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Prospects for Skills-Based Export Growth in a Labour-Abundant, Resource-Rich Economy: Indonesia in Comparative Perspective

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Prospects for Skills-Based Export Growth in a Labour-Abundant, Resource-Rich Economy: Indonesia in Comparative Perspective *

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In an integrated global economy, specialisation in trade is an increasingly prominent strategy. A labour-abundant, resource-rich economy like Indonesia faces stiff competition for labour-intensive manufactures; meanwhile, rapid growth in demand for resources from China and India exposes it to the 'curse' of resource wealth. This diminishes prospects for more diversified growth based on renewable resources like human capital. Using an international panel data set we explore the influence of resource wealth, foreign direct investment, and human capital on the share of skill-intensive products in total exports. FDI and human capital increase this share; resource wealth diminishes it. We use the results to compare Indonesia with Thailand and Malaysia. Indonesia's reliance on skill-intensive exports would have been higher had it achieved higher levels of FDI and skills. Indonesia's performance in accumulating these endowments, and its relative resource abundance, impede diversification in production and trade. Finally, we discuss policy lessons and options.

Keywords: Skill-intensive exports, resource curse, middle income trap, Indonesia

JEL: F14, O14, Q32, Q33

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INTRODUCTION

Indonesia is an important case study in economic development both by virtue of its size (it is fourth most populous nation) and for the lessons it may offer to others. One of the world's poorest and least-promising economies in the 1950s, its record of growth and structural transformation since the establishment of the New Order (1966-98) has been impressive. Fifteen years ago, in a stunning vindication of the economic gains of the New Order era, Indonesia (along with Southeast Asian neighbors Singapore, Malaysia and Thailand), was included in the group of so-called high-performing Asian economies (HPAEs) whose growth successes defined the 'East Asian Miracle' (World Bank 1993). For the half-decade 1993-97, Indonesia's per capita income placed it among the lower-middle-income economies—a position it relinquished during the Asian Crisis, but regained in 2003 (World Bank 2008).

Despite these gains, however, Indonesia's recent growth has been persistently slower than that of its closest HPAE comparators, Malaysia and Thailand. Taking 1990 as a base, by 2006 Indonesia's per capita income (measured in PPP-adjusted dollars) had grown by 35%; Thailand's by 44%, and Malaysia's by 50% (figure 1). The ratio of Indonesian to Thai per capita income had fallen from over 48% to 44%, and the ratio to Malaysia from 40% to 35%. While Indonesia's growth record remains healthy by the standards of developing economies worldwide, a puzzle remains as to why its performance within the dynamic East and Southeast Asian region has lagged.

What explains Indonesia's regional growth difference? Is there any evidence of a long-term slowdown in its growth rate, either now or in the future? What would it take for Indonesia to reach the 'next level', i.e. upper middle-income status, or at least to consolidate its position in the lower-middle income group? Obviously, there are very many ways in which these questions can be framed and answered. In this paper we focus only on Indonesia's growth challenges and opportunities as a trade-dependent economy, one that has abundant endowments of natural resources and labour and is also a participant in the dynamically growing Asian regional trade in manufactures. In particular, we focus on the likely interactions of resource abundance and the prospects for growth through participation in the booming regional trade in skill-intensive parts and components. What can we learn about Indonesia from an examination of international and regional data? What policy lessons can be drawn, for Indonesia or for other developing nations?

In the rest of this paper we first explore the particular growth challenges faced by economies that are abundant in labour and natural resources within a global economy that is increasingly integrated, which rewards specialisation, and yet is also increasingly dominated by some very large developing-country players, notably China. We continue in section 3 with a quantitative international comparison based on a broad group of countries, then, in section 4, with a more detailed examination of the Indonesian case within the Southeast Asian regional context. Our analysis is intended to shed light on whether a resource-

rich economy like Indonesia might really face a 'middle-income trap,' and if so, what policy steps may be needed to escape it. Section 5 identifies some preliminary policy implications and concludes.

FACTOR ENDOWMENTS AND COMPARATIVE ADVANTAGE IN THE SHORT AND LONG RUN

Could pursuit of comparative advantage with an ever-larger and more closely integrated global market impose a barrier to the growth of some developing economies? At first, the very question seems paradoxical; after all, economists believe that by following comparative advantage a small open economy gains from specialisation, which is associated with enhanced opportunities for economic growth. This view, however, is subject to a number of challenges that seem relevant to the present-day Indonesian case.

The 'curse' of natural resource abundance

A price-taking country with comparative advantage in non-renewable or depletable natural resources will optimally exhaust its stocks, as domestic scarcity will not be reflected in prices derived from global markets. Weak property rights in natural resources—a standard phenomenon in developing countries—generates even faster rates of depletion. Moreover, resource-based export growth may reduce the prospects for future economic growth and diversification. The claim that natural resource abundance contributes to low growth rates among developing economies has been given empirical support in several prominent papers—notably, though not exclusively, by Sachs and Warner (1999, 2001). Several explanations have been offered for this apparent paradox. First, the Dutch disease effects of natural resource exports can inhibit growth in all other tradable sectors due to competition for labour and capital from resource sectors and secondary, demand-driven expansion in non-traded sectors (Corden and Neary 1982). The losers will typically include manufacturing, a sector whose expansion is commonly believed to generate positive productivity externalities giving rise to increasing returns. Slower growth in manufacturing then reduces the economy's potential for dynamic growth. Second, specialisation in natural resource sectors may reduce returns on human capital investments, and thus diminish incentives for educational attainment (Gylfason 2001a). Resource-abundant countries in which this occurs will then find it more difficult to climb product variety or quality ladders in manufacturing, where human capital inputs are employed with increasing intensity on each successive rung. Third, lower growth rates have also been attributed to the destabilising macroeconomic consequences of Dutch disease. Resource booms cause relative shrinkage in the output of non-resource tradable sectors, while resource and non-tradable sectors expand. Consequently, the shares of resources and nontradables in GDP increase, as does the share of resources in total trade. This has the effect of increasing vulnerability to global market shocks. In world markets, commodity prices fluctuate much more than do the prices of other goods, so both relative prices and incomes in the domestic economy become less stable. By the nature of nontradable sectors, adjustment to demand or supply shocks also takes place disproportionately through price fluctuations

(Hausmann and Rigobon 2002). Thus, both price and income instability and unpredictability of returns on investments are magnified in resource-dependent developing economies.

Such effects are of course not automatic, but rather are experienced conditional on particular configurations of policies and institutions (Humphreys, Sachs and Stiglitz 2007). A large literature attributes development failures in resource-abundant economies to institutional weaknesses, whether these are due to colonial legacies (Acemoglu et al. 2002), ethnic divisions (Easterly and Levine 1997), or other causes. Some recent political economy papers argue that resource wealth itself contributes to the degradation of the rule of law and the institutions of governance and policy-making, in effect by promoting the ascendance of the 'predatory state' over the 'developmental state'—either by actively encouraging the former through corruption related to resource rents, or by undermining the latter when revenue flows associated with resource extraction become the dominant source of income (Auty 2001; Murphy et al. 1993). Arguments of this type have been made with particular force in case studies of Latin American and sub-Saharan Africa (Acemoglu et al. 2002; 2004). Mauro (1998) has uncovered a statistically significant negative relationship between corruption and investment.

The quality of development policy, including that intended to strengthen governance and the rule of law, may also be negatively affected by natural resource wealth. Gylfason (2001a, 2001b) has argued that the sudden increase in income that follows a natural resource discovery may reduce the perceived need for sound economic management and for institutional quality. The boom may also create a false sense of economic security and weaken the perceived need for investment and growth-promoting strategies. In resource-abundant economies, politically powerful interest groups use rents to gain political and economic power, which is usually against the public interest (Mauro 1998, Sachs and Warner 1999, Leite and Weidmann 1999, Gylfason 2001b; Torvik 2001). Isham et al. (2003) argue that because revenue from resources is unearned income, the diminished need to raise revenue from taxes on earned income means that the state in a resource-rich economy has less incentive to develop efficient and accountable institutions of public finance. There is also less incentive for citizens to demand mechanisms of accountability or to create the horizontal social associations that many feel are the preconditions of democracy. With unearned revenues, moreover, the state can mollify dissent through a variety of means (buying off critics, patronage, infrastructure projects, outright graft), and also has resources with which to pursue repression and violence against dissenters. In a recent econometric exercise Atkinson and Hamilton (2003) find that resource abundance has a significant negative effect on economic growth only in countries where government revenues from resource rents are directed toward consumption rather than investment, leading to low rates of genuine (i.e., resource wealth adjusted) savings. They conclude that institutions that are sufficiently robust to prevent the dissipation of resource rents on current consumption might avert the resource curse.

Exogenous changes in comparative advantage

Indonesia is also a labour-abundant economy, and in the past has used this feature to good effect, building large export-oriented sectors in low-skill, labour-intensive activities such as garments and footwear. Even within East and SE Asia, however, Indonesia faces intense competition in the markets for these products, especially from emerging low-wage producers such as China and Vietnam. Countries that depend on exports of low-skill labour-intensive products have been shown to be directly and negatively impacted by competition from China—the largest exporter by far in these product categories—in trade (Eichengreen et al. 2004) and investment (Eichengreen and Tong 2005). Regional measures of revealed comparative advantage (RCA), which show the share of each product in a country's exports relative to the share of that product in world exports, indicate the degree to which Indonesia's comparative advantage is shared with its neighbors. Table 1 illustrates this with RCA data for 2000-04.

Of course, the growth of large developing economies such as China also creates significant market opportunities and in the past decade Indonesia, like many other countries, has seen its exports to China grow far faster than total exports. However, the composition of those exports reflects complementarities between the two countries. Indonesia's exports to China are overwhelmingly dominated by agriculture, fisheries, minerals, timber and other natural resources and semi-processed manufactures based on these; labour-intensive manufactures hardly feature (Coxhead 2007). On the basis of these data one author has suggested quite strong prescriptions:

> … Indonesia, facing sharp competition in international markets from other, rapidly industrializing countries, notably China, can no longer continue to rely on its traditional sources of comparative advantage, including its large supplies of relatively cheap, but mostly low-skilled labour and its natural resources. In fact, in view of the large overlap of China's and Indonesia's labour-intensive exports … Indonesia is highly vulnerable to China's strong export competitiveness … particularly in labour-intensive manufactured exports. Indonesia will therefore have to develop a more sustainable source of comparative advantage in order to raise the international competitiveness of its manufacturing industries (Thee 2005: 218).

Fragmentation trade and endogenous growth

Endogenous growth theory is constructed around the idea that some forms of growth generate increasing returns or positive externalities such that the economy can grow in sustained fashion rather than converging on a steady state in terms of per capita income. These models are typically articulated in the single-sector context of aggregate growth models. Several contributions, however, locate endogenous growth in a two-sector or multi-sector context, and some of these provide reminders of the dynamic costs of Dutch disease and related 'resource curse' phenomena (van Wijnbergen 1984; Matsuyama 1992; Sachs and Warner 1999). In these models, the expansion of a resource-intensive sector such as oil or forestry has Dutch disease effects that reduce productivity in activities that rely more heavily on capital, skills or

technology, and whose expansion is associated with endogenous growth processes such as productivity spillovers. When those sectors contract, there is a loss (or rather, failure to emerge) of productivity spillovers, or learning-by-doing effects, or scale-related cost reductions associated with them. In van Wijnbergen 1984, for example, the level of activity in manufacturing is hypothesised to raise future factor productivity through learning by doing effects. A resource boom reduces manufacturing sector output through the familiar Dutch disease mechanisms, and this in turn lowers the potential for productivity growth in the future. The economy's capacity for diversification away from resource dependence toward higher-productivity activities in more skill-intensive sectors is reduced. This will be important from a welfare point of view when natural resources are subject to increasing extraction costs or outright exhaustion, since the economy's level of specialisation in natural resource sectors cannot be sustained in the long run. The intertemporal effects of Dutch Disease appear in van Wijnbergen's model in the form of 'unlearning by not doing,' as it were, with consequences for future rates of economic growth.[1] Institutional weaknesses, although they are not elucidated in the models just cited, can also play a role since they reduce the capacity to manage natural resource assets for the long term, to provide public goods, and to overcome coordination failures in the supply of education and training. Thus weaker institutions create a higher premium on good development policies in the present.

The importance of skill and technology upgrading is most clearly demonstrated in Asia by the rapid growth of 'fragmentation trade.' When international trade is costly, it is efficient to develop production processes that are vertically integrated within the borders of a national economy. Recently, however, the lowering of transport costs and policy barriers to international trade has led to explosive growth in semi-finished manufactures. In the new global economy, components of manufactured products are produced in many locations, depending on cost, and assembly of final products takes place elsewhere. To middle-income countries, the brightest feature of China's growth has been the expansion of its demand for knowledge-intensive and skill-intensive products, many of them unfinished goods ('parts and components'), which are then assembled into final products in Chinese factories. Countries (including Malaysia and Thailand) that have discovered comparative advantage niches within the parts and components market are finding their trade accounts flourishing along with the expansion of Chinese demand for imported intermediate goods.

The usual reasoning from Ricardian comparative advantage indicates that global welfare is enhanced by fragmentation. As with conventional trade liberalisation, however, fragmentation can

[1] This analysis is a precursor to endogenous growth models in which expansion of high-skill industries has positive productivity spillovers, which raise returns to skilled labour and induce additional investments in human capital. But human capital investments are financed by profits earned from production in lower-skill industries. So faster growth in lower-skill industries accelerates growth along with structural change (expansion of higher-skill output); conversely, lower world prices for lower-skill manufactures reduce profits, and thus reduce the rate of growth and structural change.

produce losers as well as gainers. Losses can occur when a country with comparative advantage in an integrated production process loses market share to others with specialised capabilities, either in the production of parts and components or in the assembly of the final product (Jones and Kierzkowski 2001; Markusen and Venables 2007).[2] Parts and components production tends to be intensive in skills and technology, while assembly is labour-intensive; therefore, the countries most at risk of losing from growth of fragmentation trade are those endowed with intermediate endowments of both unskilled labour and human capital. As parts and components trade expands, a lower-middle income country like Indonesia could see its comparative advantage in manufacturing sectors eroded by the growth of trade between specialist countries like Malaysia (supplying high-tech intermediates) and China (providing assembly services), causing it to lose investments in the second industry and not to gain them in the first. This speculation is supported by recent empirical studies showing that China's expansion has had beneficial effects on trade and FDI in upper-middle income economies, but has greatly intensified the competition for global market share and FDI with less advanced economies (Eichengreen et al. 2004; Eichengreen and Tong 2005).

A middle-income trap?

To sum up, the developing countries whose long-term growth prospects are most at risk in the current global economy are those that compete at the labour-intensive end of their manufacturing spectrum with low-income economies; have little or no complementarity with those economies as suppliers of more skill-intensive parts and components; and have either a high dependence on imported energy and raw materials, or have exhaustible natural resource wealth but lack robust institutions to manage its extraction and the disposition of the associated rents. These economies may be experiencing a variant of what the World Bank (2007) has termed the 'middle income trap', albeit one with features more specific to lower-middle income economies than to those economies (mainly in Latin America and Eastern Europe) aspiring to make the transition from middle to high income. The key challenges, however, are generically the same:

[2] As Jones and Kierzkowski (2001) put it, 'an Olympic gold winner in a mixed event, such as the decathlon … might return with no medals if the event is broken down into separate components.'

> History shows that while many countries have been able to make it from low income to middle income, relatively few have carried on to high income… A lot of complex challenges have to be met, from raising the skills and innovativeness of the labour force, to creating sophisticated financial systems, to maintaining social cohesion, to greatly reducing corruption. Without these sorts of tough policy and institutional changes, countries stay where they are, unable to bust out of middle income. (World Bank 2007)

The foregoing discussion is a reminder that mere engagement with the global economy is not a sufficient condition for sustained economic growth. Natural resource exhaustion, Dutch disease and the resource 'curse', and the emergence of competitor economies large enough to alter export prices in world markets all pose threats to growth strategies based on the pursuit of comparative advantage alone. To escape such a trap requires actions and policy decisions that dynamically 'build' comparative advantage in more skill-intensive (and more highly differentiated) activities. This is a well-trodden development path in East Asia, though of course the specific strategies by which changes in comparative advantage have been pursued vary widely.[3] The same World Bank study describes the challenge in general terms as follows:

> [C]ountries that are successfully making a transition towards high income status begin to specialize in selected areas where they are able to achieve economies of scale and technological leadership. Accompanying this change are a whole host of complex transitions, for example, substantial increases in the proportion of people with tertiary education and specialized skills, the transition from economies that largely absorb knowledge from abroad to ones that are also a source of innovation, the development of deep financial systems that provide a diverse range of services, the movement of much of the population into livable cities, among many others. At the socio-political level, successfully transitioning countries are able to maintain a certain level of social cohesion, avoiding the emergence of deep inequities of the kind that fuel social conflict and political instability and stall growth. Clean government and rule of law become the norm, while corruption becomes the exception.' (World Bank 2007: 26)

This list of conditions is clearly neither complete nor rigorous (for example, it's hard to imagine that urbanisation is anything but an endogenous response to other economic changes), but its characterisation of supply-side requirements— skills, capacity to use knowledge in creative ways, and macroeconomic stability—are widely agreed. Asia provides several examples of countries that have achieved upper-middle income status despite high inequality and deep social divisions—Malaysia is one— but none that have succeeded without overcoming these supply-side constraints. While the mix varies greatly, the combination of skilled domestic workers and new technologies (principally though not exclusively

[3] Collins and Bosworth (1999) provide an excellent overview of the mid-1990s blossoming of scholarly studies on this subject.

supplied through FDI) is common to all East Asian success stories. Motivated by this stylised fact, the next section of this paper explores possible relationships between country characteristics and the relative importance of net exports of skill-intensive products in total exports.

SKILL-INTENSIVE EXPORTS: INTERNATIONAL EVIDENCE

Is there any empirically observable relationship between an economy's endowments of productive factors and natural resources and its degree of specialisation in skill-intensive exports? There is no obvious answer to this question, and as with the empirical growth literature, there is also little clear theoretical guidance beyond that presented in highly stylised models of the kind referred to in the previous paragraphs. In this section we present an econometric exercise aimed at explaining the skill-intensity of exports in a panel of country data.

The total value of world exports of high-technology goods, according to World Development Indicators, is somewhat more than one trillion dollars. In 1999, developing countries accounted for almost sixteen per cent of the total, a share that had risen steadily to 22% by 2003, the last year for which such data are available. Nearly all the developing country exports come from a small group of countries in East/Southeast Asia and Latin America.

The UN Comtrade database provides usable export data for 103 countries (table 2); from these we can construct an unbalanced panel spanning 1980-2005. We are interested in *net* exports of high-tech goods; with the growth of parts and components trade, a country may appear to be a significant exporter of skill-intensive goods when in fact it serves merely as an assembly-line for final products whose skill-intensive inputs are sourced elsewhere. Therefore, in order to interpret the skill-intensity of exports as a measure of the skills endowment of an economy, imports of skill-intensive parts and components must also be taken into account. We construct a measure of the net skill-intensity of exports as follows. We first obtain the value of all exports in the first category shown in table 3 (high skill intensive products). We then compute the value of imports of all *intermediate* goods from the first category, where intermediates are defined principally by the use of the terms 'parts' or 'components' in the product description (the exact product codes used are shown below table 3). We then deduct the value of imports from that of exports, and divide this value by total merchandise export value to obtain the desired metric.

Figure 2 shows the resulting data for some of the most prominent skill-intensive developing-country exporters. For all countries in this group other than China and Hong Kong, the 1990s-era expansion in the export share of high-tech products has not been sustained in the new millennium. Some have seen pronounced falls in the contribution of high-tech products to total exports. In other countries, like Indonesia, net export shares have remained roughly steady since about 2000. In China, meanwhile, the net high-tech export share quadrupled between 1999 and 2005, from 9% to 36% of total merchandise exports.

We hypothesise that the net skill-intensity of exports should be higher in economies with larger relative endowments of human capital, and in economies that are hosts to relatively large FDI stocks. The role of FDI as a source of innovation and stimulant of skills-based activity in tradables sectors is well established in empirical studies (e.g. Hausmann et al. 2007). The level of a country's FDI stock is also likely to reflect macroeconomic conditions that determine the general attractiveness of a country's investment climate (Frankema and Lindblad 2005). For human capital we use the Barro and Lee (2001) measure, the percentage of the population aged 25 and over with post-secondary education.[4] Since FDI can be directed to many sectors, and in the absence of reliable data on the sectoral distribution of FDI by country and year, we make the assumption that sectoral FDI stocks in a given country are proportional to GDP shares. In the econometric analysis, therefore, we multiply initial FDI stocks in each period by the GDP share of manufacturing, in the hope that this adjustment better captures the amount of foreign capital going into this part of the economy rather than into property, mining, energy, or services such as tourism.[5]

Most contributions to the empirical resource curse literature employ the standard aggregate growth model, testing hypotheses about the effects of resource wealth on the long-run average growth rate of GDP per capita in linear regression models (e.g. Sachs and Warner 1999; 2001). Our variant on the resource curse hypothesis is one step removed from growth models, and rather than examining the resource wealth-GDP growth relationship directly, predicts instead that the net skill-intensity of exports will be lower, other things equal, in economies with relatively abundant natural resource wealth.

Finally, we also surmise that the relative strength of institutions may influence the net skill-intensity of exports, particularly in resource-rich developing economies, for the reasons given above. We use the 'law and order' variable from Transparency International's International Country Risk Guide (ICRG) database to proxy for institutional robustness.

Our options for econometric analysis are tightly constrained by data limitations that restrict us to using 5-year sub-periods of the data; with multiple observations on some countries we have a maximum of 191 observations, depending on which set of variables are used. Import data required to construct the net export measure are unavailable prior to 1985, so we have four usable 5-year periods, from 1985-2000. The countries in the data set range from low-income to high-income and span all regions of the world,

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[4] This measure does not discriminate by type of post-secondary qualification or by quality. We have been unable to obtain more detailed data with coverage adequate for a panel of countries.

[5] Obviously this adjustment is very crude: it ignores sectoral capital intensity, bundling of investments with technology or training, and many other relevant phenomena including the allocation of FDI *within* manufacturing. Some difficulties in constructing cross-country comparisons of FDI are raised in Anderson and Rand (2003). The validity of our results using this adjustment method depend on the adjusted figures being correlated with the true data.

meaning that the data set is highly heterogeneous. We attempt to control for the most obvious sources of heterogeneity with dummy variables for developing economies, time period, and world region.

We fit the data to the linear model

$$Y_{it} = a + \mathbf{b}'\mathbf{X}_{it} + \mathbf{c}'\mathbf{Z}_{it} + \mathbf{d}'\mathbf{D} + e_{it},$$

where Y_{it} is average net exports of skill-intensive goods as a share of total merchandise exports in country i and from year t to t+5, and $\mathbf{X}_{it}$ is a vector of continuous independent variables consisting of adjusted FDI stocks, human capital stocks, arable land per capita, oil reserves relative to GDP, and law and order as defined by the ICRG. We include the product of oil reserves and the law and order measure to control for possible institutional interactions with oil wealth, as discussed in section 2. The vector $\mathbf{Z}_{it}$ contains continuous variables intended to control for country-specific characteristics and includes population (a proxy for domestic market size), as well as telephone mainlines per capita (Canning and Fay 1993) and GDP per capita to capture relative sophistication in the economy not included in the measure of human capital. The vector **D** consists of dummy variables and interactions among them; we include dummies for each five-year period except 2000-05, an East Asia and Pacific regional dummy, and another for developing countries. We also use interactions of year and East Asia-Pacific dummies to account for the differential growth rate of intra-Asian trade, which has expanded far more quickly than has global trade since 1990, and in which skill-intensive trade occupies an ever-increasing share (Athukorala and Yamashita 2006). Finally, the error term e_{it} is itself a compound that we redefine according to the specific panel data estimator used.

The variables used in the econometric analysis are defined and summarised in table 4, and their sources are shown in table 5. Table 6 provides data for some Asian economies.

Estimation results

We estimate the model using OLS, fixed effects (FE) and random effects (RE) specifications, and in both static and first-order autoregressive (AR(1)) forms.[6] To save space, the full set of estimation results is

[6] There are in general no unambiguous ex ante reasons to prefer FE or random effects RE estimators, but in the current context, there is a case for using RE. The FE estimator uses only 'within' variation, i.e. variation in the dependent and explanatory variables after removing observation-specific means. In the case where much of the variation in the data is 'between', i.e., information contained in the means (across individual observations or time), the FE estimator ignores a relatively large share of the information in the data set. Moreover, because FE attenuates the variance in the regressors, measurement error imposes a greater degradation in the signal to noise ratio; hence a variable measured with error will be more likely to be biased toward zero. On the other hand, RE assumes that the independent variables are uncorrelated with the error terms. The FE estimator will be inefficient under the null hypothesis that RE is correctly specified, because it discards the information in the group means. If the error terms are correlated with the independent variables, then the RE estimator will be inconsistent. Another reason to prefer RE is that we want to include some time-invariant dummy variables because we believe these are important sources of

available in an online archive.[7] In table 6, we report four sets of RE results chosen on ex ante grounds to be the most plausible specifications (the criteria applied were relatively complete independent variable sets and a mix of static and AR(1) specifications). In each regression model shown, the dependent variable is the average value of the net skill-intensity of exports for a given 5-year period. The values of the independent variables in vector X_{it} are those in the initial year of the same 5-year period.[8]

The results vary somewhat according to model specification, but in most instances the major hypotheses find statistically significant support.[9] Larger relative endowments of adjusted FDI are strongly and significantly associated with higher shares of skill-intensive exports. Similarly, the relationship between human capital stocks and skill-intensive exports is robust and positive. The results indicate that countries with richer endowments of skills and complementary resources, such as the technologies, market networks and managerial inputs that are typically associated with FDI, perform more strongly in the skill-intensity race.

Natural resource wealth has a negative association with skill-intensity of exports. Larger relative endowments of arable land are associated with lower skill-intensity, though not significantly so in the two static models. Similarly, oil reserves relative to GDP have a negative and (in 3 out of 4 regressions) significant association with the dependent variable. These results are consistent with the Dutch disease component of the natural resource curse argument, that resource wealth undermines an economy's capacity to specialise in more skill-intensive products. However, the law and order variable itself, and its interaction with oil reserves, is statistically insignificant in all models.

Among the conditioning variables in vector **Z**, population and GDP per capita contribute nothing significant to the observed variation in skill-intensive export shares. The size of the domestic economy seems not to be an important factor once other characteristics have been taken into account. The intensity of telephone mainlines, included in the third and fourth estimation models, does carry explanatory power, serving (it seems) as a substitute for the basic differences between developing and high-income economies. The coefficient estimates on the developing country dummy lose significance when telephone line density is added to the set of independent variables.

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explanatory power and as such will help us to get a better prediction for Southeast Asian countries' net skill-export intensity. Accordingly, we use the Hausmann test; for the fully specified static model the null is not rejected, so we prefer the more efficient RE estimator.

[7] URL: http://www.aae.wisc.edu/coxhead/papers/coxhead-li-indonesia/resultstables.xls

[8] Empirically, there are two ways to control for an Indonesia-specific effect. We can include a dummy variable for Indonesia into all of our regressions; doing so barely changes our estimation or counterfactual analysis results (for these results see the URL cited in footnote g). Alternatively, in our counterfactual analysis (section 4 of this paper), we take the difference between Indonesia's actual net skill-intensive export share and our prediction of that share as a country-specific effect that varies over time. See subsequent discussion in the text.

[9] We are grateful to an anonymous referee for suggested improvements in the model specification.

The East Asia and Pacific dummy is strongly and significantly positive in all models, underlining the well-known special characteristics of regional production structure and intra-regional trade.

Table 8 shows the principal estimates in elasticity form. A ten per cent increase in FDI stocks is associated with approximately a 1.8% higher skill-intensive export share. A 10% greater accumulation of skilled labour would raise the same share by one quarter to one third. Finally, 10% more of either measure of natural resource wealth is associated with approximately a 1.5% lower skilled export share.

These results are suggestive of three distinct policy-relevant stories relating to the expansion of skill-intensive exports. First, investments in human capital pay dividends in the acquisition of skills-based comparative advantage for all economies. To the extent that expected returns on human capital investments are subject to policy influences (for example, through macroeconomic stability, or the provision of complementary infrastructure), there is a role for government in helping ensure that private investment decisions are sufficient to match the socially optimal growth in demand.

Second, there is a strong positive association between playing host to tradable-sector FDI and the expansion of skill-intensive industries (Sjöholm 1999; Blalock and Gertler 2004; Takii 2005). As with human capital, there are clear policy linkages to the rate of FDI accumulation, and these are likely to operate through both macroeconomic policy and microeconomic (sectoral) policies, as well as through the design, implementation and enforcement of the regulatory regime.[10]

Third, our results thus support a specialised version of the theoretical Dutch disease prediction: after controlling for more industry-specific endowments of productive assets, we find that resource-abundant countries occupy smaller niches of comparative advantage where skill-intensive products are concerned. An implication is that increased export demand for agricultural and natural resource exports may stimulate aggregate economic growth, but this growth will not necessarily lead to the expansion of skills-based manufacturing output.

INDONESIA IN INTERNATIONAL AND REGIONAL CONTEXT

In section 2 we identified some sources of apparent vulnerability to a middle-income trap: the resource curse and associated loss of capacity in tradable manufacturing sectors; loss of comparative advantage by labour-intensive manufacturing industries facing intensified global competition; and foregone opportunities for growth-enhancing spillovers from skill-intensive industries. Middle-income countries in

[10] Several recent studies of Indonesian growth also identify important supply-side constraints, including labour market regulations, infrastructural inadequacies, and an unstable legal and political setting (e.g. Athukorala 2006; Ramsli and Ramstetter 2007). Such considerations undoubtedly apply widely in the developing world. Our econometric analysis can't capture such effects for a panel of countries without the addition of much more (and more detailed) data. It is likely that the FDI measure in our data set reflects at least part of the effect of this set of constraints, as all must serve to discourage inward FDI flows in manufacturing sectors.

Southeast Asia are relatively resource-rich but—thanks to the post-Plaza Accord boom in outward FDI from Japan and East Asia and the global FDI boom of the early 1990s—have evolved manufacturing sectors that are advanced by the standards of the developing world.

Among these developing economies, Indonesia has lagged in terms of investments associated with productivity growth and progress up the technological ladder (Thee 2005; Frankema and Lindblad 2006). Its policies toward FDI have reflected considerable ambivalence. Early New Order era policies offered limited encouragement to FDI in energy and mining, as well as tariff-jumping moves into import-substituting manufacturing sectors. Liberalisation of trade and investment policies in the 1980s and early 1990s was significant but short-lived. From around 1993 it was subject to both 'mixed signals' and the onset of 'deregulation fatigue' (Azis 1998); in the late New Order era the criteria for investment policy reform seemed to be derived at least as much from a domestic political agenda as from the search for economic efficiency and growth—at least prior to major reforms adopted in 1994 (Thee 2006). Perhaps as a result, Indonesia's record of total factor productivity growth in the critical early development decades 1975-95 was respectable in an absolute sense, but not relative to Asian trade partners and potential competitors (Timmer 1999; Collins and Bosworth 1999).[11]

Relatively low TFP growth can also be understood in the context of Indonesia's transformation, during this period, from an extremely poor, rural and agrarian economy into the ranks of the lower middle income countries, a tremendous (and tremendously rapid) transformation based initially on exploitation of its abundant endowments of natural resources, and increasingly after the mid-1980s, on unskilled labour in export-oriented manufacturing. In the post-crisis era, which coincides with the rise of China both as a global exporter of many of the same labour-intensive products exported by Indonesia, and as a market for skill-intensive inputs to their production, the principal reasons for Indonesia's low performance in skills-based industries are different. These have been identified and discussed in the specific contexts of Indonesian history, politics and economics by Bird and Hill (2006), who offer three explanations: a relatively low policy weight applied to skills upgrading relative to the need to reestablish macroeconomic stability and an investment-friendly business climate; lack of an adequate educational and training infrastructure for the production of skilled workers; and the 'fundamental discontinuity' of the crisis itself and of the subsequent political upheavals and transition to democracy. To these three reasons we may speculatively add two more. The first of these is the intersectoral effect of global commodity market booms that have driven prices of some of Indonesia's key natural resource, agricultural and horticultural exports to all-time highs (World Bank 2007). While the impact of these sustained price shocks has yet to be formally tested, their effects on the real exchange rate, and perhaps

[11] 'Indonesian manufacturing is steadily climbing the technology ladder. However, global levels of TFP have also improved over the past decades. Hence, when viewed from an international perspective, Indonesia's ascent resembles a standstill on the global escalator' (Timmer 1999: 93).

even on domestic factor prices—the two principal channels through which such booms are likely to lower profitability in skills-based manufacturing—is likely to have been substantial. Second, it is impossible to ignore the potential impact of China's expansion on Indonesia's tradable manufacturing sectors in general, and on labour-intensive and skill-intensive industries in particular. Competition with China has become intense at the labour-intensive end (Coxhead 2007; Eichengreen at al. 2004); whether Indonesia has the capacity or cost advantages to exploit complementarities in parts and components trade at the skill-intensive end remains in doubt (Thee 2005; Mulapruk and Coxhead 2005; Porter et al. 2006).

Among the major Asian economies, value-added per worker in Indonesian manufacturing industries is not high (figure 3). Indonesia's labour productivity, by this measure, is lower than in China both in the aggregate, and in every product division except the major parts and components category of 'office, accounting and computing machinery'. In this category, however, productivity per worker in Indonesia is roughly matched by several other lower-middle income economies in the region (Thailand, Philippines and India) and is much lower than in neighboring Malaysia. At this level of aggregation at least, there is no evidence of a niche market advantage.

As already seen in figure 2, Indonesia also shares with other middle-income economies a declining growth rate of skill-intensive exports in relation to total exports (China is the exception). In the 1990s, Indonesia's exports of goods classified as 'high-tech' in the World Development Indicators rose from a negligible component of manufacturing exports to a share just above 16%—and most of this was in reality the labour-intensive assembly of consumer electronics. Since 2000, moreover, that share has not grown (figure 4)—in spite of a near linear rate of expansion in the *dollar value* of this export category. In fact, as the figure shows, the Indonesian data fit very well to a piecewise linear spline function in which the rate of expansion of the share of exports classed as high-tech in 2001-05 is only about one-third that of the years 1989-2000.[12]

These data are complementary with direct (though subjective) measures of high-tech capacity collected by the Georgia Tech High-Tech Indicators Project (Porter et al. 2006). On measures of socio-economic and technological infrastructure, national policy orientation, and productive capacity in high-tech industries, Indonesia is ranked at or near the bottom of the group of 33 nations surveyed. Indonesia was ranked 32/33 in expert opinions of current high-tech production capacity (2005) and 28/33 in opinions of future capability. Interestingly, four of the countries ranked below Indonesia in the latter assessment are also major resource exporters (Mexico, Venezuela, Argentina, Russia); the remaining low rank was occupied by the Philippines. It is safe to assert from these comparisons that Indonesia is at best a marginal player in the global high-tech export market.

How different would Indonesia's skill-intensive export record look if its past policies had resulted in its attaining human capital and FDI endowments comparable with its regional neighbours? As of 2000,

[12] For details of estimation, see URL in footnote 7.

only 5% of Indonesians over the age of 25 were recorded as having completed *any* kind of post-secondary education, compared with 7.5% in Malaysia and 11.3% in Thailand (table 6). Indonesia's educational attainment figures are only slightly higher than those for China and Vietnam, regional economies normally considered to have progressed much less far along the development path. On FDI, also, Indonesia at best matches most of its regional neighbours. FDI as a percentage of GDP was 2.7% in 2000, equivalent to Thailand and the Philippines, but far behind Malaysia and even Vietnam.

In order to locate the Indonesian experience in regional context we now conduct two counterfactual exercises based on the estimates in table 7. Such procedures are of course risky; every country is unique. Nonetheless there is value in drawing comparisons, if only for the purpose of sharpening debate over what it is that makes each country different, and what might be done, where desired, to alter specific country features in ways that could lead to more promising development outcomes.

As already discussed, the estimates reported in table 7 are based on a heterogeneous group of countries, and our regressions explain only about 63% of the observed variation in that data set. There is no especially strong reason to expect that the model will yield a good prediction of the dependent variable for any given country in the data set. It is instructive, therefore, to consider the data in table 9. For each country and five-year time period, the first column in this table shows the value of the net skill-intensive export share in total merchandise exports. For Indonesia, for example, gross skill-intensive exports were worth slightly less than corresponding imports in 1986-90; thereafter, the domestic industry expanded to the point where, by 2000-05, it accounted in net terms for 13% of merchandise exports. This was a huge expansion, particularly given rapid growth in Indonesia's total exports by value over the same period, but is still a figure very much lower than in the two most directly comparable Southeast Asian countries, data for which are also shown in the table.

The second column in the table shows country-specific predictions of the dependent variable, obtained by fitting country FDI and human capital data to the coefficient estimates in table 7 and then averaging the results over the four models. For Malaysia and Thailand, these average predictions fit the actual data surprisingly well, considering the heterogeneity of the underlying data from which the coefficient estimates were obtained. The model underpredicts Malaysia's skill-intensive export share until 1995, matches it almost exactly in the late 1990s, then overpredicts in the post-crisis years after 2000. For Thailand, the model likewise matches actual export data until 1995, but overpredicts in the post-crisis era.

For Indonesia, the model *consistently* overpredicts skilled exports by a very large margin, even after controlling for differences in GDP per capita and natural resource wealth and allowing for geographical location in the dynamic Asia-Pacific grouping. Based on our panel data estimates, Indonesia's skill-intensive export share by the mid-1990s should have been about 25%: three times the observed share in 1995-2000, and twice the observed share in 2000-05. Put another way, the model predicts that in 2000-05, Indonesia should have had a skill-intensive export share roughly comparable to that enjoyed by Malaysia

in 1985-90, or Thailand in 1995-2000. Its actual share, however, corresponds instead to that of Thailand in 1985-90, and is half that of Malaysia in 1985-90.

These comparisons are based on within-country predictions from the econometric model, but they also suggest an alternative approach. What if Indonesia, due to different policies and conditions in earlier years, had achieved levels of FDI and human capital corresponding more closely to those of its regional neighbors? Table 10 provides indicative answers by generating predicted values of Indonesia's skill-intensive export share using Indonesian data for all but FDI and human capital, values of which are then supplied from the neighboring countries. Suppose, for example, that Indonesia in 1985-90 had Thailand's levels of FDI and human capital; how different would its skill-intensive export share have been? From our computations, the answer for this period is 'not much': net skill-intensive exports were very low in both countries (and negative in Indonesia) during this period. But by the final decade of the data, the difference between Thai and Indonesian performance is revealed in an predicted gap of 23%–29%; by 2000–05, if Indonesia had Thai levels of FDI and human capital, its skill-intensive export share would have been four percentage points higher (a 29% difference). This counterfactual is consistent with data on the structure of industrial production and trade, factor productivity, R&D expenditures, and the technology content of FDI that suggest that Indonesia 'lags behind Thailand by about ten years, or slightly more' (Frankema and Lindblad 2006).

Malaysia provides a more stark contrast. Malaysian levels of FDI and human capital investments, if replicated in Indonesia, could have helped that country increase the contribution of its skill-intensive exports to total merchandise exports by half to two-thirds. If Indonesia had Malaysian levels of FDI and human capital in 2000–05, the counterfactual indicates that skill-intensive manufactures would have accounted for 22% of exports rather than the 13% actually recorded.

Table 10 also shows a breakdown of the contributions of human capital and FDI differences to the total difference in each comparison. This reveals that Thailand and Malaysia each differ from Indonesia in specific ways. In Malaysia, most of the difference comes from FDI; in Thailand, it comes mainly from human capital, at least until 2000. This suggests that although improvements in both FDI and human capital accumulation are necessary, there is likely to be more than one path leading to the growth of a more skill-intensive manufacturing sector.

The foregoing are static predictions obtained simply by replacing the Indonesian values of FDI and human capital by those from the other two countries within any given period of the data. As such, they ignore the dynamic effects of investment decisions on the skill-intensity export share in subsequent periods. Yet growth dynamics derived from learning by doing and other phenomena with inherent intertemporal spillovers are at the heart of the models by van Wijnbergen and others discussed in section 2. In those models, growth can be halted by a resource boom that undercuts profitability in manufacturing sectors; the goal of long-run welfare maximisation motivates interventions aimed at maintaining manufacturing sector profitability for the duration of the boom. The analog, in our analysis,

is that the goal of sustaining and increasing output in skill-intensive sectors, as a means to avoid the middle-income trap, creates a mandate for interventions that promote FDI and human capital accumulation.

To reiterate, the comparisons presented in this section are *ceteris paribus* exercises based on parameter estimates from international panel data. It would be erroneous to dwell too much on the exact numbers generated by these counterfactuals. Their real value lies in the questions they inspire. What does Indonesia's relative underperformance in this area imply for recent, current and future growth? What policies should have been, or should now be adopted to help ensure sustained economic growth? More ambitiously, what challenges does Indonesia's apparent standstill on the *regional* escalator (to paraphrase Timmer 1999) of technology and productivity growth pose for its ambitions to climb out from lower-middle income status to a level of living at which poverty alleviation and other fundamental development challenges are no longer the paramount development policy concerns?

DISCUSSION AND CONCLUSIONS

Lessons of the past

Indonesia, in 1970–96, was one of only a few resource-rich developing economies clearly to escape the 'curse' of natural resource wealth, because part of the oil revenue windfall was used for productivity-enhancing investments in other tradable sectors, notably agriculture and manufacturing (Pinto 1987; Coxhead 2007). Part of this achievement may have been merely good fortune due to exogenous events, for example the post-Plaza Accord outflow of FDI from Japan and North Asia, and the search by East Asian garment and textile producers for production bases with unfulfilled MFA export quotas (Hill 1991). But equally clearly, part of the growth boom was due to timely policy reforms during and after the oil boom years. Current development policy, both in Indonesia and elsewhere in the developing world, can still derive lessons from that experience—especially in the current energy and resource price surge.

Given this experience, it seems ironic that Indonesia now faces the possibility of a long-run downturn in growth, based on diminished prospects for labour-intensive manufacturing exports (Takii and Ramstetter 2007), lack of progress in skill-intensive relative to total exports, and the perils of excessive concentration on natural resource sectors. As in earlier years, the reasons for a possible downturn once again derive from a mix of external and domestic factors. For manufacturing sectors, external factors now include competition from China and other labour-abundant low-income countries, plus the macroeconomic and trade policy decisions of large economies like the US and the EU. But as in the earlier oil boom era, Indonesia can and should now be acting now to ensure that its capacity for manufacturing sector growth is not diminished by Dutch disease. Given the country's continuing abundance of low-skill labour, this certainly applies to labour-intensive manufacturing sectors such as garments and footwear. But to ensure the maximum gains, it is vital that policy also facilitate and accelerate the transformation of industry from its current low skill-intensity to a higher and more

dynamic configuration (Thee 2005). Though Indonesia is currently a marginal player in global high-tech markets (Porter et al. 2006), these markets are expanding very rapidly. There is scope to develop comparative advantage in niche markets in this area, if steps are taken to ensure that the economic and institutional conditions for productive investments are in place.

One very important reason to intervene in favour of a more skills-intensive pattern of growth has to do with dimming prospects for future natural resource-based growth. The resource curse literature dwells exclusively on the consequences of natural resource abundance for long-term economic growth, and this is the theme we have pursued also in this paper. In the Indonesian case, however, the long-term survival of key resource-based industries is also in serious doubt. The country's oil and gas reserves are nearing exhaustion, and its old-growth forests and fisheries are being rapidly depleted (Resosudarmo 2005). According to the World Development Indicators, Indonesia's 'genuine' savings rate, taking account of these and related environmental trends as well as net additions to the stock of human capital, is far below its measured savings rate based on the conventional System of National Accounts. Slower growth due to reliance on natural resources—the primary concern of the resource curse literature—is one issue; the prospect of structural discontinuities based on the exhaustion of resource stocks and the industries they support is quite another, and must soon be confronted in Indonesia. A shift toward production based on renewable resources, most prominently human capital, is not merely desirable for long-run growth; it is also necessary.

Implications for development policy

After the sustained growth and structural transformation of the New Order era, Indonesia is once again at a development policy crossroads. The development challenges facing the country at present are similar to those of the late 1960s-1980s in that big interventions are required to provide critical public goods (institutions and infrastructure) and to overcome coordination failures (education, skills acquisition, health care). But the specific challenges are of course different, as should be expected not only from altered domestic and international conditions, but also from the qualitative differences between the prerequisites for the transition from low-income to lower-middle-income economy, and those for the subsequent transition to upper-middle income or beyond.

Indonesia's middle-income regional neighbours, while themselves hardly paragons of good governance or policy, have nonetheless managed to achieve and sustain faster transitions away from resource dependence and toward skills and technology-intensive production. They have achieved this while facing more or less the same international conditions confronted by Indonesia. Though each country's story is unique, key differences with Indonesia appear to be sustained higher rates of investment in education, more open and stable FDI policies, and a more favourable policy and institutional setting (Frankema and Lindblad 2006). Indonesia's transformation may also have been

hampered, especially in the past half-decade, by a higher level of vulnerability to the structural effects of high energy and resource prices.

Just as rural development programs funded by oil revenues reduced chronic poverty and hastened Indonesia's earlier transformation to middle-income status, it is now time to direct the proceeds from the current resource export boom toward an industrial transformation that accelerates diversification away from natural resource and labour-intensive industries. This can be achieved, up to a point at least, without the risk of 'picking winners,' by investing in generalised rather than specialised capacity: human capital, R&D and entrepreneurial capacity, and a policy and institutional environment in which the country is viewed as a more favourable host for manufacturing sector FDI. Inconsistencies and unpredictability in policies on FDI (Takii and Ramstetter 2007; Manning and Roesad 2006) must be reduced, and complementary policies supporting the expansion of the skilled labour force are urgently needed. A firm and sustained commitment to policy innovations in these areas improves the odds that Indonesia can take advantage of the rapid growth and integration of Asian parts and components trade, the dynamism of neighbouring economies, and the internal productivity dynamics of skills-based industries to reduce dependence on exhaustible natural resource and low-skilled labour, lift itself out of the lowest rank of high-tech exporters, and establish skills-based industries as leading contributors to its future economic growth.

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Table 1: Revealed comparative advantage measures for labour-intensive product categories (2000-04 average)

Product category	SITC Code	Indonesia	China	Malaysia	Philippines	Thailand	Vietnam
Travel goods, handbags etc	83	0.87	5.12	0.06	2.48	2.00	4.33
Clothing and accessories	84	2.28	4.12	0.68	2.15	1.61	3.88
Footwear	85	3.02	4.59	0.13	0.24	1.51	13.42

Note: RCA values greater than 1 indicate comparative advantage.

Source: Coxhead (2007).

Table 2: Countries in the data set

Region	Countries		Region	Countries	
Sub-Saharan Africa	Benin	Mauritius	South Asia	Bangladesh	Pakistan
	Botswana	Mozambique		India	Sri Lanka
	Cameroon	Niger		Nepal	
	C. Af. Rep.	Senegal			
	Congo	South Africa	ME & N Africa	Algeria	Jordan
	Ethiopia	Sudan		Bahrain	Kuwait
	Gambia	Swaziland		Cyprus	Malta
	Ghana	Togo		Egypt	Syria
	Kenya	Uganda		Iran	Tunisia
	Lesotho	Zambia		Israel	Yemen
	Malawi	Zimbabwe			
	Mali		Other Indust-	Australia	Italy
			rialized Econs	Austria	Netherlands
Lat. Am. & Carib.	Argentina	Guyana		Belgium	New Zealand
	Barbados	Honduras		Canada	Norway
	Bolivia	Jamaica		Denmark	Portugal
	Brazil	Mexico		Finland	Spain
	Chile	Nicaragua		France	Sweden
	Colombia	Panama		Germany	Switzerland
	Costa Rica	Paraguay		Greece	Turkey
	Cuba	Peru		Iceland	UK
	Dom. Rep.	Trin. & Tob.		Ireland	United States
	Ecuador	Uruguay			
	El Salvador	Venezuela	E.Europe &	Russia	Lithuania
	Guatemala		Former USSR	Bulgaria	Poland
				Croatia	Romania
E. Asia & Pacific	China	Malaysia		Czech Rep.	Slovakia
	Fiji	PNG		Hungary	
	Hong Kong	Philippines			
	Indonesia	Singapore			
	Japan	Thailand			
	Korea	Vietnam			

Table 3: Products used in calculating skill-intensity of exports

	Product by Skill Intensity	SITC code
High	Aircraft and spacecraft	95
	Pharmaceuticals	54
	Office, accounting and computing machinery	75, 87,88
	Radio, TV and communications equipment	76,77
	Medical, precision and optical instruments	87,88
Medium-High	Other electrical machinery and apparatus	81
	Motor vehicles, trailers and semi-trailers	71
	Chemicals excl. pharmaceuticals	51,52,53,55--59
	Railroad equipment and other transport equip.	78,79
	Other machinery and equipment	72,73,74
Medium-Low	Coke, refined petroleum product and nuclear fuel	23, 32--35
	Rubber and plastics products	23, 62
	Other non-metallic mineral products	28
	Building and repairing of ships and boats	
	Basic metals	67, 68
	Fabricated metal products, excl. machinery	66, 69, 96, 97
Low	Other manufacturing and recycling	82, 89
	Wood, pulp, paper and printed products	24, 25, 63, 64,
	Food products, beverages and tobacco	00--12, 22, 29, 41, 42
	Textiles, textile products, leather and footwear	21, 26, 61, 65, 83, 84, 85

Notes:
1. Total merchandise export value is sum of a country's total merchandise exports to the rest of the world, using SITC codes from 00—97.

2. Intermediate goods from the first category:
HS-1992 codes: 8503, 850490, 850690, 850790, 850870, 850990, 851090, 851190, 851290, 851390, 851490, 851590, 851690, 851770, 851890, 8522, 8529, 853190, 853290, 853390, 8538, 853990, 854091, 854190, 854390, 8803, 880400, 9002, 900390, 900590, 900691, 900699, 900791,900792, 900890, 901090, 901190, 901290, 901390, 901490, 901590, 901790, 901811, 901819, 901819, 901820, 901831, 901890, 902290, 902490, 902590, 902690, 902790, 902890, 902990, 903090, 903190, 903290, 903300, 911190, 9114, 9209, 9305, 930690, 930700.

Table 4: Summary statistics of continuous variables

Variable	Unit	Mean	Std. Dev	Min	Max	Obs	Count-ries	Ave. obs
Net skill intensity of exports	share of exports	0.09	0.15	-0.35	0.63	269	103	2.61
FDI stock	share of GDP	0.03	0.06	-0.01	0.93	380	101	3.82
Arable land	ha/person	0.30	0.38	0.00	3.00	401	105	3.82
Oil reserves	share of GDP	1.54	3.96	0.00	28.84	241	90	2.68
Post-secondary education	share of pop'n	0.10	0.09	0.00	0.53	397	105	3.78
Law and order	Low=0, high= 6	3.90	1.56	0.00	6.00	322	97	3.32
Population	billion	0.05	0.16	0.00	1.26	406	106	3.83
Telephone mainlines	# per 100 person	16	19	0.02	76	526	106	4.96
GDP per capita	year 2000 dollars	7793	9481	111	37165	393	104	3.78

Note: Oil reserves data are not available for all countries and years. Missing values were computed as follows:
1) Obtain oil reserves data from World Resource Institute, oil export data from UN Comtrade.
2) Regress of oil reserves data on oil exports by country and year.
3) Generate missing oil reserves data by prediction based on oil exports, where oil exports are calculated from category 2709 of HS1992 (Petroleum oils and oils obtained from bituminous minerals, crude).
Full details of this computation are available from the authors on request.

Table 5: Data sources

Variable	Source
FDI inflow	World Development Indicators Online
Public Spending	World Development Indicators Online
Net skill intensity of exports	Calculated from UN Comtrade
Post-secondary education share	Barro and Lee (2000)
Law and order	PRS: International Country Risk Guide
Arable land	World Development Indicators Online
Oil reserves	World Resources Institute: http://earthtrends.wri.org/

Table 6: Economic indicators: selected Asia and Pacific economies

	Year	GDP PC (constant 2000 US$)	GDP PC, PPP curr intl $	Oil reserves (bn t/GDP)	Arable land (ha pc)	Post-sec education (% pop. over 25)	High tech export share	FDI as % GDP
China	1980	186	418	2.58	0.11	1	..	0.03
	1990	392	1,326	1.02	0.09	2	0.10	0.98
	1995	658	2,514	0.37	0.09	2.2	0.19	4.92
	2000	949	3,939	0.40	0.08	2.7	0.29	3.20
India	1980	223	629	0.54	0.24	2.5	0.04	0.04
	1990	317	1,351	0.40	0.19	4.1	0.05	0.07
	1995	372	1,790	0.25	0.17	4.5	0.05	0.60
	2000	453	2,364	0.31	0.16	4.8	0.06	0.78
Indonesia	1980	397	777	5.42	0.12	0.8	0.01	0.38
	1990	612	1,814	1.07	0.11	2.3	0.01	0.96
	1995	827	2,764	0.40	0.09	3.6	0.07	2.15
	2000	800	2,904	0.83	0.10	5	0.15	2.72
Korea	1980	3,221	2,581	n.a.	0.05	8.9	0.14	0.01
	1990	6,615	8,008	0.00	0.05	13.4	0.27	0.30
	1995	9,159	12,514	0.00	0.04	21.1	0.35	0.34
	2000	10,884	16,149	0.00	0.04	25.8	0.39	1.81
Malaysia	1980	1,848	2,178	2.63	0.07	1.4	0.10	3.75
	1990	2,547	4,536	1.83	0.10	2.8	0.32	5.30
	1995	3,510	7,054	0.95	0.09	6.8	0.50	4.70
	2000	3,927	8,570	1.34	0.08	7.5	0.61	4.19
Philippines	1980	983	2,149		0.11	15.2	0.02	-0.33
	1990	914	3,021		0.09	18.7	0.12	1.20
	1995	909	3,390	0.00	0.08	20.4	0.21	1.99
	2000	995	4,030	0.00	0.07	22.2	0.74	2.97
Singapore	1980	9,056	4,993		0.00	3.4	0.19	10.53
	1990	14,674	12,227	0.00	0.00	4.7	0.44	15.13
	1995	19,370	18,214	0.00	0.00	7.6	0.60	13.72
	2000	23,077	23,563	0.00	0.00	10.6	0.64	17.77
Thailand	1980	804	1,374	0.00	0.36	2.9	0.06	0.59
	1990	1,452	3,749	0.07	0.32	7.8	0.20	2.86
	1995	2,057	5,993	0.03	0.29	9.4	0.29	1.23
	2000	1,998	6,319	0.11	0.26	11.3	0.36	2.74
Vietnam	1980	..	..		0.11			..
	1990	227	940		0.08			2.78
	1995	305	1,428	1.77	0.07			8.59
	2000	397	2,016	6.11	0.08	2.6	0.07	4.16

Sources: See Table 5.

Table 7: Estimation results

Variable/Method	RE	RE	RE/AR(1)	RE/AR(1)
Adjusted FDI stock	0.695***	0.506***	0.546***	0.550***
	(0.1356)	(0.1306)	(0.1155)	(0.1131)
Arable land per capita	-0.035	-0.037	-0.050**	-0.047**
	(0.0281)	(0.0262)	(0.0192)	(0.0188)
Oil reserves	-0.009	-0.010*	-0.010*	-0.013**
	(0.0069)	(0.0063)	(0.0058)	(0.0057)
Post secondary education share	0.223*	0.146	0.329***	0.245**
	(0.1256)	(0.1226)	(0.1153)	(0.1145)
Law & order	-0.000	-0.005	-0.002	-0.007
	(0.0050)	(0.0046)	(0.0051)	(0.0057)
Law & order * Oil reserves	0.001	0.002	0.002	0.002
	(0.0017)	(0.0046)	(0.0013)	(0.0013)
Population			-0.010	-0.025
			(0.0482)	(0.0479)
Phone lines per 000 pop.			0.003***	0.003***
			(0.0009)	(0.0010)
GDP per capita		0.002		0.002
		(0.0018)		(0.0018)
Developing country = 1	-0.084***	-0.069*	0.018	0.040
	(0.0285)	(0.0386)	(0.0367)	(0.0380)
East Asia & Pacific = 1	0.196***	0.218***	0.179***	0.194***
	(0.0310)	(0.0297)	(0.0233)	(0.0286)
1985-90 = 1	-0.057***	-0.005	-0.020	0.013
	(0.0184)	(0.0213)	(0.0199)	(0.0275)
1990-95 = 1	-0.013	-0.005	0.010	0.014
	(0.0108)	(0.0101)	(0.0113)	(0.0122)
1995-2000 = 1	0.003	0.000	0.021**	0.019**
	(0.0083)	(0.0076)	(0.0088)	(0.0088)
(1985-90)*East Asia & Pacific =1		-0.132***		-0.063
		(0.0303)		(0.0423)
(1990-95)*East Asia & Pacific =1		-0.072***		-0.017
		(0.0189)		(0.0265)
(1995-2000)*East Asia & Pacific =1		0.009		0.043**
		(0.0172)		(0.0188)
Observations	160	160	160	160
Groups	76	76	76	76
R-square				
within	0.4646	0.6716	0.4528	0.5643
between	0.6322	0.6315	0.6810	0.6890
overall	0.6087	0.6282	0.6338	0.6567

Note: RE: random effects estimator; AR(1): first-order autoregressive error structure.
Standard error in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 8: Elasticities of the estimates at sample means

Variable/Method	RE	RE	RE/AR(1)	RE/AR(1)
Adjusted FDI stock	0.2315***	0.1688***	0.1819***	0.1834***
Arable land per capita	-0.1144	-0.1200	-0.1617**	-0.1529**
Oil reserves	-0.1498	-0.1686*	-0.1709*	-0.2092**
Post secondary education share	0.2461*	0.1616	0.3634***	0.2712**
Law & order	-0.0132	-0.2236	-0.1015	-0.3076
Law & order * Oil reserves	0.0860	0.1024	0.1151	0.1478
Population			-0.0060	-0.0145
Telephone lines per 000 pop.			0.4540***	0.4658***
GDP per capita		0.1708		0.1725

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 9: Actual and predicted skill-intensive export shares, developing SE Asia

	Period	Actual share	Average prediction*
Indonesia	1985-1990	-0.007	0.112
	1990-1995	0.023	0.179
	1995-2000	0.077	0.244
	2000-2005	0.132	0.258
Malaysia	1985-1990	0.240	0.219
	1990-1995	0.349	0.312
	1995-2000	0.496	0.482
	2000-2005	0.521	0.573
Thailand	1985-1990	0.131	0.141
	1990-1995	0.196	0.215
	1995-2000	0.297	0.311
	2000-2005	0.307	0.363

* Average computed from the results of four regression models shown in Table 7.

Table 10: Skill-intensive export share predictions for Indonesia using regional FDI and human capital data

Period	Actual	Counterfactual with data from	
	Indonesia	Thailand	Malaysia
		Total	
1986-90	-0.007	0.004	0.016
Difference (%)		161.27%	345.80%
		Due to human capital:	
		0.004	-0.003
share of total difference (%)		92.42%	-20.41%
		Due to FDI:	
		-0.006	0.013
share of total difference (%)		-155.63%	79.73%
		Total	
1990-95	0.023	0.042	0.048
Difference (%)		81.95%	106.88%
		Due to human capital:	
		0.036	0.024
share (%)		68.81%	4.80%
		Due to FDI:	
		0.029	0.046
share (%)		31.19%	95.20%
		Total	
1995-2000	0.077	0.094	0.119
Difference (%)		22.99%	55.31%
		Due to human capital:	
		0.090	0.084
share (%)		77.54%	17.78%
		Due to FDI:	
		0.081	0.112
share (%)		22.46%	82.22%
		Total	
2000-2005	0.132	0.170	0.223
Difference (%)		28.68%	69.21%
		Due to human capital:	
		0.147	0.138
share (%)		39.26%	6.46%
		Due to FDI:	
		0.155	0.217
share (%)		60.74%	93.54%

Source: As for Table 9.

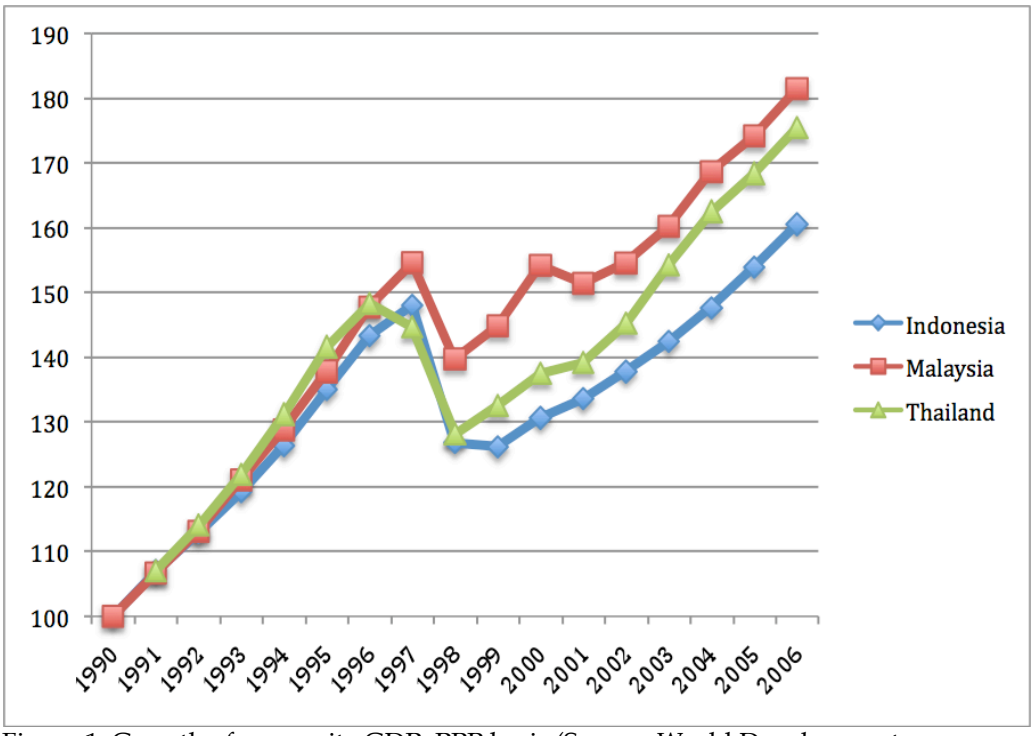

Figure 1: Growth of per capita GDP, PPP basis (Source: World Development Indicators Online).

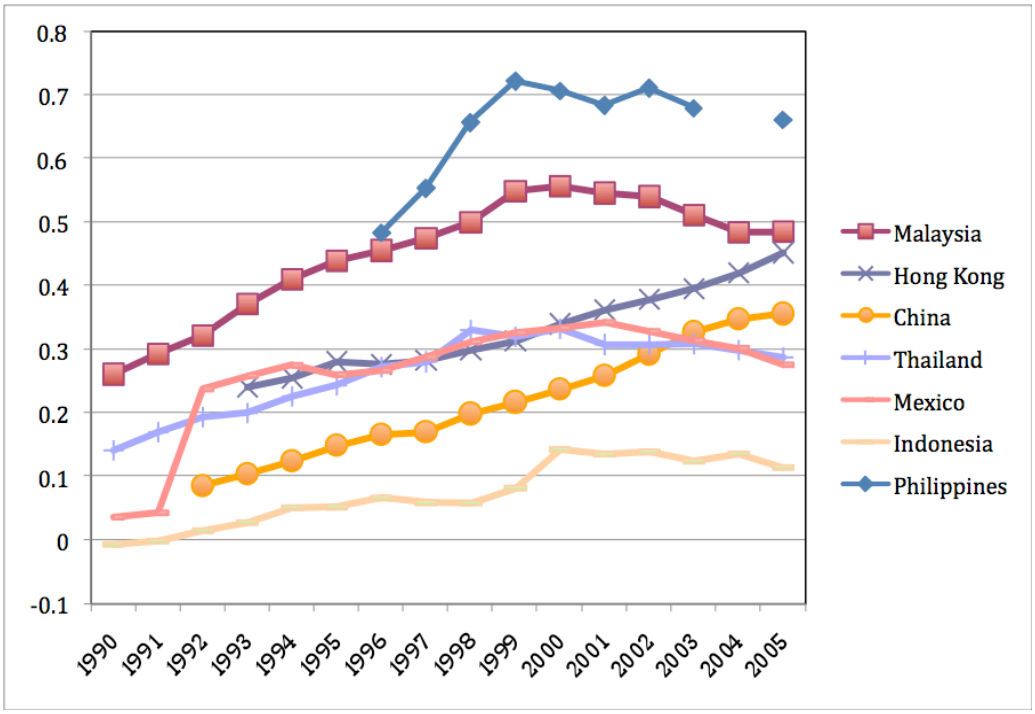

Figure 2: Net high-tech exports as share of total merchandise exports, selected countries (Source: authors' computations from Comtrade data).

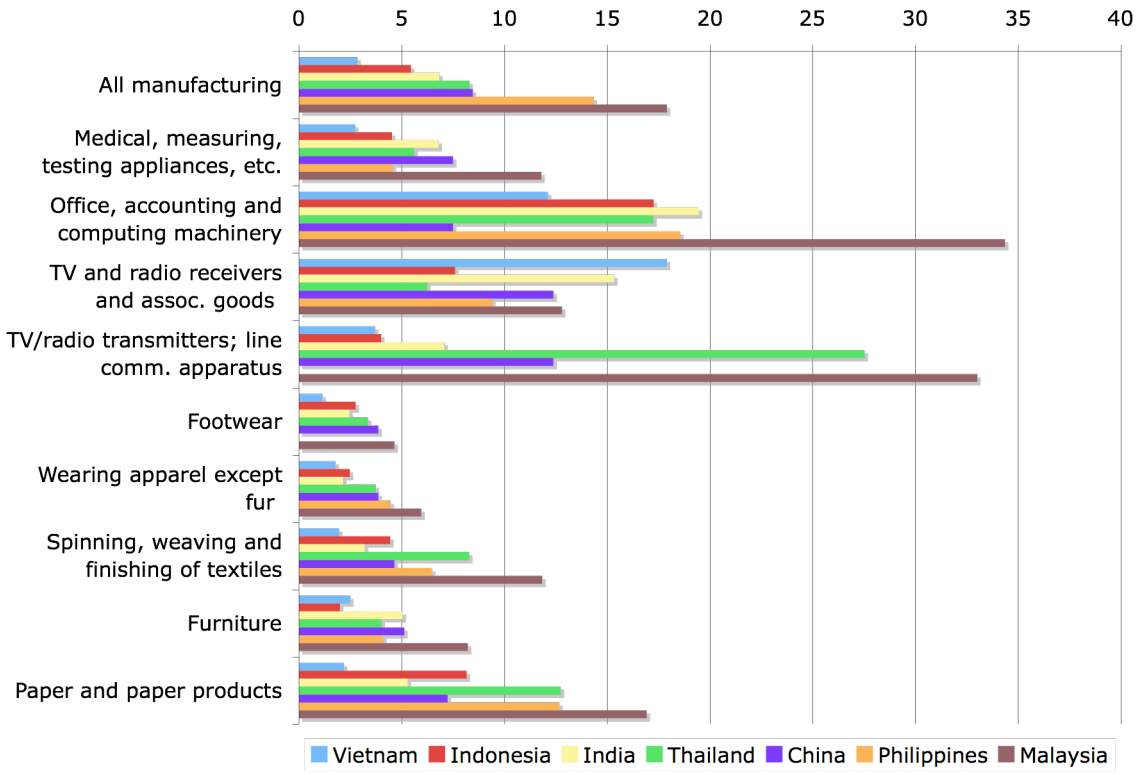

Figure 3: Manufacturing value-added per worker, selected Asia and Pacific economies (units: thousands of USD per worker). Source: UNIDO.

Figure 4: Indonesia: skill-intensive export share, 1989-2005 (Source of basic data: World Development Indicators Online)