Enterprise Training in Indonesia

- The interaction between worker's schooling and training -

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Abstract:

Why do firms under-invest in training activities? The literature tells us that worker's education is, *ceteris paribus*, among the key drivers of training incidence due to its complementarity. We show that this is not necessarily the case once we relax the exogeneity-assumption of worker's education. Indeed, certain firms do respond to an increase in the supply of educated workers by reducing training activities. These firms tend to be domestic firms without limited-liabilities hiring a small number of non-production workers. We argue that they share particular characteristics that induce substitution between educated workers and training, including (1) resource constraints, (2) high labour turnovers, (3) binding minimum-wages, and (4) large supplies of vocational students. Our findings call for policy measures that strengthen the linkage between education and training policies and minimize market/policy failures in training -enhancing credit market access and allowing apprenticeship-wages below minimum-wages-.

Keywords: enterprise training, schooling, multinational enterprise.

JEL classification: I28, J24, J31.

1. Introduction

There is a conventional wisdom that training, be it in-house informal on the job training (OJT), formal training in private or government training institutions, enhances productivity of workers and most likely benefit not only the firms[1] and its workers but also the economy as a whole[2]. Moreover, there is also evidence that training activities facilitate technology transfers from high-skilled firms to low-skilled firms (Todo and Miyamoto, 2002)[3].

Given these findings, policy-makers and researchers have looked into the incidence and extent of training activities across different type of firms in different countries. While consistent cross-country comparison of training incidence is yet non-existent, a casual comparison among three Southeast Asian countries shows that its variance appears to be quite high: 58 percent in Thailand, 35 percent in Malaysia, and 19 percent in Indonesia[4]. On the other hand, country/industry specific studies show that, in general, large firms with skilled/educated workforce using advanced technology and with access to foreign capital tend to utilize enterprise training more than otherwise (Tan and Batra, 1994).

In light of the importance and heterogeneity of enterprise training activities, one would naturally ask: *why do certain firms provide training for their workers and certain firms do not?* This leads to a related question: *what policy measures help mobilize enterprise training?* We aim to address these questions by exploiting the large-scale manufacturing firm survey in Indonesia. In doing so, we first conduct a detailed analysis of the determinants of enterprise training. We then divide the sample into different group of firms facing different constraints and disincentives for conducting training activities, and identify the differences in the training determinants. We also discuss possible policy responses to constraints that hamper training.

Throughout the paper, we pay particular attention to the role of worker's education on the incidence of enterprise training. This has been among the key variable of interest in the

[1] In this paper, we use "firm" and "establishment" interchangeably. In general, establishment can be defined as a production unit located in a building or in a certain location. Thus, a firm may well consist of a number of establishments.

[2] Numerous studies have focused on this issue. OECD (2002) provides some evidence for OECD countries. Lillard and Tan (1992), Bishop (1994), and Lynch (1992, 1994) provide evidences primarily for the US. Among the few studies focusing on the developing countries, Tan and Batra (1994) provides an econometric analysis comparing Mexico, Columbia, Malaysia, Indonesia, and Taiwan.

[3] In Todo and Miyamoto, high-skilled firms refer to multinational enterprises, while low-skilled-firms refer to domestic firms. They show that training activities and R&D by multinational enterprises play important roles in facilitating knowledge spillovers to domestic firms. R&D activities by domestic firms are also shown to facilitate spillovers from multinational enterprises to domestic firms (Kinoshita, 2002, Todo and Miyamoto, 2002). There are also studies that focused on the role of schooling on technology transfer. For example, Borensztein, Gregorio, and Lee (1998) find a significant role of minimum threshold stock of human capital -average years of secondary schooling- on technology transfer.

[4] The percentages are the incidence of formal training in . Note that the three are not directly comparable due to the different year and type of surveys used to compute the percentages. A random survey covering 5 manufacturing industries in 1997-98 is used for Thailand (Zeufack, 1998), a nationally representative survey fielded in 1995 is used for Malaysia, and a large firm survey covering 3 major provinces in 1993 is used for Indonesia (Tan and Batra, 1994).

literature, and most empirical analyses conclude that worker's education level is complementary to enterprise training. Based on these results, one important policy implication has become well accepted in the literature. This is the importance of increasing the average years of education so that future workers can be more prepared for the various and dynamic skills required in entering the labour market. This seems to be a common-sense argument since it is unarguably easier and less-costly to train educated workers than otherwise. A number of studies have also shown that the productivity gains of educated workers are much higher than that of less-educated workers[5]. However, the danger of this sort of argument is that it may lead to policies that put too much emphasis on increasing educational attainment while assuming that firms will then respond by providing training.

In this paper, we show that these policies may have large and negative impact on the human capital formation of the economy since large proportion of firms in fact substitute training by hiring educated workers. Indeed, domestic firms that represent 82 percent of the workforce exhibit low training incidence while substitute training with hiring educated workforce. Furthermore, domestic firms with low proportion of non-production workers or with non-legal status are even less likely to train their workers while showing even stronger substitutability. This is in contrast with multinational enterprises that train more workers while not showing substitutability.

The rest of the paper is organized as follows. The following section discusses the literature on training determinants with an emphasis on the interaction between education and training. Section 3 presents the basic model to be used for estimation followed by a description of the survey in Section 4. Section 5 summarizes all the empirical results along with the training constraints that some firms may face. Section 6 briefly discusses possible policy responses to the non-training problem. Section 7 concludes.

[5] The literature on wage equation provides evidence that higher educated workers are more productive and thus earn more wages.

2. Literature

In general, past work on training determinants have been hindered by the lack of detailed and wide region/sector coverage of data sets. The difficulty is that we need both firm and worker characteristics to adequately analyze enterprise training activities. Household surveys usually contain in-depth information on worker characteristics, while firm surveys contain firm characteristics that are considered to be key determinants of training. While recent developments in micro-surveys allow matching between individual and firm data sets for the developing countries, such detailed data sets are hard to find for the developing countries. Even if it exist, it is usually confined to a particular sub-sector of a particular industry/region. This would make it hard to conduct a cross industry/regional analysis.

The first part of this section summarizes the literature for both developed and developing countries. We then briefly assess studies done specifically for Indonesia, as well as studies that have addressed the interaction between education and training.

2.1 Literature on training determinants

Training determinants in the developed countries

Numerous studies have tried to identify training determinants for the developed countries. While most studies use training incidence or intensity for the dependent variables, each study focuses on a different set of dependent variables that represent firm/worker characteristics and policy changes.

Lynch and Black (1998) analyze how incidence, content, and extent of employer provided training in the US were related to workplace practices, physical capital investments, and workers' education. They found that formal training programs were positively associated with establishment size, presence of high-performance work systems, capital-intensive production, and workers' education level. They conclude that enterprise training are complements rather than substitute for investments in physical capital and education. Frazis, Gittleman, and Joyce (1998) focus on the determinants and intensity of training using firm survey in the US. They find that establishments that use more innovative workplace practices and firms that provide more fringe benefits train more. These are among the number of incentives that firms provide to workers so that they are likely to work longer in the firms that provide training. They also analyze the determinants of training using employee data and find that workers' education level is an important explanatory variable.

Among the studies that tries to identify the policy impact on training, unions and minimum wages have been a popular focus. Recent studies[6] on union-effects include Lynch and Black (1995), Frazis, Herz, and Horrigan (1993), and Frazis, Gittleman, and Joyce (1998). Unfortunately, all three works show inconclusive results with insignificant, positive, and negative impacts, consecutively. Studies focusing on the impact of

[6] Brown (1989) provides an extensive summary of the results of the older studies.

minimum wages on training have been extensively done since the work by Leighton and Mincer (1981) and Hashimoto (1982), where they find negative results. These results are consistent with the Beckerian argument that minimum wages prevent workers from accepting low wages so that they can finance training. Recent studies, however, differs from these conclusion. They include Grossberg and Sicilian (1999) and Acemoglu and Pischke (1999), where they reject negative minimum wage effects. The main argument is that minimum wages reduce training for some workers while encouraging firm-sponsored training for other workers.

Training determinants in the developing countries

There are only few studies that analyze enterprise training in the developing countries, perhaps due to the lack of quality firm/labour force surveys. Among them, Tan and Batra (1996) use micro-firm surveys for Malaysia, Indonesia, Thailand, Taiwan, Mexico, and Columbia to identify the determinants of training incidence. They find that most conventional explanatory variables –including average workers' education- used for the developed countries show significant and positive impact on training in the developing countries. Zeufack (1999) analyzes the impact of enterprise training among manufacturing firms in Thailand. He also finds variables such as firm-size, R&D expenditures, quality control, and labour productivity have positive impact on the incidence of training. He also finds that firms with high average workers' education are more likely to provide training to their workers.

Training in Indonesia

The only study, of which the authors are aware of, that covers determinants of enterprise training in Indonesia is Tan and Batra (1996). Surprisingly, they find that the effect of education on training is negative[7]. They explain this result as possibly reflecting the variable's high correlation with other included worker attributes. It is worthwhile to emphasize that this result was based on a World Bank survey which has focused on a small number of firms (300) that are primarily large firms in three of the 27 provinces. Thus, the representation of this survey requires caution.

2.2 Is Education Substitutes or Compliments of Training?

Among the variables that consistently show positive effects on training incidence and ex-post productivity is the worker's level of education (Brown, 1989). Most authors interpret this result as being consistent with highly educated workers being able to learn new skills easier, or that these workers cost less to train. Lynch and Black (1998) goes even further to claim that this result is an "evidence of a virtuous-circle in human capital investments-employee investments in schooling are augmented by employer investments in training for more educated workers"[8].

[7] This is the case even without controlling for potential endogeneity problems and/or omitted variable bias.
[8] UNCTAD (1994) also mentions that "the interaction of the two factors (skill and education) often results in a virtuous circle where the domestic availability of skills not only contributes to attracting FDI but is also

However, when one looks into the variables capturing worker's education-level used in these studies, we find that it is either the (1) average level of education –when using firm level surveys- or (2) educational attainment of each workers –when using labour force surveys-. The casual usage of these proxies for empirical analyses to induce policy implications can be very dangerous. This can be easily understood since firms presumably make hiring decisions based not only on the product-demand and prices but also on the extent of production-technology, price of labor that has the required skills to do the task, and costs required to improve the skills of workers in order to adapt to new technologies. If training costs relative to the wage of skilled workers are high, firms may have to resort to hiring higher educated workforce. Moreover, if firms face resource/credit constraints that prevent them from training their workers, they may optimally hire highly educated workers if they are affordable. Also, if minimum wage law prohibits firms to pay apprenticeship wages to workers during their training periods, firms may instead opt to hire educated workers. Thus, there can be strong arguments that firms may be substituting education and training.

Preliminary assessments of training constraints using enterprise surveys in Latin America and East Asia indeed suggest the possibility of substitution between hiring more educated/skilled workers and providing enterprise training. The World Business Environment Survey conducted in these two regions indicates that the "availability of skilled workers" in the labour market is among the main reasons behind firms providing little or no training (Batra and Tan, 2002; Batra, 2003)[9].

The major problem in the empirical literature of training determinants is that worker's education variable is assumed to be exogenous, which could lead to a biased result that worker's education and enterprise training are complimentary. Potential biases due to this worker's education variable include (1) omitted-variable bias due to the worker's education variable picking up unobserved technology-level of firms that are correlated with training incidence, (2) endogeneity bias due to training decision (or availability-of/access-to training facilities) affecting the hiring decision (education-level) of workers. These problems are directly dealt with in this paper.

upgraded in turn by the employment and training opportunities that TNCs (transnational corporations), especially in sophisticated industries provide (parentheses added by authors).

[9] More specifically, 44 percent of firms in Latin American region and 33.6 percent in East Asian region reported the availability of skilled workers as one of the main reason behind provision of little or no training.

3. Estimation Strategy

3.1 Baseline model

For the baseline model, I adopt the standard specification of training determinant models that are adopted in the literature (Tan and Batra, 1996; Lynch and Black 1998; Zeufack, 1999). Consider the probability of training incidence in firm i within manufacturing sector j in year 1996: T_{ij}^{96*}, assumed to be expressed in the following linear functional form:

$$T_{ij}^{96*} = X_{ij}^{96} \cdot \beta^{96} + HC_{ij}^{96} \cdot \delta^{96} + \nu_j + \varepsilon_{ij} \qquad (1)$$

where X_{ij}^{96} is a vector of firm characteristics including types (export share, foreign capital share, group-company dummy, parent-company dummy, child-company dummy), years of operation, per-labour value added, firm-size (raw labour), non-production worker ratio, female-labour ratio, R&D-expenditure; HC_{ij}^{96} is the average years of education completed among the work-force; ν_j is the unobserved industry specific component, and ε_{ij} is the random error. If T_{ij}^{96} is the actual training incidence, then we have $T_{ij}^{96} = 1 \; if \; T_{ij}^{96*} > 0$, and $T_{ij}^{96} = 0 \; if \; T_{ij}^{96*} \leq 0$. We use the 2-digit industry code as the cluster for the industry specific component.

Number of explanatory variables such as foreign capital share, RD_{ij}^{96} and the industry fixed effects are assumed to capture the extent of production technologies that are assumed to affect necessity of enterprise training. We interpret a positive estimate of HC_{ij}^{96} as indicating complementarity between worker's education and enterprise training, while a negative estimate implies substitutability of the estimates.

3.2 Extended model accounting for endogenous worker's education

We suspect that worker's average education level in equation (1) is not orthogonal to the error-term, due to (a) omitted-variable bias due to the worker's education variable picking up unobserved technology-level of firms that are correlated with training incidence and/or (b) endogeneity bias due to training decision (or availability-of/access-to training facilities) affecting hiring decision (education-level) of workers. We thus extend the baseline model and carefully account for the bias by using (a) lagged worker's education variable, and (b) two-step maximum-likelihood estimators for simultaneous Probit developed by Rivers and Vuong (1988).

Extension-1:
A simple way to partially account for endogeneity is to use a lagged variable for the variables in question. The panel nature of the Indonesian manufacturing survey allows us

to extract lagged worker's education variable. We thus have the following Probit model with lagged :

$$T_{ij}^{96*} = X_{ij}^{96} \cdot \beta^{96} + HC_{ij}^{95} \cdot \delta^{95} + \nu_j + \varepsilon_{ij} \tag{2}$$

where HC_{ij}^{95} is the average worker's education level in 1995.

Extension-2:
While using lagged variable has a virtue of simplicity and is presumed to lessen the above mentioned biases, it is still considered to lead to biased estimates to a certain extent. To directly deal with the bias, we adopt a two-step maximum likelihood estimator developed by Rivers and Vuong (1988). The model consists of a structural equation and a reduced form equation for the endogenous explanatory variable.

$$\begin{aligned} T_{ij}^{96*} &= X_{ij}^{96} \cdot \beta^{96} + HC_{ij}^{96} \cdot \delta^{96} + \nu_j + \varepsilon_{ij} \\ HC_{ij}^{96} &= X_{ij}^{96} \cdot \gamma^{96} + Z_{ij}^{96} \cdot \xi^{96} + \nu_j + u_{ij} \end{aligned} \tag{3}$$

Where Z_{ij}^{96} is assumed to be uncorrelated with ν_j and ε_{ij}; ν_j is uncorrelated with ε_{ij} and u_{ij}; and $(\varepsilon_{ij}, u_{ij})$, conditional on X and Z, is assumed to follow a joint normal distribution with mean zero and finite positive definite covariance matrix:

$$\Omega = \begin{bmatrix} \sigma_{\varepsilon\varepsilon} & \sigma_{\varepsilon u} \\ \sigma_{u\varepsilon} & \sigma_{uu} \end{bmatrix} \tag{4}$$

To estimate (3), we first estimate the reduced form equation for the endogenous worker's education to obtain an estimate of the residuals. The second step is to estimate the first equation in (3) –the Probit- including the estimated residuals, using appropriate covariance matrices. As proved in Rivers and Vuong (1988), this two step method provides a consistent estimate of the parameters[10].

[10] Rivers and Vuong (1988) also show that, in some cases, it is asymptotically more efficient than other classes of estimators such as Amemiya and Heckman estimators (Amemiya, 1978; Heckman, 1978).

4. The Indonesian Manufacturing Survey

We use *Statistic Industri (SI)*, a large and medium scale manufacturing survey conducted by the Central Bureau of Statistics of Indonesia from 1975. This survey gathers information from all manufacturing firms with twenty or more employees on an annual basis. A manufacturing establishment is defined as "a production unit located in a building or in a certain location," and therefore a firm may contain more than one establishment. In particular, this paper examines data from 1996, the only year in which the training activities of firms are documented. Most manufacturing firms are located in Java (80 percent) and Sumatra (11 percent).

The incidence of training activities is captured by the question: "Are there any workers in this establishment that were exposed to some training?" Unfortunately, the survey does not cover further detailed questions that identify the type of training such as formal or informal training. Since firm specific skills are more likely to be transferred via informal on-the-job training and more general skills to be learned in formal training centers, it is impossible to distinguish general and firm-specific skills in the following analysis. We aim to overcome this problem by using a rich set of controls in the explanatory variables.

For the explanatory variables, the survey includes information on the ***type of firm*** (domestic or foreign firm), ***legal status of firm*** (government company, corporation, partnership, etc.), ***firm characteristics*** (type of goods produced -primary goods, skill-intensive goods, service-related products-, R&D activities and type of production captured by industrial sector code*)*, ***worker's characteristics*** (education-level, female ratio, skilled-worker ratio), and ***location*** (region and district). These variables are all among the key determinants of enterprise training used in the literature and will be the focus of the empirical analysis.

Table 1 below provides a summary statistics of the variables used for the empirical analysis. The total number of establishments used for the baseline model is 20239. The number of observation for Education in 1995 is much smaller than in 1996 since they are limited to only those firms that we could match between the two years. Among all firms in 1996, only 32 percent provided training of some sort to their workers in 1996. This is still a larger figure than the 19 percent, which is documented in Tan and Batra (1996). The larger percentage is perhaps due to the fact that training activities in the manufacturing survey include informal on-the-job training as well as formal training.

Legal status of firms are expected to show differences in the incentives to conduct training activities since they face different level of budgetary constraints for training, impact of government policies, and exposure to new technologies, all of which is expected to affect training incidence. We find that approximately 50 percent of manufacturing firms are limited corporation or partnerships, while there are about 35 percent of firms that have no legal status.

To directly capture the technology level of production, we include non-production worker ratio, average education level of workers, female worker ratio, and R&D expenditure. We

find that an average establishment has 14 percent of skilled work force and an average worker's education of 7.7 years (1995) and 8.2 years (1996). Establishments have on average 39 percent of female workers.

Table 1: Summary Statistics

	Number of Observation	Mean	Standard Deviation
Training incidence	20239	0.318	0.466
Limited Corporation dummy	20239	0.404	0.491
Limited Partnership dummy	20239	0.088	0.283
Other legal entity dummy	20239	0.163	0.369
No legal status dummy	20239	0.345	0.476
Export dummy	20239	0.186	0.389
FDI dummy	20239	0.052	0.222
Group company dummy	20239	0.065	0.247
Parent company dummy	20239	0.045	0.208
Child company dummy	20239	0.045	0.206
Operation years	20239	9.911	9.719
Value added	20239	8486	30341
Labour 1st quartile dummy	20239	0.266	0.442
Labour 2nd quartile dummy	20239	0.247	0.431
Labour 3rd quartile dummy	20239	0.238	0.426
Labour 4th quartile dummy	20239	0.249	0.433
Non-production worker ratio	20239	0.139	0.155
Female worker ratio	20239	0.398	0.303
Education (1995)	16890	7.633	2.477
Education (1996)	20239	8.155	2.211
R&D	20239	5128	116415

Productive firms are presumably more likely to provide training, since they may have less financial constraints to invest in training[11]. We thus include average value added per worker to capture firm productivity.

In order to capture the increase in skill demand due to production of export oriented goods and the use of foreign technology, we also include establishments that exports (export dummy) and establishments that receive foreign capital (FDI dummy)[12]. We find that 19 percent of firms export abroad while only 5 percent of firm receive positive amount of foreign capital.

Large companies[13] and/or those with multi-plant facilities may have lower per–worker cost of providing training due to the economies of scale. We find that 7 percent of the

[11] Of course, one may argue that the causality may be the other way round. That is, establishment that provide training are more productive. To avert this possibility, we also analyzed using lagged value added (results not shown in this paper) and the qualitative results did not change.

[12] UNCTAD (1994) document number of surveys that indicate high incidence of training by multinational enterprises as compared to domestic enterprises. They include training activities by Japanese firms in the US, as well as multinational enterprises in Scotland, Thailand, Malaysia, Nigeria, and Turkey.

[13] Size of the company is captured by labour quartile dummies: 1st , 2nd, 3rd, and 4th quartile. Each corresponds to a labour force range of 12~24, 25~40, 41~106, and 107~39281; and an average labour force size of 21, 31, 64, and 541, respectively.

firms are group companies while approximately 5 percent are either parent or child companies. We also use variables representing the quintiles of the number of labour force.

Newly established companies may have higher demand for training since presumably they have more new recruits that do not have much experience. We find that the average year of operation is 10 years.

5. The Empirical Results

Approximately 32 percent of firms in Indonesia had workers that were exposed to some training activities with a high standard deviation of 0.466 (Table 1). This section tries to gain insights as to why workers in certain firms get trained and others do not. We first try to identify the correlates of training to see which sub-groups of firms enjoy more training than other groups. This is followed by a multivariate analysis which deals with a *ceteris paribus* question.

5.1 Correlates of Training

Table 2 below shows percentages of firms engaged in training activities for different group of firms. The first four columns in the upper row compare training incidence across different status of firms: limited-corporation, limited-partnership, other legal status, and no legal status. We find that firms with limited liabilities have higher percentages of training incidences, while those that have no limited liabilities or those that have no legal status enjoy less training activities. The latter two contains firms that are mostly small-scale family owned-enterprises with limited capital stock, technologies, and skilled workers. Firms with non-legal status are presumably located within the informal sector.

Table 2: Percentage of Firms Engaging in Training Activities by Different Groups

	(1a) Limited Corporation	(1b) Limited Partnership	(1c) Other Legal Status	(1d) No Legal Status	(2a) Labour Size 1st Quartile	(2b) Labour Size 2nd Quartile	(2c) Labour Size 3rd Quartile	(2d) Labour Size 4th Quartile
Percentage of Firms Training	50.6	34.3	18.0	15.6	15.6	20.5	31.4	60.5
	(3a) Low Ratio of Non-Production Workers	(3b) High Ratio of Non-Production Workers	(4a) Multinational Enterprises	(4b) Domestic Enterprises	(5a) Education 1st Quartile	(5b) Education 2nd Quartile	(5c) Education 3rd Quartile	(5d) Education 4th Quartile
Percentage of Firms Training	16.5	45.3	74.2	29.5	13.8	21.4	36.4	55.5

Note: **Columns (1a) – (1d):** we omit firms in the government sector since their incentives and financial source for training are presumably very different from other firms. **Columns (2a) – (2d):** total labour includes skilled (non-production worker) and non-skilled (production worker) labour. **Columns (3a) – (3b):** high skilled workers represent firms with a high concentration -4th quartile- of non-production workers that are presumably engaged in high skill tasks. **Columns (4a) – (4b):** multinational enterprises are defined as firms with a positive amount of foreign capital share. The percentage does not change even if we define it as firms that have 20 percent of foreign share. Domestic firms are defined as those without any foreign capital share. **Columns (5a) – (5d):** Education implies average years of education of workers within each firm.

The literature on training determinants has repeatedly shown that larger firms are more likely to train their workers than otherwise. Columns (2a) – (2d) confirm this by indicating that training incidences gradually increases from 15.6 percent to as high as 60.5 percent among the top quartile of firms. Presumably smaller firms face tighter financial burden in terms of higher training costs per worker and through binding credit constraints. Smaller firms may also find it difficult to allow limited number of workers to engage in training activities.

Columns (3a) – (3b) in the bottom row show that firms with higher percentage of non-production worker are more likely to train their employees. This makes a lot of sense since skilled tasks presumably require more training than otherwise.

Columns (4a) – (4b) indicate that multinational enterprises are much more likely to train their workers than domestic enterprises. Multinational enterprises presumably have better financial resources as well as better access to training facilities and hire large number of non-production workers that require training. Although only 17.6 percent of workers -5.2 percent of firms- are employed in multinational enterprises, their impact of on training and thus human capital development can be substantial.

Finally, columns (5a) – (5d) show differences in training across different education level of workers. Consistent with most of the results in the literature on enterprise training, we find that firms with more educated workforces are more likely to provide training than otherwise. If educated workers make more productivity gains from training than, or if educated worker requires less training costs to acquire certain skills, then concentrating training activities to educated workers makes sense.

To summarize, status of the firm, firm-size, ratio of non-production workers, foreign capital share, and worker's education-level appear to be highly correlated with the incidence of training activities.

5.2 Determinants of Enterprise Training

In order to see if the above mentioned results hold in a *ceteris-paribus* fashion, we run both basic multivariate analysis of training determinants as well as a more detailed two-stage conditional maximum likelihood estimation outlined in Section 3. Table 3 below summarizes the results for all the baseline models.

Column (1) gives results for the basic model controlling for firm and worker characteristics without accounting for potential bias due to the assumption of exogenous education of workers. This specification is essentially what most of the past studies have adopted. We find very similar results that are comparable to that of the past studies.

Among the variables that show the status of firms, we find that being legally registered with limited liabilities increases the likelihood of workers receiving training. This is perhaps due to the fact that these firms tend to be in a better financial position with diversified source of financial-capital and increased likelihood of obtaining credits for training. We also find that firms that have affiliations with other firms, be it intra-group company or parent-child relationships, are more likely to invest in worker's training activities. This can be the case if the affiliated companies are providers of training or if sharing training facilities across affiliated companies may reduce costs to finance training.

Table 3 : Determinants of Training – Baseline Model -

	(1) Exogenous Education	(2) Exogenous Education with Industry Dummy	(3) Exogenous Education with Industry & Region Dummy	(4) Lagged Education with Industry & Region Dummy	(5) Endogenous Education with Industry & Region Dummy
Limited corporation dummy	0.194 (0.036)**	0.190 (0.0359)**	0.192 (0.0361)**	0.202 (0.0391)**	0.413 (0.0631)**
Limited partnership dummy	0.182 (0.043)**	0.196 (0.0430)**	0.165 (0.0434)**	0.1790 (0.0477)**	0.278 (0.0486)**
No legal status dummy	0.0111 (0.0329	-0.000180 (0.0331)	0.00585 (0.0333)	-0.0168 (0.0368)	-0.0884 (0.0401)**
Export dummy	0.293 (0.0281)**	0.317 (0.0295)**	0.303 (0.0297)**	0.315 (0.0319)**	0.347 (0.0289)**
FDI dummy	0.328 (0.0486)**	0.308 (0.0489)**	0.316 (0.0490)**	0.310 (0.0523)**	0.477 (0.0582)**
Group company dummy	0.538 (0.0426)**	0.560 (0.0428)**	0.522 (0.0431)**	0.490 (0.0463)**	0.545 (0.0418)**
Parent company dummy	0.853 (0.0501)**	0.861 (0.0502)**	0.850 (0.0504)**	0.929 (0.0549)**	0.809 (0.0572)**
Child company dummy	0.663 (0.046)**	0.662 (0.0465)**	0.653 (0.0466)**	0.597 (0.0542)**	0.569 (0.0583)**
Operation years	0.00249 (0.00105)**	0.00237 (0.00106)**	0.00185 (0.00107)*	0.00187 (0.00116)	-0.00141 (0.00136)
Value added	9.44*e-7 (3.20*e-7)**	9.24*e-0 (3.21*e-7)**	8.22*e-7 (3.18*e-7)**	2.19*e-6 (5.62*e-7)*)	1.60*e-06 (3.57*e-7)**
Labour 2nd quartile dummy	0.0599 (0.0305)**	0.0605 (0.0306)**	0.0706 (0.0307)**	0.0972 (0.0351)**	0.114 (0.0309)**
Labour 3rd quartile dummy	0.205 (0.0317)**	0.199 (0.0318)**	0.217 (0.0319)**	0.238 (0.0357)**	0.293 (0.0338)**
Labour 4th quartile dummy	0.613 (0.0367)**	0.601 (0.0368)**	0.640 (0.0371)**	0.668 (0.0409)**	0.745 (0.0377)**
Non-production worker ratio	0.537 (0.0733)**	0.595 (0.0756)**	0.572 (0.0758)**	0.634 (0.0837)**	1.170 (0.159)**
Female-worker ratio	0.00479 (0.0366)	-0.0568 (0.0405)	-0.0838 (0.0407)**	-0.0812 (0.0452)*	-0.266 (0.0595)**
Education (1995)	-	-	-	0.0768 (0.00579)**	-
Education (1996)	0.115 (0.00578)**	0.108 (0.00616)**	0.103 (0.00624)**	-	-0.154 (0.0693)**
R&D	1.82*e-6 (4.98*e-7)**	1.82*e-6 (5.01*e-7)**	1.90*e-6 (5.03*e-7)**	1.76*e-06 (5.03*e-7)**	1.78*e-6 (4.67*e-7)**
Industry dummy	No	Yes	Yes	Yes	Yes
Region dummy	No	No	Yes	Yes	Yes
Number of observation	20239	20239	20239	16890	20239
Pseudo R-squared	0.21	0.21	0.21	0.22	-
Prob > chi2	-	-		-	0.000

Note: Models (1)-(4) are estimated using standard Probit maximum likelihood estimation, while (5) is estimated by two-stage conditional maximum likelihood estimator proposed by Rivers and Vuong (1988). Dependent variable is the incidence of training. Industry dummies are determined for each 2-digit manufacturing industries, while 5 region dummies are assigned for Java, Sumatera, Kalimantan, Sulaweshi, and other regions. ** denotes significant at 5 percent, * denotes significant at 10 percent. The instruments used for (5) are supply of senior secondary school and higher-education graduates per population in each province.

The key variables that determine training activities are firm and worker characteristics. The results show that firms that exports and/or those that have foreign capital share are likely to train their workers. It may be the case that foreign buyers push domestic firms to improve the quality of export goods, or that foreign ownership may put pressure on the

management to improve the efficiency of production process. This should induce firms to invest more in training[14].

Firms with high value added per worker show higher probability of providing training. This is consistent with high value added firms being less likely to be credit constrained, and that training is affordable. Value added per worker may also capture the technology level of the production process which should be correlated with the demand for training. However, one may argue that training contributes to the high value added itself, in which case the direction of causality may well be questioned.

Having a larger workforce increases the likelihood of training. It is shown that the coefficient estimates of the labour dummy variables increase as we move up the labour-quartiles. This can be explained by the lower training cost per worker in firms with larger workforce (Lynch, 1994). It may also be the case that the loss in production from having one worker in off-site training is presumably much higher for a smaller firm (Lynch, 1994). There are also evidences that smaller firms in Indonesia tend to have higher turnover-rates than larger firms (Berry, Rodriguez, and Sandee, 2001) which may lead to less investment in training.

Firms that have higher ratio of non-production workers are more likely to invest in training. This makes a lot of sense since the non-production workers are most likely to demand skill upgrades since they are more likely to be affected by technological change, while production workers are more likely to require minimal amount of training.

Firms that have higher ratio of female labour do not appear to affect training. This is in contrast to most past studies on training determinants where higher concentration of female workers have been found to reduce the likelihood of training. This may be explained by the possibility that the concentration of female workers may be correlated with the type and/or the technology of the goods being produced. The non-production worker ratio and average years of education may have absorbed the impact of the concentration of female workers.

Finally, the worker's education variable shows positive and significant effects on training, which is consistent with most empirical work on training. From this result, many authors have concluded that worker's education and training are complementary, and that policies that support expansion of education also have an indirect positive impact on enterprise training (Lynch and Black, 1998). We claim that this result is biased and that the impact of education variable is simply picking up the effect of unobserved level of technology of production as well as the endogeneity bias due to the training decision affecting the hiring decision.

Column (2) and (3) presents results of fixed-effects-Probit by controlling for industry-specific effects and region-specific effects. For industry specific effects, we account for

[14] Export oriented firms in Indonesia are known to be low tech firms specializing in labor intensive products or simple products, which implies that sophisticated skills are not necessary (World Bank, 1997). For these firms, training is presumably provided to managers and administrative workers.

common aspects among 2-digit industries, while for the region specific effects, we control for firms being located in Java, Sumatra, Kalimantan, Sulaweshi, and other regions. This would filter out any omitted industry and region characteristics that may be correlated with the explanatory variables. Comparison between (1), (2), and (3) shows that the coefficient estimates do not change so much and that the results in (1) are robust. In particular, the impact of worker's education level on training remains the same with high statistical significance.

In order to control for the potential endogeneity and omitted-variable biases that may plague the estimates of education variable in Column (1) – (3), we first tried using education variable for year 1995 instead of year 1996. Results in Column (4) show that these result remain the same as before. The coefficient estimate for education in 1995 remains statistically significant and positive but the magnitude reduces from estimates using education in 1996.

While lagged variable presumably reduce the extent of non-orthogonality, it may still suffer from such bias. We thus finally try an alternative way to directly account for potential endogeneity and omitted-variable bias[15] by applying the 2-stage conditional maximum likelihood estimation developed in Rivers and Vuong (1988), the results of which is shown in column (5). We find that the magnitudes of the impact of most non-education variables on training are the same as before. We, however, find an astonishing result for the impact of workers education on training, which is negative and statistically significant. This implies that *on average* firms in Indonesia respond to an increase in supply of educated workers by reducing investment in training.

5.3 Why Firms Substitute Training by Hiring Workers with More Education?

The result obtained in Table 3, column (5) appears to go against the commonly held view that worker's education and training are complementary. This section provides a number of possible reasons why this may happen.

Resource constraints

Training is costly to firms since it involves direct cost of training as well as opportunity costs such as the value of worker's labour hours. Direct costs are high when firms lack access to training facilities. Indirect costs can be costly for tasks requiring long training periods. Thus, firms that barely finance their training expenses may instead use more educated labour force when factor price differences fairs well for hiring educated workers and if the educated workers can reduce the necessity of providing training. This is the case since educated workers presumably require less training to do the same task (Bishop, 1994). In fact, factor price differences in Indonesia does seem to make it cheaper to hire educated workers due to the narrowing-down of wage premium for higher educated

[15] We used supply of both senior secondary school and higher education graduates per population in each province as exogenous instruments that presumably explain the human capital-level of each firm while not correlated with the error term: ε in equation (3). The exogeneity test proposed by Rivers and Vuong (1988) could not reject the assumption that supply of senior secondary school and higher education graduates are correlated with ε.

students[16] (World Bank, 1997). Substitution between worker's education and training is expected to occur the more a firm is likely to face resource constraints. Firms with financially stable legal status, foreign capital source, relatively large number of non-production workers are less likely to face resource constraints.

Lack of incentives (poaching & turnovers)

A widely accepted view on the reason behind the lack of firm sponsored training in general skills is the possibility of (1) poaching of trained workers by other firms or (2) job turnovers by workers switching to other firms where they can utilize the skilled gained in the previous firm. It is not only the trained but also the educated workers that are attractive to other firms. Thus, an exogenous increase in worker's education may lead to increased likelihood of them being poached, which gives firms less incentives to provide training. World Bank (1997) documents that poaching is most intense among Indonesian private firms in low tech sectors. We thus expect the substitution to be most intense among domestic firms hiring relatively less non-production workers.

Policy constraints

Certain policy constraints may also induce firms to invest less in training and more on hiring educated workers. One such policy is the minimum-wage policy which has been strengthened in Indonesia since 1994[17]. Firms with workers where minimum-wage is binding[18], face difficulties in continuing training while providing them with wages that are below the minimum wage[19]. Thus these firms are more likely to reduce the probability of investing in enterprise training and resort to hiring more educated workers. Minimum wage law also leads to laying off low waged workers with low skills, which leads to an increase in the average education level while reducing training activities. The substitution of educated workers and training is expected to be most intense among firms that hire workers that have binding minimum wages.

Sufficient supply of educated workers from vocational institutions

Another reason why an increase in worker's education leads to reduced training may come from the increased supply of students trained in vocational institutions in Indonesia. Indeed, the ratio of senior secondary school students that were enrolled in vocational educational institutions[20] was one-third in 1993, and was expected to increase until one-half by 1999 (World Bank, 1997). This is one reason why the wage premium for senior secondary school graduates was compressed. The increase in the supply of educated

[16] This is especially the case in the urban labor markets, where there are no longer any differentiation between those new entrants who have and those who have not completed primary schools, and extend only a small premium to lower secondary school leavers. The rate of return for vocational education at the senior secondary level has also gone down throughout the 1980s (World Bank, 1997).

[17] Indeed, Indonesia has tripled (doubled in real terms) the minimum wage in the first half of the 1990s (Rama, 2001).

[18] Young workers that receive enterprise training are more likely to face low wages during the beginning of their tenure while receiving the returns years after. This is the strategy to reduce labour turnovers.

[19] There have been number of studies that have documented the negative effects of minimum wage policy on training incidence (Fleisher, 1981; Leighton and Mincer, 1981; Hashimoto, 1982; and Parsons, 1990). There are, however, also recent studies that claim that it may have an opposite effect (Acemoglu and Pischke, 1999)

[20] Junior secondary vocational education has been phased out in Indonesia (World Bank, 1998).

students[21] from vocational educational institutions may have given incentives for firms to substitute these relatively cheap but educated inputs with enterprise training. Our data shows that domestic firms that hire relatively small number of non-production workers tend to hire more students from vocational schools rather than MNEs. We thus expect substitution between worker's education and training to be strong especially among domestic firms with lower ratio of non-production workers.

5.4 Impact of Worker's Education on Training by Different Groups.

The previous section outlined possible reasons why an increase in average worker's education may reduce the probability of enterprise training. To empirically consider these hypotheses, we divide the sample into different subgroups that presumably face different levels of the above mentioned constraints that lead to substitution. Table 4 below provides a summary table of the constraints that each subgroup is likely to experience.

The first column shows that MNEs (as compared with domestic firms) are less likely to face resource constraints, labour turnover, binding minimum wages, and a large supply of vocational students. Similarly, the second and third columns show that firms with high non-production worker ratio and limited corporations/partnerships are less likely to face resource constraints, labour turnovers, and binding minimum-wages. We thus conjecture that MNEs, especially those that possess high ratio of non-production workers and/or with limited liabilities are less likely to substitute enterprise training by hiring workers with more education.

Table 4: Possible Constraints and Incentives to Invest in Training

	Multinational enterprises	High non-production worker ratio	Limited corporation/partnership
Resource constraints	Less likely	Less likely	Less likely
Poaching/Turnover	Less likely	Less likely	Less likely
Binding minimum wage	Less likely	Less likely	Less likely
Large supply of vocational students	Less likely	-	-

Note: "multination enterprises" are in comparison with "domestic firms", "high non-production worker ratio" is in comparison with "low non-production worker ratio", and "limited corporation/partnership" are in comparison with "other legal status and no legal status" groups.

In order to test the implications in Table 4, we adopt the two-stage conditional maximum likelihood estimation to all relevant sub-samples. Columns (6a) and (6b) show results comparing MNEs and domestic firms. We find that domestic firms are more likely to substitute educated workers as compared with the MNEs. This is consistent with the fact that domestic firms are more likely to be resource constrained, subject to labour turnovers, posses workers that have binding minimum wages, and face large supply of vocational students.

Columns (7a) and (7b) show samples divided by the level of non-production workers employed. For firms with higher concentration (1st quartile) of non-production workers, worker's average level of education does not have a statistically significant effect on

[21] Universal basic schooling (until junior secondary level) had been achieved by 1994, and since then, the government has been focusing on increasing the supply of senior secondary level students.

training. However, for firms with the lowest concentration (4th quartile) of non-production workers, education has a statistically significant and negative effect on training probabilities. This is consistent with our prior that firms with lower concentration of skilled workers are more likely to face resource constraints, face worker turnovers, and have binding minimum wages.

Finally, columns (8a) and (8b) show results for samples divided by different legal status. They show that worker's average education does not have any effect on training for the "limited corporations and partnership" samples, while they have a statistically significant and negative effect for the "other legal and no legal status" group. Since the former samples are more likely to (1) suffer less from resource constraints, (2) are less likely to face labour turnovers, and (3) have fewer workers that have binding minimum- wages, an increase in the average education of workers is less likely to affect their training probabilities. On the other hand, firm that either have no legal status or lack limited liabilities are presumably more likely to (1) suffer from resource constraints, (2) face labour turnovers, and (3) have workers who receive minimum-wages. As a consequence, these latter group of firms are more likely to substitute training by hiring workers with more education.

Table 5: Determinants of Training by Sub-Samples

	(6a) Multinational enterprises	(6b) Domestic enterprises	(7a) High non-production worker	(7b) Low non-production worker	(8a) Limited Corporation & Partnership	(8b) Other legal status & no legal status
Limited corporation dummy	1.02 (0.523)*	0.383 (0.0655)**	0.453 (0.102)**	0.604 (0.0873)**	-	-
Limited partnership dummy	1.42 (0.697)**	0.258 (0.0502)**	0.314 (0.0931)**	0.364 (0.110)**	-	-
No legal status dummy	-0.637 (0.589)	-0.0763 (0.0408)	-0.0175 (0.0966)	-0.152 (0.0542)**	-	-
Export dummy	0.363 (0.101)**	0.337 (0.0310)**	0.294 (0.0541)**	0.181 (0.0805)**	0.346 (0.0689)**	0.237 (0.0693)**
FDI dummy	-	-	0.436 (0.0873)**	0.549 (0.171)**	0.328 (0.184)*	-0.372 (0.265)
Group company dummy	0.544 (0.117)**	0.542 (0.0451)**	0.495 (0.0648)**	0.689 (0.134)**	0.532 (0.0722)**	0.440 (0.115)**
Parent company dummy	0.864 (0.336)**	0.834 (0.0545)**	0.695 (0.103)**	0.952 (0.161)**	0.799 (0.0621)**	1.09 (0.0896)**
Child company dummy	0.331 (0.273)	0.593 (0.0588)**	0.446 (0.110)**	0.486 (0.169)**	0.361 (0.0818)**	0.594 (0.0834)**
Operation years	-0.0103 (0.00959)	-0.000426 (0.00132)	0.00256 (0.00235)	-0.00634 (0.00216)**	0.00325 (0.00590)	0.000796 (0.00149)
Value added	1.99e-6 (1.36e-6)	1.44e-6 (3.77e-7)**	1.78e-6 (5.69e-7)**	0.0000104 (2.07e-6)**	6.97e-7 (6.92e-7)	7.84e-6 (2.55e-6)**
Labour 2nd Quartile dummy	0.310 (0.379)	0.108 (0.0315)**	0.274 (0.0677)**	0.0237 (0.0455)	0.167 (0.105)	0.0826 (0.0346)**
Labour 3rd Quartile dummy	0.384 (0.374)	0.285 (0.0348)**	0.474 (0.0712)**	0.0660 (0.0567)	0.347 (0.155)**	0.234 (0.0406)**
Labour 4th Quartile dummy	0.735 (0.341)**	0.746 (0.0404)**	0.934 (0.0706)**	0.542 (0.111)**	0.771 (0.242)**	0.543 (0.0702)**
Non-production worker ratio	0.859 (0.388)**	1.12 (0.174)**	-	-	0.524 (0.637)	1.27 (0.165)**
Female-worker ratio	-0.148 (0.233)	-0.250 (0.0630)**	-0.260 (0.109)**	-0.102 (0.0827)	-0.119 (0.271)	-0.140 (0.0607)**
Education	-0.135 (0.213)	-0.122 (0.0720)*	-0.105 (0.0812)	-0.421 (0.108)**	0.101 (0.224)	-0.229 (0.0743)**
R&D	3.10*e-6 (1.28*e-6)**	1.55*e-6 (5.18*e-7)**	1.89*e-6 (6.89*e-7)**	9.24*e-6 (6.98*e-6)	1.66*e-6 (4.94*e-7)**	6.51*e-6 (5.69*e-6)
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes

Region dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of observation	1054	19185	5043	5081	9957	10282
% of total workers	17.6	82.4	26.1	12.9	87.4	12.6
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000

Note: All models are estimated using two-stage conditional maximum likelihood estimation proposed by Rivers and Vuong (1988). Dependent variable is the incidence of training. Industry dummies are determined for each 2-digit manufacturing industry, while 5 region dummies are assigned for Java, Sumatera, Kalimantan, Sulaweshi, and other regions. ** denotes significant at 5 percent, * denotes significant at 10 percent.

Note that all the estimations have used firms as the unit of analysis. Since large number of firms in the developing countries are small and medium scale low-technology firms hiring relatively small number of workers, the group of firms that we identified as facing constraints may only cover a small portion of the worker's population. To see this, the second last row in Table 5 ("% of total workers") indicates the number of workers covered within each category of firms. It indicates that only 13 percent of workers are working in firms that have either "no legal status or limited-liabilities" or "low percentage of non-production workers". On the other hand, the percentage of workers working in domestic firms is large: 82 percent. This implies that while a large proportion of Indonesians are subject to substitutability, those that work in firms that have either "no legal status or limited-liabilities" or "low percentage of non-production workers" face more stringent constraints against training activities[22].

[22] Indeed 99.96 percent of firms that have "no legal status or limited-liabilities", and 98.5 percent of firms in the lowest quartile of non-production worker ratio are domestic firms.

6. Policy Implications

This section describes two policy responses related to the findings. The first is to re-evaluate the relationship between education and training policies that was based on past empirical results that did not account for the potential biases emphasized in this paper. The second issue is to address possible policy responses so as to provide the right incentives to constrained firms that under-invest in training notwithstanding its positive productivity effects for both workers and firms as well as for the economy as a whole.

Coordinating education and training policies

It is common to find policy recommendations that support an increase in educational attainment not only for its own sake but also to stimulate training activities. While it is presumably true that educated workers learn more and in an efficient manner than otherwise, it does not automatically mean that firms would respond to an increase in the supply of educated workers by increasing enterprise training. This paper has demonstrated that the contrary appears to be the case, at least for constrained firms within the manufacturing sector in Indonesia. This points to the importance of reconsidering alternative policy options that may allow further boosts in human capital with low cost.

The pattern of Indonesian educational expansion and enterprise training was such that the supply of vocationally trained students increased while firm's incentives of providing training reduced. This was the case since education-policy emphasized vocational schooling while training-policy was not effective. We suggest alternative policy measures that emphasize both quantity and quality of basic education along with providing incentives for constrained firms to train their workers[23]. This policy option is expected to require much less budget with a further boost in human capital[24]. This, however, is not likely to be attained without synchronized education and training policies, which require close collaboration between the education and labour ministries.

Policies that enhance training for constrained firms

We have shown that firms that are (1) non-legal or legal but without limited liabilities, (2) domestic, and (3) composed of relatively small number of non-production workers, face constraints and disincentives such that they respond to an increase in educated workers by reducing training. Policy measures could address this problem. First, if credit market access is enhanced for these constrained firms, they may be able to benefit from investing in training. Second, if minimum wage policy is flexible enough to include a clause that

[23] Bishop (1995) provides reasons why enterprise training can be more effective than school based training: (1) training obtained at school is less likely to be used on one's job than training received from an employer, (2) advantage of OJT is the strong motivation to learn that is engendered by the high probability of using skills learned and promotions and pay increases that go to those who do well in training, (3) employer training is usually done by supervisors and coworkers who are aware of the trainee's progress and can give necessary corrective instruction, (4) equipment and materials necessary for the training are generally available at the work site and time on the machine for the trainee can generally be arranged without disrupting production, (5) trainer is usually held accountable for productivity of work group, (6) when employers provide training the trainee's time tends to be used much more efficiently.

[24] This is the case in Indonesia, where vocational education has a substantially higher unit cost and lower returns as compared to general education (World Bank, 1997).

allows employers to pay apprenticeship-wages, firms that hire workers with binding minimum-wages may increase training activities. Third, if policies limit the expansion of vocational education and instead expand the quantity and quality of general education, firms would gain more incentives to train.

7. Conclusion

Using Indonesian manufacturing survey, this paper re-examines the conventional wisdom that schooling and enterprise-training are complementary and that one important reason behind the lack of investment in training comes from worker's low educational attainment before entering the job market. We find, after accounting for potential bias that may have plagued past results, that constrained firms do not appear to be taking advantage of prior human capital investments that workers have made before entering the labour market. We argue that a closer collaboration between education and labour market policies coupled with enhanced incentive scheme for constrained firms to provide training are crucial to remedy this policy/market failure.

These findings call for more empirical analyses on training incidence in countries/industries with firms that face different sets of constraints to training. This does not appear to be a difficult task due to the recent expansion in the number and the quality of enterprise surveys. Furthermore, using employer-employee matched data sets may also allows researchers to better control worker's characteristics that are likely to be correlated with worker's education variable. Perhaps most important of all, differentiating different modes of training (e.g. informal on-the-job training, formal in-house training, and formal training in training centers) and the intensity and cost of such training variables, should enrich the analysis and further enhance our understanding of the issues addressed in this paper.

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