ABSTRACT

Title of Dissertation: ESSAYS IN SPATIAL ECONOMETRICS

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Spatial econometrics is a subfield of econometrics that deals with the treatment of spatial interactions in regression models for cross sectional and panel data.

Chapter 1: This is the first paper that highlights the role of spatial interactions, in the context of bankruptcy laws, in the entrepreneurship decision. This chapter is in two parts: one of which relates to the birth, and the other to the death, of businesses. The focus of the paper is on small businesses in the US. Small firms represent more than 90% of all enterprises and play a large role in entry and exit in the US. Further, the US has traditionally had pro-debtor bankruptcy laws. Hence this paper asks whether laws that facilitate easy exit, such as bankruptcy laws, are an important consideration in entry (and exit) of small businesses. This paper studies the decision of an entrepreneur to begin (or end) a business in a particular state, as a function of bankruptcy regulations and other business variables in that state *as well as those in neighboring states*. The study uses longitudinal household level data from the SIPP (Census) dataset. I estimate a random

effects probit model with a lagged endogenous variable. The paper finds that higher bankruptcy exemptions in neighboring states *lower* the probability of starting a business in the state of residence. The bankruptcy exemption in one's own state has a significant and positive impact on entrepreneurship.

Chapter II: This paper is a first attempt to empirically model determinants of FDI flows to emerging market economies, using a spatial approach. The paper uses data on FDI inflows to 29 emerging market and developing economies for the period 1980-2000. Apart from various country characteristics, we include a corruption perception index and an index of labor productivity as determinants of these flows. The unique contribution of this paper is to include a weighted average of these conditions in “neighbor countries” amongst factors that may explain FDI flows into a country. Results indicate that corruption perception and labor productivity, in both host and neighbor countries, significantly determine FDI inflows to a host country.

ESSAYS IN SPATIAL ECONOMETRICS

By

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DEDICATION

I wish to dedicate my thesis to my advisor, Prof. Harry Kelejian, whose advice and guidance was invaluable. I also wish to thank my parents and my husband, Kartikeya Singh, for their constant support and encouragement.

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Chapter 1

A Spatial Model of the Impact of Bankruptcy Law on Entrepreneurship[1]

1.1 Introduction

This paper analyzes the impact of bankruptcy law on births and closures of small businesses. The paper asks whether laws that facilitate easy exit are an important consideration in entry of small firms. The reason why we study small firms is that the OECD Small and Medium Enterprises (SMEs) Outlook 2002 reports that SMEs represent between 96%-99% of all enterprises in most OECD economies. The rates of gross job creation and destruction are highest among small firms. Haltiwanger, Davis and Schuh (1993) find that the rate of gross job creation in US manufacturing is nearly double for firms with less than 100 employees as compared to firms with more than 25000 employees. However, there is no clear relationship between *net* job creation rates and firm size, since small firms destroy a disproportionately large share of existing jobs.[2] Thus small businesses are responsible for much of the "churning" or turnover in the US

[1] I wish to express my gratitude to my advisors Prof. Harry Kelejian and Prof. John Shea. I wish to thank Prof. Ginger Jin and Prof. Gelbach for their advice and comments. Thanks also to Kartikeya Singh, Dr. Devesh Roy and seminar participants at the International Atlantic Economic Conference, Chicago, and the AEA Meetings (2005) for useful comments. All errors are mine. The research was funded by the Small Business Administration and was conducted while the author was a student at the University of Maryland, College Park.

[2] Between 1990 to 1995, 90.1% of the 371,547 net new establishments in the US were small firms (less than 500 employees), and very small firms (less than 20 employees) accounted for 68.4% of these. During the same period, small firms created 76.5% of the 6.85 million net new jobs, while the very small firms created 49%.

economy. Overall from 1989 to 1995, 2.9 million small firms were born, and 2.6 million small firms died.[3] In Europe, too, employment growth is strongest in small enterprises.[4]

Small firms play a large role in entry and exit in the OECD economies. If we define overall job turnover as the sum of openings and expansions, plus contractions and shutdowns, then another interesting finding emerges. As the OECD Jobs Study (1995) reports, *openings* account for the majority of job gains in the US while *closures* account for the majority of job losses. In other OECD economies, like Italy and Germany, however, the majority of job creation and destruction is accounted for by *expansion* and *contraction* of existing establishments. This finding is documented by Bartelsmann, Scarpetta and Schivardi (2003) as well, who find that entry rates in the US are significantly higher than entry rates in Germany and Italy, while entry rates for small firms (less than 20 employees) are significantly higher than for other size classes of firms.

A question that arises therefore is whether laws that determine the costs and benefits of exit, such as bankruptcy laws, are important to entry of small businesses. The US is unusual in having very pro-debtor bankruptcy laws. For example, while US bankruptcy law provides for discharge of debts of failed businesses when the business owner files for bankruptcy, German bankruptcy law does not. The owner of a failed business in

[3] Small Business Growth by Major Industry (SBA)

[4] The report of the European Observatory on SMEs (No.7, 2003) cites country studies by Gallagher and Stewart (UK,1986), Heshmati (Sweden, 2001) and Hohti (Finland, 2000), which suggest that small firm dynamics are similar to the US in European economies, and in some countries like Sweden, Denmark and Finland, there is a similar negative link between gross job creation rates and firm size.

Germany who files for bankruptcy continues to be liable for the business' debts and can be forced to repay these debts from future earnings for many years after filing.[5] The differential impact of bankruptcy law is evident from the fact that among the industrialized countries, only the US has a high and rapidly rising bankruptcy filing rate.[6]

The focus of this paper is on US personal bankruptcy law. The US personal bankruptcy system functions as a bankruptcy system for small unincorporated businesses as well as consumers. If a firm fails, the entrepreneur has an incentive to file for bankruptcy under Chapter 7, since both business debts and the entrepreneur's personal debts are discharged. The entrepreneur must give up assets above a fixed bankruptcy exemption level for repayment to creditors. However, future earnings are entirely exempt.[7]

These bankruptcy exemption levels are set by the states and vary widely across states and over time. Thus the US provides a natural panel to analyze the impact of bankruptcy law on entrepreneurship. The effect of high exemptions, as documented in the literature, is two-fold. Fan and White (2003) have shown that the wealth insurance effect of exemptions encourages entrepreneurship, while Berkowitz and White (2004) find that small firms are more likely to be denied credit if they are located in states with unlimited exemptions. My results confirm those of Fan and White (2003), that even if credit access

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[5] This is true even for corporations.

[6] Fan and White (2003)

[7] Proposed changes in the law (Bills HR333 and S420) make it harder for individuals above a certain median income to file for bankruptcy, and cap the maximum exemption limit. Only wage earners whose household incomes are below their state's median (the U.S. median for a family of four was recently $59,981) will be permitted to file under Chapter 7.

is tougher, entrepreneurs would prefer to be in states with high, rather than low exemptions.

The unique contribution of this paper is that it studies the effect of bankruptcy law in a spatial setting, whereby entrepreneurs are seen to be choosing the optimal location of their business from a choice of locations including one's own and neighboring states. Their decision to start (or end) the business is therefore a function of business conditions in these competing locations. Introducing spatial effects is not without basis. Holmes (1998), Karvel, Musil and Sebastian (2002) and other authors provide evidence that business relocation decisions could be prompted by competing business conditions in neighboring states. In the dataset that I use, I find cases in which of all individuals who had relocated to other states, about 1% started businesses in these new states. I also find cases in which entrepreneurs who had shut down their business in a particular state, sometimes moved to another state, and started a business there.[8]

I make use of detailed longitudinal data from the Survey of Income and Program Participation (SIPP) that tracks individuals over a period of three years and has monthly information on labor force characteristics, state of residence and demographic characteristics. Hence I am able to know the exact location of the individual at the time of

[8] On average per year, about 1.5% of the sample changed states. Out of these, approximately .4% (less than 1%) started businesses, and conditional on moving and starting a business, nearly 55% had moved to a higher exemption state. Further, data on why businesses ended is only available for the period 1996-98. Out of all closures per year, nearly 2% were due to filing for bankruptcy. Other reasons for shutting down businesses were restarting another business or taking up a job, and nearly 4% of businesses closed for this reason. Of the businesses that closed and restarted, nearly 3% restarted in a new state with higher exemptions.

starting (or ending) a business. That further allows me to use state business conditions, such as the bankruptcy exemption level, as factors affecting the transition to entrepreneurship.

The paper finds that higher bankruptcy exemptions in neighboring states lower the probability of starting a business in the state of residence. The bankruptcy exemption in one's own state has a significant and positive impact on entrepreneurship.

The plan of the paper is as follows. The next section provides an overview of the study. Section 2 provides a literature review and evidence for spatial effects. Section 3 develops a theoretical model, and provides details of the empirical methodology. Section 4 provides results for business starts and closures. Section 5 outlines different specifications and Section 6 concludes.

1.1.1 Overview

In this paper, I propose a two-part study. The first part of the paper will focus on job creation through the birth of small businesses. The second will focus on job destruction through the death of small businesses. In particular, I look at the decision of a cross sectional unit (an individual or a family) to either begin or end a business in a particular state, as a function of bankruptcy regulations and other business and macroeconomic variables in that state as well as those in neighboring states. I propose to expand upon models in the literature, most notably Fan and White (2003), in a number of ways. First, I will allow for spatial interactions. There has been no paper to my knowledge that has looked at spillover effects from adjoining states on the probability of starting or ending a business in a particular state. I believe that these effects are important, since individuals have the option to move and locate their businesses in states that offer better conditions, such as higher exemptions or lower tax rates[9]. To allow for these interactions, I will introduce a weighting matrix that puts a positive weight on business conditions in adjoining states. We expect that the probability of starting (ending) a business in a particular state is inversely (directly) related to business conditions in adjoining states.

Second, I will be using additional variables that have not been considered in previous literature. To the extent that some individuals move from unemployment to starting a business, policies relating to the level of unemployment benefits will also be important. Self-Employment Assistance programs for people receiving unemployment benefits vary by state and may also play a role in an individual's decision to start a business in a particular state.[10] Finally, I examine if the cost of health insurance for the entrepreneur has an impact on the decision to start a business.

[9] I assume that individuals start or end businesses in the state in which they reside at the beginning of the year.

[10] Self-Employment Assistance programs offer dislocated workers the opportunity for early re-employment. The program is designed to encourage and enable unemployed workers to create their own jobs by starting their own small businesses. Under these programs, States can pay a self-employed allowance, instead of regular unemployment insurance benefits, to help unemployed workers while they are establishing businesses and becoming self-employed. This is a voluntary program for States and, to date, fewer than 10 States have established and currently operate Self Employment Assistance programs. (Source: US Department of Labor)

Third, my study is based on Survey of Income and Program Participation data relating to two panels: 1993-1995 and 1996-1998. In future drafts, I intend to extend the paper by using data relating to the period 1983-85. In 1978, a new Federal Bankruptcy code allowed each US state to set its own bankruptcy exemption level, which they all did by 1982. It may be interesting to look at 1983 data to see the immediate impact of these exemptions on individual decisions to start or end a business.[11] Moreover, by pooling data for these years with that for 1993-98, I get more variation in state policies over time.

My formulation of the model allows for state dummies and individual random effects. I specifically test to see whether the state dummies are significant. My formulation of the model has a richer set of observable state level variables than other studies to fully capture all of the state level effects. Fan and White (2003) in their panel data model considered only a random effects specification. They did not include state dummies, and did not test to see if their observable state variables were sufficient to capture all the state effects.

Finally, I introduce a lagged dependent variable to control for the possibility that individuals who owned (or did not own) a business in the past may be more likely to start (end) a business today.

The contribution of the paper is also methodological. As described in detail in Appendix A.1, the estimation of a probit model containing random effects, a lagged dependent variable and state dummies, with a large number of cross sectional units and a relatively

[11] If possible, I will try to obtain data for before 1978, and see if results are significantly different.

short time dimension, requires special manipulations and programs for empirical implementation. In particular, separately identifying the effect of the lagged dependent variable and unobserved heterogeneity (the random effect) requires modeling of initial conditions, which further complicates the estimation procedure. None of the papers surveyed here have introduced all of these features in a single model.

1.2 Literature Review

In this section, I will review some of the theoretical and empirical literature that has researched the role of various demographic, human capital, and financial considerations in the decision to become an entrepreneur. Most previous studies have examined the importance of the earnings differential between entrepreneurship and paid employment, taxation, liquidity constraints, and intergenerational transfers. As this review shows, there has been relatively little research on the role of bankruptcy law as an important factor in spawning innovation and employment, and further, there has been no paper, to our knowledge, that has used a spatial econometric model to study the same.

There have been two papers of note that have looked at the role of bankruptcy exemptions. The first is Fan and White (2003) and the other is Georgellis and Wall (2002). Fan and White (2003) consider the impact on entrepreneurial activity of bankruptcy exemptions, along with other variables that have been used extensively in the literature. They find a significant and positive relationship between the probability of starting a business and the exemption level. The probability of starting a business rises by about 22% from the lowest exemption states to the highest exemption states. Their results also suggest that the probability of ending a business is higher in states with high bankruptcy exemption levels, increasing by about 18% between the lowest exemption states and the unlimited exemption states. However the coefficients on the exemption variables in the case for ending a business are not statistically significant. As pointed out before, Fan and White (2003) do not consider spatial effects. For instance, if neighboring states have higher exemptions, this may influence a family's decision to start or end a business in their own state. They also did not test to see if state fixed effects are important. In my model I find that including the spatial exemption variables causes the own exemption to become insignificant. Hence what appears to be important is not the exemption level per se, but the own exemption *relative* to neighbor exemptions.

Georgellis and Wall (2002) do not look at micro data on individuals or families. Instead they define the rate of entrepreneurship in a state as the proportion of the working age population that is classified as non-farm proprietors. They regress this on state policy measures, controlling for state and time dummies and for measures of business and demographic conditions, using US state panel data for 1991-98. The business condition measures include the state's unemployment rate, per capita real income and industry employment shares. The policy measures include the maximum marginal tax rate and the bankruptcy homestead exemption. The results indicate that at very low and high initial levels, an increase in the homestead exemption reduces the number of entrepreneurs. In the mid-range of homestead exemption rates, there is a positive relationship between the exemption level and entrepreneurship. Further, only for relatively high homestead exemption rates will the level of entrepreneurship be higher than if there were no exemption at all. This result is different from that of Fan and White (2003), who find the relationship between the exemption level and homeowners' probability of owning a business to be monotonically increasing. Georgellis and Wall (2002) also find significant state fixed effects. Since their paper deals with data aggregated at the state level, Georgellis and Wall are unable to analyze factors that may be more relevant at the individual level, such as family wealth, the age of the entrepreneur and so on. Moreover, even at the macro level, they do not consider factors such as the percentage of union workers in each state, which I incorporate. [12]

Other papers in this literature test for liquidity constraints, controlling for macroeconomic variables. Holtz-Eakin, Joulfaian, Rosen (1994), Evans and Leighton (1989) and Evans and Jovanovic (1989) find that higher inheritances and liquid assets increase the likelihood of entrepreneurship. Another strand of research has focused on the differential tax treatment of income earned while working for others versus income from self-employment. Some noteworthy papers include Cullen and Gordon (2002) and Bruce (1998), who find a positive relationship between personal tax rates and entrepreneurship. The role of race and work history has also been considered in the literature on self-employment. Meyer (1990) and Blanchflower and Meyer (1992) find that blacks are significantly less likely to be self-employed than whites, while older, married, male workers are more likely to be self-employed. Moreover, Evans and Leighton (1989) conclude that people who have had low earnings in the past or who have shorter job tenures are also more likely to be self-employed.

[12] Previous research has shown that the probability of moving from a wage and salary occupation to owning a business is lower for union members (Bruce, 1998).

There are other papers that have looked specifically at the factors leading to closure of businesses. These are very similar to factors that are significant for starting businesses, such as availability of financial capital, human capital in the form of skills of the entrepreneur and the relative attractiveness of being a wage earner versus owning a business. Kangasharju and Pekkala (2001) find that firms run by more educated individuals have a higher probability of survival. Also, the probability of exit is lower for firms run by more educated individuals during recessions, but higher during booms. One reason for this may be that highly educated individuals face a higher outside demand for their labor during economic upturns than less educated individuals. In another paper, Pfeiffer and Reize (1998) find that firm survival rates are lower if a previously unemployed individual founded the firm. None of these papers have looked at the role of bankruptcy exemptions, and they do not consider the role of regional differences and spatial interactions in determining this probability.

1.2.1 Evidence for Spatial Effects

The Census Bureau (2000) report on state-to-state migration flows between 1995-2000 finds that the largest migrations were to adjacent or nearby states. For instance, Arizona's largest migration inflow was from California and its largest outflow was to California. Similarly, there were large flows between New York and New Jersey, California and Nevada, and so on. A Goldwater Policy Institute Report (2004) further finds in census data that states with the highest total tax burdens suffered a net loss of more than

1,700,000 residents between 1995 and 2000 and that business climate significantly influenced millions of household decisions to move across state lines during the 1990s.

Moreover, Elul and Subramanian (1999) find that considerations of bankruptcy laws influence interstate migration. They estimate that roughly 1% of moves to states with higher exemption limits are motivated by considerations of differences in bankruptcy laws. They state that these figures are roughly the magnitude of the estimates obtained by other authors for welfare related migration.

Karvel, Musil and Sebastian (1998) studied business out migration from Minnesota**.** Of the 183 firms surveyed, eighty-two (44.8 percent) went to Wisconsin, forty-six (25.1 percent) went to South Dakota, thirty-four (18.6) percent went to North Dakota, and twenty-one (11.5 percent) went to Iowa. Business taxation (workers' compensation rates, commercial-industrial property taxes, corporate income taxes, and sales taxes) constituted the primary reason for relocation. Local and state government incentives from neighboring states comprised the next most important reason for business out migration decisions, while the absence of Minnesota state and local government incentives to *compete* in retaining or expanding businesses were the third most important set of reasons for the respondents' decisions to leave Minnesota. Karvel et al (1998) also cite a previous small-scale study carried out by the Center for Business Research, which examined a single border city—Hudson, Wisconsin. Hudson was selected because it was known that a number of Minnesota businesses had relocated or started businesses there. The major finding of the Hudson study was that the two most important reasons for locating a business in Hudson rather than Minnesota were high workers' compensation rates and commercial-industrial property taxes in Minnesota.

Finally, Holmes (1998) provides evidence that state policies play a role in the location of industry. The paper classifies a state as pro-business or anti-business depending on whether or not the state has a right-to-work law. The paper finds that on average there is a large abrupt increase in manufacturing activity when crossing a border from an anti-business state into a pro-business state. Other papers, like Glaeser (2001) and Brueckner (1999), also study the effect of business incentives, such as taxes, on location decisions by firms. None of these papers use spatial modeling in the analysis.

1.3 Details of Study

1.3.1 Theoretical Model

In this section, I develop a theoretical model for my study, which uses the basic framework in Fan and White (2003) as a starting point. However, unlike that paper, this model considers business conditions in neighboring states and demand conditions. The model analyses an individual considering whether to start up a new business in the home state, h, or to locate in another, neighboring state, n. Production costs are assumed to be the same in each location. We assume, however, that there is a cost of moving from the home state to the neighboring state, which is proportional to the distance moved.

There are two periods. In period 1, the individual invests in a project that has a cost of *I*. The potential entrepreneur's initial wealth is given by *W*, which he invests in the project in period 1, and he incurs a fixed amount of debt $B>0$. The debt is unsecured, has an interest rate r_i (where *i* indexes the state), and is due in period 2. The return on the project is realized in period 2 and is uncertain at the time of investment due to uncertain demand conditions in period 2. The inverse demand function for period 2 is given by

$$p_{2i} = a-bq_{2i}+u_{2i} \qquad i=h,n \quad u_{2i} \sim f(u) \qquad (3.1.1)$$

Where p_i and q_i denote price and quantity in location *i*, *a* is a positive constant, and $u \in [\underline{u}, \overline{u}]$ is a stochastic demand component. $f(u)$ is the density of u_{2i}, with $E[u]=0$ and $var[u]=v$. We assume that the moving decision is made prior to the realization of demand shock, *u*. We also allow that $\underline{u}<X_i$, where X_i is the bankruptcy exemption in state *i*.
The cost of production is given by

$$C_{2i} = cq_{2i} \qquad i=h,n \qquad (3.1.2)$$

Firms will not produce if $p_{2i} < c$.[13]

Let $\pi_{2i} = (a-bq_{2i}+u_{2i} -c)q_{2i}$ denote the level of profits. (3.1.3)

The value of q_{2i} that maximizes this profit function is given by

$$q_{2i}^* = \frac{a+u_{2i}-c}{2} \qquad (3.1.3a)$$

[13] We assume a profit maximizing entrepreneur.

This is monotonically increasing in u_{2i}.

If the entrepreneur files for bankruptcy then the debt of $B(1+r_i)$ will be discharged but he has to give up all assets above the fixed exemption limit X_i, as repayment to creditors.[14] Let

$$\theta_i = W-I+B+\pi_i-fd_i \qquad (3.1.4)$$

represent the realized gross wealth of the individual at the end of period 2 . Note from *(3.1.3a)* that both the maximised level of profits, $\pi_i(q_{2i}*)$, and θ_i are monotonically increasing in u_{2i}. fd_i represents the cost of moving, which is zero if the individual does not move. The entrepreneur's net wealth at the end of period 2 is $\theta_i-B(1+r_i)$ if he does not file for bankruptcy, and X_i if he does. Thus the level of gross wealth at which he is indifferent between filing and not filing is given by

$$\overline{\theta}_i = X_i+B(1+r_i) \qquad (3.1.5)$$

Hence if $\theta_i < \overline{\theta}_i$, the individual will file for bankruptcy. Given this, the entrepreneur's net wealth is determined both by the decision to file for bankruptcy, as well as the exemption level. If the individual files for bankruptcy *and* his wealth is greater than the exemption level, he will be left with exactly the exemption amount. If he files and his wealth is less

[14] Note that we can introduce a positive cost of filing for bankruptcy, without affecting the main analysis. In that case, the entrepreneur upon filing for bankruptcy must give up any wealth that exceeds the exemption level, or $max[\theta_i\text{-cost of bankruptcy filing-}X_i,0]$. For ease of convenience, and since the cost of filing for bankruptcy is not very different across US states, we assume that the cost is zero.

than the exemption level, he will be left with his actual wealth. Summarizing, the entrepreneur net wealth is

θ_i if $\theta_i < X_i$, *(3.1.6)*

X_i *if* $X_i \leq \theta_i \leq \overline{\theta}_i$, *(3.1.7)*

$\theta_i - B(1+r_i)$ *if* $\theta_i > \overline{\theta}_i$ *(3.1.8)*

Since θ_i is monotonically increasing in u, corresponding to $\overline{\theta}_i$ is a unique realization of u_{2i}, which we denote by u_{2i}*. Thus if u_{2i} is less than $u_{2i}{}^*$, the individual will file for bankruptcy, and if it is higher than u_i^*, he will not. Further, if the individual does file for bankruptcy, conditions *(3.1.6)* and *(3.1.7)* indicate that he can either be left with the exemption amount, or his actual wealth. There is a unique realization of u_{2i}, such that $\theta_i = X_i$, which we denote by $\hat{u}_{2i}$. If $u_{2i} < \hat{u}_{2i}$, the level of wealth is below X_i and the individual is left with exactly θ_i, and if $u_{2i} > \hat{u}_{2i}$, the individual is left with X_i.

CREDIT MARKET

The lenders in the credit market are assumed to be risk neutral. They face a fixed opportunity cost of funds denoted by r_f, and they are willing to lend as long as they earn zero expected profits. If the realization of u_{2i} is between $\hat{u}_{2i}$ and $u_{2i}{}^*$, the individual files for bankruptcy and the lenders receive $(\theta_i - X_i)$, while if $u_{2i} < \hat{u}_{2i}$, lenders receive nothing. Thus the lenders' zero profit condition is given by

$$L \equiv \int_{\hat{u}_{2i}}^{u_{2i}*} (\theta_i - X_i) f(u) du + \int_{u_{2i}*}^{\bar{u}} B(1+r_i) f(u) du - B(1+r_f) = 0 \quad i=h,n \quad (3.1.9)$$

Lenders set the interest rate to satisfy this equation, otherwise they do not lend. To study the effect of changes in exemptions on the rate of interest charged by creditors, we take the total derivative of *(3.1.9)* to get[15]

$$\frac{dr_i}{dX_i} = -\frac{-\int_{\hat{u}}^{u*} f(u) du}{\int_{u*}^{\bar{u}} Bf(u) du} > 0 \qquad i=h,n \qquad (3.1.10)$$

Hence lenders will charge higher rates of interest on loans as exemptions increase, since the amount that they can reclaim in case of bankruptcy is lower.

INDIVIDUALS

The individual chooses whether to start a business at home, to start a business in the neighboring state, or to start no business and receive U(W`). The expected utility from starting a business in state *i* is given by,

$$\int_{\underline{u}}^{\hat{u}_{2i}} U(\theta_i) f(u) du + \int_{\hat{u}_{2i}}^{u_2*} U(X_i) f(u) du + \int_{u_2*}^{\bar{u}} U(\theta_i - B(1+r_i)) f(u) du \qquad i=h,n$$

(3.1.11)

where the limits are as defined before.

[15] It can be shown that other terms, involving derivatives of the limits, cancel out.

The individual will be willing to move if the expected utility from moving *(EU_M)* is greater than U(W') and greater than the expected utility from not moving *(EU_{NM})*. Assuming that entrepreneurship is more attractive than wage employment, the individual moves if

$$\Delta EU = EU_M - EU_{NM} = \int_{\underline{u}}^{\hat{u}_{2n}} U(\theta_n) f(u)du + \int_{\hat{u}_{2n}}^{u_{2n}*} U(X_n) f(u)du + \int_{u_{2n}*}^{\overline{u}} U(\theta_n - B(1+r_n)) f(u)du \; -$$

$$\int_{\underline{u}}^{\hat{u}_{2h}} U(\theta_h) f(u)du + \int_{\hat{u}_h}^{u_{2h}*} U(X_h) f(u)du + \int_{u_{2h}*}^{\bar{u}} U(\theta_h - B(1+r_h)) f(u)du > 0 \qquad (3.1.12)$$

Note that the the cost of moving is included in the definition of θ_n .Next we consider how changes in the exemption level in the neighboring state affect the attractiveness of moving, given by ΔEU. To do this, we take the total derivative of *(3.1.12)* and substitute for $\frac{dr_i}{dX_i}$ from *(3.1.10)* and find*,* [16]

$$\frac{d\Delta EU}{dX_n} = \int_{\hat{u}_{2n}}^{u_{2n}*} U'(X_n) f(u)du - \int_{u_{2n}*}^{\bar{u}} U'(\theta_n - B(1+r_n)) f(u)du \frac{\int_{\hat{u}_n}^{u_{2n}*} f(u)du}{\int_{u_{2n}*}^{\bar{u}} f(u)du}$$

(3.1.13a)

Similarly for the home state:

$$\frac{d\Delta EU}{dX_h} = -\left(U'(X_h) \int_{\hat{u}_{2h}}^{u_{2h}*} f(u)du - \int_{u_{2h}*}^{\bar{u}} U'(\theta_h - B(1+r_h)) f(u)du \frac{\int_{\hat{u}_h}^{u_{2h}*} f(u)du}{\int_{u_{2h}*}^{\bar{u}} f(u)du} \right) \qquad (3.1.13b)$$

[16] Note that the total derivative involves other terms, like derivatives of the limits, which cancel out.

The sign of these expressions are, respectively, the signs of

$$U'(X_n) - \frac{\int_{u_{2n}*}^{\bar{u}} U'(\theta_n - B(1+r_n)) f(u) du}{\int_{u_{2n}*}^{\bar{u}} f(u) du} > 0 \qquad (3.1.14a)$$

$$- \left(U'(X_h) - \frac{\int_{u_{2h}*}^{\bar{u}} U'(\theta_h - B(1+r_h)) f(u) du}{\int_{u_{2h}*}^{\bar{u}} f(u) du} \right) < 0 \qquad (3.1.14b)$$

The effect of neighbor's exemption on the attractiveness of moving is positive. The expression *(3.1.14a)* equals the entrepreneur's marginal utility of wealth when he files for bankruptcy and keeps X_n, minus his average marginal utility of wealth when he avoids bankruptcy and keeps $\theta_n - B(1+r_n)$. For risk averse entrepreneurs, this expression must be positive, since wealth when filing for bankruptcy is lower than wealth when avoiding bankruptcy, so the marginal utility of wealth must be higher when filing for bankruptcy. Thus as long as credit is available, an increase in the neighbor's exemption level increases the attractiveness of becoming a business owner in the neighboring state, even though credit is more expensive when the exemption limit is higher.[17] In other words, individuals are less likely to start businesses in their own state if business conditions in neighboring state are better. At the same time, expression *(3.1.14b)* suggests that an increase in own state exemptions reduces the attractiveness of moving.

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[17] One can also show that the model implies that the net expected utility is decreasing in the cost of moving (or distance moved) and that higher expected profits, or better demand conditions in neighboring state, increase the attractiveness of moving.

1.3.2 Empirical Model

In my empirical work, I first examine small business openings, and then consider small business closings. I use the same structure for both parts. I adopt a probit formulation with a latent variable specification, allowing for individual random effects and testing the significance of the state dummies in different specifications. Since the structure of the model is the same for openings and closures, for expositional purposes I discuss only the model for small business openings. Model estimation is discussed fully in the appendix.

My model can be specified as

$$Y_{it}^{*} = \delta_0 + \delta_1 D_{it1} + \delta_2 D_{it2} + \ldots + \delta_{44} D_{it39} + X_{it} B_1 + (W_{it.} Z_t) B_2 + (Y_{it-1,2}) B_3 + \varepsilon_{it} \; ; \; i=1,..,N, \; t=3..T \qquad (3.2.1)$$

$$Y_{it}=1 \text{ if } Y_{it}^{*} > 0$$

$$Y_{it}=0 \text{ if } Y_{it}^{*} \leq 0$$

$$\varepsilon_{it} = \alpha_i + u_{it}$$

For values in years $t=1,2$, data on $Y_{it-1,2}$ is not available. For these observations, I specify:

$$Y_{it}^{*} = \gamma_0 + \gamma_1 D_{it1} + \gamma_2 D_{it2} + \ldots + \gamma_{44} D_{it39} + X_{it} B_4 + (W_{it.} Z_t) B_5 + \varepsilon_{it} \; ; i=1,\ldots.,N, \; t=1,2 \qquad (3.2.1a)$$

$$Y_{it}=1 \text{ if } Y_{it}^{*}>0$$

$$Y_{it}=0 \text{ if } Y_{it}^{*} \leq 0$$

$$\varepsilon_{it} = \alpha_i + u_{it}$$

The subscript i relates to the cross sectional unit. The subscript t relates to the time period. My latent variable is $Y_{it}*$ and my observed dependent variable is Y_{it}. Y_{it} relates to a cross sectional unit *i's* decision (for expositional purposes) to start a business in year t. In particular, Y_{it}=1 if the ith cross sectional unit starts a business in year t, and 0 otherwise. Note that the sample consists only of people who did not own a business at the beginning of year t. The lagged dependent variable $Y_{it-1,2}$ indicates whether the household owned a business at some point in the preceding two years.[18] The cross sectional unit is assumed to start a business in a geographic unit which we call state, in which it resides. $D_{it1,\ldots\ldots,}D_{it39}$ are state dummy variables. Since we have an intercept, our analysis is effectively in terms of 40 states. The reason we have 40 states and not 50 is that since the number of observations in some states was small, they had to be grouped together. The states that were joined together are discussed in some detail below. Y_{it} is explained in terms of the latent variable $Y_{it}*$, which captures the factors responsible for the decision.

X_{it} is the vector of explanatory variables relating to cross sectional unit i in year t. These variables include both state-level variables, such as unemployment benefit variables and bankruptcy exemption measures, and also family level variables such family wealth, the entrepreneur's labor or business income, and other demographic characteristics. These are explained in detail below. B_1 is a coefficient vector.

[18] Since the data are available monthly, I define as a business start when a person who did not own a business in January of that year, does own a business at some point during the year.

$W_{it.}$ is a 1x40 row vector that assigns a positive weight to "neighbor states", as defined below. The weight assigned to all other states is zero. The reason why there are only 40 states is that the SIPP dataset identifies 41 individual states and the District of Columbia. The nine other states are aggregated into three groups.[19] However, in my model, I drop observations for Hawaii (since no neighbors can be defined), and New Mexico and DC.[20] Further, I add New Hampshire to the state unit comprising Maine and Vermont, and define Rhode Island and Connecticut as one state unit.[21] Neighboring states are defined as those that are adjacent to the state in which the cross sectional unit resides. I assume that the *i*th unit will not consider moving to states that are not adjacent, and I assign these states a weight of zero. In different specifications of the model, I experiment with assigning a positive weight to all neighbor states or only to those neighboring states that have more favorable business conditions than the state in which the cross sectional unit is currently located, since these are arguably the only states the *i*th unit would consider as an alternate location for the business. The formulation of the weighting matrix is explained in detail below.

Z_t is a 40xK matrix of observations on K state-level macroeconomic variables. These variables vary across time and state. They are explained in more detail below. B_2 is a Kx1 parameter vector.

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[19]These groups are (1) Maine and Vermont; (2) Iowa, North Dakota and South Dakota; (3) Alaska, Idaho, Montana and Wyoming.

[20] These states are dropped due to insufficient observations, and they cannot be merged with neighbors since their policies are not similar.

[21] New Hampshire lies *between* Maine and Vermont, so it forms a natural unit. Rhode Island has few observations and is similar to Connecticut in its policies.

ε_{it} is the disturbance term in the latent variable formulation. It has an error components structure, where the process $\{u_{it}\}$ is *iid* over i and t, and the cross sectional component α_i is *iid* over i.

1.3.3 Definition of Variables

The vector of explanatory variables includes state-level variables as well as demographic variables[22]. In particular, X_{it} includes the following:

1. *Bankruptcy Exemption*: These are the bankruptcy exemptions that the cross sectional unit faces in its home state. I use the homestead exemption as well as the personal property exemption. The homestead exemption is an exemption for equity in owner occupied housing. As shown in Figure 1 for the year 1996, this varies widely among states, with some states having no exemption and seven states having unlimited exemptions (states shown in black). Most states also have exemptions for household belongings, equity in vehicles, retirement accounts, and a wildcard category that can be applied to any type of asset. The exemption levels have changed over time in many states. For instance between 1993-1998, 28 states effected changes to their homestead and/or property exemptions. These exemptions provide partial wealth insurance to entrepreneurs, and are therefore expected to encourage entrepreneurship.

[22] For the grouped states, I use sample population weighted averages of these variables.

2. *State per capita income:* This variable has been changing over time for all states. High state incomes may be associated with high demand, encouraging entrepreneurship. At the same time, this may mean higher incomes for current job earners, and thus transitions to entrepreneurship may be reduced.

3. *The top marginal state income tax rate*, which has changed over time for 25 states in the period 1993-1998. Most studies find that high personal taxes encourage transitions to entrepreneurship, except for Georgellis and Wall (2002), who find the relationship to be U-shaped.[23] High personal taxes encourage tax avoidance which is easier for business owners than for salary workers.

4. *State unionization rate, state unemployment rate and the proportion of population in non farm employment.* High state unionization rates may discourage entrepreneurship as wages may be higher, while different studies find differing effects of unemployment rates. [24]

5. *The self employment or unemployment assistance benefits* for each state. For the unemployment benefits, I consider the replacement rate (the ratio of the average unemployment benefit paid out to the average weekly wage) in each state. This variable varies over time for 25 states in the sample. The data are available from

[23] Cullen and Gordon (2002), Bruce (1998)

[24] The nonfarm employment rate is entered to correct for the fact that bankruptcy law is different for farmers.

the US Department of Labor. The sign on this coefficient is ambiguous since the availability of generous benefits may discourage any kind of movement out of unemployment, but at the same time, the financial assistance provided may encourage entrepreneurship.

6. *Individual and family level variables,* including marital status, age, race, health insurance coverage, employment status and education level, as well as family income from wealth and whether the family owns their home.

The matrix Z_t includes observations on state-level variables that may be important for starting a business in neighboring states, such as

1. *The bankruptcy exemption variable*
2. *Per capita income*
3. *The maximum marginal state income tax rate*

Finally, I describe the Nx40 spatial weights matrix, $W_t=[W'_{1t.},\ldots\ldots\ldots,W'_{Nt.}]'$. At any time t, the ith row of this matrix is given by $W_{it.}$, which specifies "neighborhood sets" for each observation i. The *ij-th* element of W_t, namely, $w_{ij,t}$, is positive if j is a "neighbor" of i, and is zero otherwise. In our spatial model, I consider two weighting matrices. One is based on distance and the other on population. These weighting matrices were used to create weighted averages of exemptions, per capita incomes and tax rates in neighboring states. I also present results with simple averages of these variables. In somewhat more detail, the *ijth* element of the weighting matrix based on population at time t, is,

$$w_{ijt} = \frac{pop_{ijt}}{\sum_k pop_{ikt}}$$ where k is the number of "neighbor" states for individual i.

The weighting matrix based on distance is defined in a similar manner. By convention, a cross sectional unit is not a neighbor to itself, so that the diagonal elements of W_t are all zero i.e $w_{ii,t}=0$. I also experiment with assigning a positive weight to only those "neighbors" that have the highest exemptions.

1.3.4 Data Sources and Description

In my study, I use longitudinal datasets available from the Survey of Income and Program Participation (SIPP), published by the Census Bureau. I use the SIPP longitudinal datasets for 1993-1995 and 1996-1998, and I present results for the pooled panel 1993-98, as well as for the sub-sample 1993-95. SIPP is a multi-panel longitudinal survey of adults, measuring their economic and demographic characteristics over a period of approximately three years. Persons selected into the SIPP sample continue to be interviewed once every four months over the three years of the panel. At the time of the interview they are asked questions relating to the previous four months. Thus the data are available monthly for each person in the panel. For instance, the 1993 SIPP panel consists of approximately 120,000 individuals who were interviewed in 1993, 1994 and 1995. I will look at a balanced panel of cross sectional units that have data available for all three years. Though the data are available at an individual level, it is possible to uniquely identify a family or a household, and construct family level variables. The data gives information about the state (though not the county) in which the individual is located at the time of the interview. Thus SIPP records movement of members in the sample and changes in the household composition.

The summary statistics in Table 1.1 reveal sample characteristics for the 1993-98 panel. SIPP interviews all individuals above 15 years of age in the sample household. The sample has a larger proportion of whites, while Blacks form only 13% of the sample. About 30% of the sample has attended college, while about 38% are married. About 59% of the overall sample (and 70% of the business owners) own a home, thus justifying the use of the homestead exemption as an important factor in the analysis. Over the entire period, about 1.5% of the sample started a business, while 1.9% ended one. Figure 3 profiles business owners in the sample. Controlling for sample shares of the relevant groups, a large fraction of business startups are by white males. College educated individuals and married men are more likely to start businesses, as are people younger than 50. The corresponding statistics for business closures (not shown) are the reverse of those for business startups; white, college educated, young and married males are less likely to close down their businesses.

As shown in Figure 1.2 and Table 1.2, there appears to be a large and positive correlation between business starts and closures across states in different years. In particular, even controlling for population size, states with high start up rates, such as California and Florida, also have high closure rates. Further, Figure 1.2 suggests a mild positive correlation between exemptions and startups (.0139), and exemptions and closures (.0036) (controlling for sample state size).

1.4 Regression Results[25]

1.4.1 Business Start Results

In this section, I present regression results for business starts, estimated with the random effects probit described in detail in the appendix. I define a dummy equal to one if the cross sectional unit did not own a business at the beginning of the year, but does own a business at some point during the current year. The sample is thus restricted to all individuals who did not own a business at the beginning of the year.[26] Table 1.3 presents results including the lagged dependent variable and the health insurance variables, but excluding the spatial variables. Table 1.4a presents results with the spatial variables for the pooled 1993-98 panel.[27] The sample size is 312,845 for the pooled panel.[28]

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[25] The state units are as defined in Table 2.

[26] To define the state level variables relevant for a particular individual, we use the state in which the individual resided at the beginning of the year. The dependent variable is 1 if the individual started a business in that same state during the year, and 0 otherwise. We have estimated the model coding the dependent variable as 1 even if the individual moved to a different state and started a business there in that same year. Results were similar.

[27] The estimated variances for the 1996-98 panel were larger than for 1993-95, hence pooling imposes the arbitrary restriction of equal variances. That is why I report results for the 1993-95 panel separately as well, rather than just the pooled panel.

[28] Note that the 1993 panel covers the period October 1992-Dec 1995, so I have only three years of full data.

Estimation Technique

The estimation strategy involves the following steps. *Step 1*: Following the specification outlined in Appendix A.1, we pool data across the years 1993-95, but allow for different coefficients in 1995 when we have data on lagged business ownership available. Note that the effect of state-level conditions on entrepreneurship can be captured by putting in either *state-level variables* or *state dummy variables* for each year for the 40 state units defined in the sample. There are overall 40 state units. The state effects can therefore be completely accounted for by including 40 state dummies for each year. My model specifies 16 observable state variables, whose values vary over time. My null hypothesis is that these 16 state variables, plus an intercept whose value is allowed to be different for each of the three years, are sufficient to account for all the state effects. Thus in each year since there are 40 state units, that leaves 23 degrees of freedom. Hence, I specify the regression equation in *each year* with all the demographic variables, 16 state variables (own state and weighted neighbor state), a time intercept, and 23 state dummies, and test for the joint significance of the (23×3) state dummy variable coefficients.[29] Testing revealed the 69 state dummies to be insignificant. Thus the model is specified without the state dummies.

A further test of the model involved testing for equality of the coefficients on state-level variables in 1995 and 1993-1994. The chi square statistic was small, and I could not reject the null hypothesis that these coefficients are identical. Thus the model is specified

[29] The usual Hausman specification test did not work due to numerical problems. Also, inclusion of all state dummies in this specification would have lead to collinearity problems.

with time varying coefficients for the demographic variables, but time-invariant coefficients for the state-level variables for all three years.

Step 2: The procedure for model estimation and the treatment of state dummies was replicated for the 1996-98 panel. Testing revealed the state dummies to be jointly insignificant. I then tested for equality of the coefficients on state-level variables in 1998 and 1996-97, and concluded that they were insignificantly different from each other.

Step 3: Finally, I pooled across the two panels. The coefficients on state-level variables for 1996-98 were not significantly different from 1993-95. Hence the final model pools the six years and imposes time-invariant coefficients for state-level variables.

Results

I first estimate the model without the spatial variables, as shown in Table 1.3. The coefficient on exemptions is significant and positive at the 1% level, similar to Fan and White (2003) and Georgellis and Wall (2002). The predicted probability of starting a business is increasing in the exemption level.[30] I also get significant coefficients for the lagged dependent variable (positive and significant), as well as the health insurance variables. Since these results are similar in the model with spatial variables, I discuss these in greater detail in the following section.

[30] On average, an increase in the exemption limit by $50,000 increases the probability of a business start by 20%.

Results including the spatial variables are presented in Table 1.4a. The model performs well, in that it confirms previous findings on the demographic variables, and also produces significant estimates of the spatial variables. The explanatory variables include whether the individual is male, has attended college and is married, all of which have a positive and significant impact on business formation. I also include race and ethnicity effects, which confirm earlier results (Meyer, 1990) that Blacks and other ethnic minorities are less likely to start businesses. The positive linear and negative quadratic terms in age imply that the effect of age is inverted U-shaped. Younger individuals (less than 44 years) are more likely to start businesses. The effect of family wealth is positive and significant, suggesting that high wealth reduces credit constraints that the business owner may face (Holtz-Eakin et al, 1994, Evans and Jovanovic, 1989). Individuals who have high earnings from current jobs may be less likely to switch to starting a business (Evans and Leighton, 1989). At the same time, individuals with high incomes may have the financial means to start a business. This coefficient is significant and positive. Fan and White (2003) surprisingly do not find a statistically significant effect of earnings or wealth on entrepreneurship.

This paper finds two new interesting results on the role of health insurance in entrepreneurship. If a person is in a wage and salary occupation and receives employer insurance, he is less likely to move towards self-employment, whereas if the individual has self-purchased insurance, he is more likely to start a business. Holtz-Eakin et al (1996) did not find a statistically significant impact of health insurance variables on transitions to entrepreneurship, using SIPP 1984, 1986 and 1987 panels.[31] The marginal effects suggest that employer insurance reduces the probability of transition by 5%, whereas self-insurance increases the likelihood by nearly 1%.[32] If the person is unemployed, he is significantly less likely to start a business. I defined a dummy for whether the person was unemployed, and (in some specifications, as shown in Column 4) interacted that dummy with the average unemployment benefit for that state *and* a dummy for whether the state had a Self Employment Assistance (SEA) program. The coefficient on the interaction term is insignificant, but the coefficient on SEA is positive and significant at 15%, providing some evidence on the effectiveness of these programs in transitions to entrepreneurship out of unemployment. The above mentioned results are robust to different specifications.

Apart from the demographic variables, I control for the level of state per capita income (PCI), which serves as an indicator of demand conditions, and for the maximum marginal state income tax rate. The sign on the tax coefficient is positive, though insignificant, which is in accordance with Bruce (2000), who finds that high tax rates induce individuals towards self-employment due to the tax avoidance incentive. State income is positive in all specifications, indicating that better economic conditions induce transitions to entrepreneurship. I use state unemployment rates, state unionization rates and nonfarm employment as additional controls. In most specifications, the state unemployment rate

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[31] They controlled for other job characteristics, like whether the job offered dental insurance, pension etc, and whether the spouse had insurance. I control for income from job, and whether the person was self-insured. SIPP 1993 panel does not specifically ask whether the spouse had insurance.

[32] For the 1993-95 panel, the corresponding value for employer insurance is 7%, and for self-purchased insurance, 6%.

is positive, suggesting that a lack of job opportunities may push people towards entrepreneurship.

The main variables of interest are the bankruptcy exemptions in one's own state as well as in neighboring states. To study the effect of own state exemptions, I use the sum of the actual homestead and personal property exemption level, by setting a value of 250000 for the unlimited homestead exemption. This value is sufficiently high to not be binding. I now examine the spatial variables more closely.

I define the variable, AVGNBEX, as a weighted average of exemptions of all neighboring states. High average exemptions in neighboring states may have two opposing effects on entrepreneurship. First, if we look at Figure 1, there appears to be some clustering of states across different exemption ranges. So high average neighbor exemptions imply that the individual's own state is likely to be located in a "high exemption" region, and this has a positive effect on entrepreneurship. This effect could be captured by the own state exemptions as well. However, at the same time, the individual could presumably be better off moving to a neighboring state with *higher* exemptions than in own state, which lowers the probability that the entrepreneur will start a business in his own state. To capture the second effect clearly, I define a separate dummy variable, DUMAVEX, for whether the average exemption of the neighboring states is higher than one's own exemption.

In Column 1, I report results for the full set of state variables, using the pooled 1993-98 panel. The own state exemption is insignificant in this specification. DUMAVEX is significant and negative at 5%, suggesting that if the average neighbor exemption is higher than one's own, this significantly lowers entrepreneurship in one's own state. Interpreting the marginal effect, this reduces the probability of starting a business by about 1% (given the base probability of 1.51%), which is economically significant.[33] I also put in dummy variables, DUMAVPC and DUMAVTX, which equal one if the average neighbor PCI is higher, or tax rate is *lower*, respectively, than in one's own state. DUMAVTX and DUMAVPC are the right sign, but insignificant.

In column 1, I control for distance weighted averages of conditions in neighbor states. The distance between any two states is defined as the geographic distance between their respective capital cities.[34] The greater the distance between neighboring states, the lower will be the effect of high exemptions in that state on entrepreneurship in one's own state. Distance weighted AVGNBEX is insignificant. Other spatial variables included in the model are average neighbor per capita incomes, AVGNBPC, and average neighbor tax rates, AVGNBTX. AVGNBPC is negative and significant at 10%, indicating that high average incomes in neighboring states reduce entrepreneurship in one's own state. AVGNBTX is the right sign, but insignificant.

[33] Note that the total number of business starts in my sample is approximately 4600, out of the total sample of 312,000 (approx.). If the probability is reduced by 1%, this implies that there are roughly 50 less starts. Weighting these numbers by the total US population, this reduces business starts by approximately 50,000.

[34] I experimented with defining the distance between two states as distance between their largest cities, rather than the capital cities. Results do not change.

Results in Column 1 suggest that controlling for DUMAVEX reduces the significance of own state exemptions. In Column 2 I keep all the other variables in the model, but drop the own state exemption. The estimated marginal effect for DUMAVEX does not change and is negative, but the significance level improves to 1%. Estimates of other variables are similar to those in Column 1.

In column 3, I introduce the own state exemption variable, EXEMPTION, into the model, but remove AVGNBEX. DUMAVEX is still significant, but EXEMPTION is not. DUMAVEX reduces the probability of business formation in own state. Thus even controlling for own state exemptions does not reduce the significance of DUMAVEX. AVGNBPC is negative and significant as in Column 1. The last specification that we tried included the distance weighted AVGNBEX and the own state exemption. In this case, AVGNBEX is insignificant, while EXEMPTION is positive and marginally significant at 10%. This result is not shown here.

In Column 4, I present results using population weighted averages of neighbor conditions. Results are similar to those outlined in Column 1. Population weights capture the idea that individuals are more likely to move to more populous states (since in general these are also the states with more job opportunities, larger markets, etc). The signs on the demographic variables do not change. The coefficient on the exemption level is not significant, but DUMAVEX is negative and significant as before.

Summarizing the results on the effect of exemptions, it is interesting to note that when the spatial variables are included in the model of Table 1.3, the impact of own state exemptions is lowered. Thus it appears that while own state exemptions are important to entrepreneurs, they seem to also care about the *relative* exemption in their state vis-à-vis the neighboring states. This is plausible since as pointed out in the introduction, small firms are subject to high failure and closure rates, and risk averse entrepreneurs would make the optimal choice among competing locations.

A plausible conjecture in our model is that states are most likely to be affected by their closest neighbor. Thus the greater the distance between two states (their capital cities), the less significant should be the impact on each other. Thus, in other specifications not shown here, I defined a different grouping for states whose farthest contiguous neighbor is less than 200 miles, and one whose farthest contiguous neighbor is less than 300 miles. This also takes care of the problem of distinguishing between the really big states like California, where the impact of neighboring states may be expected to be less, and the small states like New Jersey that have very close neighbors. The marginal effects on the spatial variables are larger for the states with less distant neighbors.[35] Another way we tested for the effect of distance is by first defining a dummy for all states whose closest neighbor was less than 200 miles away, and interacting that dummy with the average neighbor exemption variable. The interaction term is significantly negative.

[35] The coefficient on DUMAVEX is -.003 for states with neighbors less than 300 miles away, while DUMAVEX is -.007 for neighbors less than 200 miles away.

Finally, I present results for the lagged dependent variable, LAGBSTRT. This is a dummy variable equal to 1 for those individuals who owned a business at some point in the previous two years. This coefficient is positive and significant, suggesting that people who have owned a business before are nearly 20% more likely to start a business today. This is consistent with the recent study of small business owners by Sullivan et al (1998) which finds that business owners who file for bankruptcy have a higher likelihood of starting new businesses within the next year. Note that this variable is not defined for the years 1993, 1994, 1996 and 1997, since lagged information is not available for these years.

In other specifications (not shown), I look at the effect of the *highest* exemption neighbor on the entrepreneurship decision. Coefficients are similar to those reported in Column 1 of Table 1.4a.

As another check, I pooled data using only the two years for which we have data on the lagged variable (1998 and 1995), to ensure that the results are not sensitive to the specification across different periods. For the latter specification, I do not use random effects since these are independent panels. Results (not shown) are similar to those described above.

1.4.2 Business Closure Results

Table 1.4b presents results for business closures. I define a business closure by use of a binary variable equal to 1 if the person owned a business at the beginning of year *t*, but did not own a business at some point during year *t*. Thus the sample only includes people who owned a business at the beginning of the year. As a result, the sample size for the years 1993-1998 is fairly small, comprising only 14,983 observations. The model specification is similar to that estimated for business starts.[36]

The probability of small business closures is significantly lower for males and for individuals who are married, and is significantly higher for Blacks and Mexicans. More educated individuals are less likely to close businesses, confirming the result in Kengasharju and Pekkala (2001). The coefficient on family wealth is positive and significant. One interpretation is that asset income provides entrepreneurs insurance as they look for other jobs, making it easier to shut down weak businesses. Individuals who own homes are significantly less likely to shut down, perhaps because the businesses are home based. Own income, which includes income from the business, is significantly negatively related to business closure, which is not surprising.

[36] Some variables that were part of the business start model are not included here for obvious reasons, such as whether the individual had employer provided insurance and whether he was unemployed. Some spatial variables like AVGNBPC and DUMAVPC are not included since it is not clear why business owners may shut down their business simply because surrounding states are high income states.

I use additional controls for state per capita income (PCI), state maximum marginal tax rates, state unemployment and state unionization rates. Surprisingly, state unionization rates significantly reduce the probability of business closures. This could be because firms are more reluctant to hire workers in these markets, so that entrepreneurs may have more difficulty transitioning towards wage and salary occupations. Or it may be tougher for firms to shut down if workers are unionized. Other interesting results include the impact of SEA programs on the probability of business closure. The effect is negative and moderately significant at 15%.

In the regression without the spatial variables (Column 2 in Table 1.3), the effect of own exemptions on small business closure is positive, but significant only at the 15% level. Our interpretation of this finding is that if individuals are in states with high exemptions, they find it easier to shut down due to the wealth insurance provided by these high exemptions. Including the spatial variables in the regression (Table 1.4b), makes the own state exemptions insignificant. I use distance weighted averages of neighbor conditions in Column 1. The sign on the spatial variable, DUMAVEX is significant and positive. DUMAVEX captures the idea that higher average exemptions in neighboring states increase the probability of business closure as businesses may decide to relocate to higher exemption states. AVGNBTX and AVGNBEX are not significantly related to closure.

In Column 2 of Table 1.4b, I drop own state exemption from the model. DUMAVEX is marginally significant and continues to be positive. AVGNBTX is negative, though not significant.[37]

Finally I include a lagged dependent variable, LAGBSCLOS, which is equal to 1 if the individual *did not own* a business in the previous two years. The positive sign on this variable indicates that people who did not own a business before are more likely to shut down.

I also estimated the model using multinomial logit. The choice set included the following: not shut down, shut down and not move, shut down and move. The marginal effects are most significant for those who shut down and move. In particular, DUMAVEX is positive and significant.

1.5 Specification tests

I estimated several alternative specifications of the above model. I divided the own state exemptions into five categories, as in Fan and White (2003), to allow for the possibility of a non-monotonic relationship between exemptions and entrepreneurship, as in

[37] In other specifications, I also introduced DUMAVPC into the model. It was insignificant, and did not affect other results. I also introduced DUMAVTX and it turned out positive and significant in some specifications. Lower taxes in neighbor states increase the probability of business closure, as entrepreneurs may decide to relocate to these states to take advantage of better conditions

Georgellis and Wall(2002).[38,39] I found no significant effect of own state exemption variables. The spatial variables remained significant and had the same signs. I also tried adding a quadratic term (along with the linear term) in the own exemption variable, and found that the quadratic was not significant.

I redefined the business ownership variable to include only those businesses whose owner spent more than 35 hours per week on his business. Further, I allowed for the exemption variable to have different effects depending on whether the business owner was a renter or a homeowner. The estimated coefficients on own state exemptions were larger for homeowners.

Another specification check was to define all the other 39 states as potential neighbors, instead of only looking at states that are contiguous. In this case, the population weighted average exemption variable was not significant, though the own state exemption was still significant and positive.

Also, as a final check, I imposed equality of all coefficients across the two panels, and estimated the model by introducing time-invariant state dummies into the pooled 1993-98 model. The results relating to the own state exemption variable and the average neighbor exemption did not change.

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[38] The categories are: States with unlimited exemptions, states with exemptions in the range 95000 to 200000, states with exemptions in the range 60000 to 95000 and states with exemptions in the range 20000 to 60000.

[39] They find that entrepreneurship falls at certain high exemption levels, which may be due to lower credit availability in states with high exemptions (Berkowitz and White, 2002).

The main conclusion that can be drawn from these results is that spatial variables are significant predictors of small business formation across states. States must recognize that businesses have the option to move outside the state to take advantage of better business conditions. Thus states must follow policies that are competitive with at least their immediate neighbors, since much migration happens between neighboring states. While some existing studies have looked at tax competition between competing jurisdictions, e.g Brueckner et al (1999), this is the first paper to study the effect of competing policies encouraging small business formation among US states.

1.6 Conclusion

This paper has provided empirical evidence on the effect of bankruptcy law on small business formation. The unique contribution of this paper is the addition of spatial terms measuring the effect of business conditions in surrounding states on the decision to set up or close a business in the current state. The results suggest that entrepreneurs choose the location of their businesses in response to competing business conditions, in and outside the state. The focus of this paper is on small businesses. Since these represent the majority of all businesses and contribute to high rates of both job creation and job destruction in most OECD economies, it is important to study the factors that determine their birth and closure, which this paper has attempted to do. While the focus of this paper is on small businesses in the US, the policy implications of this study apply more generally to all economies. In particular, in Europe, where bankruptcy laws and other business conditions are not as friendly towards small business, and also in developing economies, where the majority of individuals own small businesses, adopting appropriate policies towards bankruptcy may encourage the growth of these economies.

Appendix

1.A.1 Maximum Likelihood Estimation

In the model with a lagged dependent variable, the initial value of the dependent variable may be correlated with the random effects term. One solution for this is to specify a separate equation for the initial value of the dependent variable (Heckman, 1981). Our procedure is explained in detail below.

Consider the model

$$Y_{it}^{*} = x_{it}'\beta + \gamma Y_{it-1,2} + \varepsilon_{it} \qquad i = 1,..,N_t; t = 3,...,T \qquad (1)$$

$$Y_{it} = 1 \text{ if } Y_{it}^{*} > 0 \qquad (1a)$$

$$Y_{it} = 0 \text{ otherwise} \qquad (1b)$$

$$\varepsilon_{it} = \alpha_i + u_{it} \qquad (1c)$$

where x_{it} is an exogenous vector and where α_i and u_{it} are random elements. We assume that the processes $\{\alpha_i\}$ and $\{u_{it}\}$ are independent, α_i is *i.i.d.*$N(0, \sigma_{\alpha}^{2})$ and u_{it} is *i.i.d.* $N(0, \sigma_{u}^{2})$ over both *i* and *t*. In the model specified above, (1) is defined for *t=3,..,T*. The reason for including the lagged value $Y_{it-1,2}$, is to capture "state dependence". I allow the unit to have owned or not owned a business, in the previous two years. For *t=1,2* we assume that Y_{it}^{*} is generated by a similar process, except that there is no lagged dependent variable. Hence we allow the coefficients to be different for these years. This is similar to the formulation by Arulampalam (2000), although unlike that model, my model involves joint estimation based on $(Y_{i1},....,Y_{iT})$ so that the likelihood function includes the initial years. Therefore, when *t=1,2*, we assume

$$Y_{it}^{*} = x_{it}'\lambda + \varepsilon_{it} \qquad i=1,..,N_t \tag{2}$$

$$Y_{it} = 1 \text{ if } Y_{it}^{*} > 0 \tag{2a}$$

$$Y_{it} = 0 \text{ otherwise} \tag{2b}$$

$$\varepsilon_{it} = \alpha_i + u_{it} \tag{2c}$$

where x_{it} is exogenous, the processes $\{\alpha_i\}$ and $\{u_{it}\}$ are independent, and u_{it} is *i.i.d* $N(0, \sigma_u^2)$. Thus combining specifications, u_{it} is *i.i.d.*$N(0, \sigma_u^2)$ for $i=1,..,N_t$ and $t=1,..,T$.

Let $G_{i,(1,T)}(y_{i1},....,y_{iT} \mid \alpha_i)$ be the joint density of $(Y_{i1},....,Y_{iT})$ conditional on α_i, and the sequence $x_{i1},...,x_{iT}$. The dependence on the entire sequence of *x'*s is the reason for the subscript *(1,T)* in the joint density. Then recalling that u_{it} is *i.i.d*. over $t=1,..,T$ and using evident notation,

$$G_{i,(1,T)}(y_{i1},....,y_{iT} \mid \alpha_i) = g_{i1}(y_{i1} \mid \alpha_i) g_{i2}(y_{i2} \mid \alpha_i) g_{i3}(y_{i3} \mid y_{i1,2}, \alpha_i)....g_{iT}(y_{iT} \mid y_{iT-1,2}, \alpha_i) \tag{3}$$

$$= \prod_{t=3}^{T} g_{it}(y_{it} \mid y_{it-1,2}, \alpha_i) g_{i2}(y_{i2} \mid \alpha_i) g_{i1}(y_{i1} \mid \alpha_i) \tag{4}$$

Recalling that α_i is *i.i.d*., let $h(\alpha_i)$ be the density of α_i. Then the likelihood for the entire sample, which is not conditional on $\alpha_1,.....,\alpha_N$, is

$$L = \prod_{i=1}^{N_t} L_i \tag{5}$$

where

$$L_i(\beta,\lambda,\gamma,\sigma_\alpha,\sigma_u \mid y_{i2},.....,y_{iT},x_{it},....,x_{iT}) = \int_{-\infty}^{\infty}\prod_{t=3}^{T} g_{it}(y_{it} \mid y_{it-1,2},\alpha_i)g_{i2}(y_{i2} \mid \alpha_i)g_{i1}(y_{i1} \mid \alpha_i)h(\alpha_i)d\alpha_i \quad (6)$$

and where $y_{it} = 0,1$ for all $i = 1,..,N_t$ and $t = 1,...,T$.

Note that, $g_{it}(y_{it} \mid y_{it-1,2},\alpha_i)$, the density of Y_{it} conditional on $Y_{it-1,2}$ and α_{i}, can be expressed as follows,

$$g_{it}(y_{it} \mid y_{it-1,2},\alpha_i) = \Pr ob(\varepsilon_{it} > -x'_{it}\beta - \gamma y_{it-1,2})$$

for $y_{it} = 1; i = 1,..,N_t; t = 3,..,T$ (7)

and when *t=1,2*

$$g_{it}(y_{it} \mid \alpha_i) = \Pr ob(\varepsilon_{it} > -x'_{it}\lambda) \qquad \text{for } y_{it} = 1; i = 1,..,N_t \quad (8)$$

Similarly,

$$g_{it}(y_{it} \mid y_{it-1,2},\alpha_i) = \Pr ob(\varepsilon_{it} < -x'_{it}\beta - \gamma y_{it-1,2})$$

for $y_{it} = 0; t = 3,...,T; i = 1,...,N_t$ (9)

and, when *t=1,2*

$$g_{it}(y_{it} \mid \alpha_i) = \Pr ob(\varepsilon_{it} < -x'_{it}\lambda) \qquad \text{for } y_{it} = 0; i = 1,..,N_t \quad (10)$$

Now, note that $\varepsilon_{it} \mid \alpha_i \sim N(\alpha_i,\sigma_u^2)$ for all *t=1,..,T*. Therefore, the change of variable $z_{it} = \dfrac{\varepsilon_{it} - \alpha_i}{\sigma_u}$ in the probability expressions in (7)-(10) will yield probability statements based on the standard normal variable, z_{it}. For example, carrying out this substitution in (7) and (8) would yield the following,

$$g_{it}(y_{it} \mid y_{it-1,2}, \alpha_i) = \Pr ob(z_{it} > \frac{-x'_{it}\beta - \gamma y_{it-1,2} - \alpha_i}{\sigma_u}) \;;\; t=3,....,T \tag{11}$$

and, when $t=1,2$

$$g_{it}(y_{it} \mid \alpha_i) = \Pr ob(z_{it} > \frac{-x'_{it}\lambda - \alpha_i}{\sigma_u}) \tag{12}$$

Let F(.) denote the CDF of the standard normal variable. Then, using evident notation, (11) and (12), respectively can be expressed as follows. For $t=3,..,T$,

$$g_{it}(y_{it} \mid y_{it-1,2}, \alpha_i) = 1 - F(\frac{-x'_{it}\beta - \gamma y_{it-1,2} - \alpha_i}{\sigma_u}) \quad \text{for } y_{it} = 1; y_{it-1,2} = 0,1 \tag{13}$$

and, when $t=1,2$

$$g_{it}(y_{it} \mid \alpha_i) = 1 - F(\frac{-x'_{it}\lambda - \alpha_i}{\sigma_u}) \qquad \text{for } y_{it} = 1 \tag{14}$$

Similarly, (9) and (10), respectively can be expressed as follows. For $t=3,..,T$,

$$g_{it}(y_{it} \mid y_{it-1,2}, \alpha_i) = F(\frac{-x'_{it}\beta - \gamma y_{it-1,2} - \alpha_i}{\sigma_u}) \qquad \text{for } y_{it} = 0; y_{it-1,2} = 0,1 \tag{15}$$

and, when $t=1,2$

$$g_{it}(y_{it} \mid \alpha_i) = F(\frac{-x'_{it}\lambda - \alpha_i}{\sigma_u}) \qquad \text{for } y_{it} = 0 \tag{16}$$

Therefore, substituting the expressions for $g_{it}(y_{it} \mid y_{it-1,2}, \alpha_i)$ and $g_{it}(y_{it} \mid \alpha_i)$ given in (13)-(16), in the expression for the likelihood function in (16), and using evident notation,

$$L_i(\beta, \lambda, \gamma, \sigma_\alpha, \sigma_u \mid y_{i2}, .., y_{iT}, x_{i2}, .. x_{iT}) = \int_{-\infty}^{\infty} \prod_{t=1}^{T} [F(Up_{it}) - F(Low_{it})] \exp[-(\frac{\alpha_i^2}{2\sigma_\alpha^2})] \frac{1}{(2\pi)^{1/2}\sigma_\alpha} d\alpha_i$$

for all *i=1,…,N*$_t$ and *t=1,..,T* (17)

where, when *t=3,..,T*

$$\text{for } y_{it} = 1, [Low_{it} = (\frac{-x'_{it}\beta - \gamma y_{it-1,2} - \alpha_i}{\sigma_u} \mid y_{it-1,2}, \alpha_i) \text{ and } Up_{it} = \infty]; \quad y_{it-1,2} = 0,1$$

(18)

$$\text{for } y_{it} = 0, [Low_{it} = -\infty \text{ and } Up_{it} = (\frac{-x'_{it}\beta - \gamma y_{it-1,2} - \alpha_i}{\sigma_u} \mid y_{it-1,2}, \alpha_i)]; \quad y_{it-1,2} = 0,1$$

(19)

and, when *t=1,2*

$$\text{for } y_{it} = 1, [Low_{it} = (\frac{-x'_{it}\lambda - \alpha_i}{\sigma_u} \mid \alpha_i) \text{ and } Up_{it} = \infty] \quad (20)$$

$$\text{for } y_{it} = 0, [Low_{it} = -\infty \text{ and } Up_{it} = (\frac{-x'_{it}\lambda - \alpha_i}{\sigma_u} \mid \alpha_i)] \quad (21)$$

Finally, using the substitution $w_i = \alpha_i / 2^{1/2}\sigma_\alpha$ in (17),

$$L_i(\beta, \lambda, \gamma, \sigma_\alpha, \sigma_u \mid y_{i2}, .., y_{iT}, x_{i2}, .. x_{iT}) = \frac{1}{\pi^{1/2}} \int_{-\infty}^{\infty} \prod_{t=1}^{T} [F(Up_{it}) - F(Low_{it})] \exp(-w_i^2) dw_i$$

for all *i=1,…,N*$_t$ and *t=1,..,T* (22) where in place of α_i, we substitute $\alpha_i = w_i 2^{1/2} \sigma_\alpha$ in the expressions for Up_{it} and Low_{it} in (18)-(21). This function is amenable to Gauss-Hermite quadrature, and can be computed using standard software.

Table 1.1

Sample Summary Statistics for the SIPP 1993-1998 Panel

Variable	Mean	Std. dev
Males	.470	.499
Whites	.827	.377
Blacks	.128	.335
Mexican	.030	.171
Attended College	.306	.471
Married	.385	.486
Own house	.588	.492
Bankruptcy Exemptions		
(1)Homestead	68411.17	77215.65
(2)Property	10106.56	14832.59
State Income Tax Rate (percent)	5.06	3.09
State Per Capita Income	24398.36	3443.3
Number of business starts over whole panel		
Mean	.0151	.122
Total	5268	
Number of business closures over whole panel		
Mean	.0194	.285
Total	6083	
Correlation between exemptions and		
(1)starts	.0139	
(2)closures	.0036	
Change of state (movers)	.011	.107
Person **monthly** income	1257.58	1995.17
Family **property** income/month	140	492.76
Business Income /month	2300	4368

Type of business at beginning of sample in 1993:		
(1)Sole proprietorship	480	
(2) Partnership	96	
(3) Corporation	124	
Persons with insurance coverage at time of business start (1993)		
(1) Own	.345	.475
(2) Employer	.266	.442
Average union percentage	14.59	6.47
Average unemployment rate	5.69	1.47

Table 1.2

Business Starts And Closures Across U.S States

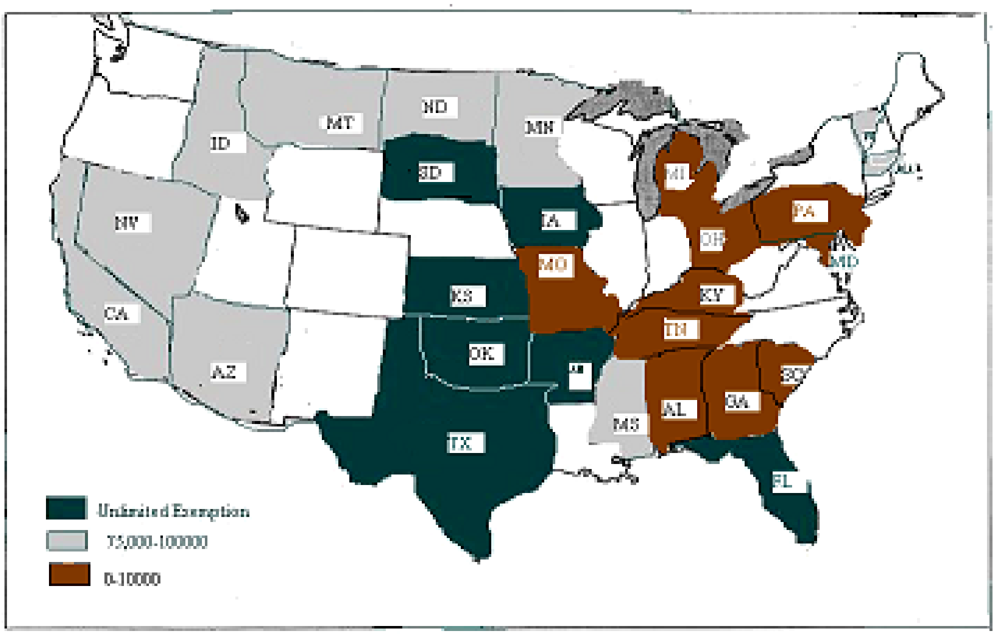
SIPP 1993-1998

States	1993-98 Starts	1993-98 Closures
Alabama	50	12
Arizona	98	111
Arkansas	40	61
California	649	800
Colorado	67	76
Connecticut, Rhode Island	84	81
Delaware	13	19
Florida	273	335
Georgia	110	164
Illinois	194	233
Indiana	114	47
Kansas	56	87
Kentucky	61	80
Louisiana	73	73
Maryland	67	102
Massachusetts	101	140
Michigan	161	170
Minnesota	132	144
Mississippi	46	65
Missouri	103	135
Nebraska	42	57
Nevada	21	32
New Jersey	153	160
New York	267	322
North Carolina	128	183
Ohio	192	221
Oklahoma	91	111
Oregon	93	109
Pennsylvania	161	214
South Carolina	58	23
Tennessee	84	95

Texas	390	441
Utah	47	46
Virginia	92	126
Washington	117	106
West Virginia	33	30
Wisconsin	81	100
Maine, Vermont, New Hampshire	64	79
Iowa, North Dakota, South Dakota	62	70
Alaska, Idaho, Montana Wyoming	27	37

Figure 1.1

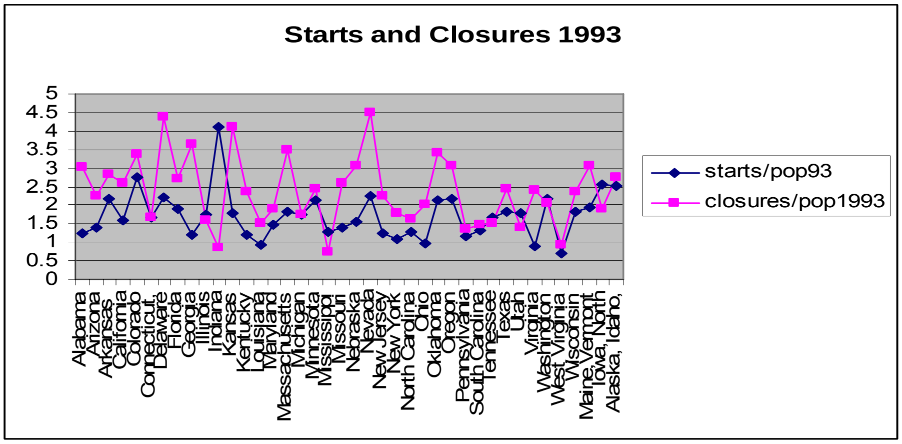
Homestead Exemptions 1996

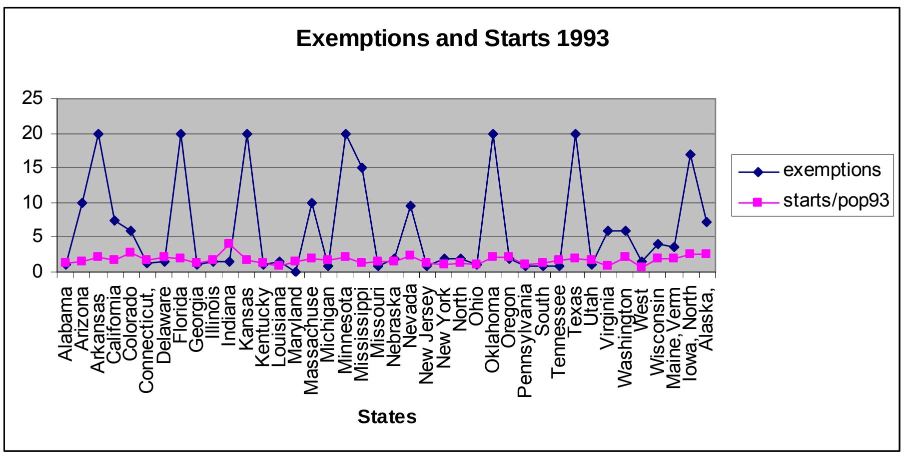


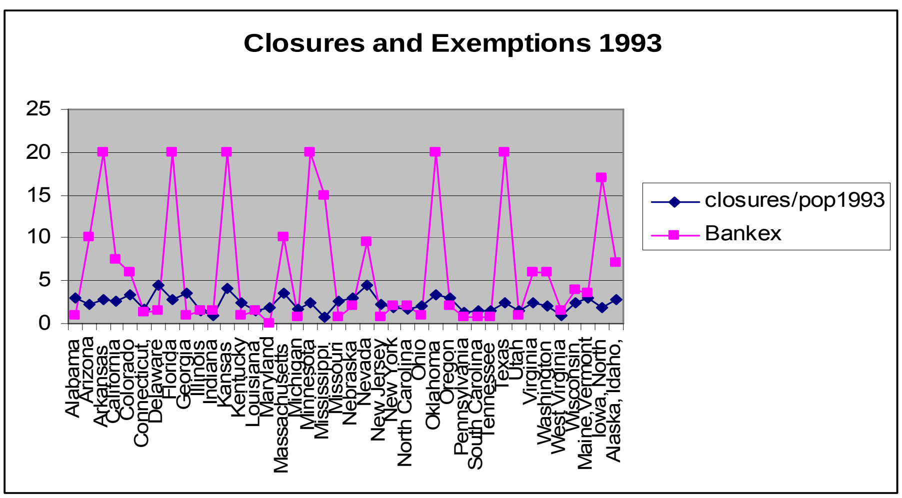
Correlation (state exemption, neighbor exemption) =.4761

Figure 1.2

Exemptions, Births and Closures[40]



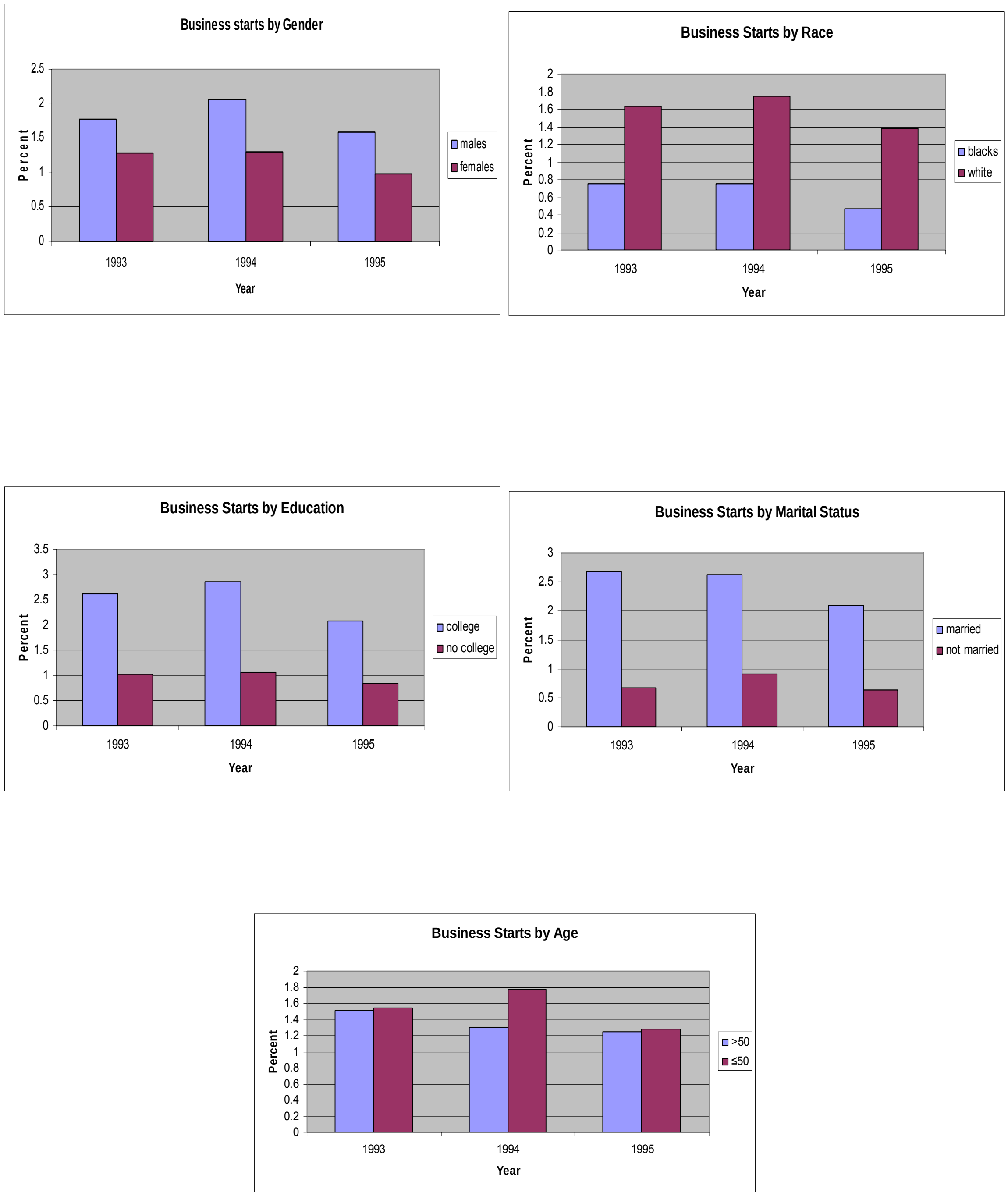




[40] Note: Business Starts and Closures are scaled by sample state populations and exemption variables have been rescaled to allow comparison. These graphs are representative of other sample years.

Figure 1.3

Profile of Business Owners: SIPP[41]



[41] All business starts are expressed as percentages of the relevant share of the group in the overall population. These charts are representative of other years in the sample.

Table 1.3: Regression Without Spatial Effects

Selected Coefficients: 1993-98

Dependent Variable	Business Start (1) Marginal Effect (p-value)	Business Closure (2) Marginal Effect (p-value)
Self-insurance	.0001 (.002)	.0075 (.487)
Employer insurance	-.0007 (.000)	
Exemption	8.89e-10 (.001)	1.22e-07 (.102)
Per Capita Income	6.40e-09 (.530)	-1.13e-07 (.962)
Tax Rate	7.91e-06 (.263)	.0014 (.497)
Lagged Variable	.0062 (.000)	.4360 (.000)
N	**312,845**	**14,983**

Note: All regressions are estimated with time dummies, all the demographic variables, and some state variables like the proportion of nonfarm employment, unemployment rate and unionization rate.

Table 1.4a: Random Effects Probit Regression: Marginal Effects

Dependent Variable: Business Start

Weights	**Distance**	**Distance**	**Distance**	**Population**
	(1)	**(2)**	**(3)**	**(4)**
Years	1993-98	1993-98	1993-98	1993-98
Male	.0006	.0006	.0006	.0006
	(.000)	(.000)	(.000)	(.000)
Black	-.0003	-.0003	-.0003	-.0003
	(.000)	(.000)	(.000)	(.000)
Mexican	-.0002	-.0002	-.0002	-.0002
	(.003)	(.003)	(.004)	(.005)
Family Wealth	1.47e-07	1.47e-07	1.48e-07	1.45e-07
	(.000)	(.000)	(.000)	(.000)
Person Income	1.71e-08	1.71e-08	1.71e-08	1.94e-08
from Job	(.006)	(.006)	(.007)	(.003)
College	.0002	.0002	.0002	.0002
	(.000)	(.000)	(.000)	(.000)
Unemployed	-.0004	-.0004	-.0004	-.0004
Dummy=1 if person	(.000)	(.000)	(.000)	(.000)
is unemployed				
Age	.0002	.0002	.0002	.0002
	(.000)	(.000)	(.000)	(.000)
Agesquare	-2.21e-06	-2.21e-06	-2.21e-06	-2.20e-06
	(.000)	(.000)	(.000)	(.000)
Married	.0002	.0002	.0002	.0002
	(.000)	(.000)	(.000)	(.000)
Own house	.00002	.00002	.00002	.0001
	(.565)	(.565)	(.562)	(.696)
Employer	-.0007	-.0007	-.0007	-.0007
Insurance	(.000)	(.000)	(.000)	(.000)
Self Insurance	.0001	.0001	.0001	.0001
	(.007)	(.007)	(.007)	(.005)
Unemployment	.00002	.00002	.00002	.00001
Rate	(.263)	(.269)	(.223)	(.454)
Unionization rate	-5.17e-06	-4.77e-06	-4.76e-06	-3.06e-06
	(.257)	(.236)	(.296)	(.490)

Table 1.4a (*continued*)				
Exemption	-8.58e-11		2.27e-10	7.39e-11
	(.849)		(.553)	(.850)
Average Neighbor Exemption	7.01e-10 (.193)	6.47e-10 (.158)		1.19e-08 (.185)
Dumavex	-.0001	-.00009	-.00008	-.00008
Dummy=1 if average Neighbor Exemption Higher	(.046)	(.009)	(.097)	(.088)
Tax Rate	.00001	.00001	.00001	8.27e-06
	(.283)	(.247)	(.207)	(.438)
Average Neighbor Tax	-3.01e-06 (.836)	-3.21e-06 (.824)	-1.75e-06 (.904)	1.19e-08 (.978)
Dumavtx	-.00005	-.00005	-.00004	-.00003
Dummy=1 if Average Neighbor Tax Lower	(.405)	(.395)	(.406)	(.551)
Per Capita Income	1.25e-08	1.15e-08	8.99e-09	2.76e-09
	(.420)	(.429)	(.556)	(.842)
Average Neighbor Per Capita Income	-2.42-08 (.085)	-2.29e-08 (.063)	-2.14e-08 (.122)	-1.38e-08 (.320)
Dumavpc	-.00005	-.00005	-.00006	-.00008
Dummy=1 for Average Neighbor Income higher	(.406)	(.387)	(.283)	(.175)
LAGBSTRT	.003	.003	.003	.003
	(.000)	(.000)	(.000)	(.000)
Unemployment benefit (avben)	.0006 (.242)	.0005 (.197)	.0003 (.509)	.0006 (.219)
SEA (*=1 if state had program)*	.0001 (.092)	.0001 (.077)	.0001 (.118)	.0001 (.090)
N	312,845	312,845	312,845	312,845

Note: All specifications use time dummies (and no constant term), and control for nonfarm employment. Separate coefficients for 1995 and 1998 not shown. p-values in parentheses.

Table 1.4b: Random Effects Probit Regression: Marginal Effects

Dependent Variable: Business Closure

Weights	**Distance**	**Distance**
	(1)	**(2)**
Years	**1993-98**	**1993-98**
Male	-.083	-.083
	(.000)	(.000)
Black	.0522	.052
	(.053)	(.053)
Mexican	.0510	.052
	(.235)	(.226)
Family Wealth	.00001	.00001
	(.039)	(.040)
Person Income	-4.55e-06	-4.54e-06
	(.001)	(.001)
College	-.004	-.004
	(.659)	(.651)
Age	-.027	-.027
	(.000)	(.000)
Agesquare	.0002	.0002
	(.000)	(.000)
Married	-.020	-.020
	(.098)	(.097)
Self Insurance	.006	-.006
	(.544)	(.545)
Own House	-.084	-.084
	(.000)	(.000)
Unemployment	.013	.015
Rate	(.035)	(.017)
Union	-.003	-.003
Percentage	(.015)	(.002)
Nonfarm	.005	.004
Employment	(.360)	(.390)

Table 1.4b (continued)		
Exemption	1.13e-07	
	(.379)	
Average Neighbor Exemption	-1.82e-07 (.276)	-8.82e-08 (.492)
Dumavex *Dummy=1 if Neighbor Exemption higher*	.024 (.100)	.016 (.158)
Tax Rate	.0016	.0008
	(.504)	(.705)
Average Neighbor Tax *(avgnbtx*)	-.004 (.286)	-.004 (.288)
Per Capita Income	4.42e-06 (.146)	5.03e-06 (.089)
LAGBSCLOS	.4360	.4365
	(.000)	(.000)
Unemployment Benefit *(avben)*	.101 (.567)	.189 (.192)
SEA *(=1 if state had program)*	-.032 (.108)	-.027 (.162)
N	14,983	14,983

Note: All regressions use time dummies (and no constant). Separate coefficients for 1995 and 1998 not shown. p-values in parentheses.

Chapter 2

Empirical Determinants of FDI: A Spatial Approach[42]

2.1 Introduction

How does a perceived lowering of corruption in China affect foreign direct investment flows into India? Does greater labor productivity in Thailand generate higher FDI flows for Malaysia and Indonesia as well, apart from Thailand itself? This paper is a first attempt to address these questions by empirically modeling determinants of FDI flows to emerging market economies, using a spatial approach. The paper uses data on FDI inflows to twenty-nine host countries such as India and China in South Asia, Brazil and Argentina in South America, and Indonesia, Philippines, Thailand, Malaysia in East Asia. We use panel data for the period 1980-2000 to study how a wide variety of factors relating to the competitive and economic environment in the host countries, affect these flows.

In the 1970s, FDI made up only 12% of all financial flows to developing countries. Between 1981 and 1984 there was a sharp fall in private lending, as international banks lost confidence in borrowing countries' financial stability following the debt crisis of 1982. Since the mid-1980s the growing integration of markets and financial institutions,

[42] This paper is co-authored with Kartikeya Singh, University of Maryland, College Park

increased economic liberalization, and rapid innovation in financial instruments and technologies, especially in terms of computing and telecommunications, have contributed to a near doubling of private flows. Most significant has been the steady progression of FDI to a 35% share in 1990-1996.

Among the low-income countries, China received an impressive 86% of the total FDI to low-income countries in 1995. Beginning with its liberalization in 1979, it received increasing FDI averaging US$2.5 billion per year between 1982 and 1991, thereafter accelerating by over 700% to US$ 37.5 billion in 1995. India recently emerged as the third largest recipient, after Nigeria. Incentives initiated in 1991 and subsequent `open door' policies have brought a cumulative FDI flow of US$ 2.9 billion during 1991-1995, compared with a total of US$ 1.0 billion during the previous two decades. Most of this flow is going into infrastructure, particularly power and telecommunications, and petroleum refining, petrochemicals and automobiles in the manufacturing sector.[43]

The study focuses on factors that may affect these flows, such as the size of the market, degree of openness, availability of skilled labor, cost of labor, and infrastructure. Included in these are measures that broadly determine or capture the ease of investing and starting a business in a country such as indices of corruption, employment protection and regulatory burden. The unique contribution of this paper is to include a weighted average of conditions in “neighbor countries” amongst factors that may explain FDI flows into a country, apart from own-country fundamentals. Alternative criteria such as geographical proximity and economic size are used to classify countries as “neighbors”. Thus, the

[43] Overseas Development Institute (1997)

paper studies whether there is competition between "neighbor countries" for FDI or whether instead there are complementarities between FDI flows to "neighbor countries".

Our results clearly document the following. First, corruption perception does play a big role in investors' decision of where to invest. Second, FDI inflows to developing economies are highly interdependent. This makes it important for policy makers to take these "neighborhood" effects into account when designing and identifying appropriate strategies for attracting FDI. One reason for the interdependence could be that some of these countries receive the bulk of their FDI from a common source. For example, on average, almost 60% of inward FDI to China, Malaysia and Thailand originates from no more than three sources. The US is one of the three biggest investors in both China and India, as well as the Latin American countries. Similarly, Malaysia and Indonesia share Japan as a key source of FDI. [44]

The paper is organized as follows. Section 2 reviews some of the existing literature on FDI flows to developing economies. Section 3 details the empirical model that we use for estimation. Section 4 discusses the data and some summary statistics. Section 5 presents the econometric results from various specifications. Section 6 concludes.

2.2 Literature Review

In this section, we detail the main empirical studies that attempt to estimate the importance of the different determinants of FDI flows. The main variables generally used

[44] Hansen et al (2003)

are locational or *pull* factors, such as the size of the market, the rate of GNP growth, economic stability, degree of openness of the economy, as well as several institutional variables, and *push* factors, relating to conditions in the source country.

Nonnenberg et al (2004) use a panel of 38 developing economies over the period 1975-2000. They find significant and positive effects for size of the economy (as measured by GNP), the average rate of growth in previous years, the level of schooling, and the degree of openness. Inflation and a country's risk rating had a significant and negative effect upon the inflow of FDI. Finally, they find that capital market growth in developed countries is a strong determinant of outflows of these investments. They do not, however, model any spatial interactions among these economies.

A paper that motivates our analysis is Hansen, Rand and Tarp (2003). This paper focuses on five East Asian economies-China, Malaysia, Indonesia, Thailand and Vietnam-and asks the question whether FDI to individual countries stimulates or crowds out investment to regional counterparts. They use a VAR framework, and find interesting and significant correlations among FDI flows to countries. For example, while China generally benefits from FDI flows to the region, Malaysia competes for FDI with the sampled countries. Countries like Thailand and Indonesia sometimes compete and sometimes complement FDI flows to the region. In conclusion, they find significant interdependence among these Asian countries.[45] This paper does not model economic and

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[45] As they say, on average almost 60% of inward FDI to China, Malaysia, Thailand and Vietnam originate from no more than three sources. In the case of Indonesia this share is 33%. Similarly, FDI is generally highly concentrated in only a few sectors. These patterns no doubt can help explain the above general findings about the interrelationship of FDI flows. For example, the strong negative co-movement between

political factors in developing economies as determinants of FDI inflows. In particular, it does not consider whether corruption perception or labor productivity in these countries significantly affect flows to the region.

In a recent working paper, Eichengreen and Tong (2005) use bilateral FDI flow data to study if the emergence of China as a destination for investment has diverted FDI receipts from other countries, Asian countries in particular. To do this, they include in the regression analysis for any particular host country, the share of China's receipts of FDI from the same *source* country. The aggregate analysis employing bilateral FDI flows from OECD sources to OECD and non-OECD destinations does not indicate FDI diversion from other Asian countries. If anything, there is some evidence that developments making China a more attractive destination for FDI also make other Asian countries more attractive destinations for FDI, as would be the case if China and these other economies are part of the same global production networks. Japanese firms appear to be among the leaders in attempting to exploit these complementarities. On the other hand there is some evidence of FDI diversion from OECD recipients. The difference with our paper is that we include a weighted average of (perceived) business conditions in "neighboring countries" as a determinant of FDI flows to a particular host country, whereas they include China's (share of) actual FDI flows to measure the crowding out effect. This enables us to highlight the relevant variables, such as corruption perception or labor productivity, that may be of interest to policy makers in host country

Malaysia and Indonesia is in all likelihood closely related to the fact that two out of the three most important FDI sectors are common and in addition they share Japan as a key source of FDI.

governments. Further, our study allows all developing economies to be potential competitors for FDI, not just China.

Shang Jin Wei (2000) studies the effect of corruption on foreign direct investment. The sample covers bilateral investment from twelve source countries to 45 host countries. There are two central findings. First, a rise in either the tax rate on multinational firms or the corruption level in a host country reduces inward foreign direct investment. In a benchmark estimation, an increase in the corruption level from that of Singapore to that of Mexico would have the same negative effect on inward FDI as raising the tax rate by fifty percentage points. Second, American investors are averse to corruption in host countries, but not necessarily more so than average OECD investors. Other papers, notably Wheeler and Mody (1992) and Hines (1995), have also studied the correlation between corruption and FDI. In a study of foreign investment of U.S. firms, Wheeler and Mody (1992) failed to find a significant correlation between the size of FDI and the host country's risk factor, a composite measure that includes perception of corruption as one of the components. Similarly, more recently, using total inward FDI (as opposed to bilateral FDI) Hines (1995) failed to find a negative correlation between total inward FDI and the corruption level in host countries. None of these papers has studied the effect of competing conditions in neighboring countries as a significant determinant of these flows.

2.3 Empirical Model

The objective of this section is to outline the model used to empirically test the effect of the aforementioned variables on foreign direct investment. The panel data methodology we use allows for variation in attributes relating to these countries both cross sectionally and over time. The panel consists of 29 countries (listed in Appendix), mainly emerging market or developing economies, over the time period 1980-2000.

The regression equation used to estimate the above model is as follows:

$$Y_{it} = \beta' x_{it} + \lambda' W_{it} Z_{it} + v_{it} \qquad i=1,.....,29;\ t=1,...,20$$

where

$$v_{it} = \alpha_i + u_{it} \qquad \alpha_i \sim N(0,1) \quad u_{it} \sim N(0, \sigma_u^2)$$

Y_{it} is the observed dependent variable, measured as the level of net inward FDI (in logs) received by country *i*, at time period *t*.

X_{it} is a vector of demographic characteristics of a country that influence the inward flow of FDI. The first important set of characteristics relate to the domestic market. The market size is measured by host country GDP or GDP growth. This emphasizes the importance of a large market for efficient utilization of resources and exploitation of economies of scale. A positive relationship is expected between GDP and inward flow of FDI. The relationship between the direction of the host country trade balance and FDI inflow could be complex. Trade surpluses are indicative of a strong economy and may encourage the flow of inward FDI. Trade deficits may also stimulate inward FDI as a result of export diversification and import substitution policies (Ioannatos, 2004). We also use another measure of openness, which is the level of imports as a fraction of GDP. The greater the degree of openness, the larger the expected FDI flows. Second, host country cost considerations would be a factor. To capture this effect, we can use either the unit cost of labor (hourly wages corrected by hourly productivity) or value added per worker. Labor productivity is expected to directly affect the ability of the host country to attract FDI. Third, we include factors affecting the country's overall financial performance such as the inflation rate or the host country government's budget deficit. High inflation would inhibit inward FDI. Other studies (Root and Ahmed, 1978) find that investment in services, such as banking or telecommunication also has a positive impact on FDI flows. We will use the spread of telephone lines to control for this effect.

Among social factors that may be important, we could use the literacy rate and the degree of urbanization. Both are expected to exert a direct impact on the flow of FDI into the host country.

Finally, we include political factors related to the degree of corruption in the host country, as widespread corruption imposes difficulties for the effective conduct of business. To this end, we use a Corruption Perception Index developed by Transparency International. A ten equals an entirely clean country while zero equals a country where business transactions are entirely dominated by kickbacks, extortion etc. The

Transparency International (TI) Corruption Index is an initiative taken by the Berlin-based international non-governmental organization, TI, together with Dr Johann Graf Lambsdorff, an economist with the University of Goettingen. The index is a "poll of polls", representing the average scores which individual countries have been given by international businessmen and financial journalists when polled in a variety of contexts. A ten equals an entirely *clean* country while zero equals a country where business transactions are entirely dominated by kickbacks, extortion etc. The data are available for the years 1980-1985, 1988-1992, 1995-2000.

We also include a Maximum Tax Rate Index and a Capital Controls Index which rank countries on the basis of their tax rates and policies relating to capital flows, respectively. Data on the Maximum Marginal Income Tax Rate Index and Capital Controls index was obtained from the Fraser Institute.[46] Higher ratings are for countries with *lower* taxes. The IMF reports on 13 different types of capital controls. This component is based on the number of capital controls levied. The zero-to-10 rating is constructed by taking 13 minus the number of capital controls divided by 13 and multiplied by 10. Hence low ratings are for countries with *most* capital controls.

W_{it} is a weighting matrix that assigns a positive weight to "neighbor countries". The definition of a neighbor country is quite broad in this context. First, all countries that are adjacent to the host country are considered neighbors, since the purely physical cost for an investor to move investment over to these countries is relatively low. At the same

[46] Gwartney, James and Robert Lawson (2004). *Economic Freedom of the World: 2004 Annual Report.* Vancouver: Data retrieved from www.freetheworld.com

time, in an economic sense, all countries are potential competitors for FDI, and therefore we're interested in the effect of competing business conditions in these countries on FDI flows to the host country. Thus in a broader sense, all countries are potential "neighbors", and we will include a weighted average of conditions in these countries as an additional regressor determining FDI flows to the host country. The weights that we use are economic weights; we weight each country by its' economic size, captured by its' GDP. Thus, an element of the weighting matrix,

$$w_{ijt} = \frac{GDP_{ijt}}{\sum_{k=1}^{N} GDP_{ikt}}$$ where k refers to all neighbors of country i.

We also allow for distance weights, where distance weights are defined correspondingly.

Finally, Z_{it} is a vector of business conditions in neighboring countries, including variables such as corruption perception indices or employment protection indices.

v_{it} is assumed to have an error component structure. We allow for a random effects specification that assumes a host-specific error term.

2.4 Data Description

Note that our measure of FDI Inflows includes net FDI Inflows, representing inward investment by foreigners less investment taken out of the country by foreigners. (For a list of countries used in the sample, see Appendix). Thus Indonesia has negative FDI Inflow between 1998 to 2000, as foreign investors took more money out than they brought in. As shown in Fig 2.1 and Table 2.1, over the period 1980-2000, FDI inflows went up for most countries in the sample. On average, the highest inflows went to South Asia. The average corruption perception for this region is not significantly different than for other regions. However, in terms of GDP growth rates and worker productivity the region stands out above others. This may explain the attractiveness of this region as a potential FDI destination, as investors take advantage of the rapidly increasing market size and the relatively cheap and productive workforce.

Studying the patterns of regional flows in Figure 1A, we find that in the 1980s and in the 1990s there was a high positive correlation between flows to South Asia, South America and East Asia. However, having said that, the correlations were far stronger for South Asia and East Asia (.67), than for South Asia and South America (.35) or even East Asia and South America (.55) in the 1980s. In the 1990s, perhaps due to the East Asian crisis, which did not affect South Asia too much, the correlation in flows was much larger between South Asia and South America (.83) than with East Asia.

Studying flows within regions in Fig 1B, countries in South Asia generally show a high positive correlation in FDI Inflows, though China stands out in terms of the magnitude of its' flows. However, in East Asia and South America countries seem to compete with each other for FDI flows in some years. For example, around 1999, while there was a big dip in flows to Singapore and Malaysia, there was an increase in flows to Philippines and Thailand. Similarly, around 1995, when Malaysia and Indonesia experienced a drop in flows, Singapore actually experienced an increase. In South America, Brazil experienced a sudden increase in FDI flows in 1998 at the cost of Mexico and Argentina.

2.5 Econometric Results

The panel is composed of 29 countries, which include emerging market and developing economies, over the period 1980-2000. The sample size is further constrained by the lack of data availability. In particular, values of the Corruption Perception Index are not available for some years.[47] Thus we drop those years from the sample. The dependent variable in the first set of results, reported in Table 2.2, is total FDI Inflows (in logs) to a particular host country, following the specification used by other authors.

Table 2.2 starts with the simplest specification of the equation determining FDI inflows. A random effects GLS regression of Log (FDI Inflows) on various economic and political characteristics of the host country, suggests that the host country market size and GDP growth rate, productivity of labor and the level of trade (as a fraction of GDP), are significant determinants of the ability of the host country to attract FDI.[48,49] Note that the trade variable in this study includes the sum of exports and imports, unlike other

[47] See appendix for years for which the CPI is available.

[48] I did a Granger causality test of FDI Flows and GDP as described in Nonnenberg (2004). Results indicate that while FDI is granger-caused by GDP, GDP is not significantly influenced by FDI Flows.

[49] We can easily include only log(GDP) or log (GDPGrowth) instead of both in the regression, without affecting the results.

studies, where authors include the trade balance, as a measure of openness. The coefficient on this variable is significantly positive as found by other authors. This result holds even when we use imports as a fraction of GDP, another measure commonly used in the literature. In other results not shown, I include host country adult literacy rates as an additional explanatory variable. The coefficient is positive and highly significant.

In the simplest specification, since the sample size is fairly limited, we do not put in too many additional variables. The only variable capturing the level of infrastructure in the country is the spread of telephone lines. The coefficient on this is positive, though not significant. In some specifications, we proxied for infrastructure using another additional variable, GROSSINV, which relates to the level of fixed investment in the country. The coefficient was positive and significant.

One of the main variables of interest is the Corruption Perception Index (CP). Again, the higher the index, the less corrupt the country is perceived to be by international investors. The coefficient is large, positive and significant. Thus perceived corruption in a host country is likely to significantly discourage investment.

In a second specification, we include an unweighted average of the CPI in the neighbor countries, where neighbor includes all of the other 28 countries. This variable, AVGCPI, captures the effect of competing conditions in other emerging market economies, on the host country's attractiveness as an FDI destination. For now, we allow competition along only one dimension, which is the extent of perceived corruption in the host country versus it's neighboring countries. The coefficient on this variable is negative but not significant, suggesting that investors may be less likely to invest in the host country, if the host country is perceived to be more corrupt than it's economic neighbors. In an extension to this paper, we will allow countries to compete along more than one dimension, such as in the degree of labor market rigidity or employment protection, or the extent of red tapism etc. The signs on the other variables do not change.

In specification 3, we now weighted the AVGCP in neighboring countries using those countries' GDP. This would weight each country by it's economic strength, rather than assigning each country an equal weight. It is of interest to note that this spatial variable is significant in the regression. The variable, GDPWTAVGCP, is negative and significant, while CP continues to be positive, but not significant. This implies that when corruption is perceived to go down in other competing economies, this adversely affects FDI flows to any particular host country. This is the first study that has explored the effect of spatial variables, in the FDI regression. [50]

Specification 4 includes some new variables into the previous regression to check for robustness of the sign on CP and GDPWTCP. The sign and significance of the relevant variables does not change. The new variables capture macroeconomic and investment climate conditions, such as the maximum tax rate that investors face, and capital controls that countries may have imposed on flows of FDI. The Maximum Tax rate and Capital Control variables take on the theoretically expected sign and are significant. Note that

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[50] Including both GDPWTCP and AVGCP in the same regression did not lower the significance of GDPWTCP.

both these variables represent rankings of countries along these indices. Thus, a country with a higher ranking, has a lower maximum tax rate, and is an attractive FDI destination. Similarly, a country with a higher ranking for capital controls, actually has a lower number of these controls, and thus is expected to receive higher inflows.

In the final specification in Table 2.2, we assigned a positive weight only to those neighbor countries that are part of the same region. For example, if we're studying FDI flows to any country in South Asia, then only the other countries in South Asia would be assigned a positive weight. The weights assigned to all other countries would be zero. The weighting scheme that I use here is distance weights. Hence countries that are geographically closer are assigned a higher weight, than countries that are distant. The distance here refers to the great circle distance between capital cities. Results indicate a large negative and significant effect of the closest neighbors' CPI on FDI inflows to the host country.

In other specifications shown in Table 2.3, we tried the following experiment. We included in the regression for (log) FDI Inflows the host country's own CP, CP for the region of which it is a part, and average Corruption Perception for all other regions in the sample. Interestingly, we got highly significant results for all the relevant variables. Own CP continued to be positive and significant, own region CP was negative and highly significant, and other region Corruption Perception was also negative and significant at the 10% level. Thus there appears to be a lot of interdependence in flows, not only within regions, but across regions. To explore this further, we split the sample into different regions, so as to ask the following question: What is the effect of corruption perception in, for example, South Asia as a region, for any particular host country within South Asia? Further, what is the effect of CP in South America on any country within South Asia? To allow for this, we included the average CP for the South Asia region as an explanatory variable, in a sample restricted to the South Asian region. We also included South American CP as another additional explanatory variable in the regression for South Asia. Note that while in principle we could include the average CP in all the different regions in the sample, we include these additional variables one at a time due to the limited sample size. Indeed, results were more interesting when we did it this way. Naturally, for any particular country, the average CP in the South Asia region, includes the CP of all it's South Asian neighbors, *excluding itself*, since by definition, no country is a neighbor to itself. The coefficient is negative and significant, thus there is a negative region effect. Countries such as India and China in South Asia are possibly competing with each other for FDI. However, including the average CP for other regions as well, such as South America, highlights another interesting result. From these latter results, it appears that South Asia competes "corruption-wise" with the African countries, South America and countries in the Middle East. However, lower corruption in East Asia does not significantly affect flows to South Asia.[51]Results for other sample regions are in some cases different. For example, South America exhibits a positive region effect. Lower perceived corruption in South America increases flows to the region in general. However, the region competes "corruption-wise" with other regions, especially African countries.

[51] Not all results shown

Finally in Table 2.4, we isolate the effect of China's CP on all regions. In recent times, China has emerged as a growing destination for FDI, and it is perceived to be drawing FDI away from other countries. Our results indicate that this is indeed the case. Including China's CP in any region's regression equation, (except East Asia, where it is insignificant), turns up the coefficient as significantly negative. Thus a lowering of perceived corruption in China does make China a more attractive FDI destination, drawing away investments from other areas.

Table 2.5 presents a different specification for the results mentioned above, allowing us to use the entire sample more efficiently. Results are similar to those described above.

This paper also tries to study if conditions relating to labor productivity in emerging market and developing economies are associated with competition in FDI inflows. The ideal measure that we would like to use would be a composite measure of cost of hiring labor, including the ease of hiring and firing workers, and worker output. We proxy for this by using the above defined measure of labor productivity, value added per person. The most interesting results for this case are associated with the South Asian region. Table 2.6 presents two specifications of this model. In (1), we use the entire sample, and include as additional explanatory variables, the labor productivity in the host country's region, as well as average labor productivity in all other regions. The coefficients associated with these are significant, and perhaps surprisingly, positive. In general, an increase in worker productivity, is increasing FDI flows to developing market economies. However, turning specifically to the South Asian region, we find that countries in this region compete with each other for FDI flows along this dimension, though they benefit in general from an increase in worker productivity in other regions. The coefficient on "own region" labor productivity is negative and significant, while on "other region" productivity is positive and significant. We tried substituting the East Asian and the South American region in place of "other region" and the results in both cases were positive and significant.

Conducting a similar exercise for other regions did not yield the same results. In general, it appears to be true that developing economies benefit from increased worker productivity not only in their own region, but in other regions as well.

The results mentioned so far are substantive, and robust to the inclusion of region dummies and various additional variables, such as inflation rates, budget deficits, literacy rates etc. The results that we present now are merely provided to encourage further study and data collection to answer questions that we posed at the beginning of the paper, such as, how does a perceived lowering of corruption in China affect India? Since the number of observations is small (only 16), we do not believe that the results are robust, and we do not provide them for any serious analysis. However, it is interesting to note that even with the very small sample size, some interesting findings that corroborate our earlier results emerge. We find that India loses out significantly when China gains along the corruption perception index. The coefficient on China CPI is negative and significant, while India's own CPI is positive and significant. The adjusted- R^2 is .8552 and the F-statistic indicates that the R^2 is significant. Surprisingly, doing a similar regression for

China yields the interesting result that a lessening of corruption in India, Malaysia or Thailand positively affects FDI flows to China. This is in line with results obtained by Hansen et al (2003), who find that China benefits greatly from investment flows to the region in general. Malaysia appears to be competing with countries like Thailand and Philippines, since a lowering of corruption in these countries appears to reduce FDI flows to it. Moving our focus to the South American region, Brazil competes for FDI with Argentina and Venezuela. However, in general, there is again a positive region effect, probably driven by other countries like Paraguay and Ecuador, who benefit from flows to the region.

We also studied whether countries compete with each other along the index of labor productivity. For India and China, the effect of an increase in the other's labor productivity is positive but not significant. An improvement in Malaysia's productivity, however, significantly lowers flows to Indonesia. The effect of high labor productivity in Argentina is positive and significant on Brazil.

While these latter set of results are extremely interesting, as we said before, they are hampered by the small sample sizes. This is an area of further study which we intend to explore using a larger panel, or using bilateral FDI flows.

2.6 Conclusion

Economic policies in developing countries have become increasingly focused on attracting FDI inflows. Interestingly, the academic literature has not clearly addressed the issue of whether developing countries are in reality competing or complementing each other in this effort.

In our attempt at studying this topic, we focus on the effect of perceived corruption in developing economies on their ability to attract FDI inflows. We find quite convincingly that corruption perception does play a big role in investors' decision of where to invest. The more corrupt a country is perceived to be, the less the flows of FDI to that country. An interesting new result that this study establishes is that corruption perception in other developing countries also affects flows to a particular host country. In general, treating all countries other than the host country as potential neighbors, a lowering of average corruption perception in the neighbor countries adversely affects flows to the host country. Focusing more deeply on the relationships between individual countries within regions, we find, in particular, that countries within South Asia compete with each other for FDI, and also compete with most other regions, except East Asia. Countries in South America however benefit generally from flows to the region.

To study the specific impact of the rise of China as an attractive FDI destination on other regions, we included China's CPI as an additional explanatory variable for flows to different regions. Interestingly, in most cases, China does have a large negative impact on FDI flows to other countries.

We also made a preliminary attempt in this paper to study bilateral relationships between countries, though admittedly the sample size is too small to allow for any serious analysis. We found that less corruption in China significantly lowers investment in India. However, in general, China benefits greatly from investment flows to the region. Similarly, Malaysia competes for FDI with both Thailand and Philippines, while flows to countries like Paraguay and Ecuador complement flows to other countries in the region. We also derived similar results allowing the effect of neighbor's labor productivity to affect FDI flows to a host country. Thus within each region, there is complementarity in flows as well as competition.

In sum, our results clearly document that FDI inflows are highly interdependent. This makes it important for policy makers to take these effects into account when designing and identifying appropriate strategies for attracting FDI. While this paper has not explained why these relationships may exist or why some bilateral relationships may be stronger than others, it is worth noting that some of these countries receive the bulk of their FDI from a common source. For example, on average, almost 60% of inward FDI to China, Malaysia and Thailand originates from no more than three sources. The US is one of the three biggest investors in both China and India, as well as the Latin American countries. Similarly, Malaysia and Indonesia share Japan as a key source of FDI.

Based on these results, we suggest the possibility that developing economies could increase their inward FDI dramatically, if they could improve the business climate for investors, not just in absolute, but in relative terms.

Appendix

2.A.1 Data Sources and Definitions

FDI Inflows: Millions of Dollars

Source: UNCTAD

Availability: 1980-2003

Other variables: International Financial Statistics, IMF

VALADDPP: Value Added Per Person Employed (1980=100)

TRADEGDP: (Imports+Exports)/GDP

Corruption Perception Index:

The Transparency International (TI) Corruption Index is an initiative taken by the Berlin-based international non-governmental organization, TI, together with Dr Johann Graf Lambsdorff, an economist with the University of Goettingen. The index is a "poll of polls", representing the average scores which individual countries have been given by international businessmen and financial journalists when polled in a variety of contexts. A ten equals an entirely *clean* country while zero equals a country where business transactions are entirely dominated by kickbacks, extortion etc. The data are available for the years 1980-1985, 1988-1992, 1995-2000.

Gwartney, James and Robert Lawson (2004). *Economic Freedom of the World: 2004 Annual Report.* Vancouver: The Fraser Institute. Data retrieved from www.freetheworld.com. Obtained data on Maximum Marginal Income Tax rate, Capital Controls. Higher ratings are for countries with *lower* taxes. The IMF reports on 13 different types of capital controls. This component is based on the number of capital controls levied. The zero-to-10 rating is constructed by taking 13 minus the number of capital controls divided by 13 and multiplied by 10. Hence low ratings are for countries with *most* capital controls.

Appendix 2.A.2

List of Countries Used in Sample By Region (Own Classification)

South Asia

- India, China, Hong Kong, Pakistan

East Asia

- Indonesia, Philippines, Thailand, South Korea, Singapore, Malaysia

Africa

- Egypt, South Africa, Morocco, Nigeria , Senegal, Angola

South America

- Peru, Brazil, Argentina, Mexico, Paraguay, Bolivia, Uruguay, Venezuela, Ecuador

Mid-East

- Qatar, Lebanon, Turkey, Poland (also included here)

Appendix 2.A.3

Variation in Corruption Perception Index Across Countries

Variation in Corruption Perception Index Across Countries	China	India	Indonesia	Argentina	Singapore
1980-85	5.13	3.67	0.2	4.94	8.41
1988-1992	4.73	2.89	0.57	5.91	9.16
1995	2.16	2.78	1.94	5.24	9.26
1996	2.43	2.63	2.65	3.41	8.8
1997	2.88	2.75	2.72	2.81	8.66
1998	3.5	2.9	2	3	9.1
1999	3.4	2.9	1.7	3	9.1
2000	3.1	2.8	1.7	3.5	9.1

Note: Higher Scores represent *less* Corruption

Figure 2.1: Regional FDI Inflows

Fig 2.1A: Across Region Flows

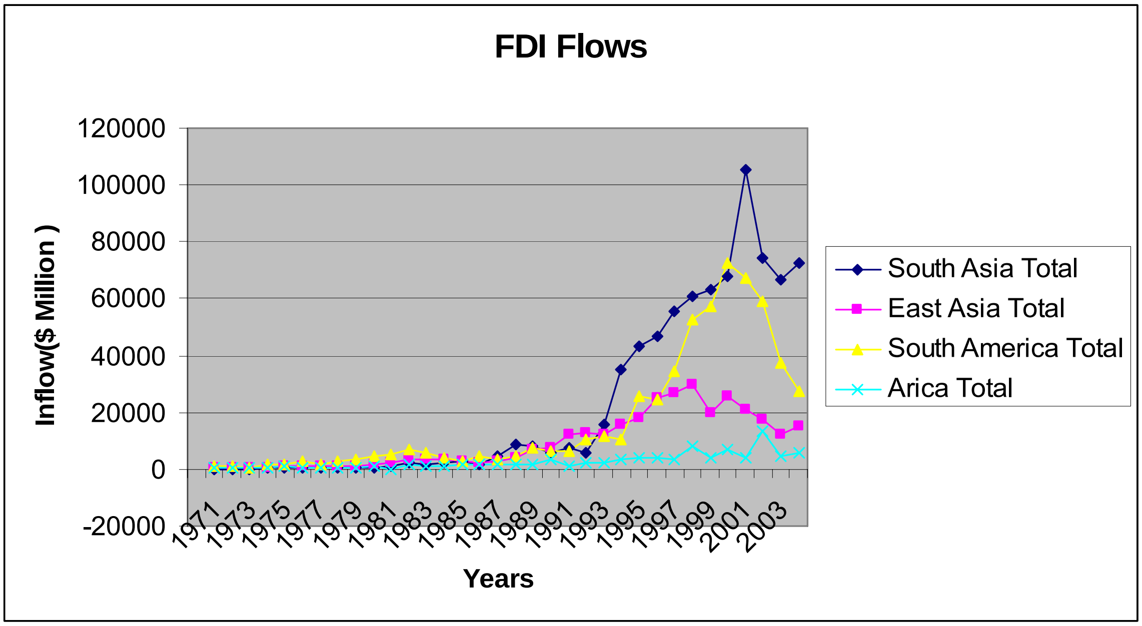
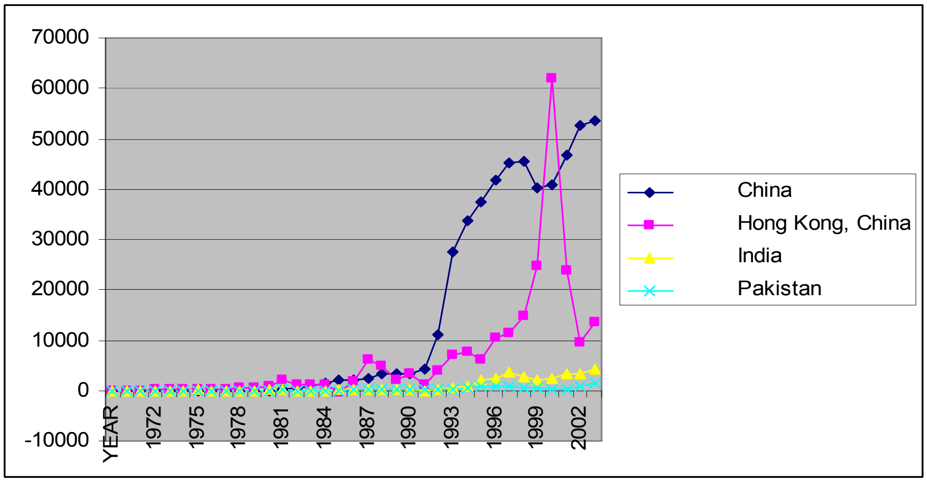
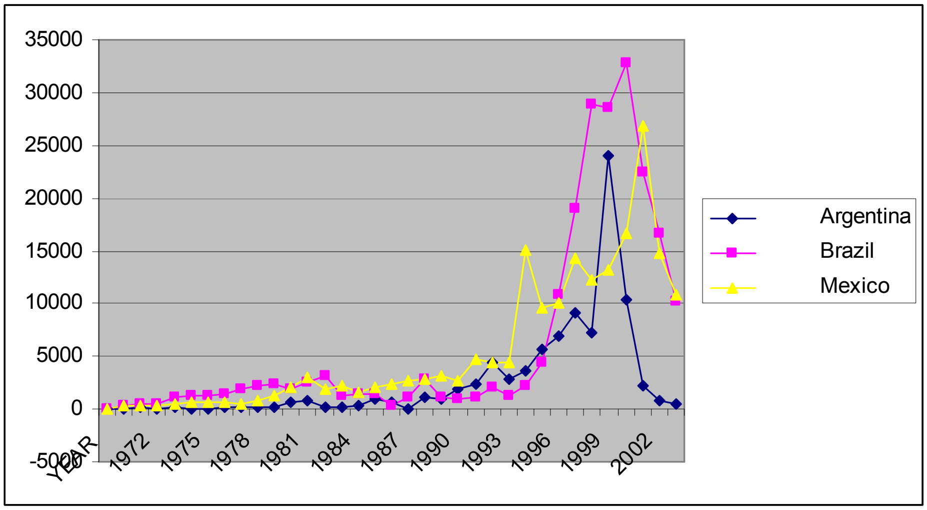


Fig 2.1B: Within Region Flows





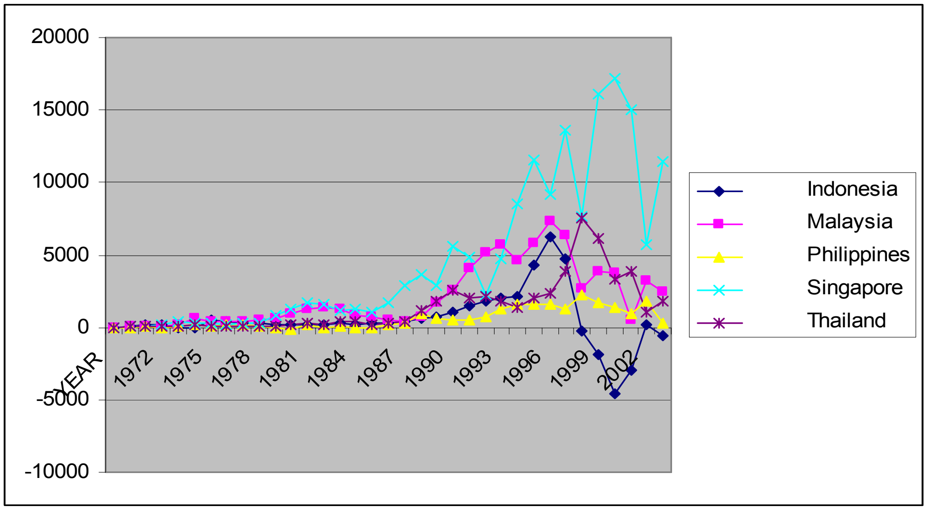


Table 2.1

Sample Summary Statistics

	No. of Observations	Mean	Std. Dev
FDI Inflow ($ million)			
South Asia	136	5608.55	12848.75
East Asia	170	1844.67	3128.64
South America	272	1766.26	4675.74
Africa	204	437.73	745.62
CP			
South Asia	67	3.78	1.89
East Asia	97	3.87	2.81
South America	110	2.96	1.13
Africa	69	3.13	2.25
GDP Growth			
South Asia	83	6.61	3.37
East Asia	103	5.68	4.64
South America	166	2.18	4.53
Africa	124	2.81	4.98
Value Added Per Person			
South Asia	79	147.63	34.14
East Asia	100	129.44	41.63
South America	80	89.02	9.17
Trade/GDP			
South Asia	83	80.53	94.20
East Asia	100	134.80	116.20
South America	166	42.67	15.57
Africa	115	60.24	19.58

Table 2.2
Regression Results:
Random Effects GLS

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	Log (FDI Inflow)	Log (FDI Inflow)	Log (FDI Inflow)	Log (FDI Inflow)	Log (FDI Inflow)
Independent variables					
Log(GDP Growth)	.286*** (.102)	.278*** (.102)	.270*** (.100)	.227*** (.090)	.280*** (.118)
Log (GDP)	1.52*** (.200)	1.60*** (.208)	1.84*** (.226)	1.41*** (.228)	1.21*** (.238)
Value Added Per Person	.005 (.003)	.004 (.003)	.001 (.004)	.001 (.003)	.009*** (.004)
Trade/GDP	.007*** (.002)	.007*** (.002)	.007*** (.002)	.003 (.002)	7.02e+08 (5.38e+08)
Low Tax Rate				.084** (.041)	
Fewer Cap. Controls				.173*** (.044)	
Telephone lines	.013 (.228)	.012 (.028)	-.002 (.029)	-.037 (.027)	-.018 (.017)
CP	.134* (.081)	.127 (.082)	.109 (.082)	.046 (.077)	.227** (.089)
AVGCP		-.140 (.291)			
GDPWTCP			-.155* (.086)	-.124* (.080)	
DISTWTCP					-.356*** (.116)
Region Dummies	Yes	Yes	Yes	No	Yes
No. Of Observations	185	159	159	154	124
Overall R-square	.5211	.4804	.4043	.4541	.4742

***significant at 1%, **significant at 5%,*significant at 10%

Note: Specification 5 assigns a positive (distance) weight only to neighbor countries within the same region as the host country.

Table 2.3

Interdependence in Flows

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Log(FDI Inflow)	Log(FDI Inflow)	Log(FDI Inflow)	Log (FDI Flow)	Log(FDI Inflow)	Log(FDI Inflow)
Sample	All Regions	South Asia	South Asia	South America	South America	East Asia
Independent variables						
Log(GDP Growth)	.290** (.118)	.757*** (.186)	.702*** (.183)	.167 (.158)	.210 (.171)	.340** (.143)
Log(GDP)	.741*** (.115)	-.053 (.185)	.016 (.171)	.850*** (.189)	.996 (.198)	1.53*** (.209)
Value Added Per Person	.013*** (.003)	.045*** (.007)	.048*** (.007)	.007 (.039)	.002 (.042)	.002 (.003)
Trade/GDP	.005*** (.001)	-.003 (.004)	-.001 (.004)	.004 (.015)	.019 (.015)	.0008 (.001)
Telephone Lines	.029 (.035)	-.209 (.081)	-.246*** (.081)	-.017 (.069)	.071 (.057)	.002 (.040)
CP	.131* (.068)	.599*** (.144)	.624*** (.143)	-.015 (.198)	-.169 (.198)	.499*** (.087)
Own Region Average CP	-.375*** (.119)			1.23*** (.479)		-.391 (.351)
Other Region Average CP	-.388* (.234)			-1.96*** (.745)		-.048 (.271)
South Asia CP		-.413** (.204)	-.205 (.168)			
South America CP		-1.09*** (.377)			1.25* (.675)	
Africa CP			-.615*** (.191)		-.660* (.405)	
Region Dummies	Yes	-	-		-	
No. of Observations	151	57	57	30	30	64
Overall R-square	.7013	.8660	.8705	.8441	.8532	.8320

***significant at 1%, **significant at 5%,*significant at 10%

Table 2.4

Impact of China CP on FDI Flows

	(1)	(2)	(3)	(4)
Dependent Variable	Log(FDI Inflow)	Log(FDI Inflow)	Log(FDI Inflow)	Log (FDI Flow)
Sample	All Regions	South Asia	South America	East Asia
Independent variables				
Log(GDP Growth)	.248** (.101)	.476** (.179)	.237 (.167)	.335** (.141)
Log(GDP)	1.25*** (.203)	.306*** (.154)	.827*** (.208)	1.47*** (.237)
Value Added Per Person	.002 (.003)	.024*** (.008)	.004 (.041)	.002 (.003)
Trade/GDP	.007*** (.002)	.016*** (.005)	.001 (.018)	.0007 (.001)
Telephone Lines	-.001 (.035)	-.289 (.007)	-.002 (.078)	.003 (.039)
CP	.120 (.088)	.010 (.179)	-.115 (.199)	.439*** (.154)
Own Region Average CP	-.326*** (.086)	-.165 (.152)	.787 (.420)	-.634 (.621)
China CP	-.204*** (.093)	-.393*** (.089)	-.435** (.218)	-.136 (.270)
No. of Observations	151	55	30	64
Overall R-square	.4540	.8905	.8255	.8327

***significant at 1%, **significant at 5%,*significant at 10%

Table 2.5
Interdependence in Flows: Alternative Specification

	(1)	(2)
Dependent Variable	Log(FDI Inflow)	Log(FDI Inflow)
Sample	All Regions	All Regions; Other Region=China
Independent variables		
Log(GDP Growth)	.208*** (.070)	.257*** (.071)
Log(GDP)	1.26*** (.110)	1.15*** (.110)
Trade/GDP	.006*** (.001)	.008*** (.001)
Telephone Lines	-.009 (.027)	.004 (.024)
CP	.037 (.062)	-.044 (.062)
S.Asia*Own Reg CP	-.692*** (.088)	-.547*** (.108)
S.Am*Own Reg CP	1.15*** (.193)	.691*** (.153)
E.Asia*Own Reg CP	-.346** (.161)	-.116 (.117)
Africa*Own Reg CP	.339 (.219)	.184 (.187)
S.Asia*Oth Reg CP	-.682*** (.211)	-.044 (.130)
S.Am*Oth Reg CP	-1.42*** (.277)	-.403*** (.089)
E.Asia* Oth Reg CP	-.643*** (.206)	-.210** (.088)
Africa*Oth Reg CP	-1.06*** (.282)	-.346*** (.118)

***significant at 1%, **significant at 5%,*significant at 10%

Table 2.6

Impact of Labor Productivity on FDI Flows

	(1)	(2)
Dependent Variable	Log(FDI Inflow)	Log(FDI Inflow)
Sample	All Regions	South Asia
Independent variables		
Log(GDPGrowth)	.208** (.093)	.705*** (.206)
Log(GDP)	.522** (.214)	.236 (.183)
Value Added per Person (Valaddpp)	.006 (.004)	.047*** (.009)
Trade/GDP	.004** (.002)	.003 (.004)
Telephone Lines	-.086*** (.031)	-.224*** (.084)
CP	.094 (.076)	.542*** (.141)
Own Region Valadpp	.009** (.004)	-.028* (.016)
Other Region Valaddpp	.048*** (.007)	.118** (.048)
No Of Observations	151	57
Overall R-Square	.5657	.8597

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