Industrial Development in Peripheral Provinces of Thailand:
Cross-section analysis of enterprise start-ups and labor productivity[1]

Phakpoom Tippakoon, Doctoral Student, GSID, Nagoya University

1. Introduction

One of the key challenges in Thailand's regional development policies is how to reduce the inequality in industrial development between regions and provinces. To help overcome this challenge, previous studies attempted to explain why industrial establishments are highly concentrated in Bangkok and area around it, or what factors determine industrial location behavior (Chintayarangsan 1989; Tambunlertchai 1989; Thongpakdi and Bunluesak 1992; and Kittiprapas and McCann 1999). Dependent variables used in these studies are the share of gross provincial manufacturing output (Rachain 1989; Somsak 1989), number of factories in each province (Nuttapong and Bunluesak 1992), and profitability of firms (Kittiprapas and McCann 1999). The main objectives are to establish the determinants explaining variation in industrial establishments and to draw some lessons for improving industrial decentralization policies.

However, what is absent in the previous studies on Thailand's regional industry development is the analysis of regional entrepreneurship and competitiveness. Following the theoretical and empirical literature, I introduce variables enterprise start-up and regional labor productivity to capture the conceptual dimensions of regional entrepreneurship and regional competitiveness, respectively.[2] The aim of this paper is to examine why enterprise start-ups and regional labor productivity vary across Thai provinces, with special focus on peripheral provinces outside Bangkok.

This paper is organized as follows. Section 2 provides the facts concerning regional variations in new enterprise start-up and labor productivity. Section 3 discusses, based on previous literature, why start-up activity and regional labor productivity vary across regions. Then, independent variables and hypotheses are drawn for empirical tests, and methodology is also discussed. Section 4 discusses the empirical results. Conclusion is drawn in Section 5.

2. Variation in enterprise start-ups and labor productivity across Thai provinces

2.1 Variation in enterprise start-ups

It is argued that the use of absolute number of firm start-ups to measure regional variation in

[1] This paper is a part of my doctoral dissertation to be submitted to the Graduate School of International Development(GSID), Nagoya University.

[2] The OECD-Eurostat Entrepreneurship Indicator Programme has discussed the concept of regional entrepreneurship and proposed indicators for measuring it, while the special issue of *Regional Studies* 1994 (Volume 4) put the concept into empirical work. The concept of regional competitiveness is intensively discussed in *Regional Studies* 2004 (Volume 9). In empirical work, some researchers broadly agree to use variable `regional labor productivity` to capture regional competitiveness (Gardiner et al. 2004; Webber et al. 2008).

star-up activity is misleading, because it does not reflect the degree of regional entrepreneurship (Audretsch and Fritsch 1994). Normal in the literature on firm start-ups is the use of workforce as a denominator for normalizing start-ups. This practice is based on the Labor Force (LF) approach which maintains that new businesses are drawn from the labor market: the entrepreneur starting a new business is in the same labor market within which that new establishment operates (Audretsch and Fritsch 1994, p.361). In this paper, I follow the LF logic and use establishment start-ups per 10,000 workforce as dependent variable.

The data on new firm registration in 2006 was taken from the Provincial Office of Business Development (POBD) which registers all business establishments in each province. However, it should be mentioned that this data has some drawbacks. First, as POBD only publishes the data on new juristic person (i.e. company limited, limited partnership, ordinary partnership, and public company limited), but not on new individual proprietors, the data used here does not represent all new establishments in the province. Second, as the data is not segregated in accordance with the organizational forms of establishment, all new establishments are counted regardless of whether they are head offices, branches, or subsidiaries. One may argue that new establishment may not be absolutely new if it is a branch of other establishment.

Figure 1: Provincial variations in new start-up per 10,000 workforce in 2006

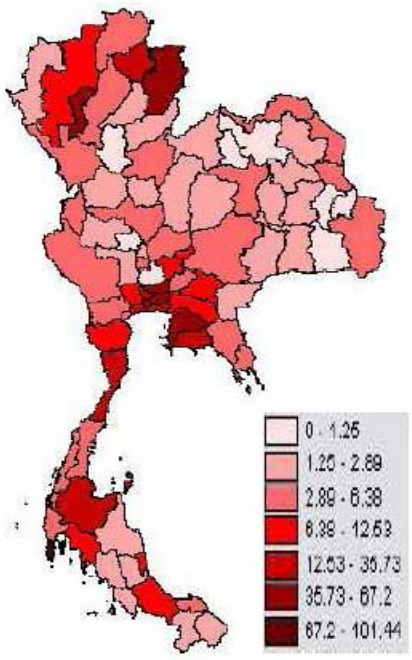


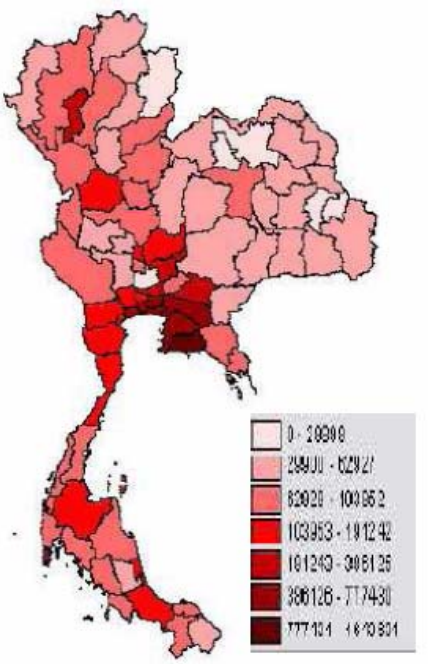
Figure 2 highlight the variation in new enterprise start-ups at the provincial level. According to the figure, high star-ups are found in the Bangkok and its vicinity and in the provinces along the east coast which enjoy good infrastructures and incentives provided by the government under the Eastern Seaboard scheme. High start-up rates can also be observed in some Northern provinces in (i.e. Lamphun, Nan, and Payao) and South provinces (i.e. Surat Thani and Krabi). Low start-up rates are

found elsewhere, especially in the Northeastern provinces.

2.2. Variation in labor productivity

Gross provincial manufacturing value-added (in Baht) per employee is used to capture provincial labor productivity. The data used here is derived from the National Economic and Social Development Board (NESDB). Figure 2 shows the variation in labor productivity across provinces.

Figure 2: Provincial variation in manufacturing labor productivity, 2006



Similar to Figure 1, Bangkok and its vicinity provinces show high level of labor productivity while peripheral provinces, especially many provinces in the North and in the Northeast register very low level of labor productivity. This figure significantly tells us that distribution of productivity is not equal among Thai provinces, subject to further examination.

3. Determinants of regional variation in firm start-ups and labor productivity

3.1 Why do enterprise start-ups vary across regions?

One of the most fundamental ideas is that entrepreneurs are well reactive to increased demand for goods and services (Reynolds et al. 1994). Therefore it is reasonable to expect that entrepreneurs will establish new firms in order to take benefits from a greater demand. In their studies, Audretsch and Fritsch (1994) and Davidsson et al. (1994) found that demand effect on new firm formation rates is positive. Following the previous literature, this study use average per capita income (2002-2006) *(INCOME)* and percentage of population growth (2001-2005) *(PGROW)* to proxy demand.

It is argued that when people lose their jobs, they may end up being self-employed or trying

to start a new firm (Reynolds et al. 1994, p.446). On the other hand, an increase in regional unemployment can be a sign of slack demand (Garofoli 1994). Unemployment, therefore, is an important indicator of new firm formation. This study use the average annual unemployment rate (2003-2005) *(UNEMP)* to test the effect of unemployment of new enterprise formation in Thailand.

The recent literature on urbanization economies (Bosma et al. 2008) argues that in the urbanized areas with a large diversity of population and economic activities, demand for products and services tend to be various, which, in turn, lead to a large number of niche markets. According to Jacob (1969) (cited in Cortright 2006, p.10), the diversity and extensive interaction of economic actors within cites generate new ideas and new work, and knowledge spillovers occurred *between* industries promote industrial growth. This idea has been supported by Glaeser et al. (1992) which found that knowledge spillovers across industries are more important for growth and employment than inter-industry spillovers. On the other hand, high degree of urbanization is often associated with congestion and high costs of inputs (e.g. labor, land, and building). This may offset the benefits of urbanization economies and may, thus, yield a negative impact on new firm start-up (Hart et al. 1994; Tamasy and le Heron 2008). In this study, I use percentage of population living in municipal areas (2005) *(URBAN)* [3] and industrial density (number of establishments per 1,000 residents) *(INDENT)* as indicators for urbanization economies.

Opposite with urban economies is localization economies which refer to benefits that arise when firms in the same industry are agglomerated in a particular location (Bosma et al. 2008). This concept is drawn from the literature on industrial cluster (e.g. Porter 1998, Schmitz and Nadvi 1999). In their empirical work, Huang et al. (2008) establish that clustering deepens the division of labor in the production process and makes it possible for small entrepreneurial firms to enter the industry by focusing a narrowly defined stage of production. The current study uses Herfindahl Index *(HERFIN)* to measure the extent to which a province is specialized in a few sectors. The index is derived from the following formula:

$$HERFIN_j = \sum (E_{ij}/E_j)^2$$

The nominator E_{ij} is the employment in industrial sector i of province j (subscripts i and j stands for industrial sector and province, respectively). The denominator E_j is the total employment in province j. This index takes continuous value from 0 to 1. An increase in the index reflects concentration in fewer sectors (Holl 2004, pp.703-704). The calculation of both indices is based mainly on 23 two-digit manufacturing sectors, plus construction, trade and business service sectors. This data is derived from industrial census 2007 conducted by the NSO, which shows important indicators of all industrial establishments existed at the end of 2006. However, as the data reporting system is different in many provinces (e.g. many provinces combine some industrial sectors together) the calculation is adjusted for such differences and yields 15 sectors.

[3] According to NSO, municipal area means urban area.

The previous literature has established that how difficult, for entrepreneurs, to enter the market by establishing new firms in a particular region depends on industrial size structure of that region. The region in which industrial structure is dominated by small firms tends to have a higher rate of firm start-up, because barrier-to-entry tends to be smaller in the small-firm dominated industrial structure than in the large-firm dominated one (Keeble and Walker 1994). This study tests this thesis by using variable mean of firm size (total employees/total establishment) *(FSIZE)* as a proxy for provincial industrial size structure.

Another well-established idea is that knowledge enables individual to be productive and efficient in their economic activities, human capital is considered important in enhancing regional entrepreneurship (Becker 1964). Thus, regions that are rich in human capital are expected to have more start-up activity. In the previous studies, there are two types of variable used to capture regional human capital: shares of workers with higher education and with less than high-school degree. Although it is reasonable to expect that higher share of workforce with high education will positively affect firm start-ups, in some cases, however, it is found that a large presence of low-educated workforce can also encourage new firm formation, because low educated workforce provides cheap labor for new firms (Armington and Acs 2002). In this study I use percentage of workforce having less than high-school degree *(UNSKIL)* to test this controversy.

Previous literature also argues that local government can also play important roles in encouraging start-up activity. Local government's policies can either encourage or discourage firm start-up activities. One the one hand, one can expect that local government expenditure on local infrastructure (e.g. roads, telephone, electricity, schools, health care, etc) may generate both demand for goods and services and supplies of public services (Davidsson et al. 1994). On the other hand, in the region which local government collects higher business or personal income taxes, one can expect negative lower start-up activity as a consequence (Guesnier 1994; Goetz and Rupasingha 2007). The roles of local government are tested in this study, using variable local government investment expenditure *(LGINV)*, which is derived from annual investment expenditures of three local administrative units in each province: Provincial Administration Organization, Municipal Administration Organization, and Tambon Administration Organization.

The last variable to be included in modeling provincial enterprise start-ups is agricultural value-added per capita *(AGRINC)* which is measured by dividing agricultural GPP by number of persons employed in agricultural activities (2005). In fact, the roles of agriculture on new firm formation have not been captured by the previous literature yet. However, in the literature on rural non-farm economy, it has been established that the nature of linkages between agricultural and agricultural sectors is a key factor explaining the dynamics of the latter. There are some evidences in many countries in Asia suggestion that the growth of agricultural sector increases demand for new agricultural inputs and raises consumption of non-agricultural goods and services. These mechanisms explain the growth of non-agricultural sector (Mellor and Lele 1972; Islam 1987). On the contrary, some authors argue that as agricultural sector is growing, the residual employed in the

non-agricultural sector may be drawn into agriculture, lowering employment in the non-agricultural sector but raising wage there (Lanjouw and Lanjouw 2001, p.12).

3.2 Why does labor productivity vary across regions?

In the standard neo-classical model, the growth of productivity (output per worker) depends on the growth of capital per worker and the rate of technical progress. Therefore, regional differences in labor productivity growth are explained by regional differences in the rate of technological progress and by regional differences in the growth of the capital-labor ratio (Gardiner et al. 2004, p. 1049).

It is, on the other hand, argued by endogenous growth theory that technological change is itself determined by the growth process. Regional variations in productivity overtime depend on the assumptions made about the process of technological progress (Gardiner et al. 2004, p. 1049). Empirical work based on the endogenous growth model take the importance of knowledge and skills acquired through education, training and work experience as important determinants of productivity growth (Nijkamp and Stough 2000). It is possible, therefore, to assume that regional differences in human capital, measured as proportion of high educated workforce (proxy of skilled labor), is the main driver of regional differences in labor productivity.

Recently, the new economic geography (NEG) literature proposes that differences in regional industrial growth can be expected from variations in regional industrial structure. On the one hand, some NEG researchers argue that regional specialization produces higher growth due to the exploitation of within-industry knowledge spillover effects, or due to economies of scale arising from higher specialization of intermediaries input suppliers (Audretsch and Feldman). On the other hand, others show that knowledge spillovers across industries are more important for growth and employment than inter-industry spillovers and, therefore, agglomeration of diverse economic activities is more significant in explaining regional growth differentials (Glaeser et al. 1992). In this study, I will test these controversies by using Herfindahl index identified above. Here, Herfindahl index is derived from provincial manufacturing employment data, which include 13 manufacturing sectors, after adjusting for differences in data reporting system. Herfindalh index close to 1 indicates industrial specialization. Its closeness to 0 indicates diversification.

Starting from the neo-classical Cobb-Douglas production function as follow:

$$Y = AK^{\beta 1}L^{\beta 2} \quad (1)$$

where Y is gross manufacturing value-added, K is capital stock, L is quantity of labor, and A represents efficiency factor which models as a function of all the factors that may affect output. Dividing both sides by L to get labor productivity as the dependent variable, converting into natural logarithm, and augmenting the model to include other explanatory variables yield an econometric model to be tested as follow:

$$\ln(Y/L) = \beta_0 + \beta_2 \ln(K)_j + \beta_3 \ln(l)_j + \beta_4 (SKILL)_j + \beta_5 (HERFIN)_j + (REGION) + u_j \quad (2)$$

where *SKILL* is the percentage of workforce having more than high school degree, *HERFIN*

is Herfindahl Index, *REGION* is regional dummies, and *u* is an error term which is assumed to be normally distributed.

3.3 Methodology

This study relies on OLS linear regression method for cross-section data analysis. It takes the province as a unit of analysis. Out of 76 provinces in Thailand, 72 are used in the analysis of new enterprise start-up, 74 are used in the analysis of labor productivity. Bangkok is always excluded because it is a great major city which is outside the scope of this study, while other provinces are excluded due to the insufficiency of necessary data.

In modeling, a series of different model specifications were tried in which these models were estimated in various levels and log forms. The inclusion, replacement, and removal of different combinations of variables both in levels and log forms were performed to see how the overall models performed and how stable the coefficient estimates were to different model specifications. All OLS assumptions were also carefully checked for all specifications to see whether those assumptions were met.

4. Empirical results

4.1 Determinants of regional variation in enterprise start-ups in Thailand

Table 1 presents the results of the OLS regression estimating enterprise start-ups. In this table, both unstandardized and standardized betas (*b* and β) are given. Note that dependent variable and some dependent variables were transformed into natural logarithm in order to facilitate the usage of linear regression based on the OLS procedure. The final model reported here explains the variation of dependent variable 81%.

As expected, variables *INCOME* and *PGROW* which capture provincial demand for goods and services have positive sings and are both statistically significant at 5% level. The result is consistent with Armington (2002), Lee et al (2004), and Garofoli (1994) (among others). The effect of income is such strong that its one percent increase estimates the increase in enterprise start-up for almost 64%, indicating that sound income distribution policies are required to achieve industrial decentralization.

Similar with Audrestsch and Fristsch (1994), variable *UNSKILL* has a negative coefficient, suggesting that new enterprises have a higher propensity to locate in provinces where workers tend to be highly skilled than in those regions consisting mainly of unskilled workers. However, this variable is only moderately significant at 10% level.

Variables *URBAN* and *INDENT* are both positive and strongly significant at 1% and 5% level respectively. This is consistent with Jacob's idea and Glaeser et al. (1992) ` s argument that diversity and extensive interaction of economic actors within cites generate new ideas and new work, and knowledge spillovers occurred *between* industries are more significant in promoting industrial growth. This result is also consistent Keeble and Walker (1994) and Armington and Acs (2002), suggesting that urban areas may have advantages as incubators for new enterprises.

Different from other previous studies is the coefficient of *FSIZE* which is positive and very significant at 1% level; although its effect is not quite strong (*b* is 0.01). This result is rather difficult to interpret. Perhaps, it has something to do with the data used in this study. As the data does not segregate the organizational forms of new establishment, if a large part of start-up enterprises are subsidiaries, it is possible that variable *FSIZE* will have positive coefficient because subsidiaries tend to locate near their buyers which tend to be large enterprises.

Table 1: OLS Regression result estimating enterprise start-ups

Independent variables	Dependent variable: *New establishments/10,000 workforces(Log)*	
	b (t-statistic)$^{Sig.}$	β
Constant	*–3.13 (–2.308)**	
INCOME (Log.)	*0.639 (2.070)***	*.180*
PGROW	*0.089 (2.508)***	*.158*
UNSKIL	*–0.003 (–1.992)**	*–.123*
UNEMP (Log.)	*0.064 (1.090)*	*.056*
URBAN	*0.014 (1.992)****	*.290*
INDENT	*0.046 (2.653)***	*.251*
FSIZE	*0.010 (5.084)****	*.413*
AGRINC (Log.)	*–0.001 (–4.133)****	*–.321*
LGINV (Log.)	*0.079 (0.612)*	*.038*
HERFIN	*0.723 (5.220)****	*.037*
Adjusted-R^2	0.871	
F-Statistic	39.358***	
N	72	

Note: Values in parentheses are t-staistics. *, **, and *** signify statistical significance at 10%, 5%, and 1% level respectively.

Variable *AGRINC* is negative and significant at 1% level, suggesting that agricultural income has a substitute effect as mentioned by Lanjouw, J.O. and Lanjouw, P. (2001). Variables proxying unemployment *(UNEMP)* and roles of local government *(LGINV)* are not significant in this study.

Variable that exert strongest effect on dependent variable in this study is *HERFIN*. This suggests that new enterprises tend to locate in the province having a high degree of specialization. This is consistent with the localization economies thesis that new ideas and economic activities are generated within the region with agglomeration of firms in the same industry.

4.1 Determinants of regional variation in labor productivity in Thailand

Table 2 reports the OLS regression estimating labor productivity. The model is based on the

traditional Cobb-Douglas production function where output per employee is driven by employment and capital. This table presents three models. Model 2 is the estimate of whether regional characteristics per se are the source of variation in labor productivity at the provincial level. Model 1 could be criticized for not taking into account the stocks of capital and labor forces, while Model 2 could be criticized for only considering the effects of regional characteristics. Model 3 is the final model accounting for the effects of all explanatory variables.

Table 2: OLS Regression result estimating labor productivity

Independent variables	**Model 1**	**Model 2**	**Model 3**
Constant	*10.112(6.159)****	*25.566(39.945)****	*11.838(5.626)****
ln(K)	*0.172(2.594)***	-	*0.152(2.189)***
ln(L)	*–0.260(–4.740)****	-	*–0.314(–4.214)****
SKILL	*0.065(2.407)***	-	*0.066(2.095)***
HERFIN	*2.276(2.222)***	-	*2.335(2.221)***
Dummies (Vicinity of BKK = 0)			
North	-	*–3.900(–4.886)****	*–0.996(–1.372)*
Northeast	-	*–3.704(–5.150****	*–0.699(–0.981)*
Central	-	*–2.784(–4.001)****	*–0.708(–1.147)*
South	-	*–3.479(–4.666)****	*–1.215(–1.881)**
Adjusted-R^2	0.583	0.277	0.586
F-Statistic	26.503***	7.983***	13.914***
N	74	74	74

Note: Values in parentheses are t-staistics. *, **, and *** signify statistical significance at 10%, 5%, and 1% level respectively.

In model 1, capital stock and labor supply have the expected coefficient magnitudes and are also statistically significant at 5% and 1% level respectively. Variable *SKILL* significantly explain that province with more educated labor force tends to enjoy more labor productivity, consistent with the human capital and endogenous growth theories.

When regional dummy variable is separately considered in Model 2, we can observe that differences in labor productivity between provinces have something to do with the regional characteristics. Provinces in backward regions, as compared against Bangkok's vicinity provinces, tend to be less efficient.

When we move to Model 3 which includes all explanatory variables, we can observe that most explanatory variables, except regional dummies, are still consistent with the previous model and statistically significant. The final point to make here is about the effect of variable *HERFIN*. This variable has strongest impact on labor productivity and statistically significant in both Model 1 and Model 3. This suggests that policy aiming at promoting regional industrial specialization is a

preferable one.

Conclusion

This paper aims to find the determinants of variations in enterprise start-up and labor productivity across peripheral provinces in Thailand. It identifies relevant concepts and draws independent variables for empirical test, based on the previous literature. This paper relies on the OLS regression of cross-section data. The findings in this study are generally consistent with those suggested by the previous studies. In the final model of enterprise start-up, it is found that income and population growth, urbanization, and industrial specialization have significant positive impact on enterprise start-ups. In the model estimating labor productivity, it is clear that stock of physical and human capital as well as industrial specialization affect labor productivity positively.

The final remark to make here is about the importance of industrial specialization which has positive and very strong impacts on both start-up activity and labor productivity. The coefficient of this variable is also robust in every model in which it is included. As the government of Thailand has promoted industrial cluster since the beginning of this decade with the main objective to improve productivity and competitiveness of Thai SMEs, this finding confirms that this policy is on the right track. This study specifically suggests that to improve entrepreneurial activity and productivity in peripheral provinces, it is possible to achieve through appropriate industrial cluster policy.

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