

ABSTRACTS OF DOCTORAL THESES ON THE INDONESIAN ECONOMY

Technology Adoption from Foreign Direct Investment and Exporting: Evidence from Indonesian Manufacturing

Garrick Blalock (garrick.blalock@cornell.edu)

Accepted 2002, Haas School of Business, University of California, Berkeley

This dissertation contains three essays on technology adoption from foreign direct investment (FDI) and exporting. The empirical analysis examines a panel dataset on Indonesian manufacturing establishments from 1988 to 1996.

The first essay investigates how the technology that accompanies FDI diffuses in the host economy. I ask whether local firms in industries that sell to downstream industries with growing multinational presence benefit from supply chain linkages. I measure the effect of downstream FDI on local suppliers' productivity and find strong evidence that *vertical* supply chains are channels for technology transfer. In contrast, prior studies that measure the *horizontal* spillover of technology from foreign entrants to domestic competitors in the same industry find mixed evidence of technology transfer. These observations are consistent with the incentives of multinationals. Whereas they wish to limit technology leakage to domestic rivals, they benefit from deliberate technology transfer to suppliers that may lower input prices or raise input quality.

The second essay examines how firm attributes affect innovation, by investigating the adoption of technology brought with FDI. I add to the literature by asking not only *whether* local firms learn from FDI, but also *which* firms are the prime beneficiaries. I measure the change in productivity of local firms in response to the entry of multinational competitors, and find evidence that local firms do acquire technology from FDI. In particular, firms with prior investment in research and development, and firms with highly educated employees, benefit more than other firms. In contrast, firms that have a narrow 'technology gap', meaning that they are close to the international best-practice frontier, benefit less than firms with weak prior technical competency. This finding suggests that the more competent firms have already adopted technologies with high returns and low costs, whereas less competent firms have room to catch up and can still benefit from the adoption of 'low hanging fruit' technology.

The third essay asks whether firms acquire technology through exporting. I adopt two strategies to control for the endogeneity of a firm's decision to export. First, I exploit the liberalisation of Indonesia's trade regime in the early 1990s as an exogenous source of variation in exporting behaviour. Second, I employ several estimation approaches to remove the bias from unobserved idiosyncratic productivity shocks that may simultaneously determine both exporting behaviour

and performance. I find strong evidence that firms benefit from a one-time jump in productivity upon entering export markets.

All three essays employ a common two-stage methodology. First, I estimate a translogarithmic (translog) production function on the panel of manufacturing establishments. The production function includes establishment fixed effects to remove static unobservable attributes at the location, industry and factory level. This estimation yields a measure of the change in establishments' productivity over time. Second, I ask whether changes in FDI or exporting can explain these productivity changes and whether firm attributes mediate the magnitude of the changes.

**Transplanted or Endogenized?
FDI and Industrial Upgrading in Developing Countries:
Case Study of Indonesia**

Chia Thye Poh (chia@iss.nl)

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This dissertation develops a new concept and analytical framework (the 'endogenisation thesis') to explain the different impacts of foreign direct investment (FDI) on industrial upgrading in developing countries. It proposes that while multinational enterprises (MNEs) make use of the location advantage of the host country to internalise arm's length transaction costs, local firms have to 'endogenise' the production factors brought in by the MNEs so as to achieve a self-evolved and sustainable upgrading of their capabilities. MNEs and the host country are two interacting systems with common but also conflicting interests. The results of upgrading depend on both MNE strategies and host country efforts.

For the smooth running of their subsidiaries, MNEs need to train local staff and transfer some management skills and production technologies, thus fostering a transplanted upgrading in the host country. However, such upgrading is generally at a low level, with MNEs tending to keep core technology and higher value-added activities at home. Moreover, they may crowd out local firms, causing a manufacturing trade deficit and de-industrialisation. To overcome such negative impacts and achieve better upgrading, local firms would need to 'endogenise' – to foster the creation of local production factors including physical, human and knowledge capital through interaction with MNEs, build up their technological capability and innovate, so as to move up the value-chain ladder. As local firms in developing countries are generally weak *vis-à-vis* the MNEs, support from government agencies and meso-institutions such as industry associations is indispensable. The endogenisation thesis emphasises synergy among various actors, but places the central role with local firms.

To substantiate the thesis, a case study of Japanese FDI in Indonesia's automotive and electronics industries is conducted. It develops indicators for measuring endogenisation and industrial upgrading, disaggregates FDI and local industries to the ISIC (International Standard Industrial Classification) 5-digit level, adopts a product-sampling approach, and conducts a firm survey to obtain micro-level data. It also investigates the strategies of inward Japanese FDI, the foreign investment laws, the industrial and technology policies of the Indonesian

government, and the functions of meso-institutions, to obtain macro- and meso-level data. Altogether more than 100 firms and 30 government agencies and meso-institutions are interviewed.

The results show that Indonesia experienced only a transplanted and not an endogenised upgrading, owing to the characteristic bias of inward FDI, incoherent government industrial and technology policy, inadequate meso-institutions, and the weak endogenisation capability of local firms. However, some local firms with better entrepreneurship and more highly skilled workers, manufacturing products for a wider market, using more local materials, and with diversified technology sources, have been able to endogenise and upgrade more effectively. This research also incorporates evidence from the other ASEAN-4 countries (Malaysia, Thailand and the Philippines) to substantiate the endogenisation thesis, and offers suggestions for improved policy making in this field.

**International Technology Spillovers and
Manufacturing Performance in Indonesia**

Jojo Jacob (jojojacob11@gmail.com)

Accepted 2006, Eindhoven Centre for Innovation Studies,

Eindhoven University of Technology

<http://alexandria.tue.nl/extra2/200610843.pdf>

Prior to the Asian economic crisis of 1997, Indonesia made rapid progress in industrialisation. This thesis explores the dynamics of manufacturing productivity growth in pre-crisis Indonesia. It examines, in a systematic framework, the productivity contributions of foreign technology spillovers deriving from the import of technology-embodied inputs, from exports and from inward foreign direct investment.

Spillovers from imports are categorised as either 'rent' spillovers (pecuniary gains) or 'knowledge' spillovers. The econometric analysis reveals that during the phase of state-led heavy industrialisation (1980-87), scale economies and capital deepening were crucial for the productivity gains of the manufacturing sector. In the later phase (1988-96) of export-led industrialisation founded on resource- and cost-based comparative advantage, international technology spillovers became the main contributors to productivity growth. Concentration in the domestic market was found to exert a modest favourable conditioning effect on both forms of spillovers.

To understand why establishments that produce similar products differ in their productivity performance, I adopted an alternative approach to the classical regression analysis, namely stochastic frontier analysis (SFA). In the SFA approach, a distinction is made between best-practice establishments and below best-practice establishments; in other words, factors causing shifts in the productivity frontier can be distinguished from those causing movements towards or away from the frontier. For the period 1988-95, the SFA results across 65 industries classified at the 5-digit ISIC (International Standard Industrial Classification) level revealed mixed evidence on the influence of foreign R&D in shifting the productivity frontier upward. Investing in more capital-intensive techniques did not in general contribute to labour productivity growth for best-practice establishments. I found

strong evidence for the assimilation of existing technology by below best-practice establishments. Among the assimilation indicators, changes in labour quality and experience offered the most promising explanations for deviations from best practice.

Drawing on the SFA results, I implemented a decomposition of industry-average labour productivity growth into 'innovation' (shifts in the frontier), 'creating potential' through accumulation (increase in capital-labour ratio) and 'assimilation' (movement towards the frontier), in the spirit of the 'appropriate technology' argument. A comparison of the results across industry groups indicated a substantially greater favourable impact of foreign R&D in the resource-intensive and science-based industries; these were at the forefront of the export-orientation drive of the late eighties. The results also showed that a majority of industries in the former category experienced a favourable assimilation effect.

In addition to its core focus on manufacturing productivity growth, the thesis examines economic growth and structural change in the Indonesian economy during the period 1975–2000, using an input–output framework. The decomposition of the growth in sectoral value added revealed important differences in the pattern and sources of growth across the inward-oriented phase (1975–85), the outward-oriented phase (1985–95) and the crisis and recovery phase (1995–2000).

The thesis also provides a comprehensive review of the historical and 'formal' literature on diffusion of technology, 'late' industrialisation and catch up. The findings of the thesis, with regard to both the learning effects associated with imports and the connection between export orientation and technological learning, are in line with an assimilationist view of late industrialisation.

**Industry Evolution and Catch Up:
The Case of the Indonesian Pulp and Paper Industry**
Michiel van Dijk (m.van.dijk@somo.nl)
Accepted 2005, Eindhoven Centre for Innovation Studies,
Eindhoven University of Technology

So far most research on economic growth and catch up in developing countries has been conducted at high levels of aggregation. The main aim of this thesis is to increase the understanding of these processes at the micro-level. For this purpose it presents a detailed investigation of the evolution of the Indonesian pulp and paper industry in a long-run and international comparative perspective.

For several reasons this industry provides an interesting case study of growth and catch up. With annual output growth of 15%, the pulp and paper industry was one of the fastest growing manufacturing sectors in Indonesia before the financial crisis in 1997. As a consequence of industrial policy, it experienced a spectacular transformation from a backward and inefficient sector into one of the largest producers and exporters of pulp and paper in the world. Capital accumulation was unprecedented, and pulp and paper firms installed the latest vintages of machinery, comparable to those used in Finland, the world technological leader in paper manufacturing.

The thesis addresses the following main questions. What industrial strategies have been used to stimulate the development of the Indonesian pulp and paper

industry? How did they influence industry evolution? What has been the rate and pattern of embodied technological change? Are Indonesian paper mills approaching world best-practice performance? And what has been the extent of technological learning in the Indonesian pulp and paper industry?

To answer these questions the thesis combines quantitative (stochastic frontier, regression and cluster) analysis and qualitative analysis using a novel longitudinal micro database (LMD), which contains economic and technological data for all Indonesian pulp and paper plants from 1923, when the first mill was established, until 2000. In addition, a large number of interviews were conducted with consultants, mill managers and government officials in Indonesia, Finland and the Netherlands to obtain a full understanding of the industry.

The thesis shows that the evolution of the Indonesian pulp and paper industry has been characterised by the emergence of a dual market structure. Growth has been driven predominantly by a handful of modern pulp and paper mills owned by a small number of Indonesian business groups, while a large number of small independent companies have continued producing with outdated technology. Furthermore, an investigation of technological learning and assimilation points out that the superior performance of the conglomerate-owned firms has been caused mainly by the involvement of foreign engineers and managers, whereas the development of indigenous technological capabilities has been limited. All of this implies that the Indonesian pulp and paper industry cannot be considered as a case of successful catch up.

The thesis has important implications for aggregate research on economic growth and catch up. It shows that industrial development is likely to be an erratic and much more dispersed phenomenon in poor countries than in rich ones. Consequently, aggregate indicators of performance for poor countries might be misleading, possibly resulting in wrong policy conclusions.

The Economy-wide Impact of Reducing Indonesia's Energy Subsidies and Improving Efficiency in Energy Consumption

Djoni Hartono (eui_dyton@yahoo.com)

Accepted 2006, Faculty of Economics, University of Indonesia

In Indonesia, the government determines the domestic prices of energy – gas, electricity, and fuel oils such as gasoline, automotive diesel oil and kerosene. In response to the weakening of the rupiah during the 1997–98 economic crisis and rising world crude oil prices, the government tended to increase the subsidy on domestic consumption of fuel oil, gas and electricity, rather than letting their prices follow world prices. At the time this research was undertaken, the domestic prices of these energy sources were significantly lower than their world prices. Meanwhile, government subsidies for them had reached approximately 30% of total government expenditure by 2000. There have been suggestions that the government should eliminate these energy subsidies, letting domestic energy prices equal world prices, since the subsidies have forced the government to forgo opportunities to spend more to improve the country's growth rate. On the other hand various groups have continued to press the government to keep energy prices constant, arguing that the poor cannot afford higher prices.

This dissertation (1) develops one of the first energy sector social accounting matrices for Indonesia, in order to identify patterns of domestic energy consumption and, in particular, to pinpoint which households and which production sectors are among the highest energy consumers; (2) employs multiplier matrix and forward structural path analysis to simulate the economy-wide impact of a situation in which several sectors in the economy are able to improve their efficiency in consuming energy inputs; and (3) uses an inter-temporal computable general equilibrium (CGE) model to analyse the impact on economic growth and household income distribution of policies to reduce energy subsidies.

The main conclusions are as follows. First, land transportation, paper industries, trade, construction and 'other chemical industries' are the main direct consumers of energy in the country. Meanwhile, among household groups, the 'urban high-income' group is the main energy consumer.

Second, after taking into account all multiplier impacts, a unit increase of output in food, beverages and tobacco manufacturing, paper industries, trade and construction would trigger the largest increase in the country's energy consumption. Meanwhile, among household groups, a unit increase in all expenditures of the urban low-income and urban high-income groups would significantly increase domestic consumption of energy.

Third, policies to create incentives for industry to increase efficiency in consuming energy are urgently needed. Improved energy consumption by the industrial sector will significantly reduce the country's energy consumption and, it turns out, will increase the income of the majority of households and the growth of the economy.

Fourth, although the country's consumption of energy would be reduced if households' energy consumption became more efficient, the magnitude of this reduction would be much smaller than would be the case if industry were able to improve its energy consumption efficiency.

Fifth, a combination of reduced energy subsidies and increases in the development budget will result in higher economic growth and more equal household income distribution than would occur if there were no reduction in energy subsidies. The best outcome would be achieved if a combination of reduced energy subsidies and increased development spending were accompanied by more efficient consumption of energy inputs by the industrial sector.

Aquarian Capitalism and Transition in Indonesia

Dorian Fougères (fougeres@gmail.com)

Accepted 2005, Department of Environmental Science,
Policy, and Management, University of California, Berkeley

In two villages of coastal Sulawesi, independent small-scale Bugis producers play central roles in organising and industrialising capitalist production of high-value seafoods, breaking with a history of state and corporate ventures elsewhere in Indonesia. This dissertation answers four questions about the political economic, social and ecological transformations involving these entrepreneurs. First, how have they gained and maintained control of production? Second, how have they consolidated control through industrialisation? Third, how have they perpetuated

historical practices of opportunistic, environmentally destructive resource exploitation? Finally, how have they attempted to move into higher-value stages of production and marketing, and to contribute to the industrialisation of the Indonesian economy?

In answering these questions I explore the commodity chains of two high-value seafoods—'live reef food fish' and tiger shrimp. The former are caught on the coral reefs near Malakaji (South Sulawesi), exported through Makassar and sold—still alive—in Hong Kong restaurants. The second are raised in ponds in Kangkelo (Southeast Sulawesi), shipped to Makassar for minimal processing and exported frozen to Japan. For each industry I highlight how the bio-geochemical nature of coastal territories and the bio-physical nature of marine commodities have affected primitive accumulation, commoditisation and nature's subsumption under capital. Based on each commodity's distinctive dynamics of enclosure,¹ uncertainty and risk, and state intervention, I argue that processes of capitalist development in fisheries and aquaculture are analogous—but not reducible—to those in agriculture. They therefore merit theoretical recognition of specifically aquarian, rather than agrarian, questions of capitalism and transition.

In the live fish case, patron-captain dyads have gained control of production through patron-client networks that facilitate the establishment and enforcement of credit-based contracts. The use of technologies like cyanide diving and aeroplane shipping has facilitated fish capture and circulation, and helped patrons to consolidate control over the fishery by increasing the indebtedness of client boat captains. However, cyanide diving has degraded the reefs and jeopardised continued extraction, driving divers who use cyanide and fishers who do not into a conflict that has persisted largely because state institutions fail to control the reef territory and enforce regulations. Finally, ethnic restrictions on market access in Hong Kong have limited producers' opportunities for 'forward integration'.

In the shrimp case, Bugis immigrants have gained control of production through migration networks that facilitate wetland brokerage, asset transfer and temporary employment opportunities. The use of water pumps and hatchery shrimp fry has allowed smallholder aquaculturists to reduce production risk, and the use of backhoes has allowed them rapidly to consolidate control over large tracts of wetland. However, epidemic shrimp disease has accompanied intensification, and producers who own water pumps have argued with those who do not over how to eradicate it. Although the state has had territorial control, the complexity of regulating a network of canals makes it difficult for state institutions to resolve the conflict. Finally, Japanese joint ventures control most marketing outlets, and their desire to export only minimally processed shrimp has limited producers' opportunities for forward integration.

This inquiry into the nexus of capitalism, nature and tropical marine commodities contributes to scholarly debates in political ecology, agrarian studies and economic geography, and also to studies of the Indonesian economy and of neo-liberal restructuring of East and Southeast Asian agro-food networks.

1 The turning of open access or communally held resources into private or state property.

**Decentralisation and Cluster Policy in Indonesia:
Case Studies from Tanggulangin and Bukir**

Kacung Marijan (kmarijan@yahoo.com)

Accepted 2005, Asia Pacific School of Economics and
Government, The Australian National University, Canberra

This study is about the impact of the 1999 decentralisation policy on the way the Indonesian government nurtures cluster industries. It examines the leather goods cluster industry of Tanggulangin and the wood furniture cluster industry of Bukir, both located in East Java province. The thesis is concerned with two main research questions. First, what are the effects of decentralisation on the way government goes about nurturing cluster industries in Indonesia? Second, to what extent does the decentralisation policy meet the needs of cluster industries?

In answering these questions, the study applied a comparative approach, looking at the way government at various levels promoted cluster industries before and after the decentralisation policy began to be implemented in 2001. Most of the data analysed were from fieldwork in 2002, and consisted of surveys and in-depth interviews, mainly with entrepreneurs in the leather cluster of Tanggulangin and the furniture cluster of Bukir, and with key government officers related to the business sector.

The implications of decentralisation for cluster policy are examined in relation to two types of government policies: those directly aimed at supporting cluster industries, such as technical and financial assistance; and those that deal with the provision of infrastructure—electricity, roads, telephones—and with the regulation of the business sector—taxes, levies, building permits and business permits. In order to obtain adequate evidence in the field, this study explores the responses of those involved in both cluster industries to these two broad areas of government policy.

The research demonstrated that the decentralisation policy changed the authority structure for the nurturing of cluster industries, because control of most aspects of industry affairs was transferred to sub-national governments. In reality, however, the central government did not lose authority over the promotion of cluster industries. The Department of Trade and Industry and the Ministry of State for Co-operatives and the Development of Small and Medium Enterprises (Menekop) attempted to formulate and implement a number of programs concerned with nurturing cluster industries. Menekop, for instance, assisted particular clusters by providing Business Development Services (BDS) and Initial Capital and Financing (Modal Awal dan Pendanaan, MAP). In implementing their programs, these institutions cooperated with regionally located central government institutions such as the *dinas* (technical agencies) of the Department of Trade and Industry and Menekop.

Indeed, decentralisation provided new opportunities for local government to support cluster industries. However, the study shows that such local initiatives were not particularly effective, because most were not formulated and implemented on the basis of the entrepreneurs' interests. Policies related to the provision of infrastructure were more effective than those designed explicitly to support clusters.

Furthermore, because the central government retained control of the policy making process, there was evidence of vertical and horizontal coordination problems in

formulating and implementing cluster policies. The thesis concludes that, owing to the limited capacity of government, public-private partnerships will continue to be an important tool for promoting clusters.

**Women and Income Generating Projects:
The Gender Impacts of Indonesian Government Policies**

Tri Lisiani Prihatinah (tlisiani@yahoo.com)

Accepted 2005, Institute of Sustainability and Technology Policy (ISTP),
Murdoch University, Perth, Western Australia

Gender inequality and poverty are two serious problems for developing countries, where the majority of women have been victims of the cultural, socio-economic, political and environmental impacts of development. The gender dimension of poverty focuses on the dilemmas women face, their multiple roles as women and their roles in alleviating poverty. The literature on women and poverty abounds with evidence that women are disproportionately subject to the economic and socio-cultural effects of poverty. Women are also known to be discriminated against in terms of economic security, basic needs support, work access, opportunities and remuneration. Despite these factors, women play a greater role than men in sustaining programs among the poor that are designed to alleviate poverty.

In Indonesia, as elsewhere in the world, micro-credit is being used as a major vehicle to improve women's well-being, reduce their vulnerability and act as a starting point in their empowerment. Using findings from a study of Indonesian government policies and the implementation of two micro-credit schemes – Tabungan Kesejahteraan Rakyat (Takesra, the Social Welfare Savings Scheme) and Kredit Usaha Keluarga Sejahtera (Kukesra, the Family Welfare Business Credit Scheme) – this thesis explores the issues of poverty and women's empowerment. First, it considers poverty from gender and economic sustainability perspectives, and second, it evaluates the impacts of the Takesra and Kukesra micro-credit schemes.

The thesis argues that an emphasis on poverty reduction among women serves both gender equity and economic sustainability objectives. The possibilities for poverty reduction are, however, internally and externally constrained by aspects of the operation of the micro-credit schemes. Evidence from the empirical research conducted in three districts of Central Java – Brebes, Purbalingga and Cilacap – shows the internal constraints (weaknesses in the schemes themselves) to include incomplete and misdirected indicators for success, the small size of available loans and the long duration of repayment terms. The external constraints (the socio-economic factors affecting the sustainability of the programs) include economic conditions that deny market access to poor women, and cultural factors that result in excessive burdens on women. Both diminish the effectiveness of the schemes as solutions to poverty.

From the analysis of lessons learned from best practice in other countries, it is suggested that Indonesian government policies need to be refocused to address these internal and external constraints, and to allow for progress to be achieved in poverty alleviation and women's empowerment. The Takesra and Kukesra

schemes, in a revised form based on an improved model for micro-credit delivery, should continue to play a role in providing credit to poor women, to encourage skill development and capacity building, to support the process of women's empowerment and to contribute towards a more sustainable society.

**Inter-household Allocations within the Extended Family
and the Determinants of Household Division:
Two Essays on the Economics of the Household**

Firman Witoelar (witoelar@msu.edu)

Accepted 2004, Department of Economics, Michigan State University

In the absence of complete financial and insurance markets, households may be involved in informal arrangements with each other in order to reduce the variability of their consumption. Previous studies in the literature have looked at whether informal insurance groups are formed at a geographical level (e.g. within the village), or whether households insure themselves spatially, for example through marriage-migration, or through other links such as ethnic ties. Few studies have so far considered the extended family as the relevant consumption-smoothing group and, of these, very few use data from developing countries, where the roles of the traditional extended family may not have been eroded as much as in developed countries.

The first part of the dissertation asks whether the extended family provides a means for households to smooth their consumption. Data from the Indonesia Family Life Survey (IFLS), a longitudinal household survey, are used to look at consumption smoothing within extended families. Panel data on extended families were constructed to test the hypothesis that income pooling occurs within these families. Specifically, using the 1997 and 2000 waves of the IFLS, the study tests whether household own income matters to household consumption after controlling for extended family fixed effects.

The findings show some evidence against income pooling within extended families among the IFLS households, both in 1997 and in 2000. Contrary to the income pooling hypothesis, household own income does matter to household consumption, even after controlling for extended family fixed effects. An instrumental variables approach is used to correct for the potential problem of measurement error and to deal with the concern that income may be endogenous. To control for the possibility that there are household-specific fixed effects that are correlated with income, a first-difference version of the model is estimated. This test helps to inform us whether households used inter-household transfers as a consumption-smoothing mechanism to cope with the financial crisis that occurred during the period. These results also show some evidence against income pooling, although the magnitudes of the coefficients on income change are small. To test whether variables from other households affect own household consumption, a set of reduced-form regressions is also estimated. The results suggest that the extended family does have a role, if only a limited one, in household allocation decisions.

The second chapter of the dissertation focuses on the dynamic nature of the household – the fact that household structure and composition changes over time.

Exploiting the longitudinal nature of the IFLS, I look at factors underlying the decision to leave the household or stay within it. The findings suggest that education variables play an important, although limited, role in determining the decision. There is evidence that higher education of the household head is associated with a lower propensity of households to divide. On the other hand, higher maximum years of schooling of other household members are associated with higher probability of household division. These results, along with the finding that rural households are more likely to divide, indicate that household division in Indonesia may largely be associated with the mobility of young, more educated members. While the empirical framework is based on a collective household model, the results can be explained within the context of a unitary household model.