THESIS

CLOSING THE GROWTH GAP: REGIONAL ENTREPRENEURSHIP GROWTH IN DIFFERENT REGIONS OF VIETNAM

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ABSTRACT

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This paper examines the effect of provincial growth factors on regional entrepreneurship growth in Vietnam by combining theoretical and empirical models. Separate regressions are run for 63 provinces of Vietnam across the time period of 2005 to 2013. The key findings are that the growth gap between the rich and the poor regions still exists, and the strongest growth factor affecting provincial entrepreneurship growth is the market factor. There is evidence of spillover effects which implies that new firms and/or the development of a province’s factors may generate new entrepreneurial opportunities not only for the province itself but also for the neighboring regions.

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Chapter 1. Introduction

Vietnam's economy has grown rapidly in the last 20 years following the economic reform in the 1990s. After the American war in 1975, the Government of Vietnam started building a centrally planned economy where the government controlled all production inputs and outputs and there was no free market. This type of economy showed great weaknesses in the early 1980s as economic and social crises occurred, inflation was out of control and people became poorer and poorer. The National Congress of the Communist Party of Vietnam was held in 1986 to decide on industrialization and modernization plans for the country. Starting from the early 1990s, the government decided to switch from the planned economy to the Socialist-oriented market economy where the State accepted the existence of many economic sectors including private and foreign sectors, however, the state sector still played the main role. With the Company Law enacted in 1990, followed by the Enterprise Law in 2002, which eliminated 150 business licenses and permits along with lowering the time and cost of registration, the number of private companies steadily increased (Mallon, 2004).

Vietnam joined the World Trade Organization (WTO) in 2007. This is thought to create more opportunities than challenges for the economy because it would attract foreign investments thanks to a stable and transparent environment. According to the Vietnam Ministry of Industry and Trade, Vietnam's exports continually increased during the 5 years after 2007, at the average of 19.52% each year. The increase in export has promoted the development of distribution and retail. Businesses have grown both quality and quantity wise, with increasing kinds and standards of goods and services in multiple sectors. Nevertheless, most of the enterprises in Vietnam are still small.

Entrepreneurship development has contributed greatly to the economic growth of Vietnam. However, there seems to be an uneven growth between geographic regions of Vietnam. Vietnam's inland territory is shaped like the letter S with a land boundary of 2,883 miles long and a coastline of 2,140 miles long. It is divided into 3 main regions: North, Central and South. There are 63 provinces in Vietnam and the two biggest are Hanoi, the capital, and Ho Chi Minh City, which used to be the capital of the French colony of Cochinchina. These two provinces account for about 15% of the total retail sales of goods and services of the country in 2014, this is a 5 percentage point increase since 2005 (GSO). It is highly possible that there exists a spillover effect from these two provinces to their neighbors, making the regions around them richer and richer while the rest is still growing slow (Hue, 2015). This fact has widened the income gap between the rich and the poor in Vietnam. There is a tight relationship between entrepreneurship development and economic growth (Wennekers, 1999); more specifically, entrepreneurship development and income growth (Freeman, 1996; Oostendorp, 2009; Le, 2015). Accordingly, looking into how to promote enterprises' development in regions with low-income growth is extremely important for policy-makers to have a better guidance in increasing income in relatively poorer regions and reducing the income gap in Vietnam.

With these concerns in mind, this paper attempts to find out which factors affect the growth of enterprises in a region and if there is truly a spillover effect by building a spatial Durbin autocorrelation regression model with fixed effects to account for factors that remain unchanged through the years but are different across regions. First, a pooled OLS regression is run to determine roughly which characteristics of a province would affect the growth of enterprises in that province. After that, first difference and percentage change OLS regressions are looked at to accounts for the biasedness and inefficiency problems of the pooled OLS regressions and further discover the trend of those factors affecting entrepreneurship growth. Fixed effect regressions are also run to determine if there are different starting points (stocks) for different provinces in order to focus only on the flows of variables, i.e. the change of variables that lead to a change in the dependent variable. Finally, a spatial Durbin autocorrelation model with fixed effects is estimated to discover if there are spatial correlations between neighboring regions.

Interesting results are found from the spatial Durbin model between the number of firms in a region and some independent variables of that region as well as of the neighboring regions (taking out two outliers from the sample: Hanoi and Ho Chi Minh City). The number of firms in a province is positively and significantly affected by the number of firms in the neighboring provinces. On the independent variables direct effect, positive and statistically significant relationships are found between the dependent variable of a region and the population, net migration, retail sales, labor, number of hospitals, and the production of aquaculture of that region; negative relationships are found between the dependent variable in a region and the average revenue of a business, the average volume of freight transported and the production of cereal in that region. Statistically significant relationships are also found between number of firms in a region and the independent variables of the neighboring provinces: population (negative relationship), net migration (positive relationship), retail sales (negative relationship), and cereal production (negative relationship). Nevertheless, only variables that measure market, facilities, and human capital have economically significant effects on growth.

Through various empirical models run on enterprises growth in Vietnam, we can further understand the reasons for the slowing down of business growth in rural areas and suggest possible policies to increase regional growth through entrepreneurship development. The results will help inform the government of regional business development policies and reduce regional inequality. Moreover, policies targeting a particular poor province could help develop small businesses in that province as well as its neighboring provinces. Examples of possible policies targeting significant factors are applying tax reduction or tax exemption on sales from new and small businesses, providing easy access to new technology and marketing knowledge to small businesses, helping poor children have easy and free access to education, developing infrastructure and facilities to attract population and labor, and other policies for attracting return migration.

Additional details on the background and motivation are provided in the next section. The third section discusses the theory of the Solow growth model and the spatial autocorrelation model with fixed effects, then build a model to test the hypotheses. The following section shows the model results and implications. The final part summarizes the key findings and suggests solutions to the problem.

Chapter 2. Motivation and background

2.1. Vietnam economy

After two consecutive wars against France and the United States from 1858 to 1975, Vietnam was left devastated by poverty and hunger. Vietnam's new government, with the help of the former Soviet Union, built the economy towards centralized planning where resources were directly allocated, the private sector was not allowed, small businesses were eliminated and the State controlled all economic activities. This mechanism was proven to be ineffective, productivity decreased year by year since everyone got the same amount of commodities no matter how hard they worked, there was little motivation for innovation and no technological advancement. The Gross Domestic Product (GDP) growth rate continually dropped from 13.6% in 1977 to -3.5% in 1980 and inflation was going out of control (GSO).

Facing this crisis, The Government of Vietnam implemented an economic reform - Doi Moi (or 'economic renewal') in 1986, though bold and thorough steps only began in 1989 and showed effects in 1992 when the economy grew rapidly and inflation was restrained. The planning economy was replaced with a market economy under socialist orientation, where private businesses were allowed to operate, and the state sector remained the primary economic actor. After the implementation of Doi Moi in the 1991-1995 period, average per capita GDP growth jumped to 6.6% and poverty was significantly reduced (Mallon, 2004).

Doi Moi policies greatly liberalized the market and mobilized resources for development, which helped accelerate growth and control hyperinflation. The opening of the market and legalization of the private sector, as well as allowing foreign investment, increased entrepreneurship development considerably. Household businesses have played an important role in rural and informal urban economic activities and have provided employment for most of the population. Formal private enterprises and foreign investors only became significant economic actors as the transition progressed. The 1992 Constitution set up an essential foundation for the private sector to compete with the state sector. It also stated that foreign investment and trade were to be encouraged (Articles 24 and 25) and that state enterprises should be run autonomously and be accountable for their performance (Article 19) (Government of Vietnam, 1992). There were 190 joint stock companies and 8,900 limited liability companies registered by 1996 (Mallon, 2004). The number of state-owned enterprises decreased in the period of 1989 to 2005 due to mergers, dissolutions, and acquisitions. The size of state-owned enterprises in GDP decreased in the period of 1994-2003, however, it still remained the largest sector (Meyer, 2006). After the creation of Enterprise law in 2002, the number of newly registered private enterprises reached 36,000 in 2004 up from 14,457 in 2000. By June 2004, the total number of firms registered under the Enterprise Law reached 95,357 (Hakkala, 2007).

Another event which greatly contributed to the quick development of Vietnam's entrepreneurship is joining the World Trade Organization (WTO) in 2007. Vietnam applied for a membership in 1995 but was not accepted as an official member until 2007 when the State's control over the economy was greatly reduced. The percentage of GDP associated with export increased from 56.3% in 2005 to 65.3% in 2010 and reached the highest point in the past 40 years at 80.7% in 2014 (which surpassed that of import at 79.4%) (GSO). Implemented FDI increased 195.95% during 2006-2007. The percentage of the number of state-owned enterprises decreased from 3.83% in 2005 to 0.86% in 2013. Surprisingly, the percentage of the number of private enterprises and foreign invested enterprises also decreased from 32.5% to 13.18% and from 3.47% to 2.74%, respectively, even though the actual number of enterprises increased in that same period of time. This is due to the boom of Limited Companies and Joint stock without state's capital companies with significant increases from 49.25% to 61.8% and from 9.89% to 20.86%, respectively (GSO). Most of these businesses are in wholesale and retail, with manufacturing firms being second.

2.2. Entrepreneurship and economic growth

Research on the relationship between economic growth and entrepreneurship growth has focused on the economic factors which affect business development and the effect of business development on the economy. Dejardin (2011) found a positive relationship between the development of new businesses and regional growth. Bunten (2014) provided evidence for the significant effect of establishment births and deaths on employment growth. Nonetheless, empirical studies on the economic determinants of new firm's formation have yielded diverse and even contradictory results. Guesnier (1994) and Armington (2002) found evidence of a positive effect of population change on new firm entry, while Audretch (1994), Garofoli (1994) and Sutaria (2004) found none. On the other hand, while Audretsch (1994) and Wang (2006) found a positive impact of the change in the unemployment rate on new firm formation, Guesnier (1994), Garofoli (1994) and Sutaria (2004) found the impact to be negative. Finally, while Audretsch (1994) found no effect of the mean establishment size, Armington (2002) found a negative one and Sutaria (2004) found a positive one. These contradicting results make policy development very difficult.

Firms' location decisions and agglomeration effects are also interesting from a policy perspective. Looking at the determinants on the locations of firms in the United States, Coughlin (2000) found a positive effect of economic size, labor force quality, agglomeration economies, urbanization economies and transportation infrastructure on the location of new foreign-owned plants. He also found that an increase in unit labor costs or taxes would have a negative effect on foreign direct investment. Ellison (2007) stated that there was a significant and positive effect of transportation costs, labor pooling and technology spillovers on agglomeration in the US. The case for agglomeration in China was analyzed in forms of the share of state-owned enterprises in employment, purchased inputs intensity, new product ratio, and average firm size. All of these variables affected agglomeration (Lu, 2009). Arauzo Carod (2004) researched the determinants of industrial location in Catalan municipalities and found that concentration of jobs had an effect but the concentration of population did not. An increase in the distance from one municipality to the capital of the local administrative division did decrease the probability of a new industrial establishment locating there. In Vietnam, the topic of agglomeration and determinants on the locations of firms is still new and has not been studied in depth.

2.3. Entrepreneurship in Vietnam

On the issue of which firm characteristics increase firm growth and survival length, Hansen (2009) finds that in Vietnam, small firms grow faster than large firms, innovative firms survive longer, and firms that have government customer grow faster and survive longer. Significant evidence of growth originated from initial government support, tax exemption, and direct credit are also found. This suggests an important role of government support in entrepreneurship development in Vietnam. Wiklund (2009) stated that entrepreneurial orientation, manager's personal attitude, and firm's dynamism directly influence small firms' growth.

Focusing on the relationship between the performance of incumbent firms and the net entry of new firms, Santarelli (2012) discovered that from 2000 to 2008, net entry of enterprises in

Vietnam was associated with the performance of incumbent firms and the overall performance of the economy. Incumbents' growth and GDP growth created changes in the existing production system and stimulated an imitation effect. He also found significant spatial autocorrelation among neighboring regions.

Some research on small businesses has been brought about for Vietnam regions. Freeman (1996) found a great jump in the number of small enterprises in Ho Chi Minh City – Vietnam's largest city after Doi Moi reform. He also suggested that small enterprises promote both rural and urban economies by increasing income, providing inexpensive goods to the poor and offering jobs to the lower class. Small enterprises helped stave off Vietnam's bankruptcy before the Doi Moi and helped the government discover an alternative path to national development. As entrepreneurship grew, non-farm household enterprises in Vietnam had become an important actor in the economy (Oostendorp, 2009). Agreeing with Freeman (1996), Oostendorp also found evidence that the nonfarm household enterprises development increased income, reduced inequality among households and created jobs especially in rural areas. Nevertheless, the role of the non-farm household enterprise sector has been diminishing, particularly in urban areas. This was due to the liberalization after 1993 where the government made an effort to promote and facilitate the development of the private sector and focus on exports. A trade-off was made between developing the high-productivity and low-productivity sectors. Le (2015), on the other hand, suggested that in the recent year, there had been an increase in small businesses and micro-enterprises in rural areas of Vietnam. He looked at success factors of woman entrepreneurship and found that entrepreneur spirit in rural areas was high, membership in an Entrepreneurs' Club increased their performance, and the primary problems faced by small business were competition and unreliable employees.

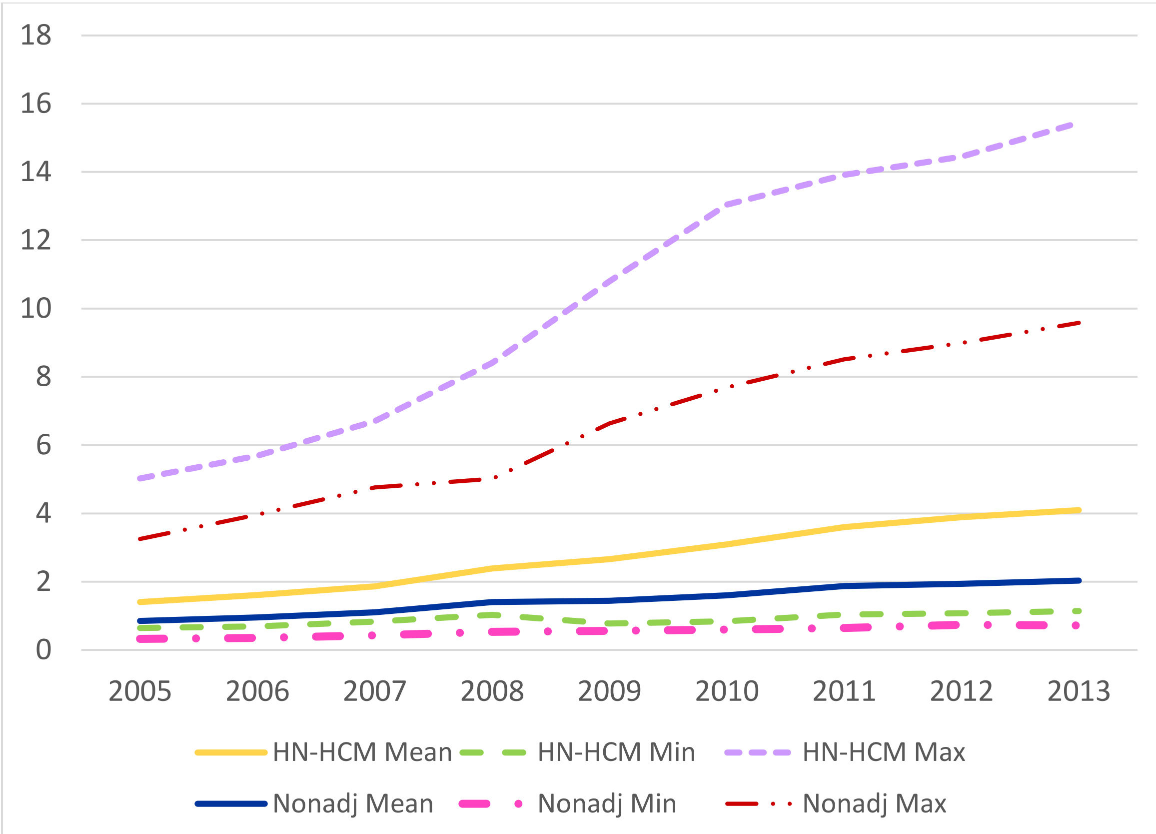

Figure 1. Average number of enterprises per thousand people 2005-2013

Data of the number of enterprises in each province in the period of 2005 to 2013 (from the Vietnam General Statistical Office) reveals the growth trends of the rich regions (Hanoi, Ho Chi Minh City, and their neighbors) and the poorer regions in Vietnam. The data is normalized against the province's population and then separated into two groups: group 1 includes Hanoi, Ho Chi Minh City, and their adjacent provinces; group 2 includes the non-adjacent provinces. Figure 1 shows that the mean, min and max values of group 1 are higher than those of group 2， respectively. Through the years, group 1 has grown faster than group 2 in terms of the average number of firms per thousand people across provinces. This is a sign that the entrepreneurship growth gap between the rich and the poorer regions is growing.

Overall, research on regional entrepreneurship growth and spillover effects between regions in Vietnam is still restricted. Due to data limitations, most studies only focus on case studies. This paper looks at entrepreneurship growth in Vietnam as a whole (including not just small enterprises), and also account for possible spatial autocorrelation.

Previous literature conveys that the development of enterprises promotes economic growth (Freeman, 1996; Wennekers, 1999; Oostendorp, 2009). Entrepreneurship development is a means of decreasing poverty and income gap between the rich and the poor. Figure 2 and 3 suggest a tight relationship between entrepreneurship development and poverty across regions of Vietnam.

Figure 2 presents a map of the average number of enterprises across provinces in 2008. Enterprises in Vietnam mainly agglomerate in Hanoi, Ho Chi Minh City, their neighboring provinces, and coastal provinces. The remaining provinces have sparsely located enterprises, especially in the North West mountain region and some provinces south of Ho Chi Minh City where floods frequently occur. In figure 3, poverty rates are mapped across regions of Vietnam in 1999 and 2009. Poverty is low in Hanoi, Ho Chi Minh City, their neighboring provinces and the coastal provinces in 2009, which are the similar regions where firms agglomerated in figure 2. Poverty rates are the highest in the North West mountain region and the Central Highland region south of Danang. These are also regions where the average number of enterprises is not high.

Looking closer into the poverty rates in figure 3, most of the regions around Hanoi, Ho Chi Minh City, and the coastal provinces have poverty rates that jumped 2 color steps, i.e. poverty rates decreased by around 20% during the 10-year period. Poverty rates in the North West mountain regions only jumped 1 color step, i.e. poverty rates decreased around 10% during the 10-year period. Regions with poverty rates greatly decreased were the ones that had high concentration of firms, for example, Hanoi, Ho Chi Minh City and Danang; not coincidentally, these are also the largest agglomeration urban areas in the country. Those with poverty rates decreased relatively less were the ones with little concentration of firms (the North West mountain region). Poverty rates in the Central Highland region to the south of Danang even increased, which is possibly linked to fact that there were only a few businesses locating here in the previous year. These facts suggest that the income gap is increasing, rich provinces are getting richer while poor provinces grow not as fast, some are getting even poorer. It is highly probable that poverty and income are linked to entrepreneurship growth.

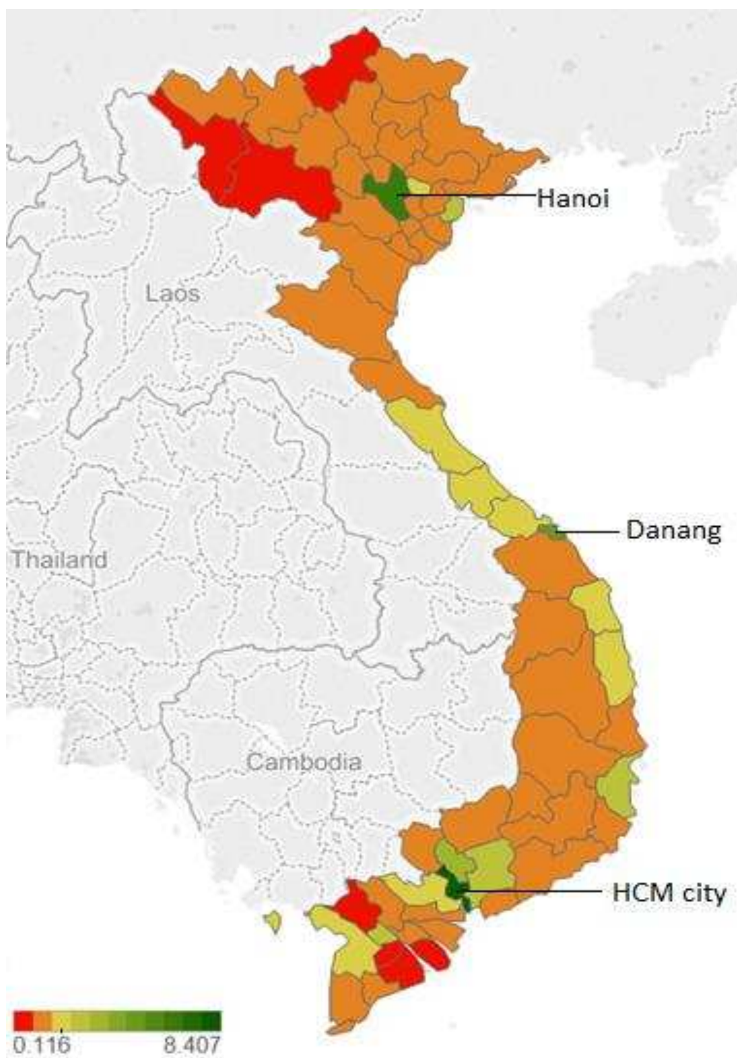

Figure 2. Average number of enterprises per thousand people 2008. Based on data from Statistical Year Book of Vietnam 2009 (GSO); HCM: Ho Chi Minh.

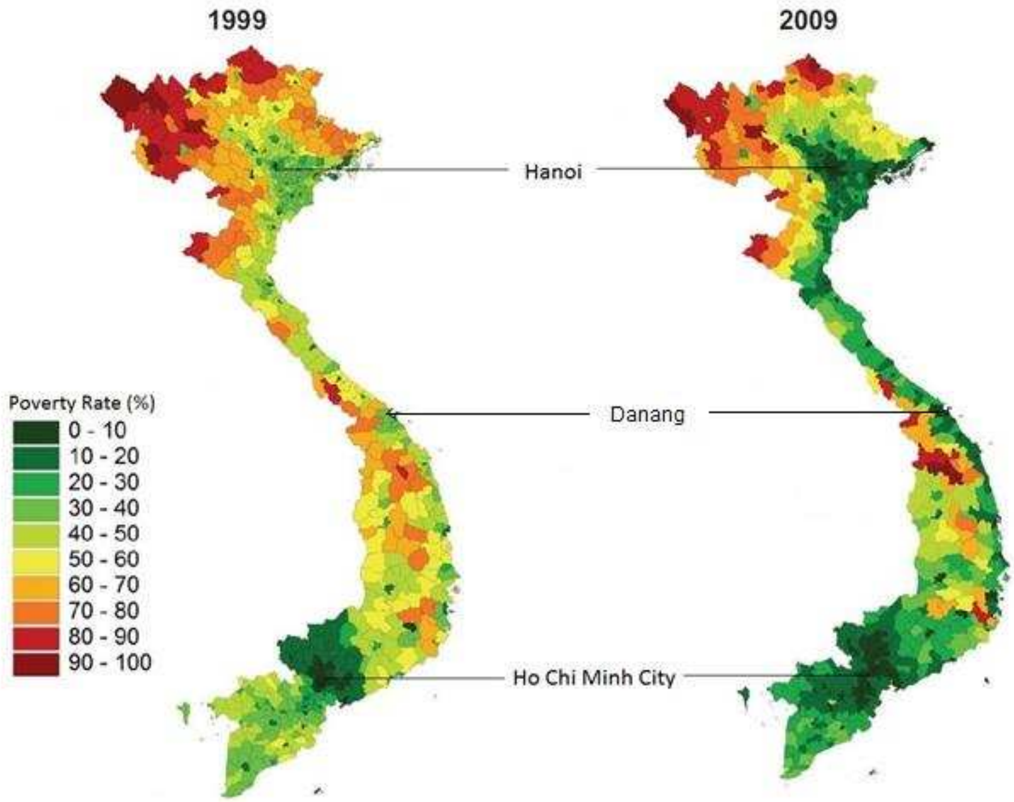

Figure 3. Poverty rate across regions of Vietnam. Based on data from Vietnam Census of Population and Housing 2009 and Living Standard Survey 2010.

Chapter 3. Regional growth model

3.1. Standard Solow model

The Solow growth model is a model explaining the mechanism of economic growth constructed by Robert Solow and Trevor Swan and is applied by many economists. This model is also known as the neoclassical growth model because some assumptions of the model are based on the theory of neoclassical economics. This model also has another name - exogenous growth model – since it is not related to internal factors. It implies that the growth of an economy will converge to a certain speed in a sustainable state. Only external factors, such as technology and the growth of labor, will change the speed of economic growth in a sustainable state.

In this paper, the Solow and Endogenous Growth models are applied to assess growth and the factors affecting this growth across regions in Vietnam. These models are used to generate testable hypotheses regarding regional growth factors. Let Y be real output (or real income), K be the amount of capital put into investment, L be labor, y be output per labor, k be capital per labor, S be the savings of the whole economy, s be the savings rate, I be investment, i be investment per labor, C be private consumption in the economy, c be private consumption per labor, δ be the depreciation rate of capital, Δ be the net increase of capital, and n be the population growth rate, which is the same as the growth rate of the labor force.

<u>Assumption 1</u>: Flexible prices in the long term.

This is a perspective of neoclassical economics. At this time, labor L is used entirely, and the economy grows at its potential and stability level. At the same time, the entire savings S will be converted into investment I (the Say rule in neoclassical economics), i.e. $sY = I$. On the other hand, the price of labor (i.e. the actual wage) and the cost of capital (i.e. the borrowing rate) are now also flexible. Therefore, these two factors can be combined however we want in production.

Assumption 2: Real output level Y depends on the amount of labor L, capital K and the level of technology A.

From this, we have a macro production function Y = F (A, L, K). This function has the Cobb-Douglas form:

$$Y = A K^{\alpha} L^{1-\alpha}$$

With the Cobb-Douglas function, if we multiply the variables in the right-hand side with the same number, the variable on the left-hand side will increase by that same number. Therefore, if we multiply L and K by 1 / L, the left-hand side will be Y/L, which equals real output per labor y, while the right-hand side contains K/L, which indicates capital per labor k. The macro production function will take the following format: $y = A k^{\alpha}$

Assumption 3: A closed economy without government intervention.

The total output Y equals the sum of private consumption C and investment I or Y = C + I, which is equivalent to Y = C + sY => C = (1-s) Y. If calculated per labor L, the private consumption per labor c will be equal to real output per capita y multiplied by 1-s or c = (1-s) y (note that $0<s<1$).

Assumption 4: There is capital depreciation.

With depreciation rate δ, the depreciation will be δK. Investment I increases the amount of capital while reducing the amount of the capital depreciation δK, hence the actual capital increase rate ΔK will be equal to I - δK.

We can also indicate this relationship as:

$\Delta K = sY - \delta K$

Assumption 5: Capital K and labor L comply with the rule of diminishing marginal income.

This means that when k increases, y will initially increase rapidly, then it will slow down after a certain time.

Assumption 6: The function y = f(k) is an increasing function, i.e. f'(k) > 0, and so is the function i = s f(k) = sy.

This is because investment per labor i is a division of output per labor y. Note that for the function y = f(k) to be an increasing function, the first derivative y' must be greater than 0, on the other hand, because it follows the rule of diminishing marginal productivity, the second derivative y'' must be smaller than 0. The graph of the function y = f(k) is shaped as shown in figure 4.

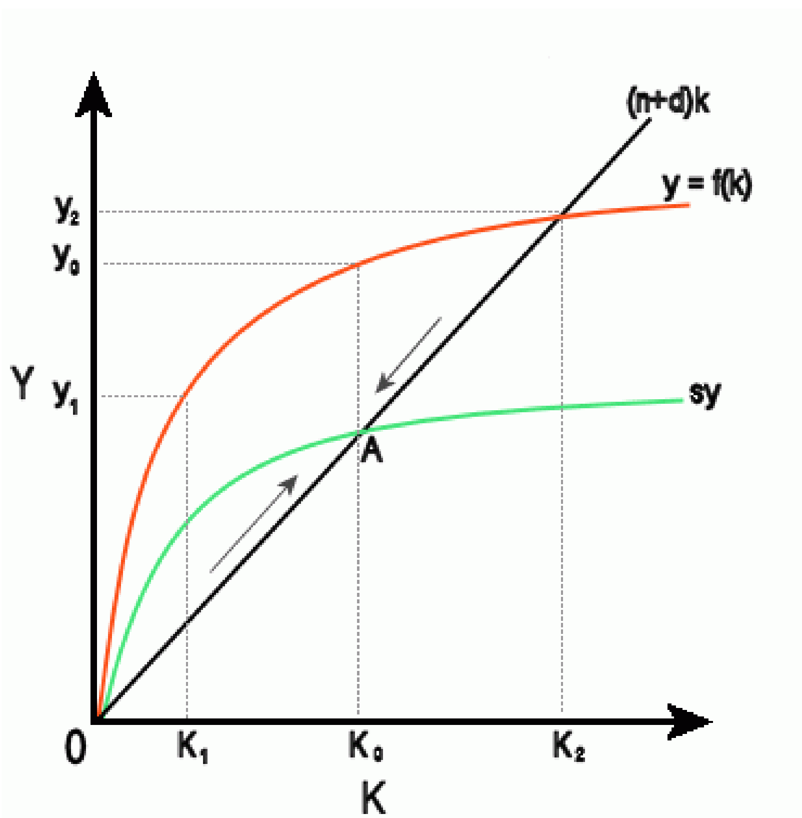

Figure 4. The Solow Growth Model

Assumption 7: The change in the labor force L is represented by the following equation:

$L_{t+1} = L_t (1 + gL)$

In which gL is a function of L assuming that the rate of change of labor is equal to the rate of change of population n.

In the short run, growth is determined by moving to the new steady state which is created only from the change in the capital investment, labor force growth and depreciation rate. The change in the capital investment is the change in the savings rate.

When capital per labor k increases, depreciation value δk increases, new capital per labor nk also increases. Let's call $\delta k + nk$ or $(\delta + n) k$ the necessary investment, because it offsets the depreciated asset and meets the capital need for new labor increase. Point A on Graph 2 is the intersection of the necessary investment line $(\delta + n) k$ and the investment per labor line i. It shows that there is an equilibrium. In the state where capital per labor k1 is smaller than k*, the investment $i = sy$ is greater than the necessary investment $(\delta + n) k$, i.e. $\Delta k = sy - (\delta + n) k > 0$, which leads to an increase in k until it reaches the equilibrium point k*. In contrast, in the state where capital per labor k2 is greater than k*, investment $i = sy$ is smaller than the necessary investment $(\delta + n) k$, i.e. $\Delta k = sy - (\delta + n) k < 0$, so k decreases to reach the equilibrium. In both cases, k reaches a state of equilibrium in the long run. And that is what we call a stable or steady state. At the steady state k*, we find that investment and necessary investment balance each other out, or $\Delta k = sy - (\delta+n) k^* = 0$, the growth rate of output per labor equals 0 ($gy = 0$), and the growth rate of capital per labor is 0 ($gk = 0$). The standard Solow model predicts that in the long run, growth is achievable only through technological progress.

3.2. Endogenous Growth model:

Output per labor convergence is proven to be a slow process (Martin, 1998) and might not be true in some cases (Romer, 1994). Poor countries grow no faster than rich countries. Noticing the flaws of the neoclassical exogenous growth theory, Romer (1994) built a model where he dropped two assumptions of the exogenous growth model. The first assumption is that technological change is exogenous, the second one is that same technological opportunities are available in all countries. The behavior of an economy then becomes endogenous and can be represented by the following equation:

$$\hat{y} = \alpha\hat{k} + \hat{A} \quad (1)$$

$$= \alpha\left[sA^{1/\alpha}y^{(\alpha-1)/\alpha} - n\right] + \hat{A}$$

where “^” denotes the exponential growth rate of a variable.

Since this is a closed economy by assumption, the saving rate s will also be equal to the investment rate. The second line of equation (1) shows that outside of the steady state, a change in the investment rate and the level of output per labor will change the growth rate. This is in sync with the finding of Martin (1998) that investment in physical capital is strongly correlated with, and causally related to, growth.

Applying the endogenous growth model above to a provincial scale, a model is built based on Romer’s endogenous growth model (Romer, 1994) and Mankiw’s model (Mankiw, 1992) where A is not equal across provinces but is determined locally by knowledge spillovers and human capital is taken into account as a factor affecting output growth. Human capital, which accounts for the skills, knowledge and experience of the population, is far less mobile than physical capital and therefore is a key component of the potential and competitiveness of a province. For this reason, human capital needs to be incorporated in the growth model. Moreover, the growth of enterprises in a province not only is affected by enterprises' inputs (physical capital, labor and human capital) but also depends on exogenous provincial characteristics. Infrastructure and facilities development of a province could also affect the development of firms. For example, an improvement in the transportation system or auxiliary facilities (warehouses, airports, hospitals, etc.) in a province will attract firms to locate in that province. On the other hand, market factors are undeniably important to the location and development of firms. A province with big population implies a big market for firms. Population income of a province measures the purchasing power of the market. Without a doubt, government policy is also an essential factor accounting for business growth in Vietnam (Hansen, 2009).

Firstly, assume that an increase in investment of capital will not only increase the physical capital but also increase the level technology through knowledge spillovers. Secondly, assume that an increase in the labor amount will have a negative spillover effect on the labor-saving innovations. Thirdly, assume an increase in the education level of the population will increase the technological advancement in a province. Incorporating exogenous and endogenous elements, the output function for a province would be:

$$Y_i = A(K, H, L, F, M, P)K^{\alpha}H^{\beta}L^{(1-\alpha-\beta)} \qquad \alpha, \beta \in (0,1);\ i \in [1,63] \qquad (2)$$

where H is human capital, F is provincial infrastructure and facilities, M is market and P is government policy. i indicates the individual province. All the variables excluding Y are both of the individual province and of every other province to account for the effect from the individual province and its neighbors. The element A in function (2) indicates Total Factor Productivity (TFP), which is the portion of output not explained by the amount of inputs used in production, i.e. the residual after accounting for all physical capital, human capital, and labor inputs. It is a function of endogenous factors K, H, L and exogenous factors F, M, P. α represents the private effect of an increase in capital of a province on output Y. For simplicity, suppose $\mathrm{A}(\mathrm{K}, \mathrm{H}, \mathrm{L}, \mathrm{F}, \mathrm{P}, \mathrm{M}) = K^x H^y L^z FMP$ with x, y, z > 0. Plugging this into function (2) to make A disappear, we will have:

$$\mathrm{Y}_i = K^{(\alpha+x)} H^{(\beta+y)} L^{[1-\alpha-\beta+\mathrm{z}]} FMP \tag{3}$$

In this case, growth is only a function of K, H, L, F, M and P. (α+x) represents the aggregate effect of an increase in capital of a province on output Y.

The factors K, H, L, F, M and P are expected to have effects on growth Y. An increase in K, H, L, and M would increase growth Y. An increase in the number of provincial facilities F that are used by firms or support firms' activities would increase firms' growth. An increase in pro-enterprise development policy P would increase growth Y. Any other investments in provincial facilities and policy that are not pro-enterprise development would cause growth to decrease.

Most studies on regional growth use pooled data for all geographical areas in the system studied, which assumes that the convergence process is identical across all regions. This is not usually true as the rate of convergence varies across regions, i.e. different regions may converge to different growth levels which reflect local differences in structural characteristics (Martin, 1998). This paper tries to account for this problem by incorporating fixed effects into the model. Another issue which needs attention is that the economics of regions might be inter-related where the growth of a region might depend on the growth of other regions. Moreover, clusters of high- and low-growth regions might emerge (Martin, 1998). I use spatial Durbin regressions to address these interrelationships and clustering effects. An empirical application of the output function with spillover effect is presented in chapter 4 where variables accounting for physical capital, human capital, labor and TFP factors are incorporated in the model to find out the magnitude of the change in growth Y induced by the change in K, H, L, F, M and P.

Chapter 4. Empirical model

4.1. Dependent and independent variables

Ideally, the growth of entrepreneurship in a province would be studied both quantitatively and qualitatively. Nonetheless, it is difficult to obtain data on the size change of each enterprise in Vietnam. For this reason, the number of enterprises in a province is the key measure of entrepreneurship growth in a province and is chosen to be the dependent variable.

Independent variables are chosen based on theory and the availability of data. Variables which account for physical capital K are material inputs of the food industry (specifically, production of cereal, aquaculture, livestock and poultry), Foreign Direct Investment (FDI) amount and the revenue of enterprises (which will be counted as the capital of the next production cycle). Variables which account for human capital H are the number of college students, the number of high school students (from 10^{th} grade to 12^{th} grade) and the number of secondary and primary students (from 1^{st} grade to 9^{th} grade). The variable which accounts for labor L is the number of employees working in enterprises. The variable which accounts for infrastructure and facilities F is the number of hospitals. In terms of market factors, population and net migration are measures of market size, and the total retail sales of goods and services is the measure of market purchasing power. The final variable, volume of freight transported, accounts for both physical capital K (volume of input materials transported to firms) and market M (volume of outputs transported to the market). No variable which suitably accounts for government pro-entrepreneurship development policies that are different across provinces can be found. Hence, policy effects will be included in the error term of the model. The following table identifies the information of the explanatory variables and their expected signs based on theory.

Table 1. Explanatory variables and expected signs

Explanatory variables	Expected signs	Factor
Production of material inputs of food industry	+	K
Foreign Direct Investment (FDI)	+	K
Revenue of enterprises	+	K
Number of college students	+	H
Number of high school students	+	H
Number of secondary and primary students	-	H
Number of employees in enterprises	+	L
Population	+	M
Net Migration	+	M
Retail sales of goods and services	+	M
Number of Hospitals	+	F
Volume of freight transported	+	K/M

An increase in the production of material inputs is expected to increase the availability of inputs and decrease the price of inputs, which in turn will increase output and enterprises' growth. An increase in FDI would increase the investment inputs, therefore, increase K. The same logic applies to enterprises' revenue. A high number of college students and high school students indicate a high level of human capital, which means high productivity and high growth. On the other hand, a high number of secondary and primary students means a high population of children, hence, the ratio of labor and population is low which has a negative effect on growth. An increase in the number of employees in enterprises implies an increase in the labor force and, according to the Solow growth model, leads to an increase in growth. A bigger population, an increase in net migration and an increase in the retail sales of goods and services all suggest a bigger market for enterprises which promotes their development. Increasing the number of hospitals would increase the facilities in the province and increase the province's attractiveness towards more population, more labor, and more businesses to come there. Lastly, an increase in the volume of freight transported is expected to indicate an increase in the inputs purchased by firms and/or an increase in the outputs purchased by customers, this also would have a positive relationship with growth.

4.2. Pooled OLS, Fixed Effects, First Difference and Spatial Durbin models

As suggested by the reduced form growth model (3) above, the empirical strategy for pooled OLS is expressed by:

$$\begin{aligned} Growth_{it} = {} & \beta_0 + \beta_1 Pop_{it} + \beta_2 NetMigration_{it} + \beta_3 FDI_{it} + \beta_4 RetailSale_{it} \\ & + \beta_5 FreightVolume_{it} + \beta_6 Labor_{it} + \beta_7 Revenue_{it} + \beta_8 CollegeStudents_{it} \\ & + \beta_9 HighschoolStudents_{it} + \beta_{10} PrimarySecondaryStudents_{it} \\ & + \beta_{11} Hospital_{it} + \beta_{12} Cereal_{it} + \beta_{13} Aquaculture_{it} + \beta_{14} Livestock_{it} + e_i \end{aligned}$$

$$i \in [1,63]; t \in [2008,2013] \tag{4}$$

where *Growth* is the number of acting enterprises, *Pop* is the province's population, *NetMigration* is the difference between the percentage of population moving in and the percentage of population moving out of a province, *FDI* is the total foreign direct investment registered, *RetailSale* is the total retail sales of goods and services at current prices, *FreightVolume* is the volume of freight transported, *Labor* is the number of employees working in enterprises, *Revenue* is the net revenue of enterprises, *CollegeStudents* is the number of students in college, *HighschoolStudents* is the number of students in high school, *PrimarySecondaryStudents* is the total number of students in primary school and secondary school, *Hospital* is the number of hospitals, *Cereal* is the production of cereal, *Aquaculture* is the production of aquaculture, *Livestock* is the total headcounts of livestock and poultry raised.

The pooled OLS regressions give some insight into the “overall” cross-province effect of the independent variables on entrepreneurship growth. This approach can be used when the provinces are relatively similar or homogenous, which in this case are very different in every category of growth. Therefore, it is highly likely that the pooled OLS regressions are both biased and inefficient since they do not account for each province’s fixed effect.

To fix the bias and inefficiency problems of pooled OLS, fixed effect regressions are estimated where the constant term β_0 in the pooled OLS function (4) now becomes $I_n\alpha$ where I_n is a n×n identity matrix, α is a constant term matrix where the element α_i is the fixed effect for province i ($i \in [1,63]$). By doing this, we are allowing individual province i to have its own intercept in order to study the theory that different regions may converge to different growth level.

Another type of regression which also accounts for pooled OLS’s bias and inefficiency is the first difference regression. Moreover, it also takes care of the omitted variable bias assuming that the omitted variable is unchanged through time. First difference regression with net change removes the stock of variables and allows us to focus on the flows. First difference regression with percentage change brings information of the trend of the changes in the independent variables and their effect on the trend of growth.

As noted in the literature review and the theory sections, there is a great chance of spillover and clustering effect existing among provinces. When variables for each province are mapped, the dependent variable, as well as most of the independent variables, clearly cluster around two biggest cities, Hanoi in the north and Ho Chi Minh City in the south. Hence, I use spatial Durbin model to account for the effect of the growth of enterprises in neighboring provinces on the growth of enterprises in a province. The analysis also allows me to study the interrelationship of independent variables among regions. The number of observations is n=63x9=567.

Taking a look at the Spatial Error Model (SEM) with fixed effect is necessary as it corrects the potential biased influence of spatial autocorrelation and possible missing of important variables. The function form for SEM with fixed effect is shown in (5)

$$Y = I_n\alpha + X\beta + u, \quad u = \lambda Wu + e \tag{5}$$

where Y is a column matrix of the dependent variable $Growth_{it}$. $I_n\alpha$ is the individual province's fixed effect, X is the independent variables matrix with 14 variables. β is the coefficient vector measuring the effect of province i's independent variables on the growth of firms in province i itself; from now on, this effect will be called Main effect. W is the row standardized weight matrix where two provinces are neighbors if and only if they share a border. λ is a constant measuring the spatial error effect. u is the error term which is a function of the spatial effect of neighboring provinces and a usual error term e. The SEM addresses missing variables with spatially distinct effects, in this case, there are missing data for variables which have possibly distinct spatial footprint: government regional policies, energy resources, transportation facilities, supporting industries and services, etc.

The Spatial Lag Model (SLM) is another form of regression that addresses the spatial autocorrelation problem. Running a spatial lagged dependent regression is relevant since there are reasons to believe that in Vietnam, the number of firms in a province is actively influenced by its neighbors' because of the regional spillover impacts. SLM function form is presented in (6)

$$Y = I_n\alpha + WY\rho + X\beta + u \tag{6}$$

where ρ is the coefficient measuring the effect of spatially lagged growth of firms on the growth of firms in province i.

Compared to the SLM and the SEM, the Spatial Durbin Model (SDM) is more useful to apply in the regional model of Vietnam as it incorporates the spatial interaction between both the dependent and independent variables. Base on theory and the Moran's I tests, it is feasible that the spatial spillover effects are not only in the dependent variables but also the independent variables (market size, capital and labor spillovers). The SDM has the following matrix function:

$$Y = I_n\alpha + WY\rho + X\beta + WX\theta + e. \tag{7}$$

Vector θ measures the effect of the independent variables of province i's neighbors on the growth of firms in province i; from now on, this effect will be called Wx effect. e is the residual matrix.

Let β_r be the r^{th} parameter from vector β, θ_r be the r^{th} parameter from vector θ, x_r be the r^{th} explanatory variable from matrix X, k be the number of explanatory variables. Moving all components containing Y to the left-hand side, we have:

$$(I_n - \rho W)Y = I_n\alpha + X\beta + WX\theta + e$$

$$(I_n - \rho W)Y = I_n\alpha + \sum_{r=1}^{k}(I_n\beta_r + W\theta_r)x_r + e$$

$$Y = (I_n - \rho W)^{-1}I_n\alpha + \textstyle\sum_{r=1}^{k}(I_n - \rho W)^{-1}(I_n\beta_r + W\theta_r)x_r + (I_n - \rho W)^{-1}e \tag{8}$$

$$(I_n - \rho W)^{-1} = I_n + \rho W + \rho^2W^2 + \rho^3W^3 + \cdots \tag{9}$$

The expressions in equations (8) and (9) indicate that there is a simultaneous feedback effect between provinces where a change in the explanatory variable of province i affects the dependent variable of the neighboring provinces, the neighbors of the neighboring provinces and so on.

Let $S_r(W) = \sum_{r=1}^{k}(I_n - \rho W)^{-1}(I_n\beta_r + W\theta_r)$

$$\begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_3 \end{bmatrix} = \sum_{r=1}^{k} \begin{bmatrix} S_r(W)_{11} & S_r(W)_{12} & \dots & S_r(W)_{1n} \\ S_r(W)_{21} & S_r(W)_{22} & \dots & S_r(W)_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ S_r(W)_{n1} & S_r(W)_{n2} & \dots & S_r(W)_{nn} \end{bmatrix} \begin{bmatrix} x_{1r} \\ x_{2r} \\ \vdots \\ x_{nr} \end{bmatrix} \tag{10}$$

$$+(I_n - \rho W)^{-1} I_n \alpha + (I_n - \rho W)^{-1} e$$

$$\frac{\partial y_i}{\partial x_{ir}} = S_r(W)_{ii} \tag{11}$$

$$\frac{\partial y_i}{\partial x_{jr}} = S_r(W)_{ij} \tag{12}$$

Equation (11) expresses the direct effect where the change in the explanatory variable x_r of province i leads to a change in the dependent variable of province i. Equation (12) expresses the indirect effect where the change in the explanatory variable x_r of province j ($j \neq i$) leads to a change in the dependent variable of province i. Both of these effects take into account the feedback effect between provinces. In contrast to the pooled OLS and the fixed effect regressions, the derivative of y_i with respect to x_{ir} usually does not equal β_r, and the derivative of y_i with respect to x_{jr} usually does not equal 0.

Two-way scatter plots of the variables show that Hanoi and Ho Chi Minh City are obviously higher in all the variables' values throughout the years. Therefore, I treat them as outliers, and divide the data set into smaller sets, the first one includes all provinces except Hanoi and Ho Chi Minh City (61 provinces, n_1=549), the second one includes all provinces except Hanoi, Ho Chi

Minh City and their adjacent neighbors (47 provinces, n_2=423), and the third one includes Hanoi, Ho Chi Minh City and their adjacent neighbors (16 provinces, n_3=144). If there exist strong spillover effects of Hanoi and Ho Chi Minh City on their adjacent neighbors, we might expect considerable differences between the coefficients of the regressions of data set two and three.

4.3. Data

Enterprises' and provincial yearly data are taken from Vietnam General Statistical Office (GSO). They are panel type data which span from 2005 to 2013 across 63 provinces. Because provinces in Vietnam vary greatly in size, all the variables are normalized. The dependent variable is normalized against provincial area (square kilometer), which the Hausman specification test suggests to be a better normalization than population (see Appendix 5 for test and Appendix 6 for population-normalized results). The independent variables are normalized against the provincial population, except the volume of freight transported, the number of employees in enterprises and business revenue which are normalized by the number of enterprises for better interpretation. From 2008 on, two provinces, Hanoi and Hatay, are merged together. Therefore, variables prior to 2008 are sums of the two provinces and are looked at as variables of Hanoi. The unit of analysis chosen for this research is province since smaller scale data cannot be obtained.

There is a significant difference in value between the dependent variable, entrepreneurship growth, in the second and third data set. The mean of the average number of enterprises per square kilometer in Hanoi and Ho Chi Minh City regions is 4.176 while that in non-adjacent provinces is only 0.557. The min and max of the dependent variable in the third data set are bigger than those of the dependent variable in the second data set. Overall, there are signs that the entrepreneurship in Hanoi, Ho Chi Minh City and their neighboring provinces is more developed than the entrepreneurship in non-adjacent provinces. It is also likely that the types of enterprises in these major cities are different from those elsewhere in Vietnam, but the data does not allow exploration of such distinctions. This line of inquiry can be left to future research.

Table 2. Dependent variables, Independent variables and their units

	Code	Unit	Factor
Dependent variables			
Number of enterprises per thousand people	Growth	Enterprises/square kilometer	
Independent variables			
Population	Pop	People	M
Net Migration	NetMigra	Percent	M
FDI per capita (P)	FDI	Thousand USD/person	K
Retail Sales per capita (P)	Retailsale	Million VND/person	M
Volume of Freight Transported (B)	Freight	Thousand tons*kilometer/enterprise	K/M
Average Labor in an Enterprise (B)	Labor	People	L
Average Revenue of an Enterprise (B)	Revenue	Billion VND/enterprise	K
Ratio of College Students to Population (P)	College	(Ratio)	H
Ratio of High school Students to Population (P)	High	(Ratio)	H
Ratio of Secondary Primary Students in Population (P)	Primsec	(Ratio)	H
Number of Hospital per thousand people (P)	Hospital	Hospital/thousand people	F
Cereal Production per capita (P)	Cereal	Kilograms/person	K
Aquaculture Production per capita (P)	Aqua	Kilograms/person	K
Population of livestock and poultry raised per capita (P)	Livestock	Heads/person	K

Note: (P) Normalized by population; (B) Normalized by number of business

Table 3. Summary Statistics

Without HN, HCM (n=549)				
Variable	**Mean**	**Std. Dev.**	**Min**	**Max**
Growth	0.685	0.981	0.021	7.356
Pop	1188.85	579.515	288.4	3477.7
NetMigra	-1.560	8.186	-27.300	74.600
FDI	0.248	1.029	0.000	17.479
Retailsale	11.977	8.818	1.119	49.319
Freight	0.381	0.381	0.021	2.683
Labor	40.628	19.277	14.110	150.333
Revenue	21.541	19.562	2.603	186.265
College	0.026	0.077	0.000	0.539
High	0.034	0.009	0.010	0.058
Primsec	0.164	0.032	0.090	0.480
Hospital	0.013	0.005	0.005	0.033
Cereal	553.897	431.225	21.000	2578.800
Aqua	89.989	116.734	0.537	588.779
Livestock	3502.296	1685.352	343.481	9922.283

Non-adjacent provinces (n=423)				
Variable	**Mean**	**Std. Dev.**	**Min**	**Max**
Growth	0.557	0.951	0.021	7.356
Pop	1159.834	613.382	288.4	3477.7
NetMigra	-2.687	5.394	-27.300	36.200
FDI	0.184	0.993	0.000	17.479
Retailsale	11.708	8.482	1.119	49.319
Freight	0.403	0.425	0.021	2.683
Labor	36.088	14.706	14.110	108.276
Revenue	17.140	11.325	2.603	85.277
College	0.019	0.058	0.000	0.498
High	0.034	0.009	0.010	0.058
Primsec	0.170	0.033	0.112	0.480
Hospital	0.013	0.005	0.007	0.033
Cereal	572.770	447.970	34.800	2578.800
Aqua	100.752	125.356	0.537	588.779
Livestock	3121.281	1295.854	343.481	7877.005

HN, HCM and neighbors (n=144)				
Variable	**Mean**	**Std. Dev.**	**Min**	**Max**
Growth	4.176	9.928	0.119	57.608
Pop	1971.055	1874.078	778	7820
NetMigra	3.105	12.976	-11.800	74.600
FDI	0.444	1.053	0.000	9.532
Retailsale	15.853	14.413	1.750	79.161
Freight	0.288	0.139	0.043	0.651
Labor	52.746	24.462	19.884	150.333
Revenue	34.777	29.268	3.804	186.265
College	0.050	0.112	0.001	0.539
High	0.034	0.007	0.013	0.053
Primsec	0.144	0.022	0.090	0.200
Hospital	0.011	0.003	0.005	0.018
Cereal	446.900	363.298	11.700	1931.100
Aqua	48.871	67.314	4.805	288.230
Livestock	4347.670	2364.395	26.378	9922.283

Note: All variables are normalized. HN, Hanoi; HCM, Ho Chi Minh City.

4.4. Tests

Evidence of heteroskedasticity is found after running the Breusch-Pagan/Cook-Weisberg test for heteroskedasticity.

H_0: Constant variance.

chi2(1) = 519.16

Prob > chi2 = 0.0000

Therefore, we reject H_0. All regressions are tested for and have heteroskedasticity, hence, all regressions are run with robust standard errors to account for heteroskedasticity.

The correlation matrix of all the independent variables shows no serious problem of collinearity (Appendix 2). The variance inflation factor is also looked at and shows little sign of multicollinearity.

A Chow test is run and the result suggests that the coefficients in the linear regressions on two data sets: the non-adjacent provinces and the Hanoi, Ho Chi Minh City with their adjacent provinces, are not equal, which implies that the effects of the growth factors are not the same across regions.

Table 4. Chow test results

Model	F	df	P-value
Pooled OLS	17.5205	15/537	0.00
Fixed Effect	15.3308	15/537	0.00
First Difference	11.1397	15/474	0.00

An F-test for fixed effects shows that there is fixed effects among provinces in Vietnam and it is appropriate to run fixed effect regressions instead of pooled OLS regressions.

H_0: the individual intercepts of each province are all zero, i.e. $u_i = 0$ ($i \in [1,61]$).

$F(60, 474) = 40.41$

$Prob > F = 0.0000$

Therefore, we reject H_0.

A Moran's I test for spatially lagged dependent and independent variables in the year 2013 shows that there is spatial autocorrelation between variables among regions with the confidence level of 10% for the two-tailed test.

H_0: the coefficient on the spatially lagged variable is zero.

Table 5. Moran's I test results

Variable	Moran's I	Z score	P-value 2 tailed
Growth	0.1603	1.9358	0.0529
Pop	0.2598	3.024	0.0025
NetMigra	0.1439	1.7561	0.0791
FDI	-0.0063	0.1133	0.9098
Retailsale	0.4497	5.1013	0.0000
Freight	0.3683	4.2106	0.0000
Labor	0.492	5.5635	0.0000
Revenue	0.1658	1.9955	0.0460
College	0.1541	1.8675	0.0618
High	0.6473	7.2623	0.0000
Primsec	0.5169	5.8367	0.0000
Hospital	0.4948	5.5951	0.0000
Cereal	0.6244	7.012	0.0000
Aqua	0.6992	7.8304	0.0000
Livestock	0.4249	4.8299	0.0000

See Appendix 1 for a scatter plot of the Moran's I test for autocorrelation of the dependent variable.

Chapter 5. Final results and implications

5.1. Model results

Table 6. Pooled OLS Regression Results

	Pooled OLS		
	Without HN, HCM	**Nonadjacent provinces**	**HN, HCM and neighbors**
Intercept	1.2665**	1.3042*	-28.467***
Pop	-0.0001	0.0001***	0.0037***
NetMigra	0.0318***	0.0426***	0.0632
FDI	0.0025	0.0098	0.6177**
Retailsale	0.0403***	0.0666***	0.4014***
Freight	0.6829***	0.7054***	5.0469**
Labor	-0.0012	0.0081**	0.0122
Revenue	0.0009	-0.0285***	-0.0639**
College	0.0855	0.0441	-0.7457
High	12.3747***	1.7006	71.8826*
Primsec	-7.4863***	-7.7911**	52.9481**
Hospital	-13.915**	2.6010	854.438***
Cereal	-0.0002***	-0.0002***	-0.0016**
Aqua	-0.0001	0.0002	0.0086
Livestock	-0.0001	-0.0001***	-0.0000
Observations	549	423	144
Provinces	61	47	16
F-value	40.84***	16.06***	26.72***
R-squared	0.5171	0.6051	0.8949

Note: The dependent variable is the average number of enterprises per square kilometer, 2005-2013. Estimates with one, two, three stars are statistically significant at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed test. HN, Hanoi; HCM, Ho Chi Minh City.

Table 6 presents the estimation results for the three data sets: the first one with all provinces except Hanoi and Ho Chi Minh City, the second one with Hanoi and Ho Chi Minh City's nonadjacent provinces, and the third one with Hanoi, Ho Chi Minh City and their adjacent neighbors. Overall, the signs of significant coefficients are mostly the same across the three regressions. However, the Revenue, Hospital, Cereal and Livestock variables have unexpected signs.

There is clear evidence that both exogenous and endogenous factors affect the growth of Vietnamese firms. The most significant factors are M, H, and F. More specifically, population, net migration and retail sales per capita of a province all have positive and significant relationships (at 1%) with the number of enterprises per square kilometer in all three data sets, except for the coefficient of population in the first data set where it is negative and statistically insignificant. This suggests that the market factor M strongly affects the number of enterprises in a region.

With regard to human capital, the percentage of high school students among population strongly and positively affects the growth of firms in a region while the percentage of college students does not have a significant effect. These relationships imply that enterprises in Vietnam are mostly firms that mainly require physical work but not intellectual labor. The coefficient of the percentage of primary and secondary school students among the population is negative in the second and third data sets and positive in the third data set, which supports the hypothesis that provinces which have more children would have less labor force and therefore, attract fewer businesses in poorer regions. This hypothesis, however, is not true for the Hanoi and Ho Chi Minh City regions.

One needs to be careful about over-interpreting the human capital results, as these variables likely have significant measurement error. In particular, while the desired benchmark for education would be average attainment for the workforce, the present paper is limited to simply concentrations of active students per capita. Thus, stocks of highly education workers, especially those that have migrated, are going to be missed in the analysis.

The estimator of the average number of hospitals per thousand people is positive and significant on the third data set, which is consistent with the hypothesis that infrastructure and facilities of a province have a positive effect on entrepreneurship growth. Nevertheless, the relationship between the number of hospitals per thousand people is negative for the first data set.

The variables for physical capital K have mix relationships with the number of enterprises per square kilometer. The estimator for FDI is positive and statistically significant for the regions around Hanoi and Ho Chi Minh City. The estimator for transported freight volume is positive and statistically significant for all regions in Vietnam. On the other hand, the variables of input materials for businesses indicate that the production of cereal, aquaculture, and livestock have a negative relationship with entrepreneurship growth. These products act more as competitive activities to entrepreneurship where production of cereal, aquaculture, and livestock takes up space in a province where firms could possibly locate. On the labor factor's effect, the coefficient of Labor is only significant for the non-adjacent provinces where it is positive, which supports the Solow exogenous growth model: the growth of labor encourages firms to grow.

The pooled OLS results above, however, are biased and inconsistent. The F-test for fixed effect shows that there is indeed fixed effects among provinces in Vietnam. That being the case, fixed effect regression is more appropriate to estimate the relationships between the independent and dependent variables. Alternatively, a first difference regression (which is a regression of the net change of variables) also gives unbiased and consistent estimators since it gets rid of the fixed or unchanged factors of the variables. Table 7 shows the main results of the fixed effect and the first difference regressions run on the same three data sets.

Table 7. Fixed Effect and First Difference (Net Change) Regression Results

	Fixed Effect (provinces)			First Difference		
	Without HN, HCM	**Nonadjacent provinces**	**HN, HCM and neighbors**	**Without HN, HCM**	**Nonadjacent provinces**	**HN, HCM and neighbors**
Intercept	0.0869	-1.6356*	-116.74***	0.0010	-0.0440*	-0.4004**
Pop	0.0004	0.0028**	0.0181***	0.0011***	0.0035**	0.0152***
NetMigra	0.0081**	0.0050	-0.0726**	0.0015	0.0011	-0.0032
FDI	0.0038	0.0099	0.0248	-0.0006	0.0009	0.0156
Retailsale	0.0439***	0.0499***	0.1685***	0.0261***	0.0331***	0.1903**
Freight	-0.3657**	-0.0796	-1.6564	-0.4471***	-0.3425***	-2.4664**
Labor	-0.0036	0.0054	0.0731***	-0.0082***	-0.0045**	0.0232
Revenue	0.0039	-0.0084***	-0.0097	0.0008	-0.0028	-0.0008
College	0.3906	2.3640***	0.7822	-0.2087	0.4367	-0.5796
High	-8.6193**	-0.6856	97.4415**	-2.8393	0.5166	70.4093*
Primsec	1.8467***	0.9615	26.4778**	0.3782	-0.2781	4.8226
Hospital	3.7400	-7.8611	547.073***	-1.3389	1.5200	109.283
Cereal	-0.0013***	-0.0013***	-0.0004	-0.0003***	-0.0002**	0.0032
Aqua	-0.0008	-0.0003	-0.0110	0.0005	0.0008**	0.0061
Livestock	0.0001	-0.0001	-0.0001	0.0001	-0.0001	0.0001
Observations	549	423	144	549	423	144
Provinces	61	47	16	61	47	16
F-value	62.96***	47***	88.9***	6.39***	3.19***	5.01***

Note: The dependent variable is the average number of enterprises per square kilometer, 2005-2013. Estimates with one, two, three stars are statistically significant at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed test. HN, Hanoi; HCM, Ho Chi Minh City.

Variables which account for the growth factor M are still significant overall, with the estimators of retail sales per capita being positive and statistically significant at the 5% level across all data sets in both the fixed effect and the first difference regressions. The province's population shares the same trend with all positive relationships with the dependent variable and statistically significant coefficients for almost all of the data sets. Contrarily, the magnitude of the effect varies across regions with the strongest effect being in Hanoi, Ho Chi Minh City and their neighbors. In contrast with the pooled OLS regression above, the coefficient of the measure for net migration is negative for the third data set for both types of regression. This means that an increase in the net change of the net migration of a province will lead to fewer firms locating in that province. It is possible that in crowded provinces like Hanoi and Ho Chi Minh City, an increase in the residential area could decrease the available area for firms to locate.

With regard to human capital, the coefficient on the percentage of college students among population becomes positive and statistically significant for non-adjacent provinces while it is not significant for other regions. The overall trend is that in recent years, unemployment rate has decreased in all regions in Vietnam, however, the rates in mountains areas and central areas are decreasing faster than that in the plain areas around Hanoi and Ho Chi Minh (GSO). In other words, there is a higher chance for graduate students to find a job in non-adjacent provinces than in regions around Hanoi and Ho Chi Minh City. The relationship between the percentage of students in high school and the number of businesses is negative for the first data set but positive for the third one. The coefficient of the percentage of primary and secondary students is positive and statistically significant in the fixed effect regression for the first and third data set but it is not statistically significant in the first difference regression. This is not the expected sign according to the hypotheses.

With regard to physical capital, FDI per capita does not show signs of a significant effect on firms' growth in both types of regressions. The parameter estimate of the volume of freight becomes mostly negative and statistically significant in both models with the strongest effect being in the Hanoi and Ho Chi Minh City regions. The estimator for enterprises' average revenue is negative for the non-adjacent provinces in the fixed effect model while in other data sets, it is not significant. Surprisingly, in the first difference model, the estimator of the average production of aquaculture per capita is positive and significant for the non-adjacent regions, but the magnitude is small. All of these results suggest that, for Vietnam, targeting factor K does not effectively increase the number of firms in a province.

In contrast, the measure for facilities factor remains positive and significant for the third data set of Hanoi, Ho Chi Minh City, and their neighbors. Its coefficients for the other data sets are not significant.

On the other hand, the coefficient of the average number of labor per firm is positive and statistically significant at 1% level for the fix effect regression of the richer regions but is negative and statistically significant for the other regions in the first difference regression. This negative sign agrees with the finding of Armington (2002) that there is a negative relationship between average firm size and the number of firms in a region.

To further investigate the trend of the effect of exogenous and endogenous growth factors on entrepreneurship growth, an OLS regression is run on the percentage change of enterprises' growth and its explanatory variables. The results are shown in table 8.

The coefficient on retail sales remains positive and significant in all the data sets, suggesting that the factor M strongly affects entrepreneurship growth with an increasing magnitude. Surprisingly, the market purchasing power in poorer regions seems to grow faster than that of rich regions.

Once again, the coefficients of Freight, Labor and Revenue are mostly negative and significant. This could either mean that the magnitude of the effects of the volume of freight, average labor and average revenue on firms' growth are decreasing or that there is a negative relationship between the number of firms and firms' size.

The factor of human capital continues to show evidence of considerable effect on growth with all coefficients of College and High being significant, specifically, the coefficient of College is negative for the non-adjacent regions and positive in the Hanoi and Ho Chi Minh regions while the coefficient of High is positive for all regions but is bigger in the latter regions. The human capital has stronger and faster effect on entrepreneurship growth in Hanoi, Ho Chi Minh City, and their adjacent neighbors. The coefficient of the percentage of primary and secondary school students is again negative, which is in line with the hypothesis that larger percentage of children among population means fewer firms. However, this coefficient is only significant in the Hanoi and Ho Chi Minh regions.

Table 8. First Difference (Percent Change) Regression Results

	Without HN, HCM	Nonadjacent provinces	HN, HCM and neighbors
Intercept	0.0475***	0.0285**	0.0894***
Pop	0.5315	0.5494	0.5467
NetMigra	-0.0001	0.0001	-0.0022**
FDI	0.0001	0.0001	-0.0007**
Retailsale	0.3149***	0.3595***	0.1937**
Freight	-0.1885***	-0.1541***	-0.4059***
Labor	-0.6307***	-0.6364***	-0.4673***
Revenue	-0.0784**	-0.0857***	-0.0255
College	-0.0019**	-0.0022***	0.0059*
High	0.1243**	0.1051*	0.4269***
Primsec	-0.0468	-0.0622	-0.2777*
Hospital	-0.0335	0.0039	-0.0659
Cereal	-0.0487	-0.0290	-0.0558
Aqua	0.0297	0.0218	0.0601
Livestock	0.0540**	0.0299	0.0538
Observations	549	423	144
Provinces	61	47	16
F-value	24***	19.3***	11.89***
R-squared	0.6056	0.5818	0.7582

Note: The dependent variable is the average number of enterprises per square kilometer, 2005-2013. Estimates with one, two, three stars are statistically significant at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed test. HN, Hanoi; HCM, Ho Chi Minh City.

In terms of physical capital, the coefficient of FDI is small and even negative for Hanoi and Ho Chi Minh regions which does not support the theory. Nonetheless, the variable Livestock shows signs of significant effect in the first data set. In terms of facilities, the variable Hospital is negative and insignificant.

The SEM in table 9 accounts for possible missing variables which are spatially correlated using spatially lagged error terms.

Table 9. Spatial Error Model Results

	Without HN, HCM	Nonadjacent provinces	HN, HCM and neighbors
Pop	0.0015	0.0047*	0.0182***
NetMigra	0.0074*	0.0058*	-0.0623
FDI	-0.0052	-0.0025	0.0486
Retailsale	0.0599**	0.0558***	0.1567
Freight	-0.5290*	-0.3550	-2.1960
Labor	-0.0009	0.0091	0.0750**
Revenue	0.0010	-0.0084	-0.0111
College	-0.0650	1.1134	0.8129
High	-17.889**	-9.2192	83.8756
Primsec	3.2523**	1.6381	28.7847
Hospital	7.0074	-7.1488	558.628***
Cereal	-0.0006*	-0.0010***	-0.0009
Aqua	-0.0017*	-0.0009	-0.0046
Livestock	0.0001	-0.0001	-0.0001
lambda	0.6056***	0.5232***	-0.1362
sigma2_e	0.0569***	0.0457***	1.7951***

Note: The dependent variable is the average number of enterprises per square kilometer, 2005-2013. Estimates with one, two, three stars are statistically significant at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed test. "lambda" is the coefficient of the spatially lagged error terms. HN, Hanoi; HCM, Ho Chi Minh City.

The regression results in table 9 further assure the significant effect of the factor M on provincial growth. Population and Retailsale both have positive and economically significant coefficients across most regions. On the factor F, the estimator of Hospital is positive and economically significant for the third data set which suggests a great influence of the number of hospitals per thousand people on entrepreneurship growth of a rich province. With respect to the factor L, labor has a positive and statistically significant coefficient in the richer regions.

Human capital H and physical capital K factors show little sign of significant influence on regional growth as coefficients of College, FDI, and Livestock are not statistically significant. The estimators for High and Primsec are statistically significant for the first data set. Nevertheless, they are in the wrong signs and are not economically significant. More importantly, there is a significant effect of spatial error terms as lambda is positive and statistically significant for all regions. This indicates that there are missing variables which are spatially correlated.

After finding evidence of spatial autocorrelation through the Moran's I test and spatially mapped all the variables, to further investigate the spillover effect between regions in Vietnam, a spatial Durbin model which incorporates fixed effects with spatially lagged dependent and independent variables is estimated. The main results are reported in table 10 with the average number of enterprises per square kilometer being the dependent variable. Another results of the SDM with the dependent variable normalized by provincial population is shown in Appendix 6. Both normalization methods, by population and by area, are reasonable since naturally, there would be more firms in populated or large provinces. Based on the Hausman specification test (appendix 5), the SDM regression with area normalization is a better fit for the data sets of Vietnam. Normalizing against provinces' population yields inconsistent results while normalizing against provinces' area does not. For this reason, the interpretation of the SDM is focus on the area normalization method.

Given the standard deviation of the average number of enterprises per square kilometer from table 3, a reasonable target for provincial entrepreneurship growth in non-adjacent provinces is an increase of 1 firm per square kilometer per year. The interpretation from here on pays particular attention to the non-adjacent provinces for better interpretation of which factors affect entrepreneurship growth in poorer regions of Vietnam.

Table 10. Spatial Durbin Model Results with Area Normalization in the Dependent variable

	Total = Direct + Indirect			Direct Effect			Indirect Effect		
	Without HN, HCM	Nonadjacent provinces	HN, HCM and neighbors	Without HN, HCM	Nonadjacent provinces	HN, HCM and neighbors	Without HN, HCM	Nonadjacent provinces	HN, HCM and neighbors
Pop	-0.0023	-0.0044*	0.0044	0.0017**	0.0038*	0.0125***	-0.0040*	-0.0082***	-0.0081***
NetMigra	0.0250**	0.0145	0.0582**	0.0085***	0.0078***	-0.0200	0.0164*	0.0067	0.0782***
FDI	0.0354	0.0307	0.1920	0.0029	0.0055	-0.0574	0.0325	0.0252	0.2495
Retailsale	0.0369	0.0562**	0.2369***	0.0825***	0.0758***	0.4102***	-0.0456***	-0.0196*	-0.1733***
Freight	0.1751	0.6947***	-5.2895**	-0.5670**	-0.3448*	-2.4233*	0.7422**	1.0396***	-2.8661
Labor	-0.0046	-0.0121	0.0069	0.0001	0.0054	0.0495***	-0.0048	-0.0175	-0.0425
Revenue	0.0140	-0.0115	-0.0067	0.0027	-0.0077	-0.0125**	0.0112	-0.0037	0.0057
College	-0.2446	2.9819*	-1.1329	-0.3956	1.2236	-3.2122**	0.1509	1.7583*	2.0793
High	5.0877	5.7835	82.9589*	-15.601**	-8.5762*	57.8507	20.6891	14.3597	25.1081
Primsec	0.9952	1.5226	59.6270***	2.7264*	1.4430	10.0156	-1.7312	0.0795	49.6114*
Hospital	45.7318	63.1306	450.507**	27.8000**	24.2457**	66.8557	17.9317	38.8849	383.651**
Cereal	-0.0023***	-0.0017**	-0.0058*	-0.0003	-0.0006**	0.0047*	-0.0019**	-0.0011	-0.0105***
Aqua	0.0028*	0.0019	0.1479***	-0.0005	0.0000	0.0995***	0.0033***	0.0018*	0.0484
Livestock	0.0000	0.0000	0.0004**	0.0000	-0.0000	0.0000	-0.0000	0.0000	0.0004*
rho	0.3690***	0.3443***	-0.3791***	0.3690***	0.3443***	-0.3791***	0.3690***	0.3443***	-0.3791***
sigma2_e	0.0468***	0.0353***	0.6675***	0.0468***	0.0353***	0.6675***	0.0468***	0.0353***	0.6675***
Observations	549	549	549	549	549	549	549	549	549
Provinces	61	61	61	61	61	61	61	61	61
Mean FE	0.6901	0.6916	0.9560	0.6901	0.6916	0.9560	0.6901	0.6916	0.9560
R^2 Within	0.0005	0.0159	0.8183	0.0005	0.0159	0.8183	0.0005	0.0159	0.8183
R^2 Between	0.0122	0.0066	0.7501	0.0122	0.0066	0.7501	0.0122	0.0066	0.7501
R^2 Overall	2.0024	3.0522	3.4090	2.0024	3.0522	3.4090	2.0024	3.0522	3.4090

Note: The dependent variable is the average number of enterprises per square kilometer, 2005-2013. Coefficient with one, two, three stars are significant at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed test. "rho"is the coefficient of the spatially lagged dependent variable. The Direct effect is the effect of the original province's independent variables on that province's growth taking feedback effect into account. The Indirect effect is the effect of the independent variables of a province's neighbors on that province's growth taking feedback effect into account. HN, Hanoi; HCM, Ho Chi Minh City.

The coefficient “rho” is positive and significant for the first data set, which leads to the belief that the number of firms in a province is affected by the number of firms in its neighboring provinces. Taking the feedback effect into account, there is evidence that the strongest factor affecting entrepreneurship growth in a province is the market factor M. For all regions in Vietnam, entrepreneurship growth in a province is positively affected by the population of that province and negatively affected by that of the neighboring province. An increase of 263 people in a non-adjacent province is related to a 1 firm increase per square kilometer. On the other hand, an increase of 122 people in the neighboring province is related to a decrease of 1 firm per square kilometer, ceteris paribus. Taking the standard deviation of the variable Pop from table 3 (which is 613.382 people) as a reference, the direct and indirect effects of the population in non-adjacent regions are both economically significant. The total effect, however, has a negative and statistically significant coefficient for the non-adjacent provinces, which suggests that the negative indirect effect overwhelms the positive direct effect, consistent with the magnitude of the coefficients.

With respect to the factor M, net migration of a province and its neighbors overall has a positive and statistically significant impact on that province’s business growth. On the direct effect in non-adjacent provinces, a 128 percent increase in net migration is associated with a 1 firm increase per square kilometer. Comparing those numbers with the standard deviation of net migration from table 3, which is 3.39 percent, the effect of net migration of business growth is not economically significant. And while entrepreneurship growth of a province is positively affected by the retail sales of that province itself, it is negatively affected by its neighbors’ retail sales which provides evidence of a highly competitive market in Vietnam. Looking closer into the total effect of nonadjacent provinces, an 18 million VND increase in retail sales per person is related to a 1 firm increase per square kilometer. This effect is economically significant when compared with the standard deviation of the variables from table 3. In short, population and retail sales have significant effects on entrepreneurship growth in non-adjacent provinces.

On the effect of factor H, the total effect of the variable College is only statistically significant for the non-adjacent provinces suggesting that overall, an increase in highly educated population will lead to business growth in poorer regions. An increase by 0.335% of the percentage of the population in college is linked to a 1 firm increase per square kilometer, this is not economically significant. The total effects of the variables High and Primsec are statistically significant for only the third data set where they indicate that an increase in either the number of high school students or the number of primary and secondary school students is linked to an increase in the number of enterprises. An increase by 1 firm per square kilometer is causally connected to an increase by 0.012% of high school students or an increase by 0.017% of primary and secondary school students. These relationships are economically significant. Overall, the effect of the human factor is statistically but not economically significant for the non-adjacent provinces. On the contrary, this effect is economically significant for the Hanoi and Ho Chi Minh City regions. Again, though, one should not over-interpret these human capital results, given the weakness of the measures themselves.

With regard to the factor K, the estimator for FDI is not statistically significant across all regions. The coefficient of the production of cereal is mostly negative and statistically significant in both its direct and indirect effects, except for that of the direct effect for Hanoi and Ho Chi Minh regions where it is positive and statistically significant. In non-adjacent provinces, an increase in the production of cereal by 588 kilograms per person is related to a decrease in the number of firms by 1 firm per square kilometer. The effect of the production of cereal is economically significant considering its standard deviation being 447.97 kilograms per person. The negative relationship between the production of cereal and the number of firms in non-adjacent regions suggests that the cereal fields take up a large area in a province which reduces the area for firms to locate. On the other hand, the estimators of the production of aquaculture and livestock are positive and statistically significant for Hanoi, Ho Chi Minh City, and their neighbors. This evidence implies that aquaculture and livestock production, rather than cereal production, are inputs for the food manufacturing firms in Hanoi and Ho Chi Minh City regions. In general, the total effect of the physical material inputs is negative and economically significant for non-adjacent provinces.

With regard to the factor F, the coefficient on Hospital is positive for all regions of Vietnam. The total effect of the number of hospitals is only statistically significant for the rich provinces regions where it has the largest effect. An increase in the average number of hospitals per thousand people by 0.0022 is related to an increase in the number of enterprises per square kilometer by 1. This effect is economically significant. For non-adjacent provinces, only the direct effect of the variable Hospital is positive and economically significant. Still, it is not economically significant for the poorer provinces which implies that a development in the facilities in Hanoi and Ho Chi Minh City regions is more likely to have a positive effect on the development of enterprises than other regions.

In comparison with the SEM, the SDM may have some problems due to missing variables as SDM assumes all explanatory variables are included while SEM tests whether there are missing variables with significant spatial correlation. Furthermore, looking only at the estimators in the total effects might suggest wrong ideas about the signs and magnitude of the effects. A clear example of this issue is the estimators on population variable where the total effect is negative and significant at 10% in the data sample of non-adjacent provinces. This negative sign may lead to a misunderstanding that there is a negative relationship between the size of the market and regional enterprises growth. It is essential to dissect the total effect into direct (positive estimator) and indirect effect (negative estimator) which shows a correct story where an increase in the population of a province attracts businesses, additionally, an increase in the population of the neighboring province pulls businesses away from that province. This is in line with the theory of regional competitiveness.

Despite its potential weaknesses in terms of missing explanatory variables, the Spatial Durbin Model above may still be the most useful in that it directly accounts for both fixed effects and spatial effects between dependent and independent variables. More importantly, the robustness test for SEM and SDM (Appendix 3) suggests that the difference in the coefficients of these two models is systematic, and that the SDM coefficients are consistent while those of the SEM are not.

In sum, the effects of the market are found to be the most significant both statistically and economically. The variables that have the strongest effects on entrepreneurship growth in Vietnam are population and retail sales, with the dueling Own and Neighbor role of density highlighting the value of incorporating full spatial effects of both dependent and independent variables. Evidence is also found on the effect of human capital and facilities factors on regional entrepreneurship growth of the regions around the two biggest provinces of Vietnam.

5.2. Implications

In order to assess the income gap problem between regions of Vietnam through entrepreneurship growth, policies should focus on the market factor. Vietnam government when considering policies to increase the number of enterprises in a poor region is suggested to increasing purchasing power of the original market in that province by creating more jobs and increasing income.

Furthermore, the issue of returning migration should also be evaluated. Skilled return migrants are becoming more important to local government policy as they bring the potential to help build networks, create further links between emigration and immigration provinces, and directly contribute to the development of the province. There are multiple ways to attract return migration back into the original province. Government can create favorable conditions and opportunities for students who immigrate to another province for better colleges to return to their own provinces. For example, policies towards college students can be implemented where university tuition will be paid for by the government on the condition that students must return to their hometown after they graduate. Agencies which provide job placement services, skills training, livelihood programs, and give employers a database of skilled workers specifically for returning immigrants will help increase their intention to return to their home provinces. Vietnam government can cooperate with non-government organizations to encourage migrants to spend money or invest in their homelands through partnership programs or assistance on establishing small businesses. Investing in infrastructure of the professional sectors which migrants have experience and skills on is also a good way to attract returning migrants. For instance, the lack of scientific research institutes and facilities in a province will make it difficult for qualified researchers to find a job back home.

Not less of an importance when it comes to researching growth in Vietnam is to have new data which more accurately measures the concerned effects on growth. Valuable data in Vietnam are gathered only at a large regional level or are only available for several years. Research would be more precise using more specific yearly data at a provincial or city level. The most important variables to gathered at a provincial level are the mean years of schooling and the number of skilled labor for each province, which are more efficient measures of the effect of human capital. Variables on transportation infrastructure, warehouses, power plants and other complementary facilities for businesses are also necessary to analyze the effect of infrastructure on entrepreneurship growth. None of the less importance, variables accounting for province specific entrepreneurship policy should be obtained to understand deeply the effect of policy on business growth in Vietnam. I recommend statisticians to collect these data in order for researchers to have better analysis in the future, which in turns will bring greater efficiency to the policies targeting growth gap in Vietnam.

Chapter 6. Conclusion

The main findings in this paper are that in 63 provinces in Vietnam, there is truly a gap between the entrepreneur growth in Hanoi, Ho Chi Minh City, their adjacent neighbors and that of the non-adjacent provinces from 2005 to 2013. The paper also finds that provincial characteristics affect entrepreneurship growth in an individual province as well as its neighboring provinces, which is consistent with the theory of the Solow growth model. The market factor M, facilities factor F, and the human capital H show the strongest effects on regional business development while little evidence of the effect of labor L and physical capital K is found in all regions across Vietnam.

In terms of spatial spillover effects, the market factor M overall has a positive direct and negative indirect effect on regional firms' growth. Human capital H overall has a positive effect of the percentage of high school students as well as primary and secondary school students on growth in rich provinces; however, this factor shows little effect in poorer provinces. But given the measurement issues underscored above, we may well be missing significant human capital results. Facilities factor and entrepreneurship growth in the Hanoi and Ho Chi Minh City regions have a substantial positive relationship while this relationship in non-adjacent provinces is not considerable.

Based on the key results above, the Vietnam government should incorporate more provincial specific policies in order to focus on the development of regional entrepreneurship growth to create more jobs and bring wealth to the poorer regions. Moreover, since there is significant spillover effect and limited resources, the government should focus its resources on a province in the center of the poor regions and let the spatial spillover promote growth in neighboring provinces. Development policies should concentrate on market factors; specifically, increasing market purchasing power by increasing income, which comes back to developing human capital, creating more training facilities, improving educational quality so that graduate students can have a better chance of getting well paid jobs, and building better school system and free tuition for poor students, especially at the high school level. Additionally, government should also focus on policies for bringing back migrants to help boost market size and provide skilled labor source. Providing favorable conditions for job finding, investment opportunities and better infrastructure are measures that should be considered when analyzing policy for return migration. It is also necessary to collect more essential data at a provincial level to precisely measure the effects on growth in Vietnam.

There are three main limitations to this study. Firstly, it is undeniable that there could be a problem of endogeneity in the models, future studies should incorporate instrumental variables to account for this possibility. Secondly, the entrepreneurship growth is studied at an aggregated level without taking into account the effect of industry-specific characteristics. Finally, firms' characteristics themselves could affect regional firms' growth which should also be incorporated into the model.

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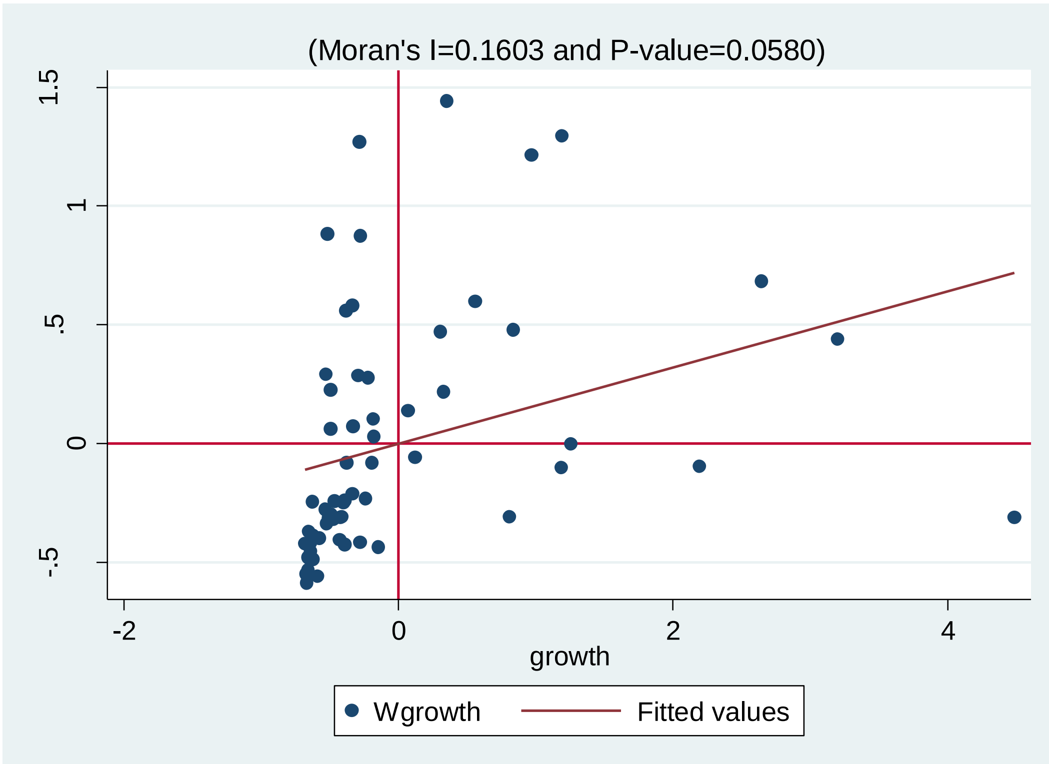
Appendix 1: Spatially lagged dependent variable (2013, without HN HCM)



Appendix 2. Correlation Matrix

	Pop	NetMigra	FDI	Retailsale	Freight	Labor	Revenue	College	High	Primsec	Hospital	Cereal	Aqua	Livestock
Pop	1.000													
NetMigra	-0.017	1.000												
FDI	-0.001	0.112	1.000											
Retailsale	0.112	0.195	0.054	1.000										
Freight	0.313	-0.063	-0.012	-0.016	1.000									
Labor	0.210	0.396	0.106	-0.064	0.273	1.000								
Revenue	0.164	0.249	0.281	0.489	0.077	0.345	1.000							
College	-0.061	0.093	0.205	0.063	-0.054	-0.026	0.307	1.000						
High	0.112	-0.142	0.082	-0.164	0.161	-0.001	-0.056	0.097	1.000					
Primsec	-0.234	-0.100	-0.022	-0.514	-0.231	-0.138	-0.354	0.068	0.198	1.000				
Hospital	-0.572	-0.043	-0.105	-0.216	-0.179	-0.125	-0.245	-0.052	0.116	0.233	1.000			
Cereal	0.163	-0.258	-0.103	0.114	-0.004	-0.291	-0.026	-0.171	-0.430	-0.221	-0.259	1.000		
Aqua	0.143	-0.267	0.033	0.345	-0.031	-0.321	0.212	0.012	-0.384	-0.286	-0.437	0.530	1.000	
Livestock	0.098	-0.155	-0.083	-0.174	0.055	0.111	0.018	-0.142	0.223	-0.287	0.111	0.064	-0.253	1.000

Appendix 3. Hausman Specification Test for SDM and SEM

.

	Coefficients (b) SDM	(B) SEM	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
pop	.0184185	.019603	-.0011845	.
NetMigra	-.0389998	-.0461341	.0071342	.
FDIcapita	.0134979	.030647	-.0171491	.
Retailsale~u	.2004083	.0790845	.1213238	.0075396
VolFreightN	-.5373466	-.3741648	-.1631818	.
Laborinbus~s	.0447197	.0546813	-.0099615	.
Turnoverof~z	-.012327	-.0163972	.0040702	.
CollStupcnt	-.7678673	.6754003	-1.443268	.
highschool	55.62608	19.79967	35.82641	8.469901
secondprim	-6.254155	7.310935	-13.56509	1.690954
Hospital	123.944	103.101	20.84292	.
cereal	.0013643	-.0019029	.0032671	.0001846
fishaqua	-.0026919	-.0038362	.0011443	.0004034
cattlepoul	.0000523	-.0001385	.0001909	.

```
                           b = consistent under Ho and Ha; obtained from xsmle
            B = inconsistent under Ha, efficient under Ho; obtained from xsmle

    Test:  Ho:  difference in coefficients not systematic

                  chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =      181.85
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

Appendix 4. Spatial Durbin Model with Area Normalization of the Dependent variable

	Main			Wx			Total = Direct + Indirect			Direct Effect			Indirect Effect		
	Without HN, HCM	Non- -adjacent provinces	HN, HCM and neighbors	Without HN, HCM	Non- -adjacent provinces	HN, HCM and neighbors	Without HN, HCM	Non- -adjacent provinces	HN, HCM and neighbors	Without HN, HCM	Non- -adjacent provinces	HN, HCM and neighbors	Without HN, HCM	Non- -adjacent provinces	HN, HCM and neighbors
Pop	0.0020**	0.0045**	0.0115***	-0.0035**	-0.0073***	-0.0052*	-0.0023	-0.0044*	0.0044	0.0017**	0.0038*	0.0125***	-0.0040*	-0.0082***	-0.0081***
NetMigra	0.0076**	0.0074***	-0.0082	0.0082	0.0026	0.0885***	0.0250**	0.0145	0.0582**	0.0085***	0.0078***	-0.0200	0.0164*	0.0067	0.0782***
FDI	-0.0004	0.0029	-0.0345	0.0183	0.0146	0.2471	0.0354	0.0307	0.1920	0.0029	0.0055	-0.0574	0.0325	0.0252	0.2495
Retailsale	0.0837***	0.0758***	0.3855***	-0.0615***	-0.0401***	-0.0649	0.0369	0.0562**	0.2369***	0.0825***	0.0758***	0.4102***	-0.0456***	-0.0196*	-0.1733***
Freight	-0.5773**	-0.4054**	-2.5722**	0.7539***	0.8672***	-3.7254	0.1751	0.6947***	-5.2895**	-0.5670**	-0.3448*	-2.4233*	0.7422**	1.0396***	-2.8661
Labor	0.0004	0.0069	0.0431***	-0.0046	-0.0142**	-0.0419	-0.0046	-0.0121	0.0069	0.0001	0.0054	0.0495***	-0.0048	-0.0175	-0.0425
Revenue	0.0016	-0.0076	-0.0120*	0.0073	0.0003	0.0048	0.0140	-0.0115	-0.0067	0.0027	-0.0077	-0.0125**	0.0112	-0.0037	0.0057
College	-0.3820	1.1508	-2.7483**	0.3003	0.8870	1.7018	-0.2446	2.9819*	-1.1329	-0.3956	1.2236	-3.2122**	0.1509	1.7583*	2.0793
High	-16.545**	-9.6687*	64.4547	20.0352*	14.6564	48.3056	5.0877	5.7835	82.9589*	-15.601**	-8.5762*	57.8507	20.6891	14.3597	25.1081
Primsec	2.7498**	1.3683	16.7691	-1.9990	-0.5168	69.7062**	0.9952	1.5226	59.6270***	2.7264*	1.4430	10.0156	-1.7312	0.0795	49.6114*
Hospital	26.0816**	20.1298*	111.256	5.4412	20.9450	520.887***	45.7318	63.1306	450.507**	27.8000**	24.2457**	66.8557	17.9317	38.8849	383.651**
Cereal	-0.0002	-0.0005**	0.0034	-0.0011**	-0.0005	-0.0114***	-0.0023***	-0.0017**	-0.0058*	-0.0003	-0.0006**	0.0047*	-0.0019**	-0.0011	-0.0105***
Aqua	-0.0007	-0.0001	0.1066***	0.0025***	0.0013*	0.1079***	0.0028*	0.0019	0.1479***	-0.0005	0.0001	0.0995***	0.0033***	0.0018*	0.0484
Livestock	0.0001	-0.0001	0.0001	-0.0001	0.0001	0.0005**	0.0001	0.0001	0.0004**	0.0001	-0.0001	0.0001	-0.0001	0.0001	0.0004*
rho	0.3690***	0.3443***	-0.3791***	0.3690***	0.3443***	-0.3791***	0.3690***	0.3443***	-0.3791***	0.3690***	0.3443***	-0.3791***	0.3690***	0.3443***	-0.3791***
sigma2_e	0.0468***	0.0353***	0.6675***	0.0468***	0.0353***	0.6675***	0.0468***	0.0353***	0.6675***	0.0468***	0.0353***	0.6675***	0.0468***	0.0353***	0.6675***
Observations	549	549	549	549	549	549	549	549	549	549	549	549	549	549	549
Provinces	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61
Mean FE	0.6901	0.6916	0.9560	0.6901	0.6916	0.9560	0.6901	0.6916	0.9560	0.6901	0.6916	0.9560	0.6901	0.6916	0.9560
R^2 Within	0.0005	0.0159	0.8183	0.0005	0.0159	0.8183	0.0005	0.0159	0.8183	0.0005	0.0159	0.8183	0.0005	0.0159	0.8183
R^2 Between	0.0122	0.0066	0.7501	0.0122	0.0066	0.7501	0.0122	0.0066	0.7501	0.0122	0.0066	0.7501	0.0122	0.0066	0.7501
R^2 Overall	2.0024	3.0522	3.4090	2.0024	3.0522	3.4090	2.0024	3.0522	3.4090	2.0024	3.0522	3.4090	2.0024	3.0522	3.4090

Note: The dependent variable is the average number of enterprises per square kilometer, 2005-2013. Coefficients with one, two, three stars are significant at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed test. "rho"is the coefficient of the spatially lagged dependent variable. HN, Hanoi; HCM, Ho Chi Minh City.

Appendix 5. Hausman Specification Test for SDM regressions with Area and Population normalization for the dependent variable

	Coefficients (b) AreaNormal~n	(B) PopNormali~n	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
Main				
NetMigra	.0076203	.0026039	.0050164	.0009943
FDIcapita	-.0004451	-.008159	.0077139	.0050138
Retailsale~u	.083754	.0751868	.0085672	.0016104
VolFreightN	-.5773556	-.6864694	.1091137	.044117
Laborinbus~s	.0004484	-.0036146	.0040631	.0009629
Turnoverof~z	.0016788	-.0042764	.0059551	.0005438
CollStupcnt	-.3820633	-.6990596	.3169963	.128163
highschool	-16.54578	-5.868746	-10.67704	2.024007
secondprim	2.749801	.2620117	2.487789	.4115338
Hospital	26.08165	24.23171	1.849936	4.809498
cereal	-.000213	-.0002946	.0000816	.0000939
fishaqua	-.0007198	-.0006419	-.0000778	.0002084
cattlepoul	.0000196	.0000332	-.0000136	8.79e-06
Wx				
NetMigra	.0082672	.0193059	-.0110388	.0020776
FDIcapita	.018353	.0304288	-.0120758	.0100276
Retailsale~u	-.0615188	-.0338639	-.0276549	.0025416
VolFreightN	.7539357	.4981799	.2557559	.0803971
Laborinbus~s	-.0046321	.0015149	-.006147	.0017945
Turnoverof~z	.0073974	.0050036	.0023938	.0013459
CollStupcnt	.3003256	.0536692	.2466565	.2136084
highschool	20.03525	18.84857	1.186678	2.550304
secondprim	-1.999026	-4.329239	2.330213	.4757355
Hospital	5.44128	-9.254326	14.69561	8.171622
cereal	-.0011818	-.0009764	-.0002053	.0001297
fishaqua	.0025933	.0010034	.0015899	.0003216
cattlepoul	-.0000204	-.0000752	.0000548	.000016
Spatial				
rho	.3690459	.3912724	-.0222265	.0066425
Variance				
sigma2_e	.0468021	.0360164	.0107857	.0018271

Appendix 5. (Continued)

Direct				
NetMigra	.0086653	.0049274	.0037379	.0007891
FDIcapita	.0026469	-.0039064	.0065534	.0058736
Retailsale~u	.0806606	.0749667	.0056939	.0019905
VolFreightN	-.5359541	-.6764386	.1404845	.0487311
Laborinbus~s	.0001364	-.0034138	.0035502	.0010015
Turnoverof~z	.0025791	-.0038799	.006459	.0005562
CollStupcnt	-.408294	-.7643623	.3560682	.1189272
highschool	-15.17438	-4.017117	-11.15727	1.867178
secondprim	2.64597	-.2507038	2.896674	.3951417
Hospital	28.34923	24.70652	3.642705	5.038172
cereal	-.0003605	-.0004313	.0000707	.0001075
fishaqua	-.0004909	-.0005816	.0000906	.000181
cattlepoul	.0000207	.0000278	-7.12e-06	8.56e-06
Indirect				
NetMigra	.0165779	.0311652	-.0145872	.
FDIcapita	.0300072	.044291	-.0142838	.0131736
Retailsale~u	-.0445672	-.0065186	-.0380485	.0044986
VolFreightN	.7524485	.3071592	.4452893	.0844461
Laborinbus~s	-.00601	.0007274	-.0067374	.0023187
Turnoverof~z	.0113835	.0047203	.0066632	.0019379
CollStupcnt	.1857718	-.3797039	.5654756	.2537733
highschool	20.25074	24.93254	-4.681791	2.665241
secondprim	-1.533124	-6.486993	4.953869	.555498
Hospital	20.18547	-1.315085	21.50056	10.87333
cereal	-.001907	-.001706	-.000201	.0001829
fishaqua	.0033898	.00112	.0022697	.0003463
cattlepoul	-.0000149	-.0000908	.0000758	.0000163
Total				
NetMigra	.0252432	.0360926	-.0108494	.
FDIcapita	.0326541	.0403846	-.0077305	.0167166
Retailsale~u	.0360934	.0684481	-.0323547	.0046423
VolFreightN	.2164944	-.3692794	.5857738	.0803825
Laborinbus~s	-.0058736	-.0026864	-.0031872	.0025722
Turnoverof~z	.0139626	.0008404	.0131222	.0021344
CollStupcnt	-.2225223	-1.144066	.9215439	.3072874
highschool	5.076361	20.91542	-15.83906	2.845623
secondprim	1.112846	-6.737696	7.850543	.6009526
Hospital	48.5347	23.39144	25.14326	12.8837
cereal	-.0022675	-.0021373	-.0001302	.0002267
fishaqua	.0028988	.0005385	.0023604	.0003605
cattlepoul	5.82e-06	-.0000629	.0000687	.0000196

```
                  b = consistent under Ho and Ha; obtained from xsmle
   B = inconsistent under Ha, efficient under Ho; obtained from xsmle

 Test:  Ho:  difference in coefficients not systematic

               chi2(34) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                        =      663.56
              Prob>chi2 =      0.0000
              (V_b-V_B is not positive definite)
```

Appendix 6. Spatial Durbin Model with Population Normalization of the Dependent variable

Summary Statistics

	Without HN, HCM (n=549)				**Non-adjacent provinces (n=423)**				**HN, HCM and neighbors (n=144)**			
Variable	**Mean**	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**
Growth (normalized by population)	1.549	1.078	0.328	9.582	1.464	1.054	0.328	9.582	2.732	2.922	0.647	15.438
Density	387.976	343.258	35.000	1347.000	327.809	319.843	35.000	1260.000	844.632	791.693	171.000	3732.000
NetMigra	-1.560	8.186	-27.300	74.600	-2.687	5.394	-27.300	36.200	3.105	12.976	-11.800	74.600
FDI	0.248	1.029	0.000	17.479	0.184	0.993	0.000	17.479	0.444	1.053	0.000	9.532
Retailsale	11.977	8.818	1.119	49.319	11.708	8.482	1.119	49.319	15.853	14.413	1.750	79.161
Freight	0.381	0.381	0.021	2.683	0.403	0.425	0.021	2.683	0.288	0.139	0.043	0.651
Labor	40.628	19.277	14.110	150.333	36.088	14.706	14.110	108.276	52.746	24.462	19.884	150.333
Revenue	21.541	19.562	2.603	186.265	17.140	11.325	2.603	85.277	34.777	29.268	3.804	186.265
College	0.026	0.077	0.000	0.539	0.019	0.058	0.000	0.498	0.050	0.112	0.001	0.539
High	0.034	0.009	0.010	0.058	0.034	0.009	0.010	0.058	0.034	0.007	0.013	0.053
Primsec	0.164	0.032	0.090	0.480	0.170	0.033	0.112	0.480	0.144	0.022	0.090	0.200
Hospital	0.013	0.005	0.005	0.033	0.013	0.005	0.007	0.033	0.011	0.003	0.005	0.018
Cereal	553.897	431.225	21.000	2578.800	572.770	447.970	34.800	2578.800	446.900	363.298	11.700	1931.100
Aqua	89.989	116.734	0.537	588.779	100.752	125.356	0.537	588.779	48.871	67.314	4.805	288.230
Livestock	3502.296	1685.352	343.481	9922.283	3121.281	1295.854	343.481	7877.005	4347.670	2364.395	26.378	9922.283

Appendix 6. (Continued)

Spatial Durbin Model detailed results															
	Main			**Wx**			**Total = Direct + Indirect**			**Direct Effect**			**Indirect Effect**		
	Without HN, HCM	**Non- -adjacent provinces**	**HN, HCM and neighbors**	**Without HN, HCM**	**Non- -adjacent provinces**	**HN, HCM and neighbors**	**Without HN, HCM**	**Non- -adjacent provinces**	**HN, HCM and neighbors**	**Without HN, HCM**	**Non- -adjacent provinces**	**HN, HCM and neighbors**	**Without HN, HCM**	**Non- -adjacent provinces**	**HN, HCM and neighbors**
Density	0.0043***	0.0075***	0.0027**	-0.0076***	-0.0089***	-0.0016	-0.0054*	-0.0026	0.0009	0.0036**	0.0028**	0.0029**	-0.0090***	-0.0093***	-0.0020
NetMigra	0.0026	0.0048	-0.0006	0.01931**	0.0108**	0.0136	0.0361***	0.0275***	0.0099	0.0049*	0.0028**	-0.0022	0.0320***	0.0203**	0.0116
FDI	-0.0082	-0.0008	-0.0059	0.0304	0.0198	0.1368	0.0404	0.0374	0.1143	-0.0034	0.0033	-0.0168	0.0458	0.0353	0.1308
Retailsale	0.0752***	0.0621***	0.0949***	-0.0339***	-0.0170**	0.0032	0.0685***	0.0804***	0.0763***	0.0764***	0.0641***	0.0986***	-0.0061	0.0157	-0.0225
Freight	-0.6865***	-0.4817***	-2.3693***	0.4982**	0.5821***	-1.7797	-0.3693	0.1305	-3.4850***	-0.7056***	0.4420***	-2.2669***	0.3087	0.5881*	-1.0224
Labor	-0.0036	-0.0048	-0.0029	0.0015	0.0038	0.0005	-0.0027	-0.0009	0.0011	-0.0029	-0.0044	-0.0023	0.0016	0.0026	0.0015
Revenue	-0.0043	-0.0084***	-0.0053*	0.0051*	0.0006	0.0041	0.0008	-0.0140	-0.0016	-0.0038	-0.0088**	-0.0059**	0.0046	-0.0052	0.0043
College	-0.6991	0.5866	-1.2098**	0.0537	0.6199	-0.7172	-1.1441	2.0451	-1.6637	-0.7758	0.6699	-1.2234**	-0.3199	1.3701	-0.4380
High	-5.8688	-7.4644	-26.2372	18.8486**	23.1034**	36.1626	20.9154*	27.3651**	8.6824	-4.1681	-4.3357	-32.4746	25.7132*	30.9979**	40.5659*
Primsec	0.2621	0.1456	19.4511**	-4.3292***	-3.6197***	-25.9582	-6.7377***	-6.2293***	-6.1608	-0.2241	-0.4741	24.2414**	-6.7621***	-5.7404***	-29.3068*
Hospital	24.2317**	17.2823	68.4622**	-9.2543	7.0227	18.7432	23.3914	41.9361	62.0123	24.4685**	19.6913	71.0781**	-0.0357	18.1705	-0.0355
Cereal	-0.0003	-0.0004	-0.0041***	-0.0010***	-0.0007	0.0004	-0.0021***	-0.0020***	-0.0028**	-0.0004	-0.0006*	-0.0044***	-0.0018**	-0.0015**	0.0016
Aqua	-0.0006	0.0003	0.014**	0.0010	-0.0002	0.0619***	0.0005	0.0001	0.0554***	-0.0006	0.0003	0.0079	0.0012	-0.0001	0.0485***
Livestock	0.0001	-0.0001	0.0001***	-0.0001*	-0.0001	0.0001	-0.0001	-0.0001	0.0002*	0.0001	-0.0001	0.0001***	-0.0001	-0.0001	0.0004
rho	0.3913***	0.4364***	-0.3014**	0.3913***	0.4364***	-0.3014*	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
sigma2_e	0.0361***	0.0275***	0.0851***	0.0360***	0.0275***	0.0851***	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Observations	549	423	144	549	423	144	549	423	144	549	423	144	549	423	144
Provinces	61	47	16	61	47	16	61	47	16	61	47	16	61	47	16
Mean FE	2.7023	1.4105	0.9797	2.7023	1.4105	0.9797	2.7023	1.4105	0.9797	2.7023	1.4105	0.9797	2.7023	1.4105	0.9797
R^2 Within	0.8716	0.8758	0.9524	0.8716	0.8758	0.9524	0.8716	0.8758	0.9524	0.8716	0.8758	0.9524	0.8716	0.8758	0.9524
R^2 Between	0.2005	0.3234	0.7646	0.2005	0.3234	0.7646	0.2005	0.3234	0.7646	0.2005	0.3234	0.7646	0.2005	0.3234	0.7646
R^2 Overall	0.2526	0.3628	0.7534	0.2526	0.3628	0.7534	0.2526	0.3628	0.7534	0.2526	0.3628	0.7534	0.2526	0.3628	0.7534

Note: The dependent variable is the average number of enterprises per thousand people, 2005-2013. Coefficient with one, two, three stars are significant at the 10 percent, 5 percent, and 1 percent levels, respectively, using a two-tailed test. “rho”is the coefficient of the spatially lagged dependent variable. The Direct effect is the effect of the original province’s independent variables on that province’s growth taking feedback effect into account. The Indirect effect is the effect of the independent variables of a province’s neighbors on that province’s growth taking feedback effect into account. HN, Hanoi; HCM, Ho Chi Minh City.