage inequality remains for Thailand after this testing (see also table 4 which uses classical testing). FDI has raised wage inequality in Thailand, contrary to predictions by traditional trade theory which suggests that FDI should be inequality reducing in less skilled labour intensive countries.

In the remaining two columns, we present regression results for country specific effects of trade (column IV) and skill scarcity (Column V). While we found that an increase in the trade ratio is significantly correlated with relative wages in columns II and III, column IV shows that this result is driven by a positive and significant coefficient in Korea and Thailand (where FDI and trade may well be correlated). The result for Korea is consistent with Galhardi (1999), who argued that international trade can be associated with within-sector skill upgrading which more than off-set the impact of specialising in less-skilled sectors over the period 1970-1990.

Column V elaborates on the effect of skill scarcity on wage inequality. We use the unemployment rate of skilled workers relative to the unemployment rate of less–skilled workers for skill scarcity. The lower the ratio, the scarcer are skills, which may push up wages of skilled workers. Columns III and IV reports a significant and negative effect for the pooled sample. The estimation results suggest that a ten percentage point decrease in the relative unemployment rate of skilled workers raises the relative wage by between 1 and 1.4 per cent. Column V shows that this is driven mainly by the effects in Korea and Singapore. It must be recognised that this measure cannot fully capture effective skill scarcity since it excludes potential and temporary migration.

Finally, an increase in the unionisation rate by 1 percentage point decreases the relative wage by 2.2 per cent. This coefficient has the same significant sign as in Freeman and Oostendorp (2000) who examined the effect of unionisation rates on dispersion of wages by occupation. We did not control for minimum wages as they are often found to be ineffective in raising wages in East Asian countries. Overall the results suggest that regressions that allow for country-specific trade and FDI effects are preferred to other regressions (see value of the SBC), that FDI and trade can have

[9] Similar effects of FDI are found when not including all the other variables.

significant effects on wage inequality, and that the supply of skills should be taken into account in the relationship between FDI, trade and wage inequality.

Table 3: FDI and Wage Inequality in East Asia (1985-1998)

(eq A) $\ln\left(\frac{w_{Sit}}{w_{Uit}}\right) = \alpha_i + \beta \ln\left(\frac{S_{it}}{U_{it}}\right) + \gamma_{1i} t + \varepsilon_{it}$, i = HK,KO,SP,PH,TH

(eq B) $\ln\left(\frac{w_{Sit}}{w_{Uit}}\right) = \alpha_i + \beta \ln\left(\frac{S_{it}}{U_{it}}\right) + \gamma_1 t + \gamma_{2i}\, fdis_{it} + other$ explanatory variables $+ \varepsilon_{it}$

(eq C) $\ln\left(\frac{w_{Sit}}{w_{Uit}}\right) = \alpha_i + \beta \ln\left(\frac{S_{it}}{U_{it}}\right) + \gamma_1 t + \gamma_2\, fdis_{it} + country - specific$ other explanatory variables $+ \varepsilon_{it}$

	I Eq A	II Eq B Pooled FDI and other effects	III Eq B Country-specific FDI effects; other effects pooled	IV Eq. C Country-specific Trade effects	V Eq. C Country-specific effects on relative skill scarcity
			Pooled effects		
β (inverse of negative of elasticity of substitution)	-0.35 (-2.59)*	-0.13 (-0.68)	-0.51 (-3.11)*	-0.40 (-2.60)*	-0.27 (-1.40)
TIME (γ_1)	0.023 (2.42)*	0.0042 (0.42)	0.029 (3.15)*	0.031 (3.82)*	0.019 (1.82)
FDI		0.26 (0.55)	(see below)	0.005 (0.01)	-0.51 (-1.40)
Trade		0.69 (6.06)*	0.61 (7.04)*	(see below)	0.71 (5.66)*
Relative skill scarcity		-0.06 (-1.33)	-0.14 (-1.70)**	-0.10 (-1.76)**	(see below)
Unionisation		-0.04 (-3.31)*	-0.022 (-2.31)*	0.008 (0.74)	-0.06 (-3.18)*
			Country-specific effects		
			FDI	Trade	Rel. skill scarcity
Honk Kong			-1.56 (-2.31)*	-0.33 (-1.38)	-0.15 (-1.06)
Korea			-4.18 (-0.36)	1.11 (7.38)*	-0.53 (-2.91)*
Singapore			-0.47 (-1.60)	0.17 (0.78)	-0.34 (-2.44)*
Philippines			-3.55 (-3.36)*	-0.46 (-1.88)**	Na
Thailand			1.52 (2.78)*	0.70 (5.15)*	-0.04 (-0.67)
Observations	48	48	48	48	48
Parameters(incl. intercept)	7	11	15	15	14
LL	50.3	71.1	83.6	88.2	78.5
SBC	36.8	49.8	54.6	59.2	51.4
Countries	5	5	5	5	5

Robust standard errors in parentheses. * (**) significant at 5% (10%) level; country-specific fixed effects not included; β is inverse (and negative) of elasticity of substitution)

FDI and skill-specific wages

The above regressions do not allow us to say anything about the effect of FDI on the level of wages. We thus estimated individual wage curves for skilled and low-skilled workers jointly, using the SUR technique. We let the data determine the skill-specific technology trends. While the relative wage curves identify the *differences* in skill-specific technology trends, $\gamma_2 = \gamma_{2S} - \gamma_{2U}$ in equation (3), the skill-specific wage curves can also identify the absolute skill-specific time trends. Table 4 shows that the coefficient on the time trend for low-skilled wages is not significant while that of skilled wages is 2.3 per cent per annum and significant. Hence, there have been 'exogenous' developments that caused an increase in wages of skilled workers but not of low-skilled workers. Capital accumulation would do this when there is evidence of capital-skill complementarity. The elasticity of substitution has been estimated at 2.7 (-1/-0.37 = 2.7), which compares well with the estimate in table 3.

Table 4: FDI and skill-specific wages in East Asia (1985-1998)

$$\ln(\frac{w_U}{P})_{it} = \alpha_{1i} + \beta \ln(\frac{U}{Y})_{it} + \gamma_1 t + \gamma_{2i}\, fdis_{it} + \varepsilon_{it}$$

$$\ln(\frac{w_S}{P})_{it} = \alpha_{2i} + \beta \ln(\frac{S}{Y})_{it} + \gamma_1 t + \gamma_{2i}\, fdis_{it} + \varepsilon_{it}$$

	Low-skilled wages	Skilled wages
β	-0.37 (-94.8)*	-0.37 (-94.8)*
Time trend	0.004 (1.42)	0.023 (6.61)*
$\gamma_{2,HK}$	0.46 (1.91)**	0.46 (1.91)**
$\gamma_{2,KO}$	32.1 (4.53)*	16.0 (1.91)**
$\gamma_{2,SP}$	0.46 (1.91)**	0.46 (1.91)**
$\gamma_{2,PH}$	0.46 (1.91)**	0.46 (1.91)**
$\gamma_{2,TH}$	0.46 (1.91)**	4.42 (6.83)*
Observations	48	
Parameters (incl. Intercepts)	7	
Log Likelihood	144.8	

SUR estimation, * (**) significant at 5% (10%) level

We have a limited number of observations, and hence concentrated on country-specific FDI effects only. We then tested for the same coefficients on the FDI variable in different countries using statistical tests. This was rejected (χ^2= 77.52) as was the same FDI effect for skilled workers and less-skilled workers separately for all (χ^2= 72.04). However, when we allow for different effects in Korea (due to its relatively low level of FDI) and for skilled workers in Thailand, we were able to impose the same FDI effects for skilled and less skilled workers in the other countries. The final results are shown in table 4.

Overall we found that FDI raised wages in all countries significantly (at 10 per cent level), regardless of skill level. This is an important finding, because FDI is also

found to have raised wages of low-skilled labour in the East Asian sample countries. This is consistent with studies that find positive correlations between FDI and poverty reduction in ASEAN (Jalilan and Weiss, 2001).

However there are also some differences in the effects of FDI across countries. FDI has a much larger effect on skilled workers than on low-skilled workers in Thailand. This reinforces the results in the previous table that FDI raised wage inequality in Thailand at least over the time periods we considered. It can also be seen that FDI does affect skilled and less-skilled workers to the same extent in Hong Kong, Singapore and Philippines, suggesting that the negative effects of FDI in Hong Kong and Philippines in table 3 are not robust to using different specifications and statistical testing. Korea's coefficients are much larger than the others, and FDI is shown to reduce wage inequality. But after noting that the ratio *fdis* was very small and stable until recently (hovering around 1.5-2 per cent), FDI may not have been of much economic significance in Korea.

The results suggest that FDI can explain an important part of the increase in wage inequality in Thailand. We can calculate the changes in explanatory variables and multiply this by the coefficients estimated in table 4. The actual annualised increase in wage inequality in Thailand was 3.2 per cent over 1986-1998. Over this period, increased employment of skilled workers reduced wage inequality by more than 1.5 per cent annually due to the substitution effect, while skill-biased technological change raised wage inequality by around 2 per cent annually and FDI by around 3 per cent annually. The FDI effect is predominately driven by the effect on wages of skilled workers, which is consistent with the suggestion in Matsuoka (2001) that multinationals can dominate segmented markets for particular types of skilled labour.

Conclusions from regression results

The regression results indicate that FDI raised wages in five East Asian countries over 1985-1998 regardless of skill level. Regressions that allow for country-specific trade and FDI effects are preferred to pooled regressions of wage inequality. It appears that both FDI and trade can have significant effects on wage inequality, and that the supply of skills should be taken into account when analysing the relationship between FDI, trade and wage inequality. Inward FDI has raised wage inequality in Thailand substantially, while the effects of FDI on wage inequality were less clear or insignificant in Singapore, Hong Kong and Philippines and Korea. The evidence for Thailand thus supports hypothesis 1 towards the end of section 4: $\gamma_2 > 0$ and $\gamma_{2S} > \gamma_{2U} > 0$. This would support the view that it is at least as important to focus on policies to use FDI (how can FDI work for all) as it is to focus on whether or not FDI contributes to development.

6 Preparing for FDI: good quality and appropriate human resources

This section tries to provide some insight into the results of the previous section, that FDI increased wage inequality in Thailand but not so in the other East Asian countries in the sample. We consider two issues here: the distribution of FDI by sector and education policies. However, other factors such as appropriate training policies and labour market institutions may also be important in determining how FDI affects the labour market in general and wage inequality in particular, which may require further analysis.

Distribution of FDI by sector

Traditional trade theory would suggest that FDI locates in sectors intensive in low-skilled labour when factors such as in East Asia are relatively low-skill labour abundant (compared to developed countries). Has this occurred? And could FDI have had a wage inequality reducing effect through this route?

Table 5 Distribution of FDI stocks in East Asia by sector ***per cent***

	Hong Kong (flows 1997)	Korea (accumulated flows 1962-1998	Singapore (stock of foreign direct equity investment, 1998)	Thailand (accumulated flows over 1970-2000	Philippines (accumulated flows 1985-1999)
Agriculture and Mining	0	0	0	1	7
Manufacturing	2	59	33	42	48
Food & textiles		7		5	12
Chemicals		12		6	14
Machinery and electrical appliances		16		20	21
Other manufacturing		25		11	
Construction		1	1	5	4
Trade	28	10	15	19	8
Financial Institutions, Real estate and other Services Other	70	30	52	33	34

Sources: Ramstetter (2000), Statistics Singapore, Bank of Thailand, Kim (1999)

Table 5 shows the sectoral distribution of FDI. FDI in Hong Kong and Singapore has been mainly aimed at the financial sector, which is relatively skill intensive. In Korea, most of the relatively little FDI is has received was in manufacturing. The manufacturing sector in Thailand and Philippines also absorbed most FDI. Thailand in particular attracted a quarter of FDI flows in the capital-intensive and relatively skill-intensive chemical, machinery and electrical manufacturing sectors. The table shows that the skill –intensive sectors overall did attract significant FDI flows in all five East Asian countries, implying that the FDI-composition effect is unlikely to have reduced wage inequality. Of course we should bear in mind that these data do not show whether effects on local firms were different by sector in terms of productivity spillovers and job-creation and whether skill-intensities within sectors differed, and how such effects would impact on wage inequality.

Education policies

Transnational Corporations as carriers of FDI are often at the leading-edge of using new technology. They are often more skill-intensive than local firms, requiring workers with knowledge of technical subjects such as engineers (Lall, 2001). The growth in FDI would thus lead to a growing demand in skilled workers. This will lead to an increase in the relative scarcity of skilled workers, who can exploit this by demanding a higher wage, unless the education system provides appropriate and good quality workers that can be employed in sectors where FDI is locating. Good quality and appropriate education is this context requires at least a good educational basis (at least secondary education) on which TNC and their training systems can build as well as provision of tertiary technical education.

Table 6 provides the score card on secondary and technical tertiary enrolment rates in developing countries and the five East Asian countries in particular. The traditional Asian Tigers stand out as having high enrolment rates in secondary and tertiary education, and particularly in the tertiary technical subjects. However, this is less true for Philippines and definitely not so for Thailand. Thailand has had a relatively low secondary enrolment rate, which can partly be explained by government inaction to stimulate secondary education, instead trying to build on an agricultural sector (Pasuk and Isra, 2000). While the tertiary enrolment rates in Thailand are relatively high, the part dedicated to technical subjects is rather low. These factors may help to explain why particular types of skilled workers are relatively scarce in Thailand (also compared to other countries). Foreign Direct Investment adding to the relatively scarcity of skilled workers in Thailand would have pushed up wages of skilled workers.

Table 6: Enrolment rates as % of population

	Enrolment ratio 2nd level[1]		Tertiary enrolments		Technical tertiary enrolments (natural science, maths, computing, engineering)	
	1980	1995	1995	Percentage point changes 1980-95	1995	Percentage point changes 1980-95
Developing Countries	34	44	0.82	0.46	0.16	0.08
Sub-Saharan Africa	17	23	0.28	0.21	0.04	0.03
MENA	42	59	1.26	0.70	0.22	0.11
Latin America	45	53	1.64	0.34	0.30	0.05
Asia 4 Tigers	72	82	4.00	2.39	1.34	0.68
Hong Kong	64	75	1.59		0.49	
Korea	76	101	4.96		1.65	
Singapore	58	62	2.52		0.47	
Asia 4 new Tigers	43	60	1.61	0.65	0.28	0.12
Philippines	65	79	2.70		0.33	
Thailand	29	55	2.10		0.19	
China	46	96	0.60	0.48	0.13	0.08

Source: Lall (2001, tables 5.1 -5A4) [1] as per cent of relevant age group

7 Conclusions and policy implications

In this paper we tested for the effects of FDI on wages and wage inequality in five East Asian countries. Using ILO data for wages and employment by occupation, we did not find strong evidence that FDI reduced wage inequality in five East Asian countries over the period 1985-1998. Controlling for domestic influences (wage setting, supply of skills) we found that FDI has raised wage inequality in Thailand. This was shown to be robust to using different specifications and to statistical testing (se table 3 and 4).

These findings contrast with the predictions of traditional trade theory suggesting that FDI in low-skilled abundant countries locates in low-skilled intensive sectors thereby raising the relative demand for low-skilled workers and hence reduce wage inequality between skilled and low-skilled workers. However, a word of caution is in place. The results here are based on five countries with most of the key data from the ILO database. In order to derive stronger conclusions and policy implications further work is required to see how robust present findings are in other countries or using different data sources.

Because we also found that FDI raises the wages for both skilled and low-skilled workers, our findings should help to move debate from impact (does FDI work for development) to appropriate policies to use FDI (how can we make FDI work for all). We suggested that the education system in Thailand was not sufficiently prepared to absorb the effects of FDI. Countries wanting to develop on the basis of FDI should invest sufficient resources in good quality and appropriate human resources, or otherwise face the possibility that growth coincides with rising wage inequality.

Good quality and appropriate human resources through investment in education and training by the private and public sector are not only required for the adoption of skill-intensive and “skill-biased” technologies, but can also be used to avoid labour market segmentation as a result of which multinationals may sometimes dominate whole segments of the market for skills. Further work should indicate what the most efficient and effective way is to provide good quality and appropriate human resources in the context of a country wanting to develop on the basis of local capabilities as well as attracting FDI.

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Data appendix

Employment by occupation. We used the ILO database (**www.ilo.org**) on employment (formal sector) by occupation. We used the ISCO 1968 basis for all countries except Singapore (ISCO 1988). For the purpose of this paper we divided occupations into skilled (ISCO 1968: major groups 0/1, 2, 3; ISCO 1988: major groups 1, 2, 3, 10A) and low-skilled workers (other major groups). We interpolated data for Singapore in 1990. This gave us the following annual time series: Hong Kong (1978-1993), Korea (1970-1993), Singapore (1985-1998), Thailand (1971-1998) and Philippines (1971-1998). Unemployment by occupation was constructed in the same way.

Wages by occupation. We used the ILO which has also been used in Freeman and Oostendorp (2000). For our purpose we collected a time series on wages by occupations on the basis of male earnings. We divided occupations into skilled and unskilled workers as above. Almost all 'skilled' workers were paid higher wages than 'low-skilled' workers. We calculated the wage of skilled workers as the mean of skilled occupations on the basis of male earnings, after cleaning the data for gaps and duplications in records. The present method does not allow for weights of the various occupations in the two skill groups, but is the best possible use of the data due to lack of suitable alternatives (weights can not be easily found for all occupations). The wage data are based on 14 occupations over 1985, 1987-1993 in Hong Kong, 29 occupations in Korea over 1983-1995, 1996-1997, 32 occupations in Singapore over 1985-1996, 11 occupations over 1986-1995 in Philippines. This is considerable less than the 160 occupations potentially available. We used the Thai Socio-Economic Household Survey to construct bi-annual data over 1986-1998 on wages by occupation (skilled = professional, technical, admin and clerical workers, unskilled=other workers). ILO data for wages in Thailand for 1985, 1991, 1993-1995 show similar wage increases as the household survey. The inequality measures in chart 1 using ILO data compare also reasonably well against inequality measure using national sources for other countries (e.g. using the *Survey Report on Wage Structure* for Korea.).

Foreign Direct Investment: Korea (IFS, stock), for other countries we accumulated flows since 1970 using data from UNCTAD and national sources (Bank of Thailand). The accumulation of flows understates the stock of FDI if revaluation of the equity component is large, but overstates the stock if the depreciation rate is high.

Other variables: Unionisation rates from Visser (2000), real GDP, trade (exports and and imports of goods and services as per cent of GDP) and GDP deflators are from the *World Development Indicators* 2001 CD-ROM.

More details are available from the authors.