How do business practices affect micro and small firms' performance? Evidence from Vietnam

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Abstract:

This paper explores how business practices affect firm productivity by using Vietnam's bi-annual surveys of small firms conducted from 2006 to 2011. We constructed two simple weighted business practice index from seven and eight business practice indicators, and then explicitly used these indices as production inputs, together with labor and capital inputs in estimating production functions. The results show that our business practice indices are strongly associated with firms' productivity. We also find that the business practice index has a larger effect on sole proprietorship firm's productivity than for corporate firms. The effect of business practice on firm performance is found to vary across different sub-samples of firms. While the estimation results show a strong and positive relationship between firm's perceived of competition and percentage of workers with college degree, there is no evidence that the education level of the business owners/managers on firm productivity. The results, however, suggest that manager's/owner's education may have indirect effects on productivity through business practice index. We also find that for whole sample and for sole proprietorship businesses, the adoption of business practice in last period have a positive and statistically significant effects on the adoption of business practice in this period. However, the total factor productivity (estimated from production function without business practice index) in the previous period does not have a strong impact on a firm's adoption of business practice in this period.

Keyword: business practice, productivity growth, control function, small medium enterprises, microenterprise, dynamic panel data, Vietnam

I. Introduction

There has been a growing literature on the impact of business practices on firm's performance. Using data from the UK, US, Germany and France, Bloom and Van Reenen (2007) find a strong and statistically significant correlation between a firm's management practice score and its total factor productivity. Similar results are also found in Bloom et al. (2012) for Eastern European firms and, to some extent, in Myiagawa et al. (2010) for Japanese and South Korean firms. Evidence from developing countries also shows that the firms that adopted the standard business practices have a better performance (e.g. Bloom et al (2013) for India, Sonobe et al (2011) for Tanzania, Ethiopia and Vietnam, Mano et al (2012) for Ghana, Berge et al (2011) for Tanzania). However, much of this literature focuses on large enterprises and to our knowledge, there is comparatively little known about the dynamic relationship between business practice and firm performance for the small- and medium-sized firms in developing countries. This paper aims at filling this gap by examining the relationship between business practices and small- and medium- firm performance in a low-income country. This is achieved by using the rich panel data for 1400 micro, small and medium firms collected in the years of 2005, 2007, 2009 and 2011 in Vietnam.

To examine the dynamic relationship between business practice and firm performance, we follow Bloom and Van Reenen (2007) and construct a weighted business practice index from eight indicators: using email in business activities, carrying out advertising, keeping an accounting book, having a good knowledge of business laws and regulations, being a member of at least one business association, organizing training course for workers, output market selection and input purchase selection. We use the control function approach, developed by Wooldridge (2009) and Petrin and Levinsohn (2012) to estimate the production function and using GMM-system method developed by Blundell and Bond (1998, 2000) to estimate the determinants of business practice adoption. These estimation methods allow us to control for the endogeneity of production input, business practices index, and other factors

The paper's contributions to the literature are two folds. First, by using a rather rich and long dataset, we are able to control for potential endogeneity among production inputs (including business practice) and firm's output. This dataset also allows us to analyze the endogenous change in business practices, an issue that has not been studied in previous literature due to data limitation. Moreover, the dataset allows us to examine the potential heterogeneous effects of business practice based on firm's selection of location and selection of ownership. Second, we have constructed a business practice index, which is simpler than

that of Bloom and Van Reenen (2010) but more relevant for the small- and medium-sized firms in developing countries where many firms do not use many "standard" business practice like those used by firms in advanced economies or by large firms in developing countries (Sonobe et al 2011).

The estimation results indicate that business practice index has a positive and statistically significant impact on firm productivity, employment and sales growth. Moreover, there is heterogeneous effect of business practice indices on firm productivity. While firm's perception of fiercer competition and percentage of workers with college degree have positive effects on firm productivity, we find no evidence that the education level of the business owners/managers have an effect on firm productivity. However, the results obtained from exploring determinants of business practice adoptions suggest that manager's/owners' education may have indirect effects on productivity (through improving business practice index.) We also find that for whole sample and for household business and sole proprietorship firms, the adoption of business practice in last period have a positive and statistically significant effects on the adoption of business practice in this period.

The paper is organized as follows. Section 2 reviews theoretical foundation and hypotheses. Estimation strategy is discussed in section 3. Dataset and descriptive statistics will be presented in section 4. Estimation results are presented and discussed in section 5. Section 6 provides some concluding remarks.

II. Theoretical foundation (review) and hypotheses

A large number of studies have attempted to explore sources of firms' growth. At both macro level and micro level, standard growth theories have considered labor and capital as the major input for growth. However, recently there are more evidences that managerial capital should also be considered as an input of production. Bruhn et al (2010) propose that the managerial input can be viewed as a significant element of "intercept shifter" of the production function. In fact, this idea was initially proposed by Lucas' (1978) in his model of firm size and it was then further expanded by Rosen (1982)), Mundlak's (1961), (Bloom and Van Reenen (2007) and Bruhn et al (2010).

According to Bruhn et al (2010), managerial capital affects the productivity though two channels. First, better-managed firms are more capable to improve the productivity of other inputs such as capital or labor (Lucas, 1978). Second, better-managed firms can have an appropriate selection of quantity of inputs used in the production process. While the first

channel is related to the effects of heterogeneity in firm productivity on output, the second channel suggests that resource constraints are function of managerial capital.

While the importance of management on firm's performance has been studied in other disciplines, it has not been widely studied in economics until recently. This, according to Bloom and Van Reenen (2010), is due to several reasons. First, economists for a long time have believed that profit maximization leads firms to minimize costs, thus firms would response to market conditions by adjusting their management practices. Second, management is a complicated concept to measure. However, recently more and more studies have attempted to estimate the impact of business practice on firm's performance. Bloom and Van Reenen (2007) construct a management practice score, which comprises of 18 management indicators in four broad areas: operations, monitoring, targets, and incentives. They relate this index with productivity using data from the UK, US, Germany and France and find that the correlation between a firm's management practice score and its total factor productivity is statistically strong and significant. Using the same management practice scores in both developed and developing countries, Bloom and Van Reenen (2010) find that the better managed firms tend to perform better and that differences in management practices explain difference in productivity and performance among firms and countries. Moreover, firms and countries usually are different in their attention to different aspects of management. They also find that firms, which face stronger product market competition, are likely to have higher management practice score and firms with higher level of human capital tend to have better management practices.

Another line of related researches is to focus on how the managers can make differences by their either education or actions (e.g. Bertrand and Schoar 2003, Kaplan, Klebanov, and Sorensen 2008 and Malmendier and Tate 2009). For example, Bertrand and Schoar (2003) find that the identity of managers (particularly for CEOs) has a significant effect on firms' returns on assets. These results reflect performance differences that can be explained by the identity of the managers. However, such results do not answer the questions of which types of knowledge or actions by managers could affect the firms' performance. More recent works have started to explore how particular CEO practices and philosophies are tied to firm's performance.

Several recent studies suggest that management education, as well as management practices, are of lower quality in developing countries than in developed countries (Chaudry 2003, Bloom and Van Reenen 2010 and Sonobe et al 2011). Gine and Mansuri (2011) find

that only 18 percent of Pakistani firms in their study separate the business expenditure from household expenditure. Similarly, only 27% of metalwork firms in Ghana keep their business record (Mano et al, 2012). This low rate of adoption of business practice may have caused the stagnated growth of the small firms in developing countries. There has been an increase in the number of field experiments, which attempt to train small business owner in developing countries to carry out modern business practice. Through such business trainings, business owners are helped to improve their knowledge, and adopt business practices conducive to the success of their enterprises (McKenzie and Woodruff, 2013). Such scientific field experiments are ideal to see how the difference in adoption of business practices affect outcomes. Although such business training programs vary in length, contents, methods of training delivery and the targeted participants, major core topics such as accounting, financial planning, inventory management and marketing are still covered in most interventions (McKenzie and Woodruff, 2013).

The results from these field experiments are mixed, however. For example, Mano et al (2012) and Gine and Mansuri (2011) find a statistically significant increase in the survival likelihood among the firms participating in business trainings while Valdivia (2012) finds that the likelihood of survival declined for women-owned Peruvian firms participating in their business training. Results are also mixed when looking at business profit and sales. Some researches (such as Berge et al (2011), Calderon et al (2012), De Mel et al (2012) and Valdivia (2012)) find that training increases profit and revenue of the male-owned firms in the short run, but others find that training has no statistically significant effect on firms' profits or revenue (e.g. Bruhn and Zia, 2012; Gine and Mansuri, 2012; Mano et al, 2012). Similarly results are also found in Indian textiles firms. Bloom et al (2013) implemented a randomized experiment which provided managerial supports to the treated firms and within the first year, the productivity have increased by 17% and within three years, some treatment firms have opened new production facilities. The magnitude of interested variables, however, is often small in absolute terms and therefore it is not easy to find a significant effect on the business performance (McKenzie and Woodruff, 2013). Even, in some cases, firms have reversed back to their old practice (Karlan et al, 2012).

Another question may arise: if the "standard" business practices are good for firms' performance, why don't they put such practices into operation? Bloom and Van Reenen (2007) offer three reasons why firms do not adopt the best practice: cost, agency considerations, industry heterogeneity and frictions. For example, carrying out advertising

may increase the sales and to some extent help to improve productivity (when firms sell more, in the short run, they need to raise their productivity to catch up with the demand). However, if the product is homogenous, carrying out advertising will not bring any benefit while the cost may be high. Similarly, keeping an appropriate accounting book involves many procedures and potentially requires firms to give up their own long practiced customs. This process may hinder the owner/manager to change his/her accounting practice, especially when the firm size is small and the financial transaction is relatively small and when the old system of reporting is perceived to work well Using email in business also incur costs (including sunk cost, especially when not many customers and business partners adopt it). In reality, upgrading management is a costly investment and some firms may simply find that these costs outweigh the benefits of moving to better practices. However, if as long as the adopting better business practice have positive impacts on the productivity, firms will at least to continue to adopt such practice.

Another factor that may affect the adoption of business practice is the competition in the product market. According to Bloom and Van Reenen (2007) and Van Reenen (2011), under tough competition, inefficient firms will find it difficult to survive in the market and they ultimately would be driven out of the market. Syverson (2004) finds that fiercer competition is associated with a higher level of productivity and smaller differences in productivity among survival firms. This could be due to the fact that tougher competition forces firms to increase their management efforts and to adopt better business practices and strategies in order to increase their productivity, and thus build up their capability to compete with more efficient firms (Schmidt, 1997). Although carrying out such activities may incur some costs, firms that operate in a highly competitive market environment may still have to implement better business practices.

Average education levels of employees and of the managers/owners may also be associated with the adoption of better business practices. This could be because such employees are more familiar with the best practices used in their line of works and are more supportive to implement them in their workplace. Moreover, if the production is improved due to better management and better use of inputs, then having workers with high level of education is likely to have an impact on both productivity and management. In some cases, especially in production of homogeneous products, higher education of workers may not translate directly to higher productivity, but through better management and better combination of inputs used in production

In summary, theoretical and empirical evidences (especially those from developed economies) have shown that adoption of best business practice have positive effects on firm performance. Although there are mixed results from field experiments in developing countries, they do not imply that the adoption of business practice has failed to improve firm's performance. Thus, our first hypothesis will be that adoption of better business practice has positive impact on firm productivity. This impact may be different for different types of firms. Given our index, which are contained basic business practices; we expect that our business practice index is more closely associated to the firm productivity of household and sole proprietorship firms than other types of firms such as limited or joint stock companies. However, firms will incur some costs to either adopt best business practice or to stop such adoption. Thus, we hypothesize that adoption of better business practice is persistent. Under fiercer competition environment, benefits from adopting business practice are larger than the cost, especially the opportunity cost, that firm may have to bear. Therefore, we expect that the fiercer perceived competition, the more they need to adopt the new business practice. Moreover, in order to successfully adopt business practice, it requires not only the knowledge of the business leaders but also the support from implementations. Thus, our next hypothesis will be the higher proportion of workers with university and the higher level of education of the manager/owners will have positive impact on firm productivity, but this impact is not direct, but through better business practice.

III. Estimation strategy

Consider a basic production function

$$y_{it} = \alpha_l l_{it} + \alpha_k k_{it} + a_{it}$$

where y is log of output, l is log of labor, and k is log of capital of firm i at time t. Assume TFP can be written as

$$a_{it} = a_0 + \beta_1 BPI_{it} + \beta_2 X_{it} + \epsilon_{it}$$

where BPI is firm's business practice and ϵ_{it} is an unobserved error. Therefore, we can rewrite the production function as

$$y_{it} = a_0 + \alpha_l l_{it} + \alpha_k k_{it} + \beta_1 BPI_{it} + \beta_2 X_{it} + \epsilon_{it}$$

OLS estimation will be biased because of the endogeneity of input choices and selection bias. Moreover, additional issues may arise due to the lack of data on firm's physical input and output and their firm-level prices if firms operate in imperfectly

competitive market and due to the lack of an appropriate production function in the case that firms produce multiple products.

Various approaches have been used to deal with the endogeneity problem. One approach is to use fixed effects estimation. If we assume that labor, capital and business practice are strictly exogeneity, fixed effects estimation will eliminate the source of endogeneity bias and the estimators are consistent. However, fixed effects estimation is not reliable if unobserved productivity is time invariant. Moreover, the assumption that of strictly exogeneity of inputs, i.e. firms are unable to choose/adjust their input level in reaction to productivity shocks are not likely hold in practice (Wooldridge, 2009). Therefore, although fixed effects have a nice property in dealing with endogenous problem, it is unlikely to perform well in practice (Ackerberg *et al*, 2006).

Another approach to deal with endogeneity problem is to use instrument variables. Independent variables that cause the endogeneity problem are instrumented by some instrument variables. The potential instrument variables include input prices, factors that shift the supply curve or demand curve. However, as Ackerberg *et al* (2006) note such instrument variables have their own weaknesses. For example, input price could be a valid instrument if the market is competitive or all input prices should be correctly reported. Meanwhile, factors that shifts demand curve or supply curve seems to be more valid instruments, it is not widely use in practice because either it is difficult to find suitable instruments for different inputs (Ackerberg *et al*, 2006).

Arellano and Bond (1992) propose to use the lagged levels of input as potential instruments. More specifically, after first differencing the production function, the lagged inputs can be used as instruments for changes in the inputs. But according to Blundell and Bond (2000) little variations in in input causes such instruments to be weakly correlated with input changes. Therefore, Blundell and Bond (2000) propose an extended GMM estimator method, which uses lagged first differences as instruments in the level equation. They also relaxed the time-invariant nature of ω_{it} in fixed effects model by decomposing the productivity into a fixed effects component and an autoregressive component. However, this approach requires rather long panel data and the initial conditions seem to be too strong.

Wooldridge-Levinsohn-Petrin approach

Consider a standard Cobb-Douglas production

$$y_t = \beta_0 + \beta_k k_t + \beta_l l_t + \beta_{bpi}\text{BPI} + \omega_t + \epsilon_t$$

Simultaneity can be solved using GMM techniques. However, the instruments are weakly correlated with the differenced explanatory variables, leading to bias in finite samples. In order to deal with this problem, some methods have tried to find proxy variables for productivity shocks and then uses the information in the proxies to invert out productivity from residual. For example, Olley and Pakes (1997) use investment as a proxy for the unobserved productivity shocks in two-step estimations. However, many firms, especially firms in developing countries, have zero-investment observations. This could lead to efficiency lost while non-convex adjustment costs may also affect the responsiveness of investment to shocks. Therefore, Levinsohn and Petrin (2003) propose to use intermediate inputs such as materials or energy to invert out the unobserved productivity shocks. They assume that given the quasi-fixed capital, the firm decides on labor and then, given the labor, firm will determines the use of material input. Therefore, under the two-step LP procedure, the labor coefficient is identified in the first step while the capital coefficient is estimated in the second step.

However, Ackerberg et al (2006) argue that in the LP estimating procedure, decisions on labor l_t and intermediate input m_t are taken simultaneously, so this approach may suffer from collinearity problem. According to Ackerberg et al (2006), if demand for intermediate input is assumed to depend on firm's capital k_t and productivity shocks ω_t then, labor may also depend on k_t and ω_t and this functional form is different from function of demand for intermediate input. Under some assumptions about the firm's production technology, one can derive the productivity shocks as a function of material inputs and capital. Plugging this productivity shock function into labor demand function, we will get labor demand function is a function of capital and material input. This, however, will invalidate the identification of labor coefficient in the first step.

In order to deal with this collinearity problem, Wooldridge (2009) proposes to estimates labor coefficient β_l and β_k (and also β_{bpi} in our setup) in one step. Given a production function as (1), assume that the error term ϵ_t is uncorrelated with labor, capital, business practice and material inputs but also with all lags of these variables, i.e.

$$E(\epsilon_t \mid l_t, k_t, \text{BPI}_t, m_t, l_{t-1}, k_{t-1}, \text{BPI}_{t-1}, m_{t-1} l_1, k_1, \text{BPI}_1, m_1) = 0 \qquad (1)$$

Another assumption to restrict the dynamics of unobserved productivity shocks:

$$E(\omega_t \mid k_t, l_{t-1}, k_{t-1}, \text{BPI}_{t-1}, m_{t-1},) = E(\omega_t \mid \omega_{t-1}) = j(\omega_{t-1}) = j(g(k_{t-1}, \text{BPI}_{t-1}, m_{t-1})) \quad (2)$$

where

$$\omega_{t-1} = j(\omega_{t-1}) + a_t$$

where $E\left(a_t \mid k_t, l_{t-1}, k_{t-1}, \text{BPI}_{t-1}, m_{t-1}, ..., l_1, k_1, \text{BPI}_1, m_1\right) = 0.$

Thus labor input l_t and material input m_t are thus correlated with productivity innovation a_t, but capital k_t, business practice input BPI_t, all past values of labor, capital, business practice and material inputs are uncorrelated with a_t. Substituting the above equations into production function yields

$$y_t = \beta_0 + \beta_l l_t + \beta_k k_t + \beta_{bpi} \text{BPI}_t + j(g(k_{t-1}, \text{BPI}_{t-1}, m_{t-1})) + u_t \quad (3)$$

where $u_t = a_t + \epsilon_t$ and $E\left(u_t \mid k_t, \text{BPI}_t, l_{t-1}, k_{t-1}, \text{BPI}_{t-1}, m_{t-1}, \ldots, l_1, k_1, \text{BPI}_1, m_1\right) = 0$

To estimate β_l , β_k and β_{bpi}, we need to specify the function g and j. Petrin and Levinshon (2012) suggest that similarly as Levinsohn-Petrin (2003) procedure, we may consider low degree polynomials in the function g of order up to three. We may assume that the productivity process is a random walk with drift so that productivity shock at time *t* becomes

$$\omega_t = \tau \times \omega_{t-1} + a_t$$

Plugging the above equation and $\omega_{t-1} = g(k_{t-1}, \text{BPI}_{t-1}, m_{t-1})$ into the production function yields

$$y_t = (\beta_0 + \tau) + \beta_l l_t + \beta_k k_t + \text{BPI}_t + g(k_{t-1}, \text{BPI}_{t-1}, m_{t-1}) + u_t \quad (4)$$

where $u_t = a_t + \epsilon_t$ and $E\left(u_t \mid k_t, \text{BPI}_t, l_{t-1}, k_{t-1}, \text{BPI}_{t-1}, m_{t-1}, \ldots, l_1, k_1, \text{BPI}_1, m_1\right) = 0$ holds.

Petrin and Levinshon (2012) suggests to estimate the above equation with polynomials in k_{t-1}, BPI_{t-1} and m_{t-1} of order up to three approximating for function g using pooled IV with k_t, BPI_t , l_{t-1} , k_{t-1} BPI_{t-1} , m_{t-1} and polynomials containing k_{t-1} , BPI_{t-1} and m_{t-1} of order up to three as instruments for l_t . Given $E\left(a_t \mid k_t, l_{t-1}, k_{t-1}, \text{BPI}_{t-1}, m_{t-1}, ..., l_1, k_1, \text{BPI}_1, m_1\right) = 0.$, this approach is robust to Ackerberg et al (2006) critique.

Construction of business practice index

In this study, we construct two business practice indices. The first index is a simple weighted of eight business practice indicators as follows:

BPI=(1/8) (Using Email + Carrying out Advertisement + Having an accounting book + Regulation knowledge + Worker training activity + Being a member of business association + Sales to other provinces and exports and + Input from other provinces and imports)*

Of which using email, carrying out advertisement, having an accounting book, workers training activity and being a member of business associations are dummy variables. These variables will take value of one if a firm carries out such activities. Regulation knowledge is a composite index. The respondents were asked whether they have a good understanding of 9 laws and regulations, including enterprise law, cooperative law, labor code, customs law, insurance law, tax law, environmental law, land law, investment law. The regulation knowledge index is constructed based on the simple weighted methods. For each law/regulation, the score will take value of one if the respondents said they have good knowledge about it and zero otherwise. Then the regulation knowledge index will be normalized by divided the total score by nine. Therefore the score will be from zero to 1. Sales to other provinces and exports are a firm's percentage of sales to customers from other provinces and exports. Similarly, input from other provinces and imports indicator is the percentage of inputs procured from other provinces and imports.

Among the eight indicators, the first indicator, using email in business activities, reflects the firm's adoption ICT in doing business. The second indicator, carrying out advertisement, represents how the firms market their products and whether they utilize advertising to expand to new customers or not. The third indicator, keeping an accounting book, represents how firms manage their financial activities and their cash flows. It is noted that many micro and small firms, especially sole proprietorship firms, do not have a standard accounting book. They may record their business transactions, but such record is mostly used to manage the debts and does not follow a standard accounting principle. The forth indicator, regulation knowledge, indicates how manager/owner understand the regulations/laws that are related to their business activity. The fifth indicator, worker training activity, indicates firm's investment in its workers. The sixth indicator, being a member of business associations, is related to a firm's acknowledgement of benefits of networking with other businesses. The seventh and eighth indicators, sales to and input procured from other province and export/imports, are related to ability to expand the market and to manage procurement ability.

While there is no formal law regulated the operation of the household business (i.e. firms in the proprietorship group), firms in the company group are operated under the Enterprise or Cooperative Law. This implies that firms in the proprietorship group do not have to keep a formal accounting book but firms in the company group have to keep an official accounting book. To account for this fact, we construct the second business practice index, which consists of seven business practice indicators as in the case for the first business practice index, except the indicator of having an accounting book.

Following Bloom et al (2012), we convert the scores to z-scores by normalizing each practice to mean zero and standard deviation one:

$$z_{m_i} = \frac{m_i - \bar{m}_i}{\sigma_{m_i}}$$

where z_{m_i} is the z-score of business practice m_i in firm i, $\bar{m}_i$ is the unweighted average of business practice m_i across all observations throughout the studied period and σ_{m_i} is the standard deviation of business practice m_i across all observation throughout the studied periods. Then we unweightedly sum up all z_{m_i} and take the average to get BPI in the form of z-scores for each firm. We continue to convert this BPI in the form of z-scores into z-scores for the whole observation throughout the studied period.

These indicators, in comparison to 18 indicators proposed by Bloom and Van Reenen (2007) are simpler, but they are suitable for small firms in developing countries. It can be seen that among such indicators, three indicators including having email, keeping a book of account, and carrying out advertisement could be considered as business practice while other three remaining indicators contains in themselves both the management and business practices. For such indicators, it relates to the firms' efforts in geographically strategic expansion and firms' capability in top-down production chain management and its commitment in doing serious business in an increasingly regulated economy.

IV. Data and descriptive analysis

The data is jointly collected by University of Copenhagen, CIEM and ILSSA in 2005, 2007, 2009 and 2011. The surveys were conducted in 10 provinces, four from the North, three from the Central and three from the South. Due to implementation issue, only some specific areas in each province and city are selected. In each province, both urban districts and rural districts are chosen. In each province, the sample was stratified by ownership form

to ensure that all types of non-state enterprises, including formal and informal firms were represented. Subsequently, stratified random samples were drawn from a consolidated list of formal enterprises and an on- site random selection of informal firms.

After each survey round, to replace exit firms or a small number of firms, which declined to participate, some firms would be randomly selected on the list of formal firms combined by the GSO in the previous years (For example, for 2007 survey, replaced firms are selected from Enterprise census in 2006) and on-site selection of informal firms. However, in terms of household firms, the GSO enterprise census only covers those with fixed professional premises (see Demenet *et al* (2010) and Rand and Torm (2012) for more detail). The sample size for each survey are 2,821 firms in the 2005 survey, 2,635 firms in the 2007 survey, 2,655 firms in the 2009 survey and 2,552 firms in the 2011 survey. After cleaning and dropping firms with missing data, we can have a balanced sample of around 1,450 firms. We excluded firms without adequate information on interested indicators. Ultimately, the sample size for this study is 1,395 firms. We re-categorize these firms into seven industries: agriculture-related industry (food, tobacco and beverage), light industry (garment, textile and leather), wood and furniture industry, chemical industry, non-metal fabricated industry, heavy industry and other industries.

Although the sample is slightly adjusted overtime, the questionnaires are nearly the same. Information collected include firm's general characteristics; firm history; household characteristics of the owner/manager; production characteristics; sales structure and export; indirect costs, raw materials and services; investments, assets, liabilities and credit; fees, taxes and informal payments; employment; environment; network and economic constraints and potentials.

[TABLE 1 IS ABOUT HERE]

We divide firms into three groups. The first group consists of include household and sole proprietorship firms throughout the studied period. The second group consists of cooperative, limited firms and joint stock firms throughout the period. The third group consists of firms in which their ownership type changed during the studied period. Although most of household and sole proprietorship firms have to register their operation to the local government, they are more likely to be considered as the informal sector. Unlike cooperative, limited and joint stock firms, these household and sole proprietorship firms do not have to comply with business regulations relating to taxes (they may have to pay a flat tax based on

their industry), accounting requirement. We also look at the district where the firms locate to identify whether a firm is a rural firm or an urban firm. In this paper, we call the first group of firms as proprietorship, the second group as the corporate and third group as mixed ownership group.

Table 1 presents the basic statistics of our sample. In general, firms in our sample did not change their location over the years. In fact, only few firms reallocate from an urban district to a rural district in the same province. However, the proportion of household and sole proprietorship firms in rural areas is much larger than that in urban area. About 75% of firms in the rural areas are sole proprietorship firms while that figure for urban areas is only more than 50%. In fact, most of corporate firms are located in the urban areas. During our studied period, the proportion of informal firms in total number of firms is slightly increases in both rural and urban during the studied period. Moreover, the proportion of companies in rural areas also slightly increases.

In absolute terms, there is a big gap between corporate and sole proprietorship firms in nearly all aspects from value added, number of workers, value of production capital, educational level of managers (which we measured by whether the manager/owner have at least vocational training or not), proportion of employees with college degrees. For example, in 2011, the value added of proprietorship firms is 10 times lower than that of companies although the number of workers is about 6 times lower. This gap is also large among firms in each area. While, in terms of value added, the gap between rural and urban for each type of firms are not so large and this gap gradually narrow down, there is a big gap between firms in rural and urban areas in terms of production capital, especially among the proprietorship firms. In 2011, the production capital of proprietorship firms in urban areas is nearly four times higher than that of proprietorship firms in rural areas.

On average, the value added grows at 6% per annum from 2005 to 2011. Among the firms, the rural firms grow at 6.5% for proprietorship firms and 5.5% per annum for companies while the figures for urban firms is 2.3% per annum for proprietorship firms and only 2.4% per annum for companies. The slower growth of urban firms may be due to the case that some of the best proprietorship firms have become companies, leaving the weaker firms to be remained as the proprietorship firms. The production capital also increases by 6.6% per annum in this period. However, the production capital of proprietorship firms in rural areas grows much slower than that of urban firms (both proprietorship and company)

and companies in rural areas. The production capital of proprietorship firms in rural areas increases by only 0.6% per annum during our studied period.

While value added and production capital grow during the studied period, the employment growth rate declines by 2.0% per annum. The average number of employees reduced from 14.5 in 2005 to 12.8 in 2011. This decline trend is seen in all types of firms regardless of their location. However, in compared to companies which experience a decline of 2.6%, the decline rate among proprietorship firms is much higher at 6.4% per annum. This figure for rural proprietorship firm is slightly higher than their urban counterparts.

[TABLE 2 IS ABOUT HERE]

Table 2 shows the business practice adopted by firms. In panel A, we present the evolution of our eight business practice indicators. In general, proprietorship firms adopt less modern business practice. For example, by 2011, only 4.5% of firms use email in their business activity, 4.8% carried out advertising, 16.1% keep a book of account, 4.4% is a member of a business association and 5.5% organized training course/section for workers, while the figures for companies are 53.7%, 36.1%, 96.3%[1] and 28.4%. Regulation knowledge of proprietorship firms is also low, at only 0.082. In terms of market strategy, only 15.8% of output is sold in other provinces or export and 13.1% of input value procured from other province or imports while for companies, these figures are 38.2% and 32.9%, respectively. In compared to 2005, for some business practice, the proportion of proprietorship firms might have declined as firms that adopted such business practice have transformed to companies, thus leaving proprietorship firms only to include firms that hesitate to carry out better business practice.

In most aspects, the urban firms usually adopt better business practice, especially among the sole proprietorship firms, although the difference between firms locating in urban areas and firms locating in rural areas are not as large as the difference between proprietorship firms and corporate firms. Regarding the percentage of output value sold in other provinces and percentage of input procured from other provinces, this figure for urban firms is lower than for rural firms. This is partly due to the fact that large local markets make firms locating in Hanoi and Ho Chi Minh City more likely to sell locally than to sell in other provinces. Because of low adoption of business practice among proprietorship firms, their business practice index is much smaller than that of companies. In panel B, we present our

[1] Firms in the company group who report that they do not have an accounting book are firms are the ones that may just be transformed from a proprietorship to a firm in the company group.

business practice from 2005 to 2011. On average, the business practice index of proprietorship firms is much lower than that of corporate firms (0.091 versus 0.411). The business practice index fluctuates not only among the proprietorship firms but also companies. This fluctuation may partly be due to dynamic ownership transformation among firms, and partly due to the fact that some firms stop to continue to use better business practice because of their ineffectiveness for their business, especially if they produce a rather homogeneous product. Another factor could be firms face with fiercer competition in both output and input markets in other provinces, so they find it more difficult to remain or expand their sales in other markets and/or to continue to procure inputs from other provinces.

For the second business practice index, which is constructed without indicator of keeping an accounting book, the business practice index of proprietorship firms does not change significantly, with the index declining slightly from 0.091 to 0.080 for proprietorship firms and from 0.411 to 0.330 for corporate firms.

[TABLE 3 IS ABOUT HERE]

Table 3 presents the business practice index of different group of firms throughout the studied period. On average, the business practice index is much higher among firms in the company group. The business practice index of those firms, which transformed from proprietorship in this period to company in the next period is higher than those with no change in proprietorship Meanwhile, the business practices of those firms after transforming to company in this period is also smaller than those with no changes in status in both periods. Both business practice indices show a similar pattern.

V. Estimation results

Table 4 presents our production function estimated by conventional methods, OLS (columns 1 and 2), fixed effects (columns 3 and 4), Wooldridge-Levinsohn-Petrin method (columns 5). In columns 2 and 4, we add the autocorrelation terms (i.e. first lag of the dependent variable).

The estimations suggest that labor contributed from 64 to 90 percent of firm's value added while capital contributes about 10 to 16 percent. However, while the contribution of capital on firm's productivity is statistically significant when we use OLS and fixed effects model, the estimated coefficient on capital is not statistically significant when we control for endogeneity of firm's output with firm's selection of industry and firms' ownership types. The results also shows a strong autocorrelation in firm's value added, although the magnitude is

not so large, partly due to the fact that our data is 2-year interval. While the autocorrelation term is positive the OLS estimation, that term for fixed effect model is negative. This is partly caused by the fixed effect models fail to capture the endogeneity of capital and labor in estimation. Controlling for firm's unobserved time-invariant characteristics may also lead to a negative term for autocorrelation.

The results also show that the productivity is positively associated with firm's perception that the competition is fierce. This is consistent with the results reported by Bloom and Van Reenen (2007) and Bloom et al (2012). When firms perceive that the competition is fiercer, they make every effort to survive by engaging in activities that improve firm's productivity.

[TABLE 4 IS ABOUT HERE]

In all specification, the education level of workers, which is measured by the percentage of employees with college degree, is positive and statistically significant. Meanwhile, the education level of manager or owner does not have a statistically significant effect, regardless of which estimation methods are used.

Table 5 presents the results for the production function estimation using Wooldridge-Levinsohn-Petrin method. In the columns [1] and [3], we estimate the impact of our two business practice indices on firm's added value. The estimation results show that both business practice indices have positive and statistically significant impact on firm productivity. The coefficient on the first business practice index (standard error) is 0.092 (0.020) and on the second business practice index is 0.085 (0.018). Our estimated coefficient is consistent with the results reported in Bloom and Van Reenen (2007). Inclusion of business practice in our production function estimation reduces the contribution of labor in firm's productivity from 82.3% (as in column 5, Table 4) to 78.5% and 78.7% (as in columns [1] and [3], Table 5).

[TABLE 5 IS ABOUT HERE]

Column [3] presents the heterogeneous impact of our business practice indices on firm productivity for two ownership groups. For cooperatives, limited company and joint stock company, the estimated coefficient (standard error) on two business practice indices are 0.070 (0.027) and 0.059 (0.023), respectively. The figures for sole proprietorship firms are 0.126 (0.025) and 0.115 (0.023), respectively. This result implies that our business practice

indices have stronger effects on firm's productivity for household business and sole proprietorship than for other type of firm ownerships.

The results also show that firm's perception of fiercer competition has a small but statistically significant effect on firm's productivity. The results also show that being located in an urban district has a positive association with the firm's value added, but this relation is not strong. Meanwhile, firm's age has negative effect on firm's growth, although this variable loses its significance when we include the square of firm age in the estimation (the results with firm age squared are not shown). This implies that there is no non-linear relationship between firm's age and firm productivity. While the percentage of employees with college degree still have a strong and statistically significant impact on firm productivity as in the estimation without business practice indices (in Table 4), the variable indicating education level of manager/owner loses its significance in the production function which incudes business practice indices. This implies that there may exist a correlation between business practice index and the education level of manager/owner.

In Table 6, we examine the effects of our business practice indices on firm productivity for different type of ownership. The result shows that the business practice indices have statistically significant impacts on firm's productivity for all groups of firms, although the magnitude effects are different from one group to another. The groups of firms that are proprietorship throughout the studied period, one standard deviation increase in the business practice index raises the productivity by 9.8%. The figures for group of firms, which are company, and for group of firms with ownership type change during the studied period are 13.9% and 10.8% respectively. The results also show that the contribution of labor to productivity for proprietorship firms is much higher than those of corporate firms and firms in the mixed ownership group. However, the contributions of capital to productivity of these groups are rather similar at about 11.7% to 16.1%. This may be attributed to higher level of labor intensity among sole proprietorship firms. In columns [4], [5] and [6], we replace the first business practice index by the second index (i.e. the one we withdraw the indicator regarding firm's accounting report). The estimated results show the same pattern as that when we use the first index, but the magnitude effects are lower.

[TABLE 6 IS ABOUT HERE]

Different from estimating the production function using the whole sample, the perception of fiercer competition has a positive effect for proprietorship firm, while for

corporate firms and firms in the mixed ownership group, this variable does not have a statistically significant effect. This pattern is also similar for the variable indicating the firm's percentage of workers with college degrees, except for the firms with ownership change. Meanwhile, the education level of managers/owners does not have statistically significant effects on firm's productivity, regardless of group a firm belongs to. Furthermore, being located in an urban district no longer has significant effect on firm's productivity. The results also suggest that there is a negative relationship between firm's age and productivity, except for the case of firms with ownership change.

Although the effects of locating in a urban districts have weak effects on productivity, we still explore the effects of business practices on firm productivity for two subsamples, one for firms locating in urban areas and one for firms locating in rural areas. Columns [1] and [3] of panel B, table 6, present the estimation results for firms locating in urban areas and the remaining columns are for firms locating in rural areas. The effects of business practice indices are strongly statistically significant for all firms, regardless where they locate. Moreover, while the magnitude effects for firms in two regions are not different when we use the first business practice index, the difference between firms locating in urban and in rural areas is quite large (nearly 1 percentage point). The contributions of capital and labor inputs to productivity are also larger for firms in rural areas than firms in urban areas, regardless of which business practice indices we use. It is also interesting that firms in rural areas seems to be more active in responses to the fiercer competition to firms in urban areas and the workers with college degrees contribute to firm productivity larger than that of urban firms.

[TABLE 7 IS ABOUT HERE]

In table 7, we test whether our business practice indices have an impact on labor, sales growth and labor productivity or not.[2] The first column presents the estimation results for the labor growth equations. The results show that number of employees in this period is affected by that figure in previous period. The estimated coefficient on the first lagged labor is rather high (in comparison to value added) and it is statistically significant at 1% level. Labor

[2] In this section, for each dynamic panel specification we test for the validity of the overidentifying restrictions using the Sargan-Hansen test. The p-values associated with this test sufficiently high that we fail to reject the null hypothesis that the overidentifying restrictions are valid. We also conduct the Arellano-Bond test for first-order autocorrelation in the time varying differenced error terms. The test results shows that the error term in the first difference equation follows an AR(1) process. With 4 time point data, we could not conduct this test for second-order autocorrelation. However, our firm-level data is bi-annual data, so we are confident that the error terms in the first difference equations do not follow an AR(2) process, which is consistent with the hypothesis that the error term in levels is serially uncorrelated.

productivity in the last period also has a positive and statistically significant impact on current period labor growth. However, past capital per labor does not have impact on labor growth. Business practice indices have positive and strong impacts on firm's employment growth. Thus, business practice indices have both direct and indirect effects on firm's productivity. However, different from our results in Table 5, perception of competition does not have an impact on the labor growth.

Similarly, we also find the positive (and statistically significant) impact of business practice index on firm's revenue (column 2), firm's labor productivity growth (column 3). In column 4, we use the factor analysis to calculate the principal component of business practice index and found that the business practice index also have statistically significant impact on firm's productivity.

[TABLE 8 IS ABOUT HERE]

We examine determinants of the first business practice index in Table 8. In all equations, autocorrelation term (i.e. first lagged business practice index) is included. Moreover, we also control for firm's location, industry, ownership types and time dummy in all estimations. Other variables in estimating determinants of business practice index include capital intensity (i.e. capital over number of workers), firm's perception of competition, and percentage of employees with college degree and education level of firm's manager/owner. The autocorrelation terms are statistically significant at the 1% level when we use the whole sample, but they are significant at the 5% level when sample is restricted to those firms, which are proprietorship and firms which are company throughout the studied period. For those firms in the mixed ownership group, the last period business practice index does not have a statistically significant effect on the current index. Another determinant of firm's adoption of business practice is its perception of competition. Our estimations show that firm's perception of fiercer competition has a statistically significant impact on business practice index. Thus, together with the results presented in Table 5, firm's perception of fiercer competition has both direct and indirect effects on productivity. However, firm's perception of competition only have a statistically significant effect on the adoption of business practice for firms in the proprietorship group, while for other groups of ownership firms, it does not have any significant effect. This, coupled with results presented in Table 6, implies that for firms in the proprietorship group, perception of fiercer competition have both direct and indirect effects on firm's performance. But for other firms, their perception of fiercer competition does not have any effects. While percentage of employees with college

degree did not have statistically significant impact on firm's business practice index in all estimations with different samples except for firms in the company group, the education level of owner has a positive and statistically significant impact. This association is rather strong in all estimations. As shown in Table 5, the education level of a firm's manager/owner do not have a statistically significant impact on firm's productivity but has a significant effects on business practice. This suggests the education level of firm's manager/owner have indirect effects on productivity through the business practice index.

VI. Conclusion

In this paper, we have constructed a business practice index for firms using an unusually rich bi-annual survey of Vietnam's small and medium firms from 2005 to 2011. Different from other papers that explore the role of business practice on firm performance, we treat business practice explicitly as an production input as labor and capital inputs. To control for potential endogeneity, we have used the Wooldridge (2009), and Petrin and Levinsohn (2012) procedure to estimate the production function.

The study found that that adoption of business practice has a positive and statistically significant effect on firm's productivity, sales growth and employment growth. However, the effect of the adoption of business practice is not the same for different types of firms. The effect is stronger for firms, which are household business and sole proprietorship than for firms, which are cooperative, limited companies or joint stock companies. However, the magnitude effect of business practice index for firms, which are household businesses and sol proprietorship throughout the studied period, is smaller than that for firms, which are cooperative, limited companies and joint stock companies throughout the studied period and for firms, which transformed their ownership during the studied period, we do not find the effect on productivity.

The estimation results also show for some firms, especially household business and proprietorship firms, become more productive when the manager/owners perceived that the competition is fiercer. Percentage of workers with college degrees also has a statistically significant effect on firm productivity. In all estimation production function, the education level of the business owners/managers, however, is found to have no direct effect on firm's performance.

The determinant of adopting better business standard are also explored using dynamic panel data analysis. The estimation results also show that, although the education level of the

business owners/managers has no effects on firm's performance, it may have indirect effects on productivity through improving business practice. Meanwhile, firm's perception of competition has a positive and statistically significant impact on firms' performance and firms' business practice index. We also find that our business practice index has the lagged effects and that total factor productivity (estimated from production function without business practice index) in the last period does not have a strong and statistically significant impact on a firm's adoption of business practice in this period.

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Table 1: Basic statistics

Year	Indicators		All firms			Proprietorship		Company	
			All	Sole Proprietorship	Corporate firms	Rural firms	Urban firms	Rural firms	Urban firms
2005	% Proprietorship firms		82.4%			58.1%	41.9%	25.7%	74.3%
	% Firms located in urban areas		47.6%	41.9%	74.3%				
	Value added (mill VND)	Mean	264.3	94.2	1062.4	71.4	125.7	869.3	1,129.3
		SD	2720.9	187.0	6430.9	138.4	235.1	3,028.2	7,252.1
	Number of workers	Mean	14.5	8.8	41.1	8.3	9.5	47.0	39.0
		SD	26.2	16.2	42.6	18.6	12.3	55.6	37.1
	Value of production capital (mil. VND)	Mean	330.7	135.2	1248.4	70.8	224.4	1,028.9	1,324.3
		SD	1322.1	455.1	2825.9	250.0	627.9	1,374.2	3,177.4
	Manager with at least vocational degree		24.7%	16.3%	64.1%	13.0%	20.7%	55.6%	67.0%
	% employees with college degree		1.5%	0.8%	4.6%	0.3%	1.5%	3.9%	4.9%
	Fiercer competition (%)		86.6%	84.5%	96.3%	82.8%	86.9%	95.2%	96.7%
2011	% proprietorship firms		77.8%			60.3%	39.7%	27.2%	72.8%
	% firms located in urban areas		47.4%	39.7%	72.8%				
	Value added (mill VND)	Mean	388.0	119.6	1275.3	103.2	144.5	1,195.5	1,305.0
		SD	2530.2	261.6	5135.5	262.6	258.4	2,294.6	5,856.4
	Number of workers	Mean	12.8	6.1	35.0	5.6	6.8	39.9	33.1
		SD	24.2	9.9	39.5	10.6	8.9	42.2	38.4
	Value of production capital (mil. VND)	Mean	485.0	159.2	1561.8	73.3	289.8	1,278.0	1,667.6
		SD	2489.4	435.2	4960.1	204.0	621.6	1,996.6	5,683.1
	Manager with at least vocational degree		26.2%	16.0%	60.2%	13.6%	19.5%	53.4%	62.7%
	% employees with college degree		3.3%	1.2%	9.9%	0.6%	2.2%	7.4%	10.8%
	Fiercer competition (%)		84.2%	82.7%	89.2%	78.2%	89.6%	89.8%	89.0%
Annual growth rate between 2005-2011									
	Value added		6.6%	4.1%	3.1%	6.5%	2.3%	5.5%	2.4%
	Number of workers		-2.0%	-6.0%	-2.6%	-6.4%	-5.3%	-2.7%	-2.7%
	Value of production capital		6.6%	2.8%	3.8%	0.6%	4.4%	3.7%	3.9%

Table 2: Business practice indicator and business practice index

Year	Indicators		All	Proprietorship	Company	All	Proprietorship	Company	
			All	Proprietorship	Company	Rural	Urban	Rural	Urban
Panel A									
2005	Using email in business	Mean	0.049	0.017	0.200	0.006	0.031	0.175	0.209
		SD	0.215	0.128	0.401	0.077	0.174	0.383	0.408
	Carrying out advertisement	Mean	0.113	0.063	0.343	0.049	0.083	0.302	0.357
		SD	0.316	0.244	0.476	0.217	0.276	0.463	0.480
	Formally financial recording	Mean	0.323	0.186	0.967	0.087	0.324	0.937	0.978
		SD	0.468	0.389	0.178	0.282	0.468	0.246	0.147
	Regulation knowledge	Mean	0.082	0.047	0.248	0.034	0.065	0.222	0.257
		SD	0.178	0.136	0.246	0.118	0.157	0.271	0.237
	Being a member of at least one business association	Mean	0.081	0.038	0.282	0.048	0.025	0.270	0.286
		SD	0.273	0.192	0.451	0.214	0.156	0.447	0.453
	Holding training for workers	Mean	0.135	0.102	0.290	0.061	0.158	0.206	0.319
		SD	0.342	0.302	0.455	0.240	0.365	0.408	0.467
	% sales to customers not from the same province	Mean	0.219	0.165	0.469	0.182	0.142	0.502	0.458
		SD	0.339	0.305	0.375	0.332	0.261	0.398	0.368
	% input purchased not from the same province	Mean	0.208	0.169	0.390	0.195	0.133	0.444	0.371
		SD	0.358	0.332	0.417	0.355	0.294	0.436	0.409
2011	Using email in business	Mean	0.159	0.045	0.537	0.034	0.061	0.489	0.555
		SD	0.366	0.207	0.499	0.182	0.240	0.503	0.498
	Carrying out advertisement	Mean	0.120	0.048	0.361	0.036	0.066	0.318	0.377
		SD	0.326	0.213	0.481	0.185	0.248	0.468	0.486
	Formally financial recording	Mean	0.347	0.161	0.963	0.082	0.280	0.966	0.962
		SD	0.476	0.367	0.189	0.275	0.450	0.183	0.192
	Regulation knowledge	Mean	0.055	0.021	0.168	0.010	0.036	0.138	0.179
		SD	0.144	0.082	0.223	0.060	0.106	0.216	0.226
	Being a member of at least one business association	Mean	0.086	0.044	0.225	0.054	0.028	0.216	0.229
		SD	0.280	0.205	0.418	0.227	0.166	0.414	0.421
	Holding training for workers	Mean	0.108	0.055	0.284	0.034	0.087	0.227	0.305
		SD	0.311	0.228	0.452	0.182	0.282	0.421	0.461
	% sales to customers not from the same province	Mean	0.210	0.158	0.382	0.173	0.136	0.510	0.333
		SD	0.325	0.300	0.345	0.324	0.260	0.387	0.316
	% input purchased not from the same province	Mean	0.177	0.131	0.329	0.155	0.095	0.351	0.321
		SD	0.310	0.280	0.352	0.308	0.229	0.351	0.352
Panel B									
2005	BPI 1	Mean	0.151	0.099	0.399	0.083	0.120	0.382	0.404
		SD	0.183	[0.136]	[0.171]	[0.123]	[0.150]	[0.184]	[0.166]
	BPI 2	Mean	0.127	0.086	0.317	0.082	0.091	0.303	0.322
		SD	0.164	[0.125]	[0.190]	[0.122]	[0.128]	[0.196]	[0.188]
2007	BPI 1	Mean	0.163	0.097	0.422	0.079	0.123	0.416	0.424
		SD	0.195	[0.133]	[0.184]	[0.125]	[0.140]	[0.203]	[0.177]
	BPI 2	Mean	0.139	0.086	0.343	0.079	0.097	0.342	0.343

		SD	0.177	[0.123]	[0.206]	[0.124]	[0.122]	[0.222]	[0.201]
2009	BPI 1	Mean	0.159	0.086	0.415	0.075	0.101	0.446	0.403
		SD	0.194	[0.124]	[0.177]	[0.119]	[0.129]	[0.173]	[0.178]
	BPI 2	Mean	0.132	0.074	0.333	0.075	0.073	0.371	0.318
		SD	0.176	[0.115]	[0.201]	[0.117]	[0.112]	[0.193]	[0.202]
2011	BPI 1	Mean	0.158	0.083	0.406	0.072	0.099	0.402	0.408
		SD	0.193	[0.118]	[0.183]	[0.110]	[0.128]	[0.195]	[0.178]
	BPI 2	Mean	0.131	0.072	0.327	0.071	0.073	0.321	0.328
		SD	0.174	[0.108]	[0.203]	[0.109]	[0.107]	[0.214]	[0.198]
All	BPI 1	Mean	0.158	0.091	0.411	0.078	0.111	0.414	0.410
		SD	0.191	0.128	0.179	0.119	0.138	0.190	0.175
	BPI 2	Mean	0.132	0.080	0.330	0.077	0.084	0.336	0.328
		SD	0.173	0.118	0.200	0.118	0.119	0.207	0.198

Table 3: Business practice index transition matrix

		BPI 1		BPI 2	
	Year	This period	Last period	This period	Last period
From proprietorship to company	2007	0.309	0.251	0.230	0.209
	2009	0.327	0.240	0.238	0.201
	2011	0.328	0.172	0.245	0.122
Proprietorship in 4 periods	2007	0.088	0.086	0.080	0.077
	2009	0.082	0.088	0.071	0.080
	2011	0.079	0.082	0.069	0.071
Company in 4 periods	2007	0.448	0.412	0.369	0.330
	2009	0.444	0.448	0.365	0.369
	2011	0.438	0.444	0.360	0.365

Table 4: Estimated production function estimation without business practice as an input

	[1]	[2]	[3]	[4]	[5]
Lagged value added		0.251***		-0.183***	
		[0.0147]		[0.0190]	
Labor	0.915***	0.743***	0.763***	0.750***	0.822***
	[0.0165]	[0.0193]	[0.0287]	[0.0277]	[0.031]
Capital	0.167***	0.126***	0.0996***	0.0978***	0.125***
	[0.0103]	[0.00976]	[0.0130]	[0.0128]	[0.012]
Perception of competition	0.147***	0.125***	0.0832**	0.0855***	0.091***
	[0.0329]	[0.0308]	[0.0336]	[0.0329]	[0.031]
% employee with college degree	1.005***	0.765***	0.762***	0.771***	0.876***
	[0.196]	[0.190]	[0.237]	[0.228]	[0.192]
Manager with vocational training	-0.00577	-0.0313	-0.0158	-0.000242	-0.02
	[0.0267]	[0.0257]	[0.0841]	[0.0863]	[0.026]
Firm age	0.183	-0.0885	-0.759	-0.449	-0.102***
	[0.134]	[0.125]	[0.642]	[0.650]	[0.019]
Locating in urban district	0.0675**	0.0495*	-0.505*	-0.604**	0.043*
	[0.0268]	[0.0256]	[0.265]	[0.275]	[0.026]
Polynomial production inputs					Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes
Ownership dummies	Yes	Yes	Yes	Yes	Yes
Province dummies	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Intercept	7.710***	5.947***	10.05***	11.87***	9.086***
	[0.227]	[0.239]	[0.475]	[0.510]	[0.835]
N	4187	4186	4187	4186	4159

Standard errors in brackets; * p<0.1, ** p<0.05, *** p<0.01

Table 5: Estimated production functions with business practice as an input

	[1]	[2]	[3]	[4]
Labor	0.785***	0.784***	0.787***	0.786***
	[0.034]	[0.034]	[0.034]	[0.034]
Capital	0.123***	0.123***	0.124***	0.124***
	[0.012]	[0.012]	[0.012]	[0.012]
Business practice index 1	0.098***			
	[0.020]			
Business practice index 1 * Company		0.070***		
		[0.027]		
Business practice index 1 * Proprietorship		0.126***		
		[0.025]		
Business practice index 2			0.085***	
			[0.018]	
Business practice index 2 * Company				0.059**
				[0.023]
Business practice index 2 * Proprietorship				0.115***
				[0.023]
Perceived fiercer competition	0.085***	0.085***	0.086***	0.086***
	[0.031]	[0.031]	[0.031]	[0.031]
% of workers with college degree	0.769***	0.770***	0.794***	0.801***
	[0.194]	[0.194]	[0.194]	[0.193]
Manager/owner with at least vocational degree	-0.028	-0.027	-0.028	-0.027
	[0.026]	[0.026]	[0.025]	[0.025]
Firm age	-0.101***	-0.102***	-0.101***	-0.102***
	[0.019]	[0.019]	[0.019]	[0.019]
Locating in a urban district	0.043*	0.042	0.045*	0.044*
	[0.026]	[0.026]	[0.026]	[0.026]
Polynomial production inputs	Yes	Yes	Yes	Yes
Ownership dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Provincial dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
N	4155	4155	4155	4155

Standard errors in brackets; * p<0.1, ** p<0.05, *** p<0.01

Table 6: Estimated production function for different types of ownership

Panel A

Type of business practice	Business practice index 1			Business practice index 2		
Type of firm ownership	Proprietorship firms	Corporate firm	Mixed group	Proprietorship firms	Corporate firm	Mixed group
Dependent variable: log of value added	[1]	[2]	[3]	[1]	[2]	[3]
Labor	0.852***	0.603***	0.638***	0.854***	0.605***	0.634***
	[0.044]	[0.072]	[0.094]	[0.043]	[0.072]	[0.094]
Capital	0.117***	0.136***	0.161***	0.117***	0.136***	0.163***
	[0.015]	[0.029]	[0.036]	[0.015]	[0.029]	[0.036]
Business practice index	0.098***	0.139***	0.108**	0.090***	0.116***	0.099**
	[0.029]	[0.035]	[0.046]	[0.026]	[0.030]	[0.041]
Perceived fiercer competition	0.088***	-0.007	0.001	0.088***	-0.008	0.011
	[0.034]	[0.106]	[0.129]	[0.034]	[0.105]	[0.131]
% of workers with college degree	0.635**	0.386	0.875*	0.664**	0.397	0.909*
	[0.292]	[0.326]	[0.472]	[0.288]	[0.326]	[0.467]
Manager/owner with vocational degree	-0.041	0.066	-0.014	-0.043	0.067	-0.012
	[0.032]	[0.061]	[0.066]	[0.032]	[0.061]	[0.066]
Firm age	-0.096***	-0.205***	0.062	-0.097***	-0.206***	0.061
	[0.022]	[0.047]	[0.058]	[0.022]	[0.047]	[0.058]
Locating in a urban district	0.032	0.045	0.065	0.034	0.043	0.062
	[0.030]	[0.063]	[0.080]	[0.030]	[0.063]	[0.080]
Polynomial production inputs	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Provincial dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	3103	679	373	3103	679	373

Panel B

Firm locations	Urban	Rural	Urban	Rural
	[1]	[2]	[3]	[4]
Labor	0.738***	0.850***	0.744***	0.851***
	[0.047]	[0.051]	[0.047]	[0.051]
Capital	0.110***	0.136***	0.110***	0.136***
	[0.016]	[0.020]	[0.016]	[0.020]
Business practice index 1	0.101***	0.104***		
	[0.027]	[0.030]		

Business practice index 2			0.083***	0.092***
			[0.024]	[0.027]
Perceived fiercer competition	0.074	0.083**	0.074	0.083**
	[0.045]	[0.041]	[0.045]	[0.041]
% of workers with college degree	0.803***	0.917***	0.845***	0.952***
	[0.227]	[0.354]	[0.227]	[0.353]
Manager/owner with vocational degree	-0.022	-0.008	-0.019	-0.008
	[0.034]	[0.037]	[0.034]	[0.037]
Firm age	-0.048*	-0.128***	-0.046*	-0.127***
	[0.026]	[0.028]	[0.026]	[0.028]
Polynomial production inputs	Yes	Yes	Yes	Yes
Ownership dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Provincial dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
N	1980	2175	1980	2175

Standard errors in brackets; * p<0.1, ** p<0.05, *** p<0.01

Table 7: Robustness checks

	[1]	[2]	[3]	[4]	[5]
Dependent variable	Labor	Revenue (log)	Labor productivity	Value Added	Value Added
Lagged labor	0.295***				
	[0.0431]				
Lagged revenue		0.0305*			
		[0.0168]			
Lagged value added				0.107***	
				[0.0366]	
Labor		0.284***	-0.145	0.675***	0.780***
		[0.0812]	[0.120]	[0.140]	[0.0345]
Capital		0.0524	0.0041	0.0335	0.125***
		[0.0346]	[0.0686]	[0.0668]	[0.0121]
Raw material		0.569***			
		[0.0568]			
Lagged capital intensity	0.014				
	[0.0170]				
Lagged labor productivity	0.0569**		0.129***		
	[0.0238]		[0.0363]		
Business practice index	0.415***	0.141**	0.237**	0.275***	0.105***
	[0.0931]	[0.0648]	[0.106]	[0.0948]	[0.0206]
Perceiving fiercer competition		-0.634	0.0531	-0.209	0.0148
		[0.718]	[1.203]	[1.098]	[0.229]
% employees having a college degree	0.0343	0.00778	0.0705*	0.0782*	0.0138
	[0.0337]	[0.0234]	[0.0419]	[0.0422]	[0.0317]
Managers/owners with at least vocational degree	0.203***	-0.00837	0.0278	0.037	-0.0163
	[0.0737]	[0.0475]	[0.0685]	[0.0744]	[0.0275]
Firm age	-0.0810*	-0.0880***	-0.213***	-0.225***	-0.104***
	[0.0460]	[0.0292]	[0.0442]	[0.0467]	[0.0206]
Locating in urban district	0.0873*	0.0768**	0.192***	0.189***	0.0577**
	[0.0491]	[0.0379]	[0.0628]	[0.0647]	[0.0292]
Industry dummies	Yes	Yes	Yes	Yes	Yes
Ownership dummies	Yes	Yes	Yes	Yes	Yes
Province dummies	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Intercept	1.118***	4.501***	9.255***	9.342***	5.894***
	[0.389]	[0.731]	[0.911]	[0.796]	[2.247]
N	4184	4155	4184	4184	4157
Number of instruments	111	84	92	97	NA
Hansen tests (p-value)	0.23	0.172	0.292	0.242	NA

Standard errors in brackets; * p<0.1, ** p<0.05, *** p<0.01

Dependent variable for column [1] is the log of labor, column [2] is log of revenue (revenue-based production function), for column [3] is labor productivity (i.e. value added per worker); for column [4] and [5] is log of value added. In column [4], we replace by our business practice index by the principal component calculated from eight business practice indicators. Column [5] presents result obtained from production function by using the Levinsohn Petrin (2003) estimation method.
Instruments used in estimating column [1] include the second and higher lags of labor, production capital, labor productivity and business practice index; the first lag of firm's perception of competition, the first and higher lags of dummy variables indicating firm's ownership type and industry in which it operates. Instruments used in estimating column [2] includes the second of labor, production capital, labor productivity and business practice index; the first lag of firm's perception of competition, the first and higher lags of dummy variables indicating firm's ownership type and the second lag of dummy variable indicating industry in which it operates. For column [3], instruments the second of labor, production capital, labor productivity and business practice index; the first lag of firm's perception of competition, the first and higher lags of dummy variables indicating firm's ownership type and the second lag of dummy variable indicating industry in which it operates. For column [4] instruments includes the second of labor, production capital, labor productivity and business practice index; the first lag of firm's perception of competition, the first and higher lags of dummy variables indicating firm's ownership type and the second and higher lag of dummy variable indicating industry in which it operates. In all columns [1] to [4], other variables are instruments for themselves.

Table 8: Determinants of business practice adoption

Panel A. Dependent variable: Business practice index 1

	[1]	[2]	[3]	[4]
Sample	Whole sample	Proprietorship	Corporate	Mixed
Lagged business practice index	0.152***	0.116**	0.189**	0.033
	[0.041]	[0.057]	[0.089]	[0.106]
Capital per employee	0.000	0.018*	-0.030*	-0.01
	[0.013]	[0.011]	[0.018]	[0.018]
Lagged TFP	0.004	0.005	0.007	-0.031
	[0.006]	[0.006]	[0.021]	[0.023]
Lagged perception of competition	0.015***	0.016***	0.005	-0.021
	[0.005]	[0.006]	[0.030]	[0.044]
Lagged percentage of workers with college degree	0.066	0.168	0.054	0.204
	[0.067]	[0.142]	[0.127]	[0.197]
Manager/Owners with vocational degree	0.059***	0.055***	0.024	0.077**
	[0.013]	[0.014]	[0.036]	[0.038]
Firm age	0.141***	-0.028	0.181	0.017
	[0.042]	[0.059]	[0.137]	[0.206]
Firm age squared	-0.032***	0.003	-0.039	-0.002
	[0.008]	[0.010]	[0.027]	[0.040]
Locating in a urban district	0	0.015	-0.033	0.049
	[0.011]	[0.011]	[0.043]	[0.042]
Ownership dummies	Yes			
Industry dummies	Yes	Yes	Yes	Yes
Provincial dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
N	4147	3103	674	370
No of instrument	79	51	49	67
Sargan Hansen test (p value)	0.471	0.308	0.567	0.416

Panel B. Dependent variable: Business practice index 2

	[1]	[2]	[3]	[4]
Sample	Whole sample	Proprietorship	Corporate	Mixed
Lagged business practice index	0.165***	0.099*	0.184**	-0.021
	[0.043]	[0.060]	[0.085]	[0.127]
Capital per employee	0.002	0.014	-0.032	0.007
	[0.014]	[0.010]	[0.022]	[0.029]

Lagged TFP	0.007	0.009	0.01	-0.033
	[0.006]	[0.006]	[0.024]	[0.030]
Lagged perception of competition	0.013**	0.011**	0.01	-0.008
	[0.006]	[0.005]	[0.034]	[0.056]
Lagged percentage of workers with college degree	0.056	0.129	0.078	0.104
	[0.074]	[0.111]	[0.149]	[0.195]
Manager/Owners with vocational degree	0.055***	0.039***	0.023	0.082**
	[0.015]	[0.013]	[0.041]	[0.034]
Firm age	0.154***	0.002	0.218	0.147
	[0.046]	[0.042]	[0.165]	[0.259]
Firm age squared	-0.035***	-0.001	-0.047	-0.026
	[0.009]	[0.008]	[0.032]	[0.051]
Locating in a urban district	-0.012	0.007	-0.032	0.026
	[0.012]	[0.010]	[0.048]	[0.061]
Ownership dummies	Yes			
Industry dummies	Yes	Yes	Yes	Yes
Provincial dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
N	4147	3103	674	370
No of instrument	79	51	49	53
Sargan Hansen test (p value)	0.493	0.165	0.561	0.331

Standard errors in brackets; * p<0.1, ** p<0.05, *** p<0.01

Dependent variable in Panel A is business practice index 1 (with indicator regarding formally financial record) and in Panel B is business practice index 2 (without indicator regarding formally financial record). The sample for Columns [1] in both Panels consists of whole sample. The sample for column [1] in Panel A and B consists of those firms, which were of proprietorship throughout the study period; for column [2] in both Panels those firms which were companies throughout and for columns [3] in both Panels those firms of which the ownership type changed during the period.
In all estimations, we use the first lag of TFP obtained from production function estimated in column 5 of Table 4. However, we take advantage of the database, which collects production input data for all years between two surveys to estimate this production function. Using this method, we are able to use TFP for the year 2005. We also use the first lags of perception of competition, percentage of workers with college degree and education level of manager/owner in all specification. This enables us to treat lagged perception of competition and lagged education level of manager/owner as exogenous without worry about the endogeneity of these variables with the business practice index.
For estimating column [1] in both Panels, we use the second lag of capital intensity (K/L), TFP, business practice index, percentage of workers with college degree, the first and higher lag of firm's ownership type and industry in which a firm operates as instruments. For column [2] in both Panels, instruments include second and higher lags of capital intensity (K/L), TFP, business practice index, percentage of workers with college degree, the first lag of dummy variable indicating industry in which a firm operates as instruments. For column [3] in both Panels, instruments include second and higher lags of capital intensity (K/L), TFP, business practice index, percentage of workers with college degree as instruments. In this column, we use the first lagged of dummy variable industry in our estimation (instead of using the variable at the current time). We treat this variable as strictly exogenous. For column [4] in both Panels, instrument includes second lag of capital intensity (K/L), TFP, business practice index, percentage of workers with college degree, the first lag of dummy variable indicating industry in which a firm operates as instruments. In all estimations, strict exogenous variables are instrument for themselves.