How do business practices affect micro and small firms' performance in a low-income economy? An analysis using dynamic panel data[1]

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Abstract:

There has been an increasing interest among economists in the impact of management practices on firm's productivity. 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 a simple weighted business practice index from 8 indicators. This index is simple but rather suitable for small and medium firms in developing countries. To examine the role of business practices in determining firm performance, production function and determinants of business practice adoption are estimated using the GMM-system method, which allows us to control for the endogeneity of production input, business practices index, and other factors. The results indicate that business practice index has a positive and statistically significant impact on firm productivity, employment and sales growth. As business practice index increases by 1 standard deviation (e.g. by 0.194 points over 1 and 0.173 points), the firm's value added increases by 19.1% to 24.0%. There is no evidence that the education level of the business owners/managers, percentage of employees with college degree on firm productivity. The results suggest that education may have indirect effects on productivity through business practice index. The effect of business practice on firm performance is found to vary across different sub-samples.. Both direct and indirect effects of competition lose their significance when we separately estimate production functions for each group of firms. 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, 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 while previous revenue and value added have a statistically significant impact.

Keyword: business practice, dynamic panel data, productivity growth, small medium enterprises, microenterprise, 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 GMM-system method developed by Blundell and Bond (1998 and 2000) to estimate the production function and the determinants of business practice adoption. This estimation method allows us to control for the endogeneity of production input, business practices index, location choice and other factors such as firm's industry choice, ownership types. More specifically, the paper's contributions to the literature are two folds. First, by using a rather rich and long dataset, we are able to use GMM-system

methods 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 no evidence that the education level of the business owners/managers, percentage of employees with college degree on firm productivity. The results suggest that education may have indirect effects on productivity through business practice index. The effect of business practice on firm performance is found to vary across different sub-samples. Both direct and indirect effects of competition lose their significance when we separately estimate production functions for each group of firms. 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, 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 while previous revenue and value added have a statistically significant impact

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 researches 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 l responses to market conditions by adjusting their management practices. Second, management is a complicated concept to measure. However, recently more and more researches 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 what the managers do or know that affects performance. More recent works have started to explore how particular CEO practices and philosophies are tied to firm's performance.

Several recent papers 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 and the same proportion keeps sales records. 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 is not statistically significant (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 experiments which provided managerial supports to the treated firms and within the first year, the productivity of these firms have increased by 17% and within three years, some treatment firms have opened new production facilities. The magnitude of such effects, 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).

Then, 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 accurate 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 not huge an 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 affects the adoption of business practice is the product market competition. According to Bloom and Van Reenen (2007) and Van Reenen (2011), under tough competition, inefficient firms will find it difficult to exist in the market and they ultimately would be driven out of the market. Syverson (2004) finds that fiercer competition is associated with a higher average level of productivity and smaller differences in productivity among survival firms. This could be due to the reason that tougher competition forces firms to increase their management efforts and to adopt new 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 operating in a highly competitive market environment may still have no other ways to do but implement better business practices,

Average education level 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 some 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 our business practice index has lagged effects. 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 s 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. In the 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.

System GMM methods[2]

Consider the following production function:

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

Instead of decomposing the error terms ϵ_{it} into two components, we decompose it into 4 components: the year specific component which reflect common shocks to all firms γ_t, firm-specific time invariant effect η_i, potentially autoregressive shock ζ_{it} and serially uncorrelated measurement errors, μ_{it}. We can rewrite the production function as

$$y_{it} = a_0 + \alpha_l l_{it} + \alpha_k k_{it} + \beta_1 BPI_{it} + \beta_2 X_{it} + \gamma_t + \eta_i + \zeta_{it} + \mu_{it}$$

of which $\zeta_{it} = \rho\zeta_{it-1} + \psi_{it}$; -1<ρ<1 and ψ_{it} and μ_{it} is MA(0)

If we assume that $E(x_{it}\psi_{it}) = E(x_{it}\mu_{it}) = 0$ for t=2...T, we have the following moment conditions:

$$E(x_{it-s}\Delta\omega_{it}) = 0 \text{ where } x_{it} = (l_{it}, k_{it}, BPI_{it}, y_{it})$$

for s≥2 when $\omega_{it} \approx$ MA(0) and s≥3 if $\omega_{it} \approx$ MA(1). With this establishment we can use lagged levels of the variables as instruments, after first differencing to eliminate the firm specific effects as proposed by Arellano and Bond (1991). However, when the lagged levels are only weakly correlated with first differences, the instruments for first differenced equations are weak, thus the estimator is downward and very imprecise (Blundell and Bond, 1998 and 2000). If we further assume that $E(\Delta l_{it}\eta_i^*) = E(\Delta k_{it}\eta_i^*) = E(\Delta BPI_{it}\eta_i^*) = E(\Delta X_{it}\eta_i^*) = 0$ and that initial conditions satisfy $E(\Delta y_{i2}\eta_i^*) = 0$, then we obtain the additional moment conditions

$$E(\Delta X_{it-s}(\eta_i^* + \omega_{it})) = 0$$

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[2] This section is adopted from Blundell and Bond (2000)

for s=1 when $\omega_{it} \approx$ MA(0) and s=2 when $\omega_{it} \approx$ MA(1). Therefore, the lagged first differences of the variables an be used as instruments for the equation in levels (Arellano and Bover, 1995). Both sets of moment conditions can be exploited as a linear GMM estimator in a system containing both first-differenced and levels equations. Combining both sets of moment condition we can have the system GMM estimator.

Construction of business practice index

It is through business practices and how a firm operates to achieve outcomes that a firm builds distinctive capabilities, which are capable of providing competitive advantage. Good business practices can be thought of as the base or foundation on which distinctive capabilities and hence competitive advantages are built. Maintaining or enhancing these capabilities and advantages demands continued reinvestment and development of processes and practices.

In this study, we construct a business practice index, which 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 in micro and small firms, especially among household firms, many do not have a standard accounting book. They may record their business transactions, but such record are mostly used to manage the debts and for internal use. 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 converted 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 ILLSA in 2005, 2007, 2009 and 2011. The surveys were conducted in 10 provinces, four in the North (Hanoi, Haiphong, Hatay and Phutho), three in the Central (Nghean, Quangnam and Khanhhoa) and three in the South (Lamdong, Hochiminh City and Longan). Of these provinces, Hanoi, Hochiminh City and Haiphong are three of five major cities in Vietnam. 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 (normally, one urban districts in seven provinces and nearly all urban districts in three cities 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 for more detail), which in turn means that the SME survey is not representative along the household dimension (the number of household businesses is underestimated). In addition, since the informal household firms were chosen randomly within the selected survey districts, they all operate alongside officially registered enterprises and therefore may be relatively more competitive than the average informal firm in the district. Thus, our sample of informal firms is not representative of the overall informal sector in Vietnam (Rand and Torm, 2012). The sample size for each survey are 2821 firms in the 2005 survey, 2635 firms in the 2007 survey, 2655 firms in the 2009 survey and 2552 firms in the 2011 survey. After cleaning and dropping firms with missing data, we can have a balanced sample of around 1450 firms. We excluded firms without adequate information on interested indicators. Ultimately, the sample size for this study is 1395 firms. We re-categorize these firms into 6 industries: agriculture-related industry (Food, Tobacco and Beverage), light industry (Garment, textile and leather), wood and furniture industry, chemical 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.

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 that 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 company 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 a urban district to a rural district within 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 household and proprietorship while that figure for urban areas is only more than 50%. In fact, most of companies 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 companies and 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 between 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 production 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 production and production capital grow during the studied period, the employment growth rate declines by 2.0% per annum. In 2005, on average, a firm in our sample has about 14.5 employees, but in 2011, this number reduces to 12.8. This decline 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%[3] 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 have higher adoption of business practice, especially among the 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 companies. 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 business practice from 2005 to 2011. On average, the business practice index of proprietorship firms is 0.091, much lower than companies' (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.

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[3] 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.

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 companies.

[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), GMM-system (columns 5). In columns 2 and 4, we included the autocorrelation terms (i.e. first lag of the dependent variable). In the GMM system estimation (column 5), we use second and higher lags of value added, labor, capital, percentage of workers with university degrees, the first lag of firm's perceived of competition, firm's selection of industry and ownership type as instruments for autocorrelation, firm's selection of production inputs and firm's selection of industry and ownership type. Other variables are used as instruments for themselves. We also use the two-step method with small sample variance adjustment. [4]

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[4] In this section, for each 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.

The estimations indicate 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 of this effect is not so large, partly due to the fact that our data is 2-year interval. While the autocorrelation term is positive in GMM-system estimation and the OLS estimation, that 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. When we use random effects model, the autocorrelation term becomes positive. Failing to capture firm's unobserved time-invariant characteristics may also cause the coefficient of autocorrelation terms in OLS estimation becomes positive, although OLS also fails to control for the endogeneity of labor and capital. 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 the OLS and FE estimations, the education level of workers, which is measured by the percentage of employees with college degree, is positive and statistically significant. However, when we control for endogeneity of such factor inputs and firm's selection of industry and ownership type, education level of workers becomes insignificant. Meanwhile, in all specification except the GMM-system equation, the education level of manager or owner does not have a statistically significant effect.

Table 5 presents the results for the production function using the two-step GMM-system methods with small sample adjusted covariance. In the first two columns, we estimate the

impact of our two business practice indices on firm's added value. Column [3] presents the

impact of each indicator in our business practice index on firm productivity. The estimation

results shows that both business practice indices have strong and statistically significant impact

on firm productivity. As the firm's business practice index increases by one standard deviation

(e.g. by 0.194 points), firm's value added increases by 24.0%. The effect is slightly lower, 19.1%,

when the second business practice index is used Inclusion of business practice in our

production function estimation reduces the contribution of labor in firm's productivity from

83.3% (as in column 5, Table 4) to 66.7% (as in column 3, Table 5) and 72.3% (as in column 2,

Table 5).

<center>[TABLE 5 IS ABOUT HERE]</center>

The results also show that firm's perception of fierce competition has a small but statistically

significant effect on firm's productivity. Among the business practice indicators having an email,

keeping an accounting book, higher percentage of sales outside their own provinces and higher

percentage of inputs procured from other provinces, organizing training courses for workers

have all an statistically significant impact on firm's value added. The results also show that

being located in an urban district has a positive association with the firm's value added.

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. This implies that there is

no non-linear relationship between firm's age and firm productivity. While percentage of

employees with college degree still does not have a statistically significant impact on firm

productivity as in the estimation without business practice indices, the variable indicating

education level of manager/owner loses its significance in the production function which

incudes business practice indices. This implies that there is 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 the business practice index 1 (i.e. index in which

we include the indicator of firm's accounting system) has a statistically significant impact on

<center>21</center>

firm's productivity for groups of proprietorship firms and company, although the impact is rather weak for the former. For group of firms with change in the ownership type during the studied period, business practice index is not statistically significant. This is partly due to opposite growth trends between the group of some better-performed firms in the proprietorship group, which then upgrade themselves to become a company and the groups of poorer-performed firms in the company group, which have to transform from a company to a proprietorship firm. The results also show that the contribution of labor under proprietorship is much higher than under company and the mixed ownership group. This may be due to the fact that proprietorship firms are more labor-intensive than company and firms in mixed ownership group. In columns 4, 5 and 6, we replace the first business practice index by the second index (i.e. The index we withdraw the indicator regarding firm's accounting report). The estimated results show that the business practice index loses its significant effect on productivity for those firms in the proprietorship group, and it is statistically significant effect at 5% level only for those firms in company group. This implies that the keeping an accounting book has a strong effect on the productivity for group of proprietorship firms.

[TABLE 6 IS ABOUT HERE]

The results also show that, for all groups of firms, the contribution of labor in firm's value added increases when we withdraw the indicator of keeping an accounting book from the business practice index. It should be noted that although both business practice indices do not have a statistically significant effect on productivity for firms in mixed ownership group, the capital contribution becomes significant. The results also show that the there is persistence in the productivity growth for proprietorship firms while this phenomenon is not seen for other types of firms. Similar to the results obtained from estimating production function using with the whole sample, firm's perception of competition, firm's percentage of workers with college degrees and education level of managers/owners all have statistically significant effects on firm's productivity for different type of ownerships. Meanwhile, being located in an urban district no longer has significant effect on firm's productivity.

[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. 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 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 5% level when we use the whole sample, but they are significant at the 10% level when sample is restricted to those firms, which are proprietorship during the studied years. Furthermore, for those firms in the company group and 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 does not have a significant effect on the adoption of business practice for different groups of ownership firms. This, coupled with results presented in Table 6, implies that for each group of firms, perception of fiercer competition does not have any effects, both direct and indirect, on firm's performance. 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, the education level of owner has a positive and statistically significant impact. This association is rather strong in all estimations, except for those firms in the company group. 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. To control for potential endogeneity, we have used GMM-system method to estimate the production function. We also use this estimation method to examine determinants of adoption of business practice.

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 those firms, which are cooperative, limited companies and joint stocks firms throughout the period than for those firms, which are household businesses throughout the

studied period. For those firms, which transformed their ownership during the studied period, we do not find the effect on productivity.

We also find that keeping a book of accounting have positive effects business practice. As we withdraw the indicator indicating whether firms formally keep financial record from our index, the effect of business practice index on firm's value added loses its significance for firms being proprietorship.

The estimation results also show that the education level of the business owners/managers, percentage of employees with college degree is found to have no direct effect on firm's performance. The estimation results, nevertheless, suggest that the education level of the business owners/managers may have indirect effects on productivity through business practice. Meanwhile, firm's perception of competition has a positive and statistically significant impact on firms' performance and firms' business practice index. However, for each group of firms, both direct and indirect effect of competition loses its significance. However, such effects are not statistically significant when we use sub-samples based on firm's ownership type. 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	Proprietorship	Company	Rural	Urban	Rural	Urban
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	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

	Year	BPI 1		BPI 2	
		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		0.252*** [0.0146]		-0.183*** [0.0190]	0.0928*** [0.0354]
Labor	0.916*** [0.0165]	0.743*** [0.0193]	0.762*** [0.0287]	0.750*** [0.0276]	0.833*** [0.106]
Capital	0.168*** [0.0103]	0.126*** [0.00976]	0.0992*** [0.0130]	0.0975*** [0.0128]	0.044 [0.0618]
Perception of competition	0.147*** [0.0329]	0.125*** [0.0308]	0.0826** [0.0336]	0.0852*** [0.0329]	0.0729* [0.0415]
% employee with college degree	1.014*** [0.197]	0.765*** [0.190]	0.758*** [0.237]	0.769*** [0.228]	-0.451 [0.931]
Manager with at least vocational training	-0.006 [0.0267]	-0.0314 [0.0257]	-0.0164 [0.0834]	-0.000727 [0.0860]	0.112* [0.0646]
Firm age	-0.127*** [0.0198]	-0.115*** [0.0185]	-0.311** [0.126]	-0.195 [0.132]	-0.240*** [0.0446]
Locating in urban district	0.0661** [0.0268]	0.0494* [0.0256]	-0.505* [0.262]	-0.604** [0.273]	0.195*** [0.0569]
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	8.104*** [0.154]	5.979*** [0.189]	10.08*** [0.472]	11.89*** [0.507]	9.120*** [0.775]
N	4187	4186	4187	4186	4186
Number of instruments					111
Hansen tests (p-value)					0.311

Standard errors in brackets; * p<0.1, ** p<0.05, *** p<0.01
Column [1] and [2] are OLS estimation results without and with autocorrelation terms, respectively; Column [3] and [4] are a fixed effects estimation results without and with autocorrelation terms, respectively; Column [5] presents GMM-system estimation. Dependent variable in all five estimations is the natural log of value added in real terms. From this table onward, labor and capital are natural logs of total labor and production capital (i.e. sum of building, equipment for production); perception of competition is a binary variable which takes value of one if firm perceived the competition is fiercer in last two years and zero otherwise; manager with at least vocational training is also a dummy variable which take value of one if the owner/manager have at least vocational training, and zero otherwise.

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

	[1]	[2]	[3]
Lagged value added	0.104***	0.103***	0.106***
	[0.0358]	[0.0358]	[0.0344]
Labor	0.688***	0.723***	0.667***
	[0.136]	[0.130]	[0.130]
Capital	0.0264	0.0218	-0.0076
	[0.0679]	[0.0680]	[0.0631]
Business practice index 1	0.240***		
	[0.0911]		
Business practice index 2		0.191**	
		[0.0837]	
Having emails			0.0740***
			[0.0232]
Carrying out advertisement			0.0197
			[0.0157]
Keeping an accounting book			0.0661**
			[0.0319]
Have a good knowledge of regulations			0.0279
			[0.0170]
% sales to customers outside provinces			0.170**
			[0.0782]
% input procured from other provinces			0.119*
			[0.0622]
Being a member of a business association			0.024
			[0.0196]
Organizing training course for workers			0.0363**
			[0.0160]
Perception of competition	0.0749*	0.0748*	0.0883**
	[0.0422]	[0.0423]	[0.0426]
% employee with college degree	-0.142	0.14	-0.811
	[1.120]	[1.130]	[1.129]
Manager with at least vocational training	0.0509	0.05	0.047
	[0.0738]	[0.0723]	[0.0637]
Firm age	-0.229***	-0.223***	-0.170***
	[0.0475]	[0.0474]	[0.0377]
Locating in urban district	0.205***	0.204***	0.199***
	[0.0657]	[0.0646]	[0.0598]
Industry dummies	Yes	Yes	Yes

Ownership dummies	Yes	Yes	Yes
Province dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Intercept	9.461***	9.484***	9.565***
	[0.829]	[0.843]	[0.703]
N	4184	4184	4184
Number of instruments	97	97	122
Hansen tests (p-value)	0.209	0.165	0.335

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

In all estimations, we use the second lag of value added, labor, capital and the percentage of workers with college degree as the instruments for autocorrelation term, labor, capital and percentage of workers with college degree, respectively. For business practice indices, we use the second lag as the instrument. In column 3, we use the first lag of variables of having emails, carrying out advertising, keeping a book of account and having a good knowledge of regulations, being a member of a business association and organizing training for workers and the second lag of percentage sales outside either provinces or districts and percentage of input procured from either other provinces or other districts as the instruments for these eight business practice indicators. (We initially use the second lag of all six indicators, but using such instruments produces the very high p-value from Hansen test, which implies the model misspecification (Roodman 2007)). We use the first lag of firm's perception of competition and ownership type as instruments. The first and higher lag of firm's ownership (column 1 and 2) and first and second lag (column 3) are used to instrument for ownership, while for firm's selection of industry, the second and higher lags of dummy variables that indicate the industry in which firm operated as the instruments in column 1 and 2 and the second lag as instrument for firm's industry in column 3. Other variables, including variable indicating that manager/owners have at least vocational degree, are instrumented for themselves.

Table 6: Estimated production function for different types of ownership

	[1]	[2]	[3]	[4]	[5]	[6]
Sample	Proprietorship	Company	Mixed ownership	Proprietorship	Company	Mixed ownership
Lagged value added	0.0885**	-0.0257	0.00423	0.0914**	-0.0288	0.00612
	[0.0367]	[0.0876]	[0.0766]	[0.0373]	[0.0879]	[0.0764]
Labor	0.945***	0.709***	0.744***	0.985***	0.720***	0.773***
	[0.155]	[0.231]	[0.190]	[0.140]	[0.231]	[0.193]
Capital	0.0825	0.0223	0.221**	0.0941	0.0202	0.216**
	[0.101]	[0.128]	[0.108]	[0.0829]	[0.130]	[0.109]
Business practice index 1	0.328*	0.341**	0.106			
	[0.194]	[0.160]	[0.162]			
Business practice index 2				0.178	0.282**	0.0499
				[0.163]	[0.142]	[0.135]
Perception of competition	0.0761	0.117	-0.0687	0.067	0.114	-0.049
	[0.0477]	[0.225]	[0.271]	[0.0468]	[0.224]	[0.262]
% employees with college degree	-1.772	1.321	1.102	-1.196	1.422	1.253
	[2.566]	[1.346]	[1.150]	[2.660]	[1.284]	[1.156]
Manager with at least vocational training	-0.0348	0.113	-0.0713	-0.0108	0.114	-0.062
	[0.0923]	[0.156]	[0.130]	[0.0937]	[0.157]	[0.132]
Firm age	-0.141*	-0.285***	0.0822	-0.147**	-0.283***	0.0714
	[0.0788]	[0.105]	[0.103]	[0.0725]	[0.106]	[0.100]
Locating in urban district	0.0622	-0.0767	-0.0498	0.073	-0.0806	-0.0485
	[0.0702]	[0.184]	[0.161]	[0.0642]	[0.182]	[0.153]
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Province dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	8.277***	10.16***	6.966***	7.990***	10.32***	7.016***
	[1.249]	[1.459]	[1.416]	[1.057]	[1.437]	[1.449]
N	3128	680	376	3128	680	376
Number of instruments	78	61	59	18	61	59
Hansen tests (p-value)	0.182	0.403	0.131	0.118	0.372	0.161

Standard errors in brackets; * p<0.1, ** p<0.05, *** p<0.01
The sample for Columns [1] and [4] consists of those firms, which were of proprietorship throughout the study period; for column [2] and [5] those firms which were companies throughout and for columns [3] and [6] those firms of which the ownership type changed during the period. We use the second lags of value added, labor, capital, percentage of employees with university, business practice index, the first lag of variables indicating firm's perception of competitions and the first (and higher for columns [1] and [4]) lags of dummy variable indicating industry in which a firm operated as instruments for potentially endogenous variables. Other variables are instruments for themselves.

Table 7: Robustness checks

Dependent variable	[1] Labor	[2] Revenue (log)	[3] Labor productivity	[4] Value Added	[5] Value Added
Lagged labor	0.295*** [0.0431]				
Lagged revenue		0.0305* [0.0168]			
Lagged value added				0.107*** [0.0366]	
Labor		0.284*** [0.0812]	-0.145 [0.120]	0.675*** [0.140]	0.780*** [0.0345]
Capital		0.0524 [0.0346]	0.0041 [0.0686]	0.0335 [0.0668]	0.125*** [0.0121]
Raw material		0.569*** [0.0568]			
Lagged capital intensity	0.014 [0.0170]				
Lagged labor productivity	0.0569** [0.0238]		0.129*** [0.0363]		
Business practice index	0.415*** [0.0931]	0.141** [0.0648]	0.237** [0.106]	0.275*** [0.0948]	0.105*** [0.0206]
Perceiving fiercer competition		-0.634 [0.718]	0.0531 [1.203]	-0.209 [1.098]	0.0148 [0.229]
% employees having a college degree	0.0343 [0.0337]	0.00778 [0.0234]	0.0705* [0.0419]	0.0782* [0.0422]	0.0138 [0.0317]
Managers/owners with at least vocational degree	0.203*** [0.0737]	-0.00837 [0.0475]	0.0278 [0.0685]	0.037 [0.0744]	-0.0163 [0.0275]
Firm age	-0.0810* [0.0460]	-0.0880*** [0.0292]	-0.213*** [0.0442]	-0.225*** [0.0467]	-0.104*** [0.0206]
Locating in urban district	0.0873* [0.0491]	0.0768** [0.0379]	0.192*** [0.0628]	0.189*** [0.0647]	0.0577** [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*** [0.389]	4.501*** [0.731]	9.255*** [0.911]	9.342*** [0.796]	5.894*** [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 Wooldridge-Levinsohn-Petrin (2009) 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	Company	Mixed ownership
Lagged BPI (with accounting)	0.163***	0.118*	0.141	-0.0333
	[0.0479]	[0.0628]	[0.104]	[0.183]
K/L	0.0041	0.00213	-0.0629	0.0432
	[0.0184]	[0.0240]	[0.0574]	[0.0551]
TFP	0.00418	0.00757	0.0346	-0.0302
	[0.00646]	[0.00589]	[0.0288]	[0.0341]
Perception of competition (lagged)	0.0296***	0.0129	0.0387	-0.0493
	[0.00742]	[0.00907]	[0.0367]	[0.0771]
% employee with college degree (lagged)	0.133	0.134	0.0425	-0.0189
	[0.0865]	[0.585]	[0.165]	[0.544]
Manager with at least vocational training (lagged)	0.0685***	0.0516***	0.0525*	0.142**
	[0.0139]	[0.0169]	[0.0271]	[0.0546]
Firm age	0.004	0.0738	0.226	0.0894
	[0.0912]	[0.110]	[0.162]	[0.555]
Firm's age square	-0.00666	-0.0138	-0.0465	-0.00693
	[0.0163]	[0.0177]	[0.0310]	[0.103]
Locating in a urban district	0.0105	0.00919	-0.03	0.0288
	[0.0144]	[0.0116]	[0.0273]	[0.0735]
Ownership dummies	Yes			
Industry dummies	Yes	Yes	Yes	Yes
Province dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Intercept	0.352	-0.145	0.455	-0.114
	[0.229]	[0.348]	[0.635]	[0.982]
N	2786	2084	453	249
Number of instruments	71	43	35	37
Hansen tests (p-value)	0.282	0.188	0.34	0.387

PANEL B: Dependent variable: business practice index 2

	[1]	[2]	[3]	[4]
Sample	Whole sample	Proprietorship	Company	Mixed ownership
Lagged BPI (without accounting)	0.186***	0.118**	0.129	-0.0463
	[0.0480]	[0.0590]	[0.100]	[0.176]
K/L	0.00344	0.0124	-0.0599	0.0475
	[0.0182]	[0.0226]	[0.0628]	[0.0562]
TFP	0.00578	0.00894*	0.0404	-0.0402
	[0.00692]	[0.00542]	[0.0327]	[0.0397]
Perception of competition (lagged)	0.0259***	0.00618	0.0453	-0.0674
	[0.00725]	[0.00849]	[0.0410]	[0.0764]

% employee with college degree (lagged)	0.156	-0.239	0.0357	-0.0795
	[0.0952]	[0.233]	[0.187]	[0.545]
Manager with at least vocational training (lagged)	0.0655***	0.0373***	0.0618**	0.138**
	[0.0135]	[0.0142]	[0.0310]	[0.0539]
Firm age	0.057	0.127	0.279	0.2
	[0.0834]	[0.0953]	[0.180]	[0.547]
Firm's age square	-0.016	-0.0218	-0.0562	-0.0244
	[0.0149]	[0.0152]	[0.0344]	[0.101]
Locating in a urban district	-0.0029	-0.0000642	-0.0341	-0.000436
	[0.0122]	[0.0121]	[0.0311]	[0.0736]
Ownership dummies	Yes			
Industry dummies	Yes	Yes	Yes	Yes
Province dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Intercept	0.237	-0.305	0.279	-0.414
	[0.216]	[0.286]	[0.696]	[0.977]
N	2786	2084	453	249
Number of instruments	71	43	35	37
Hansen tests (p-value)	0.131	0.46	0.253	0.42

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, perception of competition, percentage of workers with college degree and education level of manager/owner. 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.