Internationalization and Firm Performance: Meta Analysis and New Empirical Evidence

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Abstract

There has been considerable research on the performance gains attributable to international trade and foreign direct investment in recent years. However, the empirical findings are still unclear, in part because of different studies adopting different methodologies.

The first aim of this thesis is to contribute to the international economics and international business literature by conducting a meta-analysis of research that studies the causal relationship between exporting and firm productivity and of research that examines the relationship between multinationality and firm performance. In particular, the results indicate the impact of exporting upon productivity is higher in developing than developed countries, an important result from the point of views of the economic analysis of globalization and economic policy in general.

Existing studies on multinationality and firm performance have not considered that multinational firms may differ with respect to their location choices of overseas investment. This is an important aspect given that there are substantial differences across developed and developing countries locations. My research fills this gap by drawing on data covering a very large number of multinational firms from 46 countries. Specifically, I examine whether heterogeneous investments abroad, in developed and developing countries, have significantly different effects on firm performance. The results indicate that multinational firms with more FDI presences in developing countries have significantly higher performance than developed countries.

China has been undergoing a period of high economic growth and this is likely

to be due, in part, to the massive levels of international trade. The third issue covered in my dissertation concerns whether there is any export premium and/or learning by exporting. I conduct my analysis using data for more than 3,000 Chinese firms over the period 2000-2005. Overall, I find the existence of export premium, and once the firm has entered there is additional productivity growth in post-entry period.

Abbreviation

Difference in Difference Matching, DDM

Fixed Effect, FE

Foreign Direct Investment, FDI

Instrumental Variable, IV

International Monetary Fund, IMF

Organisation for Economic Co-operation and Development, OECD

Meta Analysis Regression, MAR

Multinational Corporate, MNCs

Multinationality-Performance, M-P

National Bureau Statistics of China, NBS

Ordinary Least Square, OLS

Propensity Score Matching, PSM

South-East Europe, SEE

The Commonwealth of Independent States, CIS

United Nations Commodity Trade Statistics, UNComtrade

United Nations Conference on Trade and Development, UNCTAD

World Bank Investment Climate Survey, WBIC

World Trade Organization, WTO

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Chapter 1

Introduction to the PhD Thesis

1.1 An introduction

Two important parts of globalization in recent years have been the ongoing rise in international trade and foreign direct investment (FDI)[1]. The World Trade Organization (WTO, 2008) reports that for the 2000-2007 period exporting is undergoing consecutive year of growth and exporting on average increased by 2.5 percentage points faster than real gross domestic product. The United Nations Conference on Trade and Development (UNCTAD, 2008) reports that from 1998 to 2007, the ratio of world FDI stock to world gross domestic product rose from 13.9% to 27.9% and the ratio of world FDI inflows to global gross domestic capital formation rose from 11.0% to 14.8%. One consequence of these trends on a microeconomic perspective is that increasing shares of firms' output is accounted for by exports and/or sales of overseas subsidiaries, a large percentage of which is between overseas subsidiaries and their multinational parent firms. The foreign-affiliate share of world production is now 15% in manufacturing and other tradables (Haskel et al., 2007; Lipsey et al., 1998).

Exporting can be an important source of competitive pressures, information and other productivity advantages for firms, leading to significant performance improvements in the post-entry period that have been identified as 'learning by exporting' (Bernard et al., 2003; Clerides et al., 1998; Fernandes, 2007). New

[1]Expansion into foreign market can be achieved via many entry modes, including export domestically-produced goods into another country (Krugman and Obstfeld, 2009; Melitz, 2003); direct investment into another country (Buckley and Casson, 1976; Dunning and Lundan, 2008); use the property of the licensor in the target country (Arora and Fosfuri, 2006; Arora et al., 2004); set up international outsourcing program of management practices and/or execution of a business function to an outside contractors (Kotabe and Omura, 1989; Mol et al., 2005); set up the joint venture program to build alliance with firms in target country (Hennart and Reddy, 1997; Reuer and Koza, 2000), and among others (Root, 1994). This PhD thesis focuses on two modes that are exporting and foreign direct investment.

export market entrants may learn considerably when they start exporting, and have higher productivity growth than non-exporters in the entrant year that could be identified as 'entrant effect' (Martins and Yang, 2009). Apart from learning and entrant effects, export premium is also worth of note. Export premium could be recognized as that exporters, on average, are larger, more productive, more capital-intensive, more technology-intensive and willing to pay higher wages (Bernard and Jensen, 1995).

According to BPM (1993) of the IMF and DBFDI (1996) of the OECD, foreign direct investment refers to an investment made to acquire lasting interest in enterprises operating outside of the economy of the investor. Performance gains attributable to foreign direct investment on a microeconomic perspective could be explained as overseas investment has the potential to generate employment, raise productivity, transfer skills and technology that will foster firm productivity (Li, 2007). For firms with international expansions their overseas subsidiaries have opportunities to achieve greater returns from internalizing intangible assets of the multinational firm, and create intra-firm markets thereby lowering the costs of organizing and transacting business when they expand their subsidiaries into overseas market. The internal markets that firms create are for intermediate products, such as proprietary technological know-how, managerial skills, marketing skills etc (Dunning and Lundan, 2008).

In the last decades, the field of performance gains attributable to international trade and foreign direct investment has witnessed an ongoing rise in scholarly interest. Several studies have been released as journal articles, published papers and chapters in books in the past decades that aim to evaluate it and sought to map its direction for the future. However, there is still a large amount of het-

erogeneity across existing studies in terms of their findings. These inconsistent empirical findings are as result of the sampling and methodological heterogeneity across studies that deal with this literature. Searching related studies from 1960s till now, this PhD thesis draws on a new and global database that contains the characteristics of each study from 1960s and its results. By conducting the Meta analysis approach, we aim to understand if there are any systematic relationships between study characteristics and its estimated results. Equally important, this PhD thesis also provides new empirical evidences on performance gains attributable to international trade by using almost three thousand Chinese firms in the period of 2000-2005 and attributable to foreign direct investment by using more than sixteen thousand multinational firms across 46 countries in the period of 2000-2005. Firms included in our data analysis cover almost all sectors based on two digit standard industrial classification.

1.2 Context

1.2.1 Global exporting

WTO (2008) reports that undergoing consecutive year of growth, in the period of 2000 to 2007 the trade flows across the world have increased from $ 6,230 to $ 12,170 billion (as shown in figure 1.1). In percentage terms, the growth in volume of world merchandise exports on average is 5.5%, while the growth of world GDP is about 3.0%. Trade remained strong in most developing countries. Regions such as Africa, the Middle East, the Commonwealth of Independent States (CIS), developing Asia, and South and Central America showed sustained growth in their

economies in 2007. Brazil, India and mainland China (hereafter called China) are illustrative of a clear trend of vigorous growth among a number of emerging economies. This growth implies a growing share of world trade, and the share in world exports remains relatively small for most of the emerging economies individually. The share of Brazil and India, for example, is still just over 1%. However, China's share is approaching 10%. China increased its exports by a remarkable 21 percent in year of 2007, further developing its role as a central hub for global manufacturing of electronic products (WTO, 2008). At the same time, China remained the fastest growing market for Asian economies' exports of integrated circuits and other intermediate products. In 2007 the top ten exporting countries are Germany, China, USA, Japan, France, Italy, Netherlands, the United Kingdom, Belgium and Canada, which account together 56% of world exports (IMTS, 2009). This thesis uses the case of China to explain performance gains attributable to exporting. The 'open door' policy in the last three decades has made China become one of world's major exporters. Over the last 20 years, China has grown at a rate of nearly 10 percent per annum, and this, in part, is due to the massive levels of trade. Moreover, the structure of China's exports has been changing as well, away from clothing, footwear, other light manufactures and fuels that dominated its trade in the 1980s and early 1990s, toward office machinery, telecommunications, furniture, and industrial supplies in the late 1990s and automated data processing equipment and consumer electronics in recent years (Eichengreen et al., 2007). The evidence for China as one of today's most important exporters on issues related to international trade and heterogeneous firm productivity opens up new question in this PhD thesis.

1.2.2 China

China statistical yearbook (NBS, 2008) published by the National Bureau Statistics of China indicates that undergoing consecutive year of growth, in the period of 1998 to 2007 the GDP growth rate on average increased by 9 percentage points. It is well known that membership in the WTO exerts great impetus on the international trade and development of China's economy. It also provides China the opportunity to play a large and growing role in the world economy. WTO (2008) reports that since China joined the WTO in 2001, it has almost quadrupled its exports while imports have more than tripled. In 2007, the merchandise trade from China to Asia is $ 521 billion; to North America is $ 264 billion; to South America is $ 39 billion; to Europe is $ 264 billion; to Middle East is $ 44 billion; to Africa is $ 37 billion, and to CIS is $ 48 billion. In percentage terms, some 45% of its trade receipts stem from Asia, while Europe and North America each receive 21% of China's exports, and 34% are in other economies. The (UNComtrade) United Nations commodity trade statistics (IMTS, 2009) by the United Nations Statistics Division indicates that in the period of 1998 to 2007 the ratio of China's exports to the world exports increased from 4% to 10%, and export values grows from $ 183 billion to $ 1,217 billion.

1.2.3 Global FDI

UNCTAD (2008) reports that undergoing consecutive year of growth, the flow of foreign direct investment continued to rise in 2007: at $ 1,833 billion, it reached a new record level, and the previous record set in 2000 was surpassed by some $ 400 billion. All the two major groups of economies developed countries, developing

countries (including the transition economies of South-East Europe (SEE) and the commonwealth of independent States (CIS)) - saw continued growth in foreign direct investment. In the period of 1998 to 2007 the inward FDI stock in developed countries has increased from $ 2,875 to $ 10,458 billion (as shown in figure 1.2), while the FDI stock in developing countries has increased from $ 1,276 to $ 4,752 billion. Inflows of foreign direct investment to developed countries in 2007 amounted to $ 1,247 billion, an increase of 146%, compared to just $ 506 billion in 1998, while to developing countries they rose to the highest level ever recorded $ 412 billion, with an increase of 116%, compared to just $ 190 billion in 1998. In percentage terms, the share of developed countries decreased somewhat, to 66% of global inward FDI in 2007, compared to about 71% in 1998. In contrast, the share of inflows foreign direct investment to developing countries increased about 5%. Developing countries' inward stock of FDI amounted to about one third of their GDP, compared to just 10 per cent in 1980. It is quite obvious that developing countries contribute at least equal as developed countries to the World inward FDI.

1.3 International trade

The traditional or old theories of international trade could be traced back to 1810s, and the first contribution was that of David Ricardo (1817) (thereafter called Ricardo model). The comparative advantage is particularly worthy of note as it is perhaps the most important of Ricardo's contribution. The Comparative advantage is identified as there is mutual benefit from trade even if one country (resource-rich or highly-skilled labour country) is more productive

in every possible area than its trading counterpart (resource-poor or unskilled labour country), as long as each concentrates on the activities where it has relative productivity advantage. It would reap gains from specializing in what it was best at producing and trading with other nations. It is the ability to produce a product most efficiently given all the other products that could be produced. It can be contrasted with absolute advantage proposed by Adam Smith (1776) which refers to the ability of a country to produce a particular good at a lower absolute cost than another. Ricardo's international trade model considered a single factor of production and aims to explain the flow of goods between countries in terms of comparative advantage arisen by productivity differences.

Derived from the earlier insights of comparative advantage work by Ricardo, Heckscher (1919) and Ohlin (1933) (thereafter called Heckscher-Ohlin model) built a general equilibrium mathematical model of international trade by especially introducing the cross-industry differences in factor intensity and cross-country differences in factor abundance in the trade model. Heckscher-Ohlin model built on Ricardo's model; however, introduced variable capital endowments, recreating endogenously the inter-country variation of labour productivity. Essentially, Heckscher-Ohlin model noted that relative endowments of the factors of production (land, labour, and capital) determine a country's comparative advantage. Countries have comparative advantages in those goods for which the required factors of production are relatively abundant locally. This is because the prices of goods are ultimately determined by the prices of their inputs. Goods that require inputs that are locally abundant will be cheaper to produce than those goods that require inputs that are locally scarce. Ricardo, Heckscher and Ohlin's work are one of earliest of explanations of the international trade

between countries in terms of comparative advantages - later taken up (though from somewhat different approaches) by new theories which have more role in determining the pattern or commodity composition of trade.

The new trade theories of international trade aim to elaborate a wider relative factor endowments that international trade makes available to the consumers, including scale economies, technology, consumer preferences, intra-industry trade and other endowments. The Dixit-Stiglitz monopolistic competition is particularly worthy of note as it is the foundation of new theories of international trade. Each firm has some monopoly power, but entry drives monopoly profits to zero. This means in the long run, a monopolistically competitive firm will make zero economic profit. Chamberlin (1933) and Robinson (1933) are regarded as the parents of the modern study of monopolistic competition, which provided insights into competitive markets. The monopolistic competition is a market structure where many competing producers sell products that are differentiated from one another product. The well-known monopolistic competition equilibrium indicates that in a monopolistically competitive market a firm making profits in the short run will break even in the long run because demand will decrease and average total cost will increase. The maximum profit will be the point when the marginal revenue is higher than marginal cost, and then the monopoly profit will be getting to zero when the marginal revenue is getting lower than the marginal cost, and then the firm will be incurring losses and firms will leave the industry. The application of the monopolistic competition model to trade is the idea that trade increases market size. In sectors where there are economies of scale, both the variety of goods that a country can produce and the

scale of its production are constrained by the size of the market. A larger market leads to both a lower average price and the availability of a greater variety of goods. By applying application of the monopolistic competition model to international trade, it shows that by trading with each other it forms an integrated world market that is larger than any of the national markets, and nations are able to loosen the constraints by the size of the market. Therefore, integrating markets through international trade has the same effect as growth of a market within a single country (Krugman and Obstfeld, 2009). In monopolistic competitive market Dixit and Stiglitz (1977) noted that with scale economies, the resources can be saved by producing fewer goods and larger quantities of each. A commodity should be produced if the costs can be covered by the sum of revenues and a properly defined measure of consumer's surplus. The optimum amount is then found by equating the demand price and the marginal cost.

Since the late 1970s and early 1980s, there have been many attempts by economists to refine the international trade models, of which Krugman (1979), Krugman (1980), Krugman (1981), Helpman (1981), Ethier (1982) and Helpman and Krugman (1985) among others are the leading exponents. Essentially, this group of economists sought to extend an international context of monopolistic competition by addressing the importance of economies of scale in production, consumer taste or preferences, and other factor endowments. Gains from the intra-industry trade between countries are addressed in Krugman (1981) and Ethier (1982), and propose that the trade between similar countries are largely intra-industry in character; that is, it consists of two-way trade in similar products, and it is basically complementary to the international factor mobility. In a seminal contribution, Helpman and Krugman (1985) integrated the traditional

or old theories to elaborate a view of international trade that would allow for an interplay between economies of scale, product differentiation, and factor proportions. It developed such an approach, making allowance for sectors that differ in their sources of scale economies and market structure. It makes a clear classification that new trade theories are actually complementary to the explanations provided by factor endowments in Heckscber-Oblin orthodoxy (Bernard, Jensen, Redding and Schott, 2007; Helpman, 1999).

The heterogeneous-firm trade theories aim to develop the new theories of international trade models by emphasizing the importance of firm heterogeneity in generating international trade and boosting aggregate productivity growth. One framework, developed by Bernard et al. (2003), reconciles trade theory with plant-level export behaviour, by adapting a Ricardian model to firm-specific comparative advantage and accommodating countries of United States and 46 major trade partners. The framework points to the importance of export costs in segmenting markets, and of efficiency differences across producers in generating heterogeneity in market power, measured productivity, and the ability to overcome geographic barriers. After linking the variances and covariance that we observe in productivity, size, and export participation to the single producer-level characteristic of technological efficiency in its equilibrium mathematical model, it proposes that more efficient producers are also likely to have more efficient rivals, charge lower prices, and, with elastic demand, sell more. Finally, more efficient producers are more likely to beat out rivals in foreign markets. The other important and may be most representative model in earlier stage of heterogeneous-firm trade theories was that of Melitz (2003) who develops a dynamic industry model

with heterogeneous firms to analyze the intra-industry effects of international trade. The model extends Krugman (1980)'s international trade model to incorporate firm level productivity differences by applying the insights of dynamic industry model (Hopenhayn, 1992*a*,*b*) into Dixit-Stiglitz model of monopolistic competition. The Melitz's model is set out schematically as Figure 3.1 from Greenaway and Kneller (2007). Essentially, the model noted that the existence of export market entry costs (thereafter called suck cost) makes a productivity draw from an exogenous distribution. In fact, only portions of the firm-the most efficient ones-reap benefits from international trade in the form of gains in market share and profit. Less efficient firms lose both, while the exposure to trade, or increase in this exposure, force the least efficient firms out of the industry.

Melitz's work is an important model linking heterogeneous firms and industry productivity, with exporting being a key factor, and the model is now being developed in various ways, of which Helpman et al. (2004), Bernard, Redding and Schott (2007) and Melitz and Ottaviano (2008) are particularly worthy noting. Helpman et al. (2004) extended Melitz's work to a wider choice of the multinationals aspect. Helpman's model is a general equilibrium model and consists of three cut-off points in the whole sequences of international engagements, including setting up production facility in the home country, entering exporting market and the engagement of foreign direct investment practices. The model suggests that the most productive firms tend to invest in foreign plants and facilities; the small and medium firms are willing to serve the foreign market through exporting, while the least productive firms may only serve the domestic market. Building on monopolistic competition and comparative advantage, Bernard, Redding and Schott (2007) extended Melitz's work by introducing an additional industry

and factor and the complex interactions to which they give rise. It examines how country, industry, and firm characteristics interact in general equilibrium to determine nation's responses to trade liberalization. The framework simultaneously explains why some countries export more in certain industries than in others (endowment-driven comparative advantage), why nonetheless two-way trade is observed within industries (firm-level horizontal product differentiation combined with increasing returns to scale) and why, within industries engaged in these two forms of trade, some firms export and others do not (self-selection driven by trade costs). A recent work by Melitz and Ottaviano (2008) developed Melitz's model by introducing the endogenous differences in the 'toughness' of competition across markets. It predicts how a wide set of industry performance measures (productivity, size, price, and mark-up) respond to changes in the world trading environment. It shows how market size induces important changes in industry performance measures: larger markets exhibit tougher competition resulting in lower average mark-ups and higher aggregate productivity. Essentially, the model noted that the market size and trade affect the toughness of competition, which then feeds back into the selection of heterogeneous producers and exporters in that market. Aggregate productivity and average mark-ups thus respond to both the size of a market and the extent of its integration through trade (larger, more integrated markets exhibit higher productivity and lower mark-ups).

Analysis of studies on a microeconomic perspective on international trade shows that one could distinguish three prevalent research streams, as described above. The traditional or old theories of international trade (Heckscher, 1919; Ohlin, 1933; Ricardo, 1817) build on the concept of comparative advantage under which it is beneficial for the flow of goods between countries; the new trade

theories (Helpman, 1981; Helpman and Krugman, 1985; Krugman, 1980) propose that there are economies of scale and consumer tastes or preferences in the flow of goods between countries; the heterogeneous-firm trade theories (Bernard, Redding and Schott, 2007; Bernard et al., 2003; Melitz, 2003; Melitz and Ottaviano, 2008) introduce the inter-firm reallocation and industry productivity growth in the trade model by especially emphasizing the importance of firm heterogeneity in generating international trade. Some of these international trade economists have been awarded the Nobel Prize in economic science for outstanding contributions in the field of economics, especially on the international trade theory, including Bertil Ohlin and Paul Robin Krugman in the year of 1977 and 2008, respectively. The heterogeneous-firm trade theories are the basis for the contribution of exporting chapters in this thesis. We would like to see that the monopolistically competitive model of trade with firm heterogeneity is different with respect to productivity differences.

1.4 Foreign Direct Investment

There is a wide literature on foreign direct investment that provides thorough reviews. We would like to highlight the main studies in this PhD thesis. **Theories of foreign direct investment** could be traced back to early 1960s, and the first contribution was that of Hymer (1960) who talks about the imperfections in markets and transferable package of sources (technology, management skills, entrepreneurship and so on). Vernon (1966)'s product cycle is the other influential and pathbreaking contribution to foreign direct investment in the 1960s, which aims to elaborate the dynamic interpretation of foreign production. Vernon

also contributes to combine FDI with trade trends. He speculates on the future of the MNCs, and proposes that past trends point toward continued growth in the importance of MNCs in world trade. Hymer and Vernon's works are the progenitors of explanation of foreign production - later taken up (though from a somewhat different perspective) by eclectic paradigm of international production and the internalization theory of the MNE.

The eclectic paradigm (ownership, location and internalization advantages) seeks to offer a general framework for determining the extent and pattern of both foreign-owned production undertaken by a country's own enterprises, and that of domestic production owned or controlled by foreign enterprises (Dunning and Lundan, 2008). Ownership advantage refers to the possession of intangible assets and/or coordinating or risk reducing advantages which are, at least for a period of time. For a multinational firm it is more beneficial to the enterprise possessing their ownership advantage to internally use them, and it does through an extension of its existing value added chains, which is identified as the 'internalization advantages'. Considering the global interests of the enterprise to utilize their ownership and internalization advantages outside its home country, multinational enterprises are expected to make a selectively strategic decision of expanding business abroad and also willing to entry into more attractive markets that maintain their high returns from that market. Decisions on location choices of overseas direct investment may be affected by characteristics of host countries, including lower costs, abundant sources of input, market size, high managerial capability, technological capability, and among others. All these characteristics of host country could be identified as the 'location advantages' (Dunning, 1988).

Coase (1937)'s transaction cost is particularly worthy of note. Essentially,

the Coase's work noted that there are a number of transaction costs to using the market; the cost of obtaining a good or service via the market is actually more than the price of that good. Other costs, including search and information costs, bargaining costs, keeping trade secrets, and policing and enforcement costs, can all potentially add to the cost of procuring something with a firm. Derived from the earlier insights of transaction cost work by Coase, the internalization school of thought as the other general explanation of MNE activity, of which Buckley and Casson (1976), Hennart (1982) Rugman (1982), Teece (1985), Rugman (1986), and Casson (1987) among others are the leading exponents, developed the basic hypothesis that multinational hierarchies represent an alternative mechanism for coordinating related value-added activities across national boundaries to that of the market; and firms are likely to engage in overseas investment whenever they perceive that the net benefits of their common ownership of domestic and foreign activities, and the transaction arising from them, are likely to exceed those offered by external trading relationship (Dunning and Lundan, 2008). Internalization theory is essentially concerned with identifying the situations in which the markets for intermediate products are likely to be internalized, and hence those in which firm control value adding activities outside their natural boundaries. It is more beneficial to the enterprise possessing ownership advantage to use them rather than to sell or lease them to foreign firms, and it does through an extension of its existing value added chains or the involvement of new ones (Columbia, 1993; Dunning, 1988; Rugman, 1986). The internalization theory explains the emergence and growth of the multinational corporations, in terms of the way in which cross border transactions in intermediate products is organized. It asserts that in the event of market imperfections or market failure, a firm will possess intangible

assets and create intra-firm markets thereby lowering the costs of organizing and transacting business when they expand their subsidiaries into overseas market. The internal markets that firms create are for intermediate products, such as technological know-how, managerial skills, marketing skills etc. Our chapter applies the internalization theory to investigate how foreign investment is correlated with performance through internalization of intangible assets.

Theory of learning aims to elaborate the internationalization process of firms (Johanson and Vahlne, 1977), which is known as the Uppsala model. Essentially the model predicted increasing resource commitment to foreign market over time as a result of organizational learning and the accumulation of experience. The model believes that internationalization is the product of a series of incremental decisions and resources committed to foreign market which affect the firm's perceived opportunities and risks. It suggests that a firm strives to increase its long-term profit and keep risk-taking at a low level, and the incremental risk is implied by an incremental addition to operations on foreign market. The multinationality-performance (hereafter called M-P) relationship has been investigated since 1970s, while much of the recent research suggests that the relationship between these two constructs is curvilinear. These researches have applied the perspective of incremental internationalization. The fact that the stages or process model of internationalization have received empirical support in several studies (see Table 6.1 to 6.3).

Theory of resource-based view of MNE activity is much like the concept of ownership advantage. Derived by the seminal contribution of Penrose (1959), the resource-based theory (Barney, 1991; Wernerfelt, 1984) postulates that resources are the source of competitive advantage of firms if they are

valuable, rare and difficult to imitate. From the perspective of the OLI paradigm, the developments in the resource-based theory add much to our understanding of the kinds of physical assets and human competences that contribute to the competitiveness of firms. The resource-based view is an economic tool used to determine the strategic resources available to a firm. The fundamental principle of the resource-based view is that the basis for a competitive advantage of a firm lies primarily in the application of the bundle of valuable resources at the firm's disposal. Firm resources include all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc; controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness.

Analysis of studies on a microeconomic perspective on overseas expansions shows that one could distinguish three prevalent research streams, as described above. The theories of foreign direct investment (Buckley and Casson, 1976; Dunning, 1981; Hymer, 1960; Rugman, 1986; Vernon, 1966) explain the conditions under which it is beneficial for a firm to expand its affiliate into overseas markets, and analyze when, why and how a firm should go abroad; the learning theory (Johanson and Vahlne, 1977) proposes that internationalization is the product of a series of incremental decisions and resources committed to foreign market which affect the firm's perceived learning process, opportunities and risks; the resource-based view of the firm (Barney, 1991; Wernerfelt, 1984) aims to explain the determining factors for firms to invest abroad. The internalization theory is an important part in foreign direct investment literature, which is used in FDI chapters of this thesis. We would like to test that in the event of market imperfections or market failure, a firm will possess intangible assets and create

intra-firm markets thereby lowering the costs of organizing, and it is related to performance increase. Equally important, the relationship between multinationality and firm performance is different with respect to the economic development of market where a multinational firm invests.

1.5 Firm Performance

There is a wide and growing range of studies looking at the performance consequences of the exporting and foreign direct investment, and measurements of firm performance in these studies are various (Li, 2007; Wagner, 2007*a*). In terms of the measurement of firm performance in the literature on exporting and firm performance, the most standard approach to estimate the effects of exporting on firm performance - but perhaps also the most difficult to compute, given its data requirement - is the total factor productivity (Levinsohn and Petrin, 2003; Olley and Pakes, 1996) that is typically concerned with reaching precise estimates. Total factor productivity is used to measure firm performance in our exporting chapter 3 and 4. Besides total factor productivity, a few other performance measurements were also considered in related studies, including sales per worker (Isgut, 2001; Wagner, 2002), sales (Requena Silvente, 2005), labour productivity (Girma, Greenaway and Kneller, 2004; Yasar and Rejesus, 2005), unit cost (Kraay, 1999), employment (Bernard and Jensen, 1995; Isgut, 2001) and wages (Bernard and Jensen, 1999; Greenaway and Kneller, 2008; Van Biesebroeck, 2005). The information on sales and sales per worker is available in our database, and we consider these two performance measurements as robust tests.

The performance measures in the literature on the relationship between multi-

nationality and performance are various, including patent (Bascavusoglu, 2005; Globerman et al., 2000), innovation (Keller, 2006), accounting-based firm performance (return on assets (Buhner, 1987; Lu and Beamish, 2001), return on sales (Grant, 1987; Qian, 2002), and return on equity (Sambharya, 1995; Thomas and Eden, 2004)) and market-based (Tobin's Q (Christophe and Lee, 2004; Lu and Beamish, 2004), and risk-adjusted return (Hughes et al., 1975; Michel and Shaked, 1986)) financial indicators in the earlier studies, while the relevant literature has shown that there has been a predominant use of accounting-based and market-based financial indicators in the earlier studies. Because of the problem of a severely reduced sample size in our FDI chapter 6 if we use market-based performance, we only consider accounting-based firm performance. Originally, return on equity was also considered as a possible measure of firm performance in our analysis. However, in the end it was ruled out because to the extent that it is sensitive to capital structure differences (Hitt et al., 1997; Li et al., 2007; Qian et al., 2008), which will be used as an independent variable in our estimation equation, and similar consideration for return on asset indicator. In addition, the results from ROA and ROS generate similar findings and they were highly correlated (r=0.91) (Capar and Kotabe, 2003; Hitt et al., 1997). Therefore, a firm's ROS value is used to measure firm performance in our FDI chapter 6. ROS is defined as the after-tax profits (before extraordinary items) divided by total sales, which indicates how much net income is produced by each sale, and it is widely used as an indicator of firm performance in economic research and in the international business literature.

1.6 Sources of Data

The data used in this thesis are derived from two data sets: investment climate survey database WBIC 2003, conducted by the World Bank, and a commercial database named Orbis, collected by the consultancy Bureau van Dijck. In attempting to empirically investigate performance gains of Chinese firms attributable to export market, firm level data used in Part I of the thesis are derived from the World Bank investment climate survey (WBIC) in 2003 that contains 2400 Chinese firms from 2000 to 2002. Firms from WBIC 2003 data set[1] are located in 18 major provincial capitals or cities [2]. The other dataset in this exporting part is from Orbis. A thousand largest Chinese firms from 2002 to 2005 in the Orbis data set are considered to be used in our chapter. These firms are located in 22 provinces, 5 autonomous regions and 4 municipalities. In these two datasets main business sectors of total firms include both manufacturing firms and service firms. These two datasets contain information on export value and firm performance, which are most important indicators in dealing with research on exporting and firm performance. The data also contains information on firm characteristics, including input, employment, year of establishment and assets.

At a more micro level, more detailed overseas operational data is needed for an evaluation of performance gains attributable to foreign direct investment.

[1]The World Bank investment climate survey in China is normally carried out under auspices of national stakeholders. The survey consists of two questionnaires, one filled up by the senior manager of the main production facility of the firm while the other filled up by the accountant or personnel manager of the firm. In the year of 2002, the WBIC survey in China was implemented by National Bureau of Statistics of China. 1548 firms from 1997 to 2000 are included in this survey, which are located in five cities. Of the ongoing WBIC survey in the year of 2003, it contains 2400 companies from 2000 to 2002.

[2]They include Benxi, Changchun, Changsha, Chongqing, Dalian, Guiyang, Haerbin, Hangzhou, Jiangmen, Kunming, Lanzhou, Nanchang, Nanning, Shenzhen, Wenzhou, Wuhan, Xian and Zhengzhou.

Firm level data used in Part II of the thesis are derived from the Orbis. We have access to company information on over 250,000 firms in the Orbis database. The records of each company include information on whether the company has ownership stake in its subsidiaries (path of minimal 25.01 % shares control over its overseas subsidiary) and where the subsidiary locates in the latest year released in the Orbis dataset. Therefore, it is possible to calculate the ratio of subsidiaries in foreign countries in relation to its total subsidiaries, which is most important variable in our chapter indicating the multinationality of a firm. In attempting to dealing with the topic on multinationality and firm performance, we rule out those domestic firms, and many thousands of multinational firms are considered in our analysis. Financial and operational information of samples in our data is available for 1997 through 2007, but the information on multinationality is not time-dimension and we cannot follow the multinationality changes during the sample period.

Due to variation in national reporting (e.g., monetary), all monetary measures are reported in the Orbis in home currencies. However, we convert them to Euro using international monetary fund annual exchange rates to have a consistent monetary measure that is crucial in our analysis, and variables are comparable across different countries. We retrieve firms on the basis of information available on expenditure on investment, employees, assets and firm age. For firms without any one of the information we cannot include them in our sample. Although there is severely reduced sample size - in particular Canada, Liechtenstein, Mexico and India, we do not believe that this is a serious problem and we still have a considerable number of firms from most important countries. There are 16,533 multinational firms used in our analysis. The country distribution of firms in

our cross-section data is listed, alongwith most important variables used in our analysis. Firms are concentrated in some EU countries, most G8 countries and some developing countries with significant number in France, Germany, Italy, Japan, UK, US and South Korea. The pattern of firm locations looks broadly consistent with typical patterns of investment: Taken together firms from US, UK, France, Germany, Italy and Japan, they account 55.2% of total samples.

Economic development of country is used in some chapters of this thesis. We consider both the UN definition (WIR, 2008) of a developed economy and level of income and welfare. Developed countries generally include the members of G8 (except Russia), most EU members, Norway, Iceland, Switzerland, and New Zealand, Australia, Bermuda, Israel, Japan, Taiwan (China), South Korea, Hong Kong (China). In contrast, the developing countries generally include all other countries in the world.

1.7 An overview of each chapter

This PhD thesis is organized into two parts. Part I and Part II are exporting-performance and multinationals-performance, respectively. In Part I Chapter 2 aims to overview the causal relationship between exporting and firm performance by using a Meta-analysis approach. In statistics, a Meta-analysis is the approach that combines the results and characteristics of several studies that address a set of related research hypotheses. By running Meta-analysis regression, it tries to understand if there are any systematic relationships between the characteristics of each study and its results. In this chapter we gather almost 300 estimates of regression results from more than 30 papers that address the learning by exporting

hypothesis. The different characteristics of studies we considered in this Chapter include the range of country coverage, the estimation method, performance measurement timing, the characteristics of the sample, the type of dependent variable and year of survey. Moreover, we would like to test whether there is the evidence of publication bias, which is noted that studies on the field of causal relationship between exporting and productivity are more likely to be published if they obtain significant results[1].

Following a large amount of reviewing work we have done in Chapter 2, Chapter 3 empirically focuses on examining the export premium, learning by exporting and entrant effect[2]. The data used in this Chapter contain 2400 Chinese firms from 2000 to 2002 and 575 largest Chinese firms from 2002 to 2005. By using these two datasets, it allows analysis of performance gains attributable to exporting in the period of 2000-2005. In addition, by using two sets of Chinese firm samples, we argue that performance gains attributable to the exporting are different with respect to different firm sizes.

As some of recent works on exporting and firm productivity prefer using matched samples, Chapter 4 is an extension of chapter three, and it departs from the previous chapter by using matched firms. The propensity score matching method used in this chapter is to adjust for observable differences of firm characteristics between exporters and non-exporters, allowing an adequate 'like-for-like' comparison. The difference in difference matching estimator used in data analysis aims to capture the magnitude of different productivity growth between

[1]This Chapter is forthcoming in The Review of World Economics.

[2]Considering the length of volume and readability, I divide my work into two chapters. Chapter 3 and Chapter 4 aim to test same questions by using different estimators: regression estimation and semi-parametric estimation. However, our benchmark results are based on matched firms in Chapter 4.

matched new export market entrants and non-exporters in the post-entry period up to three years[1].

A large number of studies have looked into the micro level M-P relation since 1970s. However, the findings are still contradictory and little consensus has emerged among researchers as to the nature of this M-P relationship. Following the Meta analysis approach used in Chapter 2, Chapter 5 in Part II combines more than 300 estimated results from 51 studies that explore the linear M-P relationship, while characteristics of studies we considered in this chapter include the country coverage, the estimation method, the measurement of multinationality, the sample heterogeneity, the measurement of performance and year of survey, and we also test whether there is the evidence of publication bias. Equally important, much of recent research has a focus on curvilinear relationships where analyses indicate an inverse U-shaped performance relationship (Gomes and Ramaswamy, 1999; Qian et al., 2008) while others found a U-shaped relationship (Qian, 1997; Ruigrok and Wagner, 2003). Curvilinear relationships suggest that, beyond a certain degree of multinationality, the M-P will reverse. However, one may argue that if firms reaching that certain degree of multinationality are few, to the extent those firms cannot be representative, and the finding of curvilinear M-P relationship based on these firms may be misleading. In order to test this hypothesis, this chapter surveys 14 papers that explore the curvilinear relationship between multinationality and performance[2].

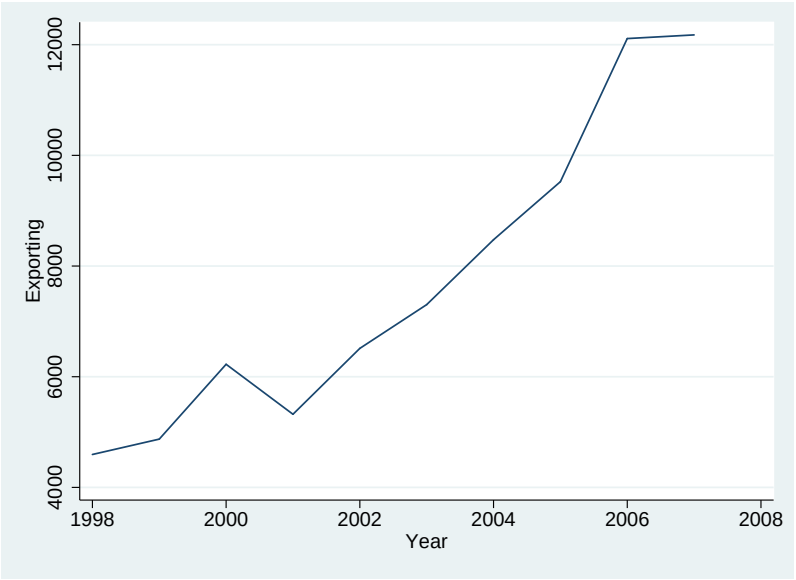
After reviewing a large number of empirical studies on the relationship between multinationality and firm performance in Chapter 2, we find that more

[1]This Chapter is currently under revise and resubmit with The World Economy.
[2]This Chapter is currently under revise and resubmit with Strategic Management Journal.

than 50 percent of existing studies use firms from the United States as the sample, and such selection of samples would result in a somewhat non-representative set of evidence. Chapter 6 aims to examine the relationship between multinationality and firm performance by using a very large number of multinational firms (16,533 in total) from 46 countries. Equally important, in the process of reviewing empirical studies in previous Chapter, we find that existing studies on this issue have not yet considered how firm location choices may interact to the firm performance. Therefore, in this Chapter we investigate the relationship between multinationality and firm performance by specially addressing the importance of the location choices of overseas investment, and examine whether there are significant differences in firm performance associated with heterogeneous firm's abroad investments in developed and developing country locations. Finally, a conclusion of this PhD thesis is given in Chapter 7 that summarizes main findings from each chapter, and mentions main contribution to the literature, and discusses implications of main findings.

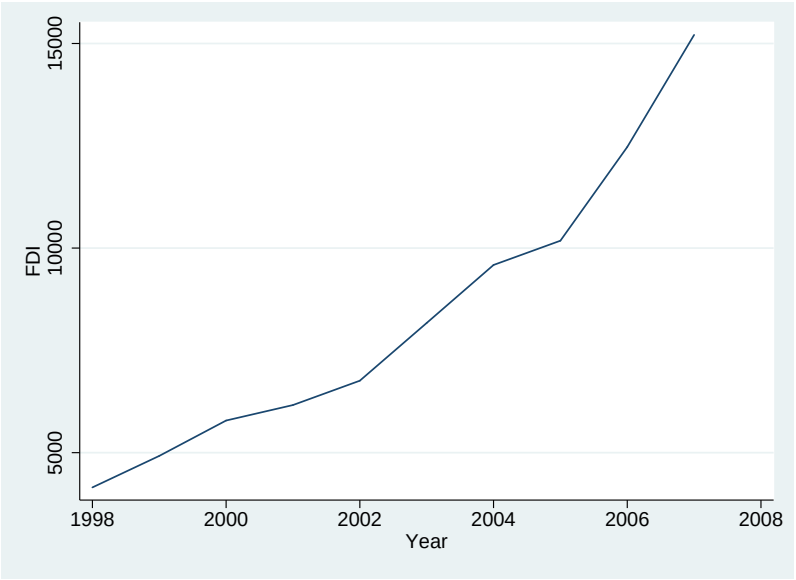
1.8 Figures

Figure 1.1: Global exporting, 1998-2007



Values are in millions of US dollars

Figure 1.2: inward FDI stock, 1998-2007



Values are in billions of US dollars

Part I

Exporting and Firm Performance

Chapter 2

The Impact of Exporting on Firm Productivity: A Meta-Analysis of the Learning-by-Exporting Hypothesis

2.1 Introduction

Exporting can be an important source of information, competitive pressures and other productivity advantages for firms, leading to significant performance improvements (Bernard et al., 2003; Krugman, 1980). Given its potential relevance, this 'learning by exporting' hypothesis spurred a large number of empirical studies that seek to assess the causal effect of exporting. However, there is no consensus on whether such effect exists or what specific factors may be behind it. In fact, a recent survey (Wagner, 2007*a*) indicates that the evidence on this 'learning effect' is "mixed and unclear", while it is well established that, on average, firms that export are more productive than firms that do not export and that there is self-selection in the exporting process (more productive firms are the ones that tend to become exporters).

Given the large amount of heterogeneity across the many studies that examine the causal impact of exporting, our chapter adopts a Meta-analysis approach (Ashenfelter et al., 1999; Card and Krueger, 1995; Görg and Strobl, 2001; Pereira and Martins, 2004). This chapter departs from the survey paper in one major aspect. Most literature surveys could summarize the large literature written on one topic, give coherence to the complex, and serve as a springboard for new ideas; however they are hardly to explain the variations in results of a number of similar empirical studies concerned with one research topic (Stanley and Jarrell, 1989). Under the Meta analysis approach, we aim to understand if there are any systematic relationships between the characteristics of each study and its results. In fact, there are several dimensions in which a specific paper can be different from other studies, such as the range of country coverage, the type of dependent

variable, the characteristics of the sample, and the estimation methods[1].

A related question that we are also interested in concerns the possibility of publication bias. Indeed, it has been suggested that journal editors may favour studies that reach significant results to the detriment of papers which find no significant relationships. Such selection process would result in a non-representative set of evidence, thus biasing one's inference about the magnitude of the effect of interest.

Surveying more than 30 papers and conducting different robustness tests, we are able to find some clear patterns concerning the study features that can systematically predict study outcomes. In particular, we find that the impact of exporting upon productivity is higher in developing than in developed economies, an important result from the point of view of the economic analysis of globalization and economic policy in general. We also find evidence that the impact of exporting upon productivity 1) is higher in the first year that firms start exporting than at later years; and 2) is lower when only matched firms are considered. Moreover, we do not find evidence of publication bias.

The next Section describes in more detail the econometric approach undertaken in the studies that we analyze and then explain our own econometric methodology. Section 2.3 describes the studies that we examine, while Section 2.4 presents the results and the robustness analysis. Finally, section 2.5 concludes.

[1]See also the Meta-analysis results presented in (The International Study Group on Exports and Productivity, 2007).

2.2 Methodology

As we are interested primarily in firm-level panel-data studies that examine the causal impact of exports in terms of firm performance, we consider only papers that estimate equations of the following type:

$$dY_{it} = \beta Export_i + \lambda X_{it} + \gamma_t + e_{it}, \tag{2.1}$$

in which dY_{it} is a measure of the (percentage) change in the performance of firm i for a given base period up to period t; and $Export_i$ is an indicator variable taking value one if firm i became an exporter over period t or value zero if the firm remained a non-exporter over the same period. The equation may also include other control variables, such as firm characteristics (X_{it}) and/or controls for business cycle effects (γ_t). The key parameter that we are interested in is β, which indicates the average change in performance for firms that become exporters with respect to firms that remain non-exporters. We then relate the estimates of β to the characteristics of each respective study.

It is important to emphasize that there are other methods that have been employed in the literature about the relationship between exporting and firm performance. For instance, some studies conduct Kolmogorov-Smirnov analyses (Arnold and Hussinger (2005*b*) and Wagner (2007*b*) among others), in order to consider the entire distribution of firm performance. Another group of studies also adopt equations similar to equation 2.1 but are interested instead in other dependent variables than performance, such as employment, wages, costs, investment or innovations (Salomon and Shaver (2005) and Aw et al. (2005) among others). A third group of studies addresses different but related issues, such as

the determinants of exporting behaviour, comparisons between domestic firms and multinationals or comparisons between the exiting behaviour of exporting and non-exporting firms (Bernard and Jensen (2004*b*) and Bernard and Wagner (2001) among others). However, in order to focus our analysis on comparable studies, we consider only those that estimate equations as in equation 2.1 and that take the change in firm performance as their dependent variable. We therefore do not consider studies that measure performance in levels rather than in growth rates or that analyze the effects of different export intensities.[1]

Another important point to mention is that even panel-data studies that adopt a difference-in-differences approach do not necessarily estimate the causal effect of exporting upon firm productivity or any other dependent variable of interest. If assignment to 'treatment' (to become an exporter) is not random and, in particular, if such assignment varies with unobserved characteristics that also affect the outcome of interest, then the estimate obtained in studies such as those we consider here will also capture other effects than simply the effect of exporting. However, we also believe that by restricting our coverage to papers that use firm-level panel data to estimate equation 2.1, we will be examining less biased estimates of the causal effect of exporting than if we were to consider the wider set of estimates available in the literature.

Once the set of studies considered is defined, our next step is to characterize them in terms of several dimensions that we regard as of particular interest and that can be obtained from the information available in the papers. The variables that we consider can be grouped into the following categories:

[1]There is a small number of studies that do implement analysis as those of equation 2.1 but are not considered in our chapter because they do not make available enough information about the data and methods used.

1. *Economic development*

   Differences in the level of development of a country may tend to be systematically related to the impact of exporting upon performance. It is well known that firms from developing countries may benefit from a stronger performance effect when entering the export market, to the extent that those firms are likely to be further away from the frontier of technological knowledge. Therefore, such firms from developing economies are perhaps likely to learn more from overseas clients or competitors than 'similar' firms based in developed countries. We examine the role of this factor by considering a dummy variable taking value one for firms based in developed countries and value zero for firms based in developing countries. We consider the UN definition of a developed economy but our results below are robust to alternative definitions.

2. *Estimation method*

   While the most standard approach to the estimation of equation 2.1 is OLS/FE, several papers adopt alternative methods. Some papers implement Propensity Score Matching, some conduct different version of the Generalized Method of Moments, while others use Full Information Maximum Likelihood approaches. To the extent that the assumptions made in OLS/FE lead to upward biased estimates of the impact of exporting upon firm performance (because high-performance firms are more likely to select into exporting than low-performance firms), then one may expect that non-OLS methods would lead to lower estimates. We implement this analysis by lumping into a non-OLS dummy variable all estimation methods other

than OLS or Fixed Effects.

3. *Performance measurement timing*

   The effects of exports upon performance do not need to be constant over time. For instance, firms may learn considerably when they start exporting but not much more after they have exported for some time. Alternatively, the effects from exports may take some time to materialize, possibly if the distance to the technological frontier is considerable. Again, we create a dummy variable that flags those estimates that are based on a 'long-run' analysis, which here we define as more than two periods after the firm began exporting.

4. *Sample heterogeneity*

   The comparability of firms in the 'treatment' and 'control' groups is a crucial aspect of most empirical studies. Recently some researchers have suggested that (propensity score) matching methods can be more effective than traditional OLS and other methods in terms of generating an adequate 'like-for-like' comparison between the two groups (Rosenbaum and Rubin, 1983). To the extent that non-matched samples are more diverse and less comparable than matched samples (when the sample is restricted to firms with similar matching values), the measured effects of the relationship between exports and performance may be higher than when a matched sample is used. As before, we address this hypothesis by considering a dummy variable taking value one for estimates based on matched samples.

5. *Measurement of productivity*

There are different ways of measuring productivity. The most common one - but perhaps also the most difficult to compute, given its data requirement - is total factor productivity. Perhaps due to such potential problems in correctly estimating TFP, measurement error in that variable can introduce an attenuation bias and lead to lower estimates of the impact of exporting upon performance. We test this hypothesis by considering a dummy variable that captures all estimates based on other variables than TFP.

6. *Time period*

   The effect of exports may also be changing over time, particularly as globalization affects more profoundly a wider set of countries. This process of widening globalization may mean that exporters become an increasingly more common group of firms, thus eroding the performance advantage that is presumably generated by exporting. We test this hypothesis by including a control variable indicating the average year of the data sample underpinning each estimate.

Finally, our main results from our Meta-analysis are obtained from estimating an equation of the following type:

$$\hat{\beta}_j = \alpha_0 + \sum_{k=1}^{K} \alpha_k Z_{jk} + e_j, \tag{2.2}$$

in which $\hat{\beta}_j$ is the reported estimate of the j^{th} study and Z_{jk} are the variables that measure the characteristics of that same estimate and that were described above.

Although Meta-analyses typically weight each study equally, one may also ar-

gue that papers published in journals that stand higher in comparative rankings are likely to be of greater importance and thus also deserve a greater weighting in Meta-analysis studies. Under that assumption, we also consider in our estimation different weights for each estimate, depending on the ranking of the journal in which the paper and the estimate appear. In particular, we consider three different rankings: those computed by Axarloglou and Theoharakis (2003) and Kalaitzidakis et al. (2001) and a third ranking based on the simple average of twelve different rankings (CEMPRE and NIPE, 2006). However, our benchmark results are based on an unweighted analysis of the estimates.

Another important aspect to be taken into account is that some papers present more estimates than others. In order not to let a few papers that may include large numbers of estimates dominate our findings in a disproportionate way; we divide the weight of the ranking (if we are using one) by the number of estimates in the paper. In the benchmark case in which we do not use any journal weight, we use a weight defined by the inverse of the number of estimates in the paper.

2.3 Descriptive statistics

We were able to find 57 studies that address the causal effect of exporting on firm performance. After restricting the studies to those that consider productivity effects, we are left with 33 studies [1]that we include in our analysis. 27 papers are

[1]These 33 studies include Bernard and Jensen (1999), Kraay (1999), Aw et al. (2000), Castellani (2002), Isgut (2001), Hallward-Driemeier et al. (2002), Wagner (2002), Baldwin and Gu (2003), Hansson and Lundin (2004), Bernard and Jensen (2004*a*), Bigsten et al. (2004), Blalock and Gertler (2004), Damijan et al. (2004), Girma, Görg and Strobl (2004), Greenaway and Yu (2004), Greenaway and Kneller (2004), Hahn (2004), Mengistae and Pattillo (2004), Alvarez and Lopez (2005), Arnold and Hussinger (2005*a*), Fernandes and Isgut (2005), Greenaway et al. (2005), Requena Silvente (2005), Van Biesebroeck (2005), Yasar and Rejesus (2005), Yasar et al. (2006), Damijan and Kostevc (2007), De Loecker (2007), Farinas and Martin-Marcos

published in academic journals and six are working papers.

Table 2.1 and Table 2.2 present the list of those 33 papers that we use in the Meta-analysis, along with some of their main characteristics, such as their (average) estimate (as mentioned above, many papers present more than one estimate of the relationship between exports and productivity). Other variables described in the table are if the paper carries out a matching analysis, if the paper adopts other methods than OLS or fixed effects, if the country upon which the estimates are based is developed or not, and the number of estimates reported in the paper. Finally, we also indicate the weight carried by each paper (which, in some specifications, is then divided by the number of estimates to generate the weight of each estimate). The paper weight can be derived from one of three different rankings (the one displayed in the table is from CEMPRE and NIPE (2006)).

The next table summarizes the main features of our data set. In Table 2.3 we describe the 275 estimates included in our analysis, of which 60% refer to developed countries; 39% of all estimates implement non-OLS econometric techniques; and 32% involve propensity score matching. The average number of observations in each sample is 13303 (although this large number is driven to a large extent by an outlier in this respect (Hahn, 2004)).

2.4 Results

Our main results, based on the estimation of equation 2.2 are presented in Tables 2.4 and 2.5. In both tables, the first column does not assign any weight to each

(2007), Greenaway and Kneller (2007), ISGEP (2007), Crespi et al. (2008) and Greenaway and Kneller (2008)

estimate, while the remaining three columns consider each a separate weight to different papers based on the ranking of the journal in which the paper was published.

As documented in Table 2.4, we find that developed countries tend to exhibit lower effects from exporting in terms of the performance of their firms, the effect ranging between -.059 and -.083. On the other hand, non-OLS estimators tend to generate higher estimates of the role of exports (although the difference is only significant in one column), while long-term effects tend to result in weaker effects upon performance. We also find that matched samples tend to produce lower estimates, although in two specifications the coefficient is not significant.[1]

We complement this main analysis by extending our specification with a control for the standard error of the estimate under analysis. In fact, bigger point estimates are not necessarily as significant as smaller estimates, so that our previous results may be misleading in terms of the effects of different characteristics of the studies. By controlling for the standard error, we address this possibility. Once we do this (see Table 2.5), we find that more covariates are significantly related to the estimates of the impact of exports on productivity. In particular, in the case of the model without weights, we find that non-TFP dependent variables and more recent data now lead to bigger (more positive) impacts.

In general, we find that the results are very robust across the two tables. In particular, the result about the role of development is generally unchanged across the different weights, at least in qualitative terms. Across virtually all columns of the two tables, developed countries display lower estimates of the relationship

[1]Moreover, Table 2.4 shows that studies with more observations tend to lead to smaller effects; and there is some evidence that more recent studies lead to bigger effects, although in only one case the coefficient is significant.

between exports and productivity. In fact, the role of development ranges between -0.056 to -0.121 and, except for one case out of eight, all coefficients are significant, at least at the 5% level. Given that the average level across all studies of the role of exporting upon productivity is around 9% (see Table 2.3), it is clear from our findings that a country development level can be a particularly important dimension in these studies.

However, there are two other results that also suggest a relatively clear relationship between the respective study characteristic and the ensuing estimate of the role of exports. These additional variables are the short-/long-run dimension and the matched/unmatched sample. In the first case, the estimates in columns 1, 3 and 4 (Table 2.5) indicate that long-run studies systematically display lower relationships between exporting and productivity. The three coefficients are also particularly similar, ranging between -0.045 and -0.068, each significant at least at the 5% level.

The second case concerns the role of matched samples. Across all columns, we find that the coefficients are, again, almost identical. Moreover, only one of the four coefficients is significant at only 10% while the others are significant at least at the 5% level. Taken at face value, the size of the estimates (about -0.06) is again considerable, when compared to the average coefficient across all studies (0.09).

Finally, for the benefit of robustness, we also reestimate our results considering only the subset of significant estimates. Moreover, we also consider the possible role of the level of the data (firm- or plant/establishment-level), another dimension that may affect the size of the estimates reported in different stud-

ies.[1] These new findings are presented in Table 2.6. The results again indicate a (very) significant negative relationship between development and the export effect on firm productivity. The coefficients range between -.16 and -.27 and are all significant at the 5% level or less.[2]

However, we also find that most of the other dimensions of the studies for which we document significant relationships (short-/long-run dimension and matched / unmatched sample) are now insignificant (and sometimes of the 'wrong' sign). We believe this can be explained by the smaller number of observations under this sub-sample. Another explanation is the smaller amount of variation across observations, given the restriction that only significant estimates are to be considered, which would reduce the precision of the coefficients of the Meta-analysis results. On the other hand, it is noteworthy that even these restrictive conditions do not lead to the erosion of the main result of the paper, that of a negative relationship between the level of economic development and the exporting effect on firm productivity. This finding is consistent in all result tables.

2.4.1 Publication bias

Following the Meta-analysis literature (Card and Krueger, 1995), our chapter also tests whether there is a publication bias in the research about the causal effects of exporting on performance. Indeed, one may expect that studies on this or any other topic will be more likely to be published if they obtain significant effects. In this case, the evidence one would obtain from studying the literature could be

[1] This is achieved by including a dummy variable that takes value one only if the estimate is based on plant-level data. We found that 43% of the 275 estimates are based on such data.

[2] We have also conducted this robustness analysis separately - i.e. including only the significant estimates or including only the plant-level dummy variable and the quantitative and qualitative results are generally unchanged.

severely biased.

We search for evidence about publication bias in our sample by regressing the t-ratio of each estimate on the same set of controls as in equation 2.2 plus a control for the square root of the number of observations used for that same estimate. The rationale for this analysis is that in the absence of publication bias, the studies with relatively small number of observations are more likely to be published if they have a high t value. As Card and Krueger (1995) put it, 'If studies are only published if they achieve a t ratio of 2 or more, and if researchers choose their specification in part to achieve statistically significant results, then the early studies [in the minimum-wage literature examined by the author] may tend to have high t ratios despite their small samples.' (page 239).

Our results about this issue are presented in Table 2.7. We find that, consistent with the publication bias case, the results of some specifications do suggest that estimates based on more observations have lower t-ratios. However, as Figure 2.1 indicates, this result may be related to the two observations in its right-hand-side corner, which can be interpreted as outliers. Once these two observations are removed from the analysis, we actually find a typically very significant and positive relationship between sample size and the t-ratio (see Table 2.8). We therefore conclude that there is no evidence of publication bias in the literature about the effects of exporting upon firm performance.

2.5 Conclusions

We conduct a Meta-analysis of more than 30 papers and almost 300 estimates of the causal relationship between exporting and productivity. Meta-analysis

techniques are useful in this context as the many studies available tend to have different characteristics, making it difficult to discern clear patterns in their findings. Indeed, in a recent survey, Wagner (2007*a*) concludes that the effects of exporting on productivity are "mixed and unclear".

Our results indicate that the impact of exporting upon productivity is higher in developing than in developed economies, a finding robust to a large set of different specifications. Moreover, we also find that this 'learning-by-exporting' effect 1) is higher in the first year that firms start exporting than in later years; and 2) is lower when only matched firms are considered in the study. These latter findings are also shown to be generally robust to different specifications and to different weights, based on different rankings of the journals in which the estimates are published. Finally, we also find no evidence of publication bias across the estimates considered.

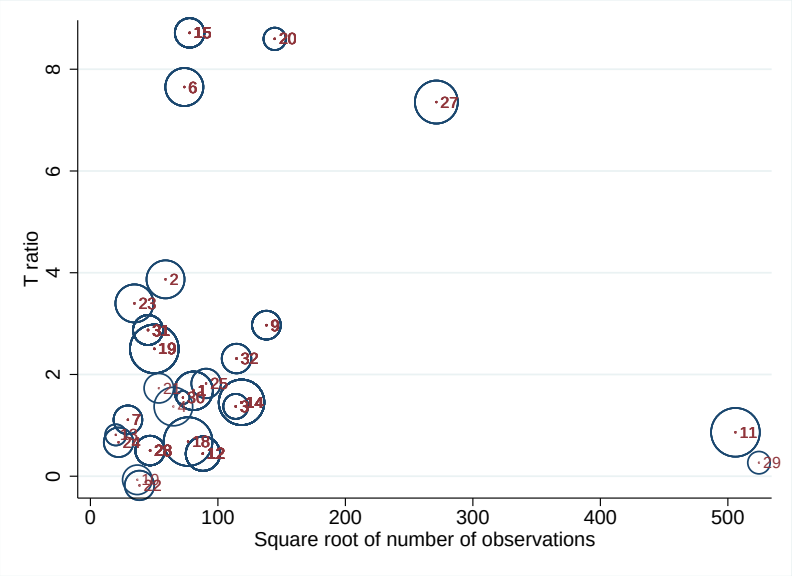
Overall, our results emphasize the importance of access to international markets for the performance of firms in developing countries, perhaps due to the greater distance to the technological frontier that tends to characterize such firms. Our results also support 'learning by exporting' models, in that they tend to suggest that the greater impact from exports will arise precisely when firms begin their internationalization process. On the other hand, the present state of knowledge does not allow one to disentangle other specific characteristics of developing countries from their level of development - longitudinal studies that relate the 'learning effect' across firms and their country's level of development will be useful in this respect.

On a more technical level, the findings presented in our chapter suggest that one should be careful when comparing estimates from papers that adopt different

methodologies: OLS/FE estimates and/or estimates based on matched samples are likely to indicate lower effects of exporting when compared to estimates based on different methodologies and/or non-matched samples, as non-matched samples are more diverse and less comparable than matched samples (when the sample is restricted to firms with similar matching values).

2.6 Tables and figures

Figure 2.1: T-ratios and the square root of number of observations



Size of circle proportional to the weight of the journal in which the paper was published. Weight used from CEMPRE and NIPE (2006). See text for more details.

Table 2.1: List of all studies and their main characteristics

Reference	Countries	Coeff.	Sig.	M.	N.O.	Dev.	N	W.
Bernard and Jensen (1999)	US	0.00	0	0	0.0	1.0	3	42.2
Kraay (1999)	China	0.71	++	0	1.0	0.0	2	
Aw et al. (2000)	Asian (1)	0.02	0	0	0.0	0.0	20	20.9
Castellani (2002)	Italy	-0.00	0	0	0.0	1.0	1	15.5
Isgut (2001)	Colombia	0.06	+	0	0.0	0.0	10	14.7
Hallward-Driemeier et al. (2002)	Asian (2)	0.12	+	0	0.0	0.0	10	
Wagner (2002)	Germany	0.04	0	1	1.0	1.0	1	26.4
Baldwin and Gu (2003)	Canada	0.04	++	0	0.3	1.0	6	25.7
Hansson and Lundin (2004)	Sweden	0.03	+	0	0.0	1.0	6	15.5
Bernard and Jensen (2004*a*)	USA	0.00	0	0	0.0	1.0	1	8.9
Bigsten et al. (2004)	African (3)	0.06	0	0	1.0	0.0	6	14.7
Blalock and Gertler (2004)	Indonesia	0.04	++	0	0.0	0.0	4	32.8
Damijan et al. (2004)	Slovenia	0.03	0	0	0.0	1.0	5	
Girma, Görg and Strobl (2004)	UK	0.05	+	1	1.0	1.0	8	11.1
Greenaway and Yu (2004)	UK	0.33	+	0	1.0	1.0	2	15.5
Greenaway and Kneller (2004)	UK	0.05	+	1	0.5	1.0	6	8.9

Notes: All variables are averaged by paper. 'Coeff.' is the coefficient of each paper. 'Sig.' describes the significance of the estimates reported in each paper (++: at least 75% of the estimates significantly positive at the 10% level; +: at least 50% of the estimates significantly positive at the 10% level; –: at least 75% of the estimates significantly negative at the 10% level; -: at least 50% of the estimates significantly positive at the 10% level; 0: less than 50% of the estimates significantly positive at the 10% level and less than 50% of the estimates significantly negative at the 10% level); 'M.' is a dummy variable equal to one if the paper adopts a matching method. 'N.O.' is a dummy variable if the paper adopts a different econometric method that OLS (or fixed effects). 'Dev.' is a dummy variable equal to one if the country is classified as developed. 'N' indicates the number of estimates used from the paper. 'W.' is an indication of the total weight assigned to the paper. The weight used here draws on CEMPRE and NIPE (2006); alternative weights are also used in the paper. Country groups: (1): Taiwan and South Korea; (2): Malaysia, Indonesia, Thailand, S. Korea and Philippines; (3): Cameroon, Kenya, Ghana and Zimbabwe; (4): Ghana, Kenya and Ethiopia; (5): Ethiopia, Tanzania, Burundi, Zambia, Kenya, Ghana, Cote d'Ivoire, Cameroon and Zimbabwe; (6): Austria, Belgium, Chile, China, Colombia, France, Germany, Italy, Ireland, Slovenia, Spain, Sweden and United Kingdom (Denmark is also analyzed in the paper but not in terms of the 'learning-by-exporting' hypothesis).

Table 2.2: List of all studies and their main characteristics [Cont's]

Reference	Countries	Coeff.	Sig.	M.	N.O.	Dev.	N	W.
Hahn (2004)	S. Korea	0.90	0	0	0.0	0.0	1	
Mengistae and Pattillo (2004)	African (4)	0.08	+	0	0.0	0.0	2	8.0
Alvarez and Lopez (2005)	Chile	0.23	+	0	0.0	0.0	3	25.7
Arnold and Hussinger (2005*a*)	Germany	-0.01	0	1	1.0	1.0	2	15.5
Fernandes and Isgut (2005)	Colombia	0.05	++	1	0.8	0.0	8	
Greenaway et al. (2005)	Sweden	0.19	0	1	1.0	1.0	26	15.5
Requena Silvente (2005)	UK	0.01	+	0	0.0	1.0	4	3.1
Van Biesebroeck (2005)	African (5)	0.25	++	0	0.3	0.0	12	42.2
Yasar and Rejesus (2005)	Turkey	0.16	+	1	1.0	0.0	9	26.4
Yasar et al. (2006)	Turkey	0.21	++	0	0.0	0.0	12	15.5
Damijan and Kostevc (2007)	Slovenia	0.20	0	1	1.0	1.0	5	15.5
De Loecker (2007)	Slovenia	0.01	0	1	1.0	1.0	5	42.2
Farinas and Martin-Marcos (2007)	Spain	0.04	+	0	0.5	1.0	16	15.9
Greenaway and Kneller (2007)	UK	0.01	0	1	1.0	1.0	3	15.5
ISGEP (2007)	13 countries (6)	0.02	0	0	0.0	0.8	57	
Crespi et al. (2008)	UK	0.21	++	0	0.3	1.0	4	25.7
Greenaway and Kneller (2008)	UK	0.04	0	1	1.0	1.0	15	36.9

Notes: All variables are averaged by paper. 'Coeff.' is the coefficient of each paper. 'Sig.' describes the significance of the estimates reported in each paper (++: at least 75% of the estimates significantly positive at the 10% level; +: at least 50% of the estimates significantly positive at the 10% level; –: at least 75% of the estimates significantly negative at the 10% level; -: at least 50% of the estimates significantly positive at the 10% level; 0: less than 50% of the estimates significantly positive at the 10% level and less than 50% of the estimates significantly negative at the 10% level); 'M.' is a dummy variable equal to one if the paper adopts a matching method. 'N.O.' is a dummy variable if the paper adopts a different econometric method that OLS (or fixed effects). 'Dev.' is a dummy variable equal to one if the country is classified as developed. 'N' indicates the number of estimates used from the paper. 'W.' is an indication of the total weight assigned to the paper. The weight used here draws on CEMPRE and NIPE (2006); alternative weights are also used in the paper. Country groups: (1): Taiwan and South Korea; (2): Malaysia, Indonesia, Thailand, S. Korea and Philippines; (3): Cameroon, Kenya, Ghana and Zimbabwe; (4): Ghana, Kenya and Ethiopia; (5): Ethiopia, Tanzania, Burundi, Zambia, Kenya, Ghana, Cote d'Ivoire, Cameroon and Zimbabwe; (6): Austria, Belgium, Chile, China, Colombia, France, Germany, Italy, Ireland, Slovenia, Spain, Sweden and United Kingdom (Denmark is also analyzed in the paper but not in terms of the 'learning-by-exporting' hypothesis).

Table 2.3: Descriptive statistics

Variable	Mean	Std. Dev.	N
Coefficient	0.09	0.19	275
St. Error	0.09	0.21	275
t value	1.99	3.2	275
Developed	0.60	0.49	275
Non-OLS	0.39	0.49	275
Matched Sample	0.32	0.47	275
Long Effect	0.68	0.47	275
Survey Year	1994.21	4.99	275
No. Observations	13303.2	55786.54	275
Weight1	0.91	1.29	151
Weight2	0.76	1.58	168
Weight3	2.9	3.26	192

Notes: 'Developed' is a dummy variable equal to one when the estimate refers to developed economies (UN definition). 'Non-OLS' is equal to one if the estimate is based on other econometric methods than OLS or fixed effects. 'Matched Sample' is a dummy variable equal to one if the estimate is based on a matching approach. 'Long Effect' is a dummy variable equal to one if the estimate is based on the exporting effect after entrant year. 'Plant' is a dummy variable equal to one if the estimate is based on plant-level data. (Journal) Weight 1 corresponds to Kalaitzidakis et al. (2001), Weight 2 corresponds to Axarloglou and Theoharakis (2003), and Weight 3 corresponds to CEMPRE and NIPE (2006). Significance levels: *: 0.10; **: 0.05; ***: 0.01.

Table 2.4: Meta-Analysis regression

	No-Weight	Weight1	Weight2	Weight3
	(1)	(2)	(3)	(4)
Developed	-.059	-.077***	-.083***	-.059**
	(.041)	(.029)	(.030)	(.025)
Non-TFP	-.024	.012	.039*	.023
	(.032)	(.026)	(.021)	(.023)
Non-OLS	.104**	.029	.062	.051
	(.050)	(.049)	(.039)	(.050)
Matched Sample	-.045	-.075*	-.076**	-.064
	(.041)	(.042)	(.034)	(.049)
Long-term	-.043*	-.058*	-.061**	-.072**
	(.026)	(.034)	(.025)	(.030)
Survey Year	.0001	.0008	.002**	.002
	(.004)	(.001)	(.0009)	(.002)
$\sqrt{No.\ Observations}$	.0003	-.0003***	-.0002*	-.0002**
	(.0003)	(.0001)	(.00008)	(.00007)
Intercept	-.079	-1.443	-3.545**	-4.146
	(8.808)	(2.433)	(1.771)	(3.683)
Obs.	218	151	168	192
R^2	.053	.3	.285	.181
F statistic	3.238	7.44	10.227	6.185

Notes: The dependent variable for each regression is an estimate of the relationship between exports and firm productivity from the studies considered in this chapter. The explanatory variables are different characteristics of each study. 'Developed' is a dummy variable equal to one when the estimate refers to developed economies (UN definition). 'Non-OLS' is equal to one if the estimate is based on other econometric methods than OLS or fixed effects. 'Matched Sample' is a dummy variable equal to one if the estimate is based on a matching approach. 'Long Effect' is a dummy variable equal to one if the estimate is based on the exporting effect after entrant year. (Journal) Weight 1 corresponds to Kalaitzidakis et al. (2001), Weight 2 corresponds to Axarloglou and Theoharakis (2003), and Weight 3 corresponds to CEMPRE and NIPE (2006). Significance levels: *: 0.10; **: 0.05; ***: 0.01.

Table 2.5: Meta-Analysis regression (including standard errors)

	No-Weight	Weight1	Weight2	Weight3
	(1)	(2)	(3)	(4)
Developed	-.121***	-.065**	-.056**	-.059***
	(.029)	(.027)	(.028)	(.022)
Non-TFP	.057**	.024	.042**	.039**
	(.023)	(.024)	(.020)	(.019)
Non-OLS	.063*	-.003	.024	.018
	(.038)	(.036)	(.029)	(.032)
Matched Sample	-.064**	-.063**	-.058***	-.058*
	(.033)	(.027)	(.021)	(.031)
Long-term	-.045**	-.050	-.058**	-.068***
	(.022)	(.030)	(.023)	(.025)
Survey Year	.007***	.001	.002*	.003
	(.002)	(.001)	(.001)	(.002)
$\sqrt{No.\ Observations}$	.0003**	-.0002**	-.0001	-.00008
	(.0001)	(.00009)	(.00007)	(.00007)
St. Error	.593***	.653***	.705***	.557***
	(.106)	(.121)	(.127)	(.111)
Intercept	-14.566***	-2.373	-3.075	-6.444
	(4.345)	(2.715)	(1.927)	(4.164)
Obs.	218	151	168	192
R^2	.441	.465	.426	.424
F statistic	9.062	11.443	15.658	8.882

Notes: The dependent variable for each regression is an estimate of the relationship between exports and firm productivity from the studies considered in this chapter. The explanatory variables are different characteristics of each study. 'Developed' is a dummy variable equal to one when the estimate refers to developed economies (UN definition). 'Non-OLS' is equal to one if the estimate is based on other econometric methods than OLS or fixed effects. 'Matched Sample' is a dummy variable equal to one if the estimate is based on a matching approach. 'Long Effect' is a dummy variable equal to one if the estimate is based on the exporting effect after entrant year. (Journal) Weight 1 corresponds to Kalaitzidakis et al. (2001), Weight 2 corresponds to Axarloglou and Theoharakis (2003), and Weight 3 corresponds to CEMPRE and NIPE (2006). Significance levels: *: 0.10; **: 0.05; ***: 0.01.

Table 2.6: Meta-Analysis regression (only significant estimates; including plant control)

	No-Weight	Weight1	Weight2	Weight3
	(1)	(2)	(3)	(4)
Developed	-.266***	-.195***	-.217***	-.160**
	(.095)	(.064)	(.059)	(.069)
Non-TFP	.055	.041	.047*	.031
	(.041)	(.035)	(.027)	(.035)
Non-OLS	.028	-.048	-.081**	-.057
	(.051)	(.037)	(.037)	(.041)
Matched Sample	.003	.008	.049	.052
	(.033)	(.042)	(.038)	(.038)
Long-term	.005	.045	.054**	.019
	(.030)	(.034)	(.026)	(.034)
Survey Year	.015***	.013***	.011***	.013***
	(.003)	(.003)	(.003)	(.004)
$\sqrt{No.\ Observations}$	-.0004**	-.002***	-.001***	-.001***
	(.0002)	(.0002)	(.0002)	(.0002)
Plant	-.088	.011	-.036	.025
	(.079)	(.079)	(.069)	(.082)
Intercept	-29.234***	-26.034***	-21.938***	-26.395***
	(5.802)	(5.516)	(6.872)	(8.144)
Obs.	102	72	72	82
R^2	.312	.65	.668	.525
F statistic	10.811	26.655	29.695	8.972

Notes: The dependent variable for each regression is an estimate of the relationship between exports and firm productivity from the studies considered in this chapter. The explanatory variables are different characteristics of each study. 'Developed' is a dummy variable equal to one when the estimate refers to developed economies (UN definition). 'Non-OLS' is equal to one if the estimate is based on other econometric methods than OLS or fixed effects. 'Matched Sample' is a dummy variable equal to one if the estimate is based on a matching approach. 'Long Effect' is a dummy variable equal to one if the estimate is based on the exporting effect after entrant year. 'Plant' is a dummy variable equal to one if the estimate is based on plant-level data. (Journal) Weight 1 corresponds to Kalaitzidakis et al. (2001), Weight 2 corresponds to Axarloglou and Theoharakis (2003), and Weight 3 corresponds to CEMPRE and NIPE (2006). Significance levels: *: 0.10; **: 0.05; ***: 0.01.

Table 2.7: Publication bias

	No-Weight	Weight1	Weight2	Weight3
	(1)	(2)	(3)	(4)
$\sqrt{No.\ Observations}$	.002	-.005	-.002	-.001
	(.003)	(.003)	(.003)	(.003)
Developed	-.773	-.983	-.051	-1.100
	(.533)	(.766)	(.616)	(.703)
Non-TFP	1.289***	1.609***	1.816***	1.889***
	(.424)	(.479)	(.460)	(.463)
Non-OLS	-2.156**	-2.104**	-2.697**	-2.368***
	(.867)	(1.046)	(1.267)	(.890)
Matched Sample	1.090	-.872	.377	.523
	(.859)	(.620)	(1.067)	(.729)
Long Effect	-1.289***	-.321	-1.349**	-1.186**
	(.497)	(.669)	(.528)	(.546)
Survey Year	.044	.016	.046*	.076
	(.050)	(.041)	(.025)	(.051)
Intercept	-83.347	-26.707	-88.296*	-146.568
	(98.832)	(82.829)	(49.832)	(100.692)
Obs.	218	151	168	192
R^2	.173	.34	.256	.263
F statistic	8.196	7.47	6.507	9.224

Notes: The dependent variable for each regression is the t-ratio from the studies considered in this chapter. The explanatory variables are different characteristics of each study. 'Developed' is a dummy variable equal to one when the estimate refers to developed economies (UN definition). 'Non-OLS' is equal to one if the estimate is based on other econometric methods than OLS or fixed effects. 'Matched Sample' is a dummy variable equal to one if the estimate is based on a matching approach. 'Long Effect' is a dummy variable equal to one if the estimate is based on the exporting effect after entrant year. (Journal) Weight 1 corresponds to Kalaitzidakis et al. (2001), Weight 2 corresponds to Axarloglou and Theoharakis (2003), and Weight 3 corresponds to CEMPRE and NIPE (2006). Significance levels: *: 0.10; **: 0.05; ***: 0.01.

Table 2.8: Publication bias (excluding outliers)

	No-Weight	Weight1	Weight2	Weight3
	(1)	(2)	(3)	(4)
$\sqrt{No.\ Observations}$	.022***	.018***	.021***	.020***
	(.005)	(.004)	(.004)	(.004)
Developed	.554	.636	.825	.470
	(.548)	(.730)	(.556)	(.716)
Non-TFP	-.145	.473	.895**	.764
	(.398)	(.439)	(.410)	(.470)
Non-OLS	-.848	-1.412	-1.678	-1.324*
	(.670)	(.959)	(1.054)	(.801)
Matched Sample	-.033	-1.920***	-.961	-1.014
	(.696)	(.560)	(.850)	(.617)
Long Effect	-1.819***	-.821	-1.440***	-1.287**
	(.466)	(.584)	(.452)	(.519)
Survey Year	-.097*	-.095*	-.050	-.019
	(.053)	(.053)	(.033)	(.047)
Intercept	195.659*	193.356*	102.002	40.566
	(105.175)	(105.885)	(65.272)	(93.997)
Obs.	255	135	151	174
R^2	.244	.455	.395	.351
F statistic	10.256	15.827	14.294	19.774

Notes: The dependent variable for each regression is the t-ratio from the studies considered in this chapter. The explanatory variables are different characteristics of each study. 'Developed' is a dummy variable equal to one when the estimate refers to developed economies (UN definition). 'Non-OLS' is equal to one if the estimate is based on other econometric methods than OLS or fixed effects. 'Matching Sample' is a dummy variable equal to one if the estimate is based on a matching approach. 'Long Effect' is a dummy variable equal to one if the estimate is based on the exporting effect after entrant year. (Journal) Weight 1 corresponds to Kalaitzidakis et al. (2001), Weight 2 corresponds to Axarloglou and Theoharakis (2003), and Weight 3 corresponds to CEMPRE and NIPE (2006). Significance levels: *: 0.10; **: 0.05; ***: 0.01.

Chapter 3

Exporting and Firm Productivity: Evidence from Chinese Firms

3.1 Introduction

Mainland China (hereafter called China) has been undergoing a period of extremely high economic growth and this, in part, is due to the massive levels of trade. It is well known that membership in the WTO improves international trade and development of China's economy. It also provides China the opportunity to play a large and growing role in the world economy. The United Nations commodity trade statistics database indicates that in the period of 1998 to 2007 the ratio of China's exports to the world exports increased from 4% to 10%, and export values growing from $ 183 billion to $ 1,217 billion (as shown in Table 3.1 and Table 3.2).

Therefore, the evidence for China as one of today's most important exporters on issues related to international trade and heterogeneous firm productivity is an important research area. Moreover, the ratios of exports in each commodity have been adjusted in the last ten years. China exports more in commodities of nuclear reactors, boilers, machinery, electrical, electronic equipment, iron, steel, vehicles, tramway, apparatus, furniture and prefabricated buildings; less in commodities of apparel, accessories, footwear, gaiters, toys and sports requisites (as shown in Table 3.3 to Table 3.5). It is the fact that more and more Chinese firms enter into the trade market, and it is particularly worth investigating the performance gains of these Chinese exporters attributable to trade. This chapter departs from existing empirical studies in two major aspects. Firstly, this is one of the first papers to use instrumental variables to avoid the self-selection effect in the regression estimation of performance gains attributable to exporting, which leads to get more efficient estimates that are not usually available in data sets used to

investigate the topic of exporting and firm productivity. Secondly, this chapter argues that the performance gains attributable to exporting are different with respect to different firm size.

The first objective of this chapter[1] is to test the existence of export premium. We want to know whether exporters on average, are larger, more productive than non-exporters. The second research question that we are interested in concerns the learning by exporting (exporters have higher productivity growth than non-exporters in the post-entry period). In fact, the main focus in the literature of exporting and firm productivity in the 1990s and the 2000s, despite some findings on the 'export premium', mainly concerns the 'learning effect' (learning by exporting). Exporting could be an important source of competitive pressures, information and other productivity advantages for firms, leading to significant performance improvements that have been identified as 'learning by exporting' (Bernard et al., 2003; Clerides et al., 1998; Fernandes, 2007). Learning by exporting fosters higher productivity in firms, and transfers the knowledge from international buyers and competitors to help improve the post-entry performance of exporters (Baldwin and Gu, 2003; Crespi et al., 2008; Greenaway and Kneller, 2004; Hallward-Driemeier et al., 2002; Isgut, 2001; Mengistae and Pattillo, 2004; Van Biesebroeck, 2005; Yasar et al., 2006). Given its potential relevance, the 'learning by exporting' hypothesis has spurred a large number of empirical studies seeking to assess the causal effect of exporting at the firm level. However, there is no consensus on whether the effect exists or what specific factors may be

[1]Considering the length of volume and readability, I divide my work into two chapters. Chapter 3 and Chapter 4 aim to test same questions by using different estimators: regression estimation and semi-parametric estimation. However, our benchmark results are based on matched firms in Chapter 4.

behind it. The evidence of the learning effect is mixed or unclear in some papers, including Castellani (2002), Arnold and Hussinger (2005*a*) and The International Study Group on Exports and Productivity (2007). Our study therefore will investigate this learning effect on firm productivity by estimating the magnitude of sales growth between exporters and non-exporters from year t-1 to year t.

The simultaneous problem arises when there is a contemporaneous correlation between the exporting and firm productivity residuals, generating biased estimates in the regression estimation. The nationality[1] and overseas education background of general managers [2] are used as instrumental variables in the learning by exporting analysis to alleviate a potential endogeneity problem of the export variable. One may argue that the international experience of the general manager seems likely endogenous. That is, good firms would choose managers with experience in foreign markets. However, we believe that for those firms with an interest in entering foreign markets the decision of how and when to enter the export market partly depends on the international experience of general managers, but general managers who are educated in Chinese universities or institutions may be more aware of Chinese domestic markets and cultures that could be great strategic advantages. Therefore, the international experience of general managers cannot directly improve the productivity of firm. Meanwhile, the Sargan test in our analysis fails to reject the null hypothesis that the instruments are valid. We believe that these two instruments, to some extent, are valid and efficient in our regression estimation.

[1]WBIC survey asks the nationality of the general manager. In our analysis we create a dummy equal to one if the nationality of general manager is not Chinese.

[2]WBIC survey asks whether the general manager was educated at home institution or aboard. In our analysis we create a dummy equal to one if the general manager was educated abroad.

The third question that we are also interested in concerns the entrant effect of exporting on firm productivity (new export market entrants have higher productivity growth than non-exporters in the entrant year). Firms have to afford the sunk cost to enter the international market. One may argue that the growth of firm productivity may be higher in the entrant year, especially when there is a large amount of new investment into foreign facilities. This study tests this entrant effect by estimating the magnitude of sales growth between new export market entrants and non-exporters in the entrant year.

We also argue that there are heterogeneous performance gains attributable to exporting caused by different firm size. Large firms have ability to internationalize often because of slack resources and other ownership advantages which allows them to exploit internationalisation more effectively. In contrast, small firms are likely to be further away from the frontier of technological knowledge, but may learn more from overseas clients or competitors which could be reflected in their long term performance. To investigate this possibility we use two sets of samples. One sample is from the world bank climate survey database which does not restrict the sample size in their surveys, and the other sample contains the 575 firms listed in top thousand Chinese firms according to the annual revenue in the Orbis database (those firms listed in top thousand without sufficient information are ignored).

The remainder of this chapter is organized as follows. First, Section 3.2 aims to elaborate a literature review of theoretical and empirical studies, followed by Section 3.3 describing details of data sets used in this study and presents the descriptive statistics of data sets. We then describe the methodology undertaken in the study in Section 3.4, after which Section 3.5 shows the results. Finally,

Section 3.6 gives concluding remarks.

3.2 Literature review

Exporting and firm productivity have been analyzed through both the theoretical approach and tested by the empirical work at firm level. Since the mid-1817s, various economists sought to provide the mathematical model of international trade, and since the mid-1990s, a large number of empirical studies have provided a wealth of information about the important role that exporting plays in the heterogeneous firm productivity. In this chapter we provide a critical review of theoretical and empirical studies on the topic about international trade and heterogeneous firm productivity.

3.2.1 Review of theoretical studies

Analysis of theoretical studies with a microeconomic perspective on international trade shows that one could distinguish three prevalent research streams. The traditional or old theories of international trade (Heckscher, 1919; Ohlin, 1933; Ricardo, 1817) build on the concept of comparative advantage under which it is beneficial for the flow of goods between countries; the new trade theories (Helpman, 1981; Helpman and Krugman, 1985; Krugman, 1980) propose that there are economies of scale and consumer tastes or preferences in the flow of goods between countries; the heterogeneous-firm trade theories (Bernard, Redding and Schott, 2007; Bernard et al., 2003; Melitz, 2003; Melitz and Ottaviano, 2008) introduce the inter-firm reallocation and industry productivity growth in the trade

model by especially emphasizing the importance of firm heterogeneity in generating international trade. Details of the theoretical review are in section 1.3 of the introduction chapter.

3.2.2 Review of empirical studies

A firm needs to afford the sunk cost to expand its market to wider country coverage through the exporting or foreign direct investment. It is apparent that, on average, exporters are larger, more productive, more capital-intensive, more technology-intensive and willing to pay higher wages (Bernard and Jensen, 1995). That is also the first empirical study to examine performance gains attributable to exporting at firm level. So far, the country coverage of the empirical research has spanned to many countries [1].

In terms of the measurement of firm performance, the most standard approach to estimate the effects of exporting on firm performance - but perhaps also the most difficult to compute, given its data requirement - is the total factor pro-

[1] They include Canada (Baldwin and Gu, 2003), Chile (Alvarez and Lopez, 2005), China (Kraay, 1999; Yang, 2008), Colombia (Fernandes and Isgut, 2005; Isgut, 2001), Indonesia (Blalock and Gertler, 2004), Italy (Castellani, 2002), Germany (Arnold and Hussinger, 2005*a*; Wagner, 2002), Slovenia (Crespi et al., 2008; Damijan and Kostevc, 2007; De Loecker, 2007; Greenaway and Kneller, 2008), South Korea (Hahn, 2004), Spain (Farinas and Martin-Marcos, 2007), Sweden (Greenaway et al., 2005; Hansson and Lundin, 2004), Turkey (Yasar et al., 2006; Yasar and Rejesus, 2005), UK (Girma, Görg and Strobl, 2004; Greenaway and Kneller, 2004, 2007; Greenaway and Yu, 2004; Requena Silvente, 2005) and US (Bernard and Jensen, 1995, 1999). Furthermore, the data in some papers are derived from a group of countries, including a group of Taiwan (China) and South Korea (Aw et al., 2000); a group of Malaysia, Indonesia, Thailand, South Korea and Philippines (Hallward-Driemeier et al., 2002); a group of Cameroon, Kenya, Ghana and Zimbabwe (Bigsten et al., 2004); a group of Ghana, Kenya and Ethiopia (Mengistae and Pattillo, 2004); a group of Ethiopia, Tanzania, Burundi, Zambia, Kenya, Ghana, Cote d'Ivoire, Cameroon and Zimbabwe (Van Biesebroeck, 2005) and a group of Austria, Belgium, Chile, China, Colombia, Denmark, France, Germany, Italy, Ireland, Slovenia, Spain, Sweden and United Kingdom (The International Study Group on Exports and Productivity, 2007).

ductivity (Levinsohn and Petrin, 2003; Olley and Pakes, 1996) that is typically concerned with reaching precise estimates. Besides total factor productivity, other performance measurements were also considered in some papers, including sales, sales per worker, labor productivity, unit cost, employment and profits. In terms of estimation methods, the propensity score matching approach is more efficient to generate an adequate 'like-for-like' comparison between the treated (exporter) and untreated (non-exporter) groups in the estimation (Rosenbaum and Rubin, 1983). Wagner (2002) is the first paper to investigate the causal effect of exporting on firm size and labor productivity, using the propensity score matching approach. So far, the matching method has been conducted in a few empirical papers (Arnold and Hussinger, 2005*a*; Damijan and Kostevc, 2007; De Loecker, 2007; Fernandes and Isgut, 2005; Girma, Görg and Strobl, 2004; Greenaway et al., 2005; Greenaway and Kneller, 2004, 2007, 2008; Yang, 2008; Yasar and Rejesus, 2005).

In fact, Wagner (2007*a*) indicates that it is well established that, on average, firms that export are more productive than firms that do not export and that there is evidence of 'self-selection' in the exporting process, while the evidence on the 'learning effect' is mixed and unclear. A recent publication (Martins and Yang, 2009) conducts a Meta-analysis of more than 30 papers that study the causal relationship between exporting and firm productivity. The main result of the paper, robust to different specifications and to different weights for each observation, indicates that the impact of exporting upon productivity is higher for developing than developed economies. The paper also finds that the export effect tends to be higher 1) in the first year that firms start exporting (compared to later years); and 2) when the sample used in the paper is not restricted to

matched firms. Moreover, there is no evidence of publication bias. In this case, the journal editors do not only favor studies that reach significant results.

3.3 Data sources

The first data set in our chapter are derived from the World Bank investment climate survey (WBIC) in year of 2003 that contains 2400 Chinese firms from 2000 to 2002. Firms from WBIC 2003 data set[1] are located in 18 major provincial capitals or cities [2]. 68% of total firms are in manufacturing. The main business sectors of total firms include garment and leather products, electronic parts making, household electronics, auto and auto parts, food processing, chemical products and medicine, biotech products and Chinese medicine, metallurgical products, and transportation equipment. The remaining 32% of firms are in service sectors that consist of information technology, accounting and non-banking financial service, advertisement, and marketing and business service.

In this chapter we complement the analysis of exporting and productivity by only considering large Chinese firms. We exploit the data from the Orbis collected by the consultancy Bureau van Dijck. A thousand largest Chinese firms

[1]The World Bank investment climate survey in China is normally carried out under auspices of national stakeholders. The survey consists of two questionnaires, one filled up by the senior manager of the main production facility of the firm while the other filled up by the accountant or personnel manager of the firm. In the year of 2002, the WBIC survey in China was implemented by National Bureau of Statistics of China. 1548 firms from 1997 to 2000 are included in this survey, which are located in five cities. Of the ongoing WBIC survey in year of 2003, it contains 2400 companies from 2000 to 2002.

[2]They include Benxi, Changchun, Changsha, Chongqing, Dalian, Guiyang, Haerbin, Hangzhou, Jiangmen, Kunming, Lanzhou, Nanchang, Nanning, Shenzhen, Wenzhou, Wuhan, Xian and Zhengzhou.

from 2002 to 2005 in the Orbis data set are used in our chapter. These firms are located in 22 provinces, 5 autonomous regions and 4 municipalities[1]. Firms in Guangdong province, Jiangsu province, Shandong province, Shanghai municipality and Beijing municipality account for over 50% of total firms. 37.5% of these one thousand Chinese firms are publicly quoted firms, and the remaining 62.5% are privately owned firms. Unfortunately, there are 375 publicly quoted firms and 50 privately owned firms who do not reveal their export status and export value in the whole period. One might argue that those firms may be non-exporters, but we believe that it could lead to seriously biased results when grouping those firms without export information into non-exporters. We therefore consider a much smaller sub-sample of 575 enterprises with full information on export value as the second data set in this chapter.

3.3.1 Descriptive statistics

In table 3.9 we summarize the main features of 2400 Chinese firms from 2000 to 2002 in the World Bank investment climate survey 2003 data set. After ignoring those observations without sufficient information on sales, capital, input

[1]China is administratively divided into 23 provinces, 5 autonomous regions, 4 centrally administrative municipalities and 2 special administrative regions (SAR). Twenty-three Provinces: Anhui, Fujian, Gansu, Guangdong, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, Zhejiang and Taiwan. — Five Autonomous Regions: Guangxi, Inner Mongolia, Ningxia, Tibet (Xizang) and Xinjiang. — Four Municipalities: Beijing (Peking), Chongqing, Shanghai and Tianjin. — Two Special Administrative Regions (SAR): Hong Kong and Macao. Municipalities are directly under the administration of central government of China. A municipality has the same political, economical and jurisdictional rights as a province; Special Administrative Regions (SAR) was established specially designed for Hong Kong and Macao. The most interest of this study is to investigate the effects of exporting on mainland Chinese firms, excluding firms in Taiwan, Hong Kong and Macao.

and employment, it corresponds to a total of 4744 observations, of which 20% are exporters; the average annual sales are over 155 million RMB (about $ 22.8 million); the average annual capital of tangible fixed assets reaches over 133 million RMB (about $ 19.6 million); the average annual employment is 628; the average annual input of material is over 70 million RMB (about $ 10.3 million). In this table we also present the main features of 575 largest Chinese firms from 2002 to 2005 in the Orbis data set. It results in a total of 2007 observations, of which 68% are exporters; the average annual sales reach 6641 million RMB (about $ 976.7 million); the average annual capital of tangible fixed assets reaches over 3146 million RMB (about $ 462.6 million); the average annual employment is 9867, the average annual input of material is over 5407 million RMB (about $ 795.1 million). The table also indicates that, on average, exporters are larger, more productive, more capital-intensive, and hire more workers.

The most remarkable difference within these two data sets is the sample heterogeneity in the context of firm size. The t-test of mean comparison in this table shows that, on average, Chinese firms in the Orbis data set have more sales, inputs, capitals and employees than firms from the World Bank data set (All these differences are at significant level in the t-test column). We therefore believe that firms from the Orbis data set are much larger than those in the World Bank data set, and have a higher propensity to export. Only 20% of total observations in the World Bank data set are exporters, while 80% observations in the Orbis data set are exporters.

3.4 Methodology

Being an exporter could be a highly influential factor that is correlated with the output of a firm. The so-called one step total factor productivity[1] approach (Fernandes and Isgut, 2005; Van Biesebroeck, 2005) used in our chapter is to test the relationship between exporting and firm productivity in the regression estimation.

1. *Export Premium*

   The export premium, firms that export are more productive than firms do not, is the first research question in our chapter. The results of export premium in our chapter are obtained from estimating an equation of the following type,

$$Y_{it} = \beta_0 + \beta_e E_{it} + \beta_1 K_{it} + \beta_2 L_{it} + \beta_3 I_{it} + \beta_j \gamma_{jit} + \epsilon_{it}, \tag{3.1}$$

   in which Y_{it} refers to the annual sales of firm i in year t. E_{it} is a dummy equal to one if the firm is an exporter in year t and equal to zero if the firm is a non-exporter. This equation also contains capital K_{it}, labor L_{it}, input I_{it} and some observable firm characteristics γ_{jit}, including wage, firm age, expenditure on research and development, new investment, some observable general manager's characteristics, time fixed effects and firm fixed effects (sector, regional and manufacturing dummies). All variables, apart from dummies, are in logarithm. The key parameter in this equation we are

[1] We also use two step total factor productivity(Levinsohn and Petrin, 2003). Results of estimations are largely similar to those found in this chapter.

interested in is β_e, which indicates the magnitude of different sales between exporters and non-exporters.

2. *Learning Effect*

   The second question that most recent studies are interested in concerns the different productivity growth between exporters and non-exporters in the post-entry period. The results of the learning effect analysis could be captured in equation 3.2,

$$\Delta Y_{it} - \beta_1 \Delta K_{it} - \beta_2 \Delta L_{it} - \beta_3 \Delta I_{it} = \beta_0 + \Delta_e E_{it} + \beta_j \Delta \gamma_{jit} + \epsilon_{it}, \quad (3.2)$$

   in which ΔY_{it} refers to the growth rate of sales of the firm i from year t-1 to year t; ΔK_{it}, ΔL_{it}, ΔI_{it} and $\Delta \gamma_{jit}$ are the growth rates of capital, labor, input and some observable firm characteristics from year t-1 to year t. E_{it} is a dummy equal to one if the firm is an exporter in both year t-1 and year t and refers to zero if the firm is a non-exporter in both years. The key parameter β_e, the most important estimate in the learning effect model, indicates the magnitude of different sales growth rates between exporters and non-exporters from year t-1 to year t.

3. *Entrant Effect*

   The third question of this study is to investigate the entrant effect, which refers to the magnitude of different productivity growth between new export market entrants and non-exporters in the entrant year. Taking the first difference fixed effects estimator (FD) on equation 3.1, those firm fixed

effects will be deleted. The result of entrant effect could be obtained from the following equation,

$$\Delta Y_{it} - \beta_1 \Delta K_{it} - \beta_2 \Delta L_{it} - \beta_3 \Delta I_{it} = \beta_e E_{it} + \beta_j \Delta \gamma_{jit}, \tag{3.3}$$

in which year t is the year of entry; E_{it} is a dummy equal to one when a firm becomes an exporter in a given year t. The β_e, the key estimate in this entrant effect model, indicates the magnitude of different sales growth rates between new exporters and non-exporters in the entrant year.

3.5 Results

The main results, obtained from equation 3.1, 3.2 and 3.3, are presented in Table 3.10 and 3.11. In Table 3.10 the results are based on firms from the World Bank data set, and in Table 3.11 the results are based on firms from the Orbis data set.

The results from sector fixed effect in Table 3.10 indicate that exporters tend to generate 19.7% higher productivity (significant level at 1%), and once we control firm fixed effect we find the export premium is 14.0%, and still significant at 1%. It also shows that, on average, the productivity growth of exporters is even lower than non-exporters at insignificant level - in column 3 (firm fixed effect estimator). An important concern in the productivity literature is the problem of simultaneity of exporting. Most productive firms may self-select to pay the sunk

cost in order to enter the trade market. Therefore, the previous productivity of firm will affect the general manager's decision on whether to export or not. That is to say firms with better performance will self-select into the export markets. In order to eliminate this 'self-selection' effect in the regression estimation, instrumental variable estimator (IV) can be a good solution. In column 4 (IV estimator) we use the nationality and overseas education background of general managers as instruments to correct a potential endogeneity problem of the exporting and exporting. However, we still cannot find any evidence of learning by exporting from the column 4. In addition, we list the first stage of IV in column 5. It shows that the exporting is strongly correlated to the international experience of general managers which includes the nationality and education background of the general managers. Meanwhile, the Sargan test in our analysis fails to reject the null hypothesis that the instruments are valid, which means the instruments we introduced in the analysis do not affect the firm performance. Therefore, we believe that these two instruments, to some extent, are valid and efficient in our regression estimation. The results in column 3-5 indicate that the learning by exporting is not evidenced in Chinese firms from the World Bank data set. Considering now the entrant effect, the result by using the first difference fixed effects estimator (FD) in column 6 shows that new export market entrants tend to perform 10.2% higher growth in productivity than non-exporters in the entrant year (significant level at 10%).

In fact, some very large Chinese firms may obtain a certain share of the domestic market, and the exporting may not be the only strategy to survive. This study complements the analysis of exporting and productivity by only considering 575 largest Chinese firms from 2002 to 2005. These firms in our chapter are

derived from the Orbis data set. The result in column 1 of Table 3.11 is based on the analysis of export premium as in equation 3.1, and the remaining two columns list the results of learning effect and entrant effect as in equation 3.2 and 3.3. The results in all columns indicate that there is no evidence on export premium, learning effect and entrant effect in these largest Chinese firms (All of them are at insignificant level). These differences may be also due to the sample heterogeneity across data sets. 80% are exporters in Orbis data, while 20% are exporters in the world bank data.

Overall, the findings of export premium and learning by exporting are different with respect to different samples we included in our analysis. Large Chinese firms have a relatively strong comparative advantage and they can draw on a huge home market. Moreover, largest firms may also a multinational firm; therefore the return to the exporting is not high for this group of firm. However, small and medium do not have a large of domestic market, and have to go aboard. They are also in an advantageous position to capitalize on the learning opportune as they are far away from the high technology.

3.6 concluding remarks

Using detailed Chinese firm level data of 2400 from 2000 to 2002 and 575 largest firms from 2002 to 2005, our chapter finds that 1) the export premium is obvious and once the firm has entered there is additional productivity growth in the entrant year, 2) the learning by exporting in the post-entry period is unclear and 3) there is no evidence of the export premium and the entrant effect if only

large firms are considered in the analysis. We believe our chapter provides an useful evidence that is particularly suited to the further analysis of trade and heterogeneous firms.

In addition to contributing to better understanding of exporting and productivity of Chinese firms, our results may also help the analysis of the characteristics of Chinese exporters. It is interesting that the performance gains attributable to exporting are different with respect to different firm size. Large Chinese firms have more capitals, assets, sales and employment, and they may be conservative to protect their domestic market shares. Also, they may have some channels with the local or central government that could help them to secure shares in the domestic market. Therefore, the export premium, learning effect and entrant effect in these large firms are not significant as what we expected. In most of small and medium firms, general managers aggressively seek the overseas market to expand their business, and the returns and gains from the exporting market are significant.

In economic terms, the monopolistically competitive model of trade with firm heterogeneity is different with respect to productivity differences and differences in the "toughness" of competition across the market (Melitz and Ottaviano, 2008). China is a large market that exhibits tougher competition, resulting in lower average mark-ups and higher aggregate productivity. Under this competitive market, large firms have a strong comparative advantage, including scale of economies, consumer preference and other advantages, and they can draw on a huge home market and do not have to take the additional risk and cost of international trade in order to gain from the economies of scale. However, small and medium firm's marginal cost is relatively higher than large firms, and marginal revenue

is lower. Moreover, they are constrained by a lower mark-ups in the integrated markets. Therefore, the performance gains attributable to trade may be higher in the sample of small and medium firm size than the sample of large size. Equally important, small and medium firms are in an advantageous position to capitalize on the learning opportune. It may be relatively easier to communicate, and obtain buyin, of learning as an object.

3.7 Tables and figures

Table 3.1: List of exports of top 30 countries from 1998 to 2007

	1998		1999		2000		2001		2002	
Country	Values	Shares	Values	Shares	Values	Shares	Values	Shares	Values	Shares
Germany	543.56	0.11	542.84	0.10	549.61	0.09	571.43	0.10	616	0.10
⊗**China**	**183.81**	**0.04**	**194.93**	**0.04**	**249.2**	**0.04**	**266.10**	**0.05**	**325.6**	**0.05**
USA	680.43	0.13	692.78	0.13	780.33	0.13	731.01	0.12	693.22	0.11
Japan	388.14	0.08	417.61	0.08	479.25	0.08	403.36	0.07	416.72	0.07
France	300.57	0.06	296.03	0.06	295.35	0.05	289.6	0.05	304.89	0.05
Italy	242.10	0.05	234.96	0.04	239.93	0.04	244.25	0.04	254.22	0.04
Netherlands	167.60	0.03	170.54	0.03	180.07	0.03	169.48	0.03	175.39	0.03
United Kingdom	270.30	0.05	265.44	0.05	282.85	0.05	272.58	0.05	280.63	0.05
Belgium	N.A.	N.A.	178.87	0.03	184.79	0.03	190.31	0.03	215.8	0.04
Canada	214.61	0.04	238.78	0.04	277.11	0.05	261.06	0.04	252.58	0.04
South Korea	132.3	0.03	143.69	0.03	172.27	0.03	150.43	0.03	162.47	0.03
Russian Federation	72.28	0.01	72.88	0.01	103.09	0.02	99.87	0.02	106.69	0.02
China, Hong Kong SAR	174.86	0.03	174.4	0.03	202.68	0.03	191.07	0.03	201.93	0.03
Singapore	109.9	0.02	114.68	0.02	137.81	0.02	121.75	0.02	125.18	0.02
Mexico	117.33	0.02	136.26	0.03	166.19	0.03	158.39	0.03	160.75	0.03
Spain	109.25	0.02	111.49	0.02	113.34	0.02	116.15	0.02	125.87	0.02
Saudi Arabia	39.81	0.01	50.69	0.01	77.48	0.01	67.97	0.01	72.45	0.01
Malaysia	73.25	0.01	84.51	0.02	98.23	0.02	88.00	0.02	94.06	0.02
Switzerland	78.86	0.02	80.30	0.02	81.53	0.01	82.14	0.01	91.99	0.01
Sweden	84.99	0.02	75.66	0.01	86.94	0.01	76.3	0.01	82.95	0.01
Brazil	51.12	0.01	48.01	0.01	55.12	0.01	58.29	0.01	60.44	0.01
Austria	60.86	0.01	59.27	0.01	63.67	0.01	66.49	0.01	73.11	0.01
Thailand	53.58	0.01	58.42	0.01	68.82	0.01	64.92	0.01	68.11	0.01
India	33.21	0.01	36.92	0.01	45.25	0.01	44.31	0.01	52.47	0.01
Australia	55.81	0.01	54.53	0.01	63.77	0.01	63.33	0.01	65.01	0.01
Poland	28.19	0.01	27.37	0.01	31.61	0.01	36.05	0.01	40.25	0.01
Norway	40.4	0.01	45.48	0.01	59.9	0.01	59.22	0.01	59.53	0.01
Ireland	64.25	0.01	71.23	0.01	76.26	0.01	82.97	0.01	88.48	0.01
Indonesia	48.85	0.01	48.67	0.01	62.12	0.01	56.32	0.01	57.16	0.01
Turkey	26.88	0.01	26.59	0.00	27.49	0.00	31.33	0.01	35.76	0.01

Notes: All export values columns are denominated in billions of US dollars.

Table 3.2: List of exports of top 30 countries from 1998 to 2007 [Cont's]

	2003		2004		2005		2006		2007	
Country	Values	Shares	Values	Shares	Values	Shares	Values	Shares	Values	Shares
Germany	748.53	0.10	911.74	0.10	977.13	0.10	1121.96	0.10	1328.84	0.10
⊗**China**	**438.23**	**0.06**	**593.33**	**0.07**	**761.95**	**0.08**	**968.94**	**0.08**	**1217.78**	**0.10**
USA	723.61	0.10	817.91	0.09	904.34	0.09	1037.03	0.09	1162.54	0.09
Japan	472.00	0.07	565.76	0.06	594.94	0.06	646.73	0.06	714.33	0.06
France	358.13	0.05	413.71	0.05	434.35	0.04	479.01	0.04	539.73	0.04
Italy	299.47	0.04	353.54	0.04	372.96	0.04	417.15	0.04	500.2	0.04
Netherlands	227.34	0.03	290.48	0.03	320.07	0.03	370.21	0.03	477.64	0.04
United Kingdom	307.70	0.04	349.01	0.04	384.36	0.04	444.44	0.04	439.97	0.03
Belgium	255.46	0.04	306.39	0.03	334.11	0.03	369.26	0.03	430.82	0.03
Canada	272.23	0.04	317.16	0.04	360.55	0.04	388.18	0.03	420.23	0.03
South Korea	193.82	0.03	253.84	0.03	284.42	0.03	325.46	0.03	371.48	0.03
Russian Federation	133.66	0.02	181.60	0.02	241.45	0.02	301.55	0.03	352.27	0.03
China, Hong Kong SAR	228.71	0.03	265.54	0.03	292.12	0.03	322.67	0.03	349.39	0.03
Singapore	159.96	0.02	198.63	0.02	229.65	0.02	271.81	0.02	299.3	0.02
Mexico	164.91	0.02	187.98	0.02	214.21	0.02	249.96	0.02	271.82	0.02
Spain	158.21	0.02	182.73	0.02	192.80	0.02	214.06	0.02	253.75	0.02
Saudi Arabia	93.24	0.01	126.00	0.01	180.74	0.02	211.31	0.02	234.95	0.02
Malaysia	104.71	0.01	126.64	0.01	141.62	0.01	160.67	0.01	176.21	0.01
Switzerland	104.97	0.01	123.01	0.01	130.93	0.01	147.86	0.01	172.08	0.01
Sweden	102.41	0.01	123.31	0.01	130.26	0.01	147.37	0.01	169.06	0.01
Brazil	73.20	0.01	96.68	0.01	118.53	0.01	137.81	0.01	160.65	0.01
Austria	89.26	0.01	110.83	0.01	117.74	0.01	134.05	0.01	156.59	0.01
Thailand	80.32	0.01	96.25	0.01	110.11	0.01	130.58	0.01	153.57	0.01
India	63.03	0.01	79.83	0.01	103.40	0.01	126.13	0.01	145.90	0.01
Australia	70.25	0.01	86.44	0.01	105.75	0.01	123.32	0.01	139.12	0.01
Poland	53.54	0.01	73.78	0.01	89.38	0.01	109.58	0.01	138.78	0.01
Norway	67.94	0.01	82.49	0.01	103.76	0.01	122.2	0.01	136.36	0.01
Ireland	93.04	0.01	104.31	0.01	110.00	0.01	108.76	0.01	121.51	0.01
Indonesia	61.06	0.01	71.58	0.01	85.66	0.01	100.8	0.01	114.1	0.01
Turkey	47.25	0.01	63.12	0.01	73.48	0.01	85.53	0.01	107.27	0.01

Notes: All export values columns are denominated in billions of US dollars.

Table 3.3: The ratio of exports of each commodity to total China's exports from 1998 to 2007

Code	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
1	0.0024	0.002	0.0015	0.0013	0.0011	0.0007	0.0006	0.0004	0.0003	0.0003
2	0.0047	0.0036	0.003	0.0031	0.0019	0.0012	0.0008	0.0007	0.0006	0.0005
3	0.0101	0.0107	0.0097	0.0104	0.0094	0.0082	0.0073	0.0061	0.0053	0.0042
4	0.001	0.0008	0.0007	0.0007	0.0006	0.0005	0.0004	0.0003	0.0003	0.0003
5	0.0037	0.0033	0.0031	0.0025	0.002	0.0017	0.0017	0.0014	0.0011	0.0009
6	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
7	0.0083	0.0081	0.0063	0.0067	0.0057	0.005	0.0043	0.004	0.0039	0.0033
8	0.0025	0.0022	0.0017	0.0016	0.0017	0.0017	0.0015	0.0014	0.0013	0.0013
9	0.0022	0.0022	0.0017	0.0018	0.0015	0.0012	0.0013	0.001	0.0009	0.0008
10	0.0076	0.0047	0.0057	0.003	0.0046	0.0055	0.0012	0.0019	0.001	0.0015
11	0.0004	0.0004	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002	0.0002	0.0004
12	0.004	0.0042	0.0035	0.0033	0.0028	0.0025	0.0019	0.0017	0.0013	0.0013
13	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0002	0.0002	0.0002
14	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.00005
15	0.0018	0.0007	0.0006	0.0005	0.0003	0.0003	0.0003	0.0003	0.0004	0.0002
16	0.0072	0.0077	0.0082	0.0083	0.0077	0.0066	0.0064	0.0062	0.0061	0.0052
17	0.0008	0.0007	0.0007	0.0005	0.0006	0.0004	0.0004	0.0005	0.0004	0.0004
18	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
19	0.0015	0.0016	0.0015	0.0016	0.0015	0.0013	0.0012	0.001	0.0009	0.0008
20	0.0059	0.006	0.0055	0.0059	0.0056	0.0052	0.0045	0.0041	0.0039	0.0045
21	0.0019	0.0018	0.0015	0.0015	0.0014	0.0012	0.001	0.0009	0.0009	0.0009
22	0.0025	0.0024	0.0021	0.0022	0.0018	0.0014	0.0013	0.0009	0.001	0.0007
23	0.0011	0.0012	0.0011	0.0012	0.0013	0.0009	0.0009	0.0007	0.0006	0.0009
24	0.0028	0.0017	0.0012	0.0013	0.0012	0.001	0.0008	0.0006	0.0005	0.0005
25	0.0066	0.0058	0.0052	0.0052	0.0038	0.0031	0.0025	0.0026	0.0025	0.0019
26	0.0004	0.0004	0.0003	0.0004	0.0006	0.0006	0.001	0.0016	0.001	0.0008
27	0.0281	0.0239	0.0318	0.0307	0.0254	0.0251	0.0239	0.0223	0.0176	0.0156
28	0.0126	0.0115	0.0105	0.0106	0.0091	0.0081	0.0081	0.0091	0.0079	0.008
29	0.0185	0.019	0.017	0.0176	0.0173	0.0165	0.0155	0.0161	0.0162	0.0173
30	0.0034	0.0029	0.0025	0.0026	0.0022	0.0019	0.0017	0.0017	0.0015	0.0016
31	0.0007	0.001	0.0011	0.0011	0.0008	0.0016	0.002	0.0011	0.0011	0.003
32	0.0051	0.0047	0.0044	0.0044	0.0041	0.0034	0.0032	0.0032	0.003	0.0029
33	0.0015	0.0014	0.0013	0.0015	0.0016	0.0017	0.0015	0.0015	0.0015	0.0014

Notes: Data source: United Nations Commodity Trade Statistics Database. Commodity codes are listed in Table 3.6, Table 3.7 and Table 3.8.

Table 3.4: The ratio of exports of each commodity to total China's exports from 1998 to 2007 [Cont's]

Code	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
34	0.0015	0.0016	0.0014	0.0014	0.0014	0.0012	0.0013	0.0011	0.001	0.0011
35	0.0013	0.0005	0.0005	0.0006	0.0006	0.0006	0.0007	0.0007	0.0007	0.0008
36	0.0014	0.0018	0.0011	0.0011	0.001	0.0008	0.0007	0.0006	0.0005	0.0005
37	0.0008	0.0012	0.0017	0.0016	0.0016	0.0017	0.0017	0.0015	0.0008	0.0006
38	0.0043	0.0048	0.0045	0.0048	0.0042	0.0039	0.0044	0.0044	0.004	0.0042
39	0.0289	0.0271	0.0262	0.0257	0.025	0.023	0.022	0.0228	0.0224	0.0211
40	0.0046	0.0052	0.0053	0.0049	0.0052	0.0051	0.0056	0.0064	0.0069	0.0076
41	0.0021	0.0019	0.0023	0.0036	0.0031	0.0027	0.0025	0.0022	0.002	0.0011
42	0.0294	0.0275	0.0273	0.0271	0.0248	0.0225	0.0179	0.0155	0.0132	0.012
43	0.0016	0.0016	0.0017	0.002	0.0018	0.0023	0.0037	0.0037	0.0014	0.0009
44	0.0076	0.0091	0.0087	0.0089	0.0089	0.0081	0.0086	0.0085	0.0089	0.008
45	0.00001	0.00002	0.00003	0.00003	0.00003	0.00002	0.00002	0.00002	0.00002	0.00002
46	0.0026	0.0025	0.0024	0.0024	0.0024	0.0022	0.0019	0.0016	0.0015	0.0014
47	0.00003	0.00001	0.00004	0.00002	0.00005	0.00005	0.00003	0.0001	0.0001	0.0001
48	0.0052	0.0047	0.0054	0.0054	0.0051	0.0051	0.0047	0.005	0.0054	0.0056
49	0.002	0.002	0.0019	0.0019	0.0019	0.0017	0.0017	0.0016	0.0016	0.0018
50	0.0043	0.0039	0.0038	0.0031	0.0025	0.002	0.0019	0.0019	0.0016	0.0012
51	0.0042	0.0048	0.0044	0.0039	0.0032	0.0029	0.0028	0.0023	0.002	0.0017
52	0.0133	0.0147	0.0128	0.0113	0.0122	0.0114	0.0088	0.0077	0.0073	0.0059
53	0.0022	0.0019	0.002	0.0016	0.0015	0.0012	0.0009	0.0008	0.0007	0.0005
54	0.0046	0.0037	0.0042	0.0047	0.0058	0.0063	0.0065	0.006	0.0054	0.0053
55	0.0107	0.0095	0.0085	0.0073	0.0059	0.0048	0.0045	0.0044	0.0044	0.0042
56	0.0014	0.0011	0.0011	0.0011	0.001	0.0009	0.0009	0.001	0.001	0.001
57	0.0025	0.0023	0.002	0.0019	0.0018	0.0015	0.0013	0.0013	0.0011	0.0011
58	0.0034	0.0026	0.0024	0.0024	0.0029	0.0029	0.0024	0.0027	0.0025	0.0027
59	0.0012	0.0013	0.0016	0.0017	0.0018	0.0018	0.002	0.0022	0.0021	0.0022
60	0.0046	0.0043	0.0046	0.0047	0.0055	0.005	0.0043	0.0042	0.0042	0.0042
61	0.0647	0.0607	0.0535	0.0503	0.0483	0.0455	0.0417	0.0389	0.0452	0.0463
62	0.0868	0.0808	0.0765	0.0728	0.0645	0.0579	0.0488	0.0466	0.046	0.0394
63	0.0143	0.0147	0.0139	0.0138	0.0134	0.0141	0.013	0.0133	0.0122	0.0108
64	0.0455	0.0439	0.0392	0.0379	0.0333	0.0282	0.0246	0.0236	0.0214	0.0198
65	0.0026	0.0026	0.0025	0.0024	0.0024	0.0022	0.0021	0.0019	0.0019	0.0017
66	0.0035	0.003	0.0025	0.0024	0.0018	0.0015	0.0014	0.0012	0.0012	0.0011

Notes: See the footnote in table 3.3.

Table 3.5: The ratio of exports of each commodity to total China's exports from 1998 to 2007 [Cont's]

Code	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
67	0.0044	0.0044	0.0038	0.0036	0.0031	0.0025	0.002	0.0017	0.0016	0.0016
68	0.0043	0.0043	0.0039	0.0043	0.0041	0.0037	0.0034	0.0034	0.0035	0.0034
69	0.0085	0.0083	0.0074	0.0064	0.0068	0.0063	0.006	0.006	0.0059	0.005
70	0.004	0.0045	0.0047	0.005	0.0056	0.0053	0.0057	0.0057	0.0055	0.0055
71	0.0116	0.014	0.0109	0.0098	0.0095	0.0081	0.0082	0.0079	0.0077	0.0073
72	0.012	0.0092	0.0131	0.0077	0.0067	0.0074	0.018	0.0189	0.0246	0.0311
73	0.0205	0.0214	0.021	0.0217	0.0214	0.0208	0.0225	0.024	0.0266	0.0286
74	0.0037	0.0031	0.0032	0.0023	0.0023	0.0021	0.0035	0.004	0.0058	0.0043
75	0.0005	0.0004	0.0004	0.0002	0.0002	0.0003	0.0005	0.0004	0.0006	0.0006
76	0.0057	0.0043	0.0041	0.0054	0.007	0.0078	0.0084	0.0077	0.0092	0.0089
78	0.0008	0.0012	0.0009	0.0009	0.0007	0.0005	0.0007	0.0006	0.0007	0.0005
79	0.0025	0.0029	0.0026	0.0022	0.0014	0.0011	0.0006	0.0005	0.0014	0.001
80	0.0018	0.002	0.002	0.0012	0.0005	0.0004	0.0006	0.0003	0.0003	0.0004
81	0.0028	0.003	0.0027	0.0028	0.002	0.0024	0.0033	0.0032	0.003	0.0031
82	0.0082	0.0081	0.0081	0.0081	0.0079	0.0074	0.007	0.0067	0.0062	0.0059
83	0.0061	0.0059	0.0054	0.0057	0.0062	0.0056	0.0059	0.0062	0.0067	0.0067
84	0.0917	0.0987	0.1093	0.1276	0.1538	0.1922	0.2024	0.2	0.1959	0.2079
85	0.1493	0.1728	0.1903	0.1978	0.2099	0.2119	0.2288	0.2363	0.2453	0.2438
86	0.0093	0.0078	0.0099	0.0085	0.0071	0.0095	0.0096	0.0087	0.0068	0.008
87	0.0113	0.0132	0.0172	0.0167	0.0163	0.0165	0.018	0.0194	0.0204	0.0227
88	0.0023	0.0027	0.0022	0.0015	0.0015	0.001	0.0009	0.001	0.0014	0.0012
89	0.0102	0.0084	0.0061	0.007	0.0058	0.0067	0.0048	0.0055	0.0075	0.0093
90	0.0242	0.0251	0.0265	0.0252	0.0233	0.0244	0.0273	0.0345	0.0351	0.0317
91	0.0115	0.0099	0.0077	0.0063	0.0054	0.0046	0.0036	0.0027	0.0022	0.0022
92	0.0018	0.0019	0.0016	0.0016	0.0016	0.0015	0.0014	0.0013	0.0011	0.0011
93	0.0007	0.0001	0.00003	0.0001	0.00004	0.00003	0.00003	0.00003	0.00004	0.00005
94	0.0241	0.0287	0.0291	0.0294	0.0313	0.0305	0.0303	0.0302	0.0295	0.0303
95	0.0448	0.0418	0.039	0.0362	0.038	0.0325	0.0272	0.0269	0.0252	0.0241
96	0.0073	0.0068	0.006	0.0059	0.0055	0.005	0.0049	0.0048	0.0045	0.0047
97	0.0003	0.0002	0.0001	0.0001	0.0001	0.00005	0.0001	0.0001	0.0001	0.0001
99	0	0.0005	0.0008	0.0016	0.0016	0.0013	0.0016	0.0016	0.0018	0.0016

Notes: See the footnote in table 3.3.

Table 3.6: Commodity description: from Code 1 to Code 34

Commodity Code	Commodity Descriptions
1	Live animals
2	Meat and edible meat offal
3	Fish, crustaceans, molluscs, aquatic invertebrates ne
4	Dairy products, eggs, honey, edible animal product nes
5	Products of animal origin, nes
6	Live trees, plants, bulbs, roots, cut flowers etc
7	Edible vegetables and certain roots and tubers
8	Edible fruit, nuts, peel of citrus fruit, melons
9	Coffee, tea, mate and spices
10	Cereals
11	Milling products, malt, starches, inulin, wheat glute
12	Oil seed, oleagic fruits, grain, seed, fruit, etc, ne
13	Lac, gums, resins, vegetable saps and extracts nes
14	Vegetable plaiting materials, vegetable products nes
15	Animal,vegetable fats and oils, cleavage products, et
16	Meat, fish and seafood food preparations nes
17	Sugars and sugar confectionery
18	Cocoa and cocoa preparations
19	Cereal, flour, starch, milk preparations and products
20	Vegetable, fruit, nut, etc food preparations
21	Miscellaneous edible preparations
22	Beverages, spirits and vinegar
23	Residues, wastes of food industry, animal fodder
24	Tobacco and manufactured tobacco substitutes
25	Salt, sulphur, earth, stone, plaster, lime and cement
26	Ores, slag and ash
27	Mineral fuels, oils, distillation products, etc
28	Inorganic chemicals, precious metal compound, isotope
29	Organic chemicals
30	Pharmaceutical products
31	Fertilizers
32	Tanning, dyeing extracts, tannins, derivs,pigments et
33	Essential oils, perfumes, cosmetics, toileteries

Notes: The commodity code description above is from the United Nations Commodity Trade Statistics Database.

Table 3.7: Commodity description: from Code 34 to Code 66

Commodity Code	Commodity Descriptions
34	Soaps, lubricants, waxes, candles, modelling pastes
35	Albuminoids, modified starches, glues, enzymes
36	Explosives, pyrotechnics, matches, pyrophorics, etc
37	Photographic or cinematographic goods
38	Miscellaneous chemical products
39	Plastics and articles thereof
40	Rubber and articles thereof
41	Raw hides and skins (other than furskins) and leather
42	Articles of leather, animal gut, harness, travel good
43	Furskins and artificial fur, manufactures thereof
44	Wood and articles of wood, wood charcoal
45	Cork and articles of cork
46	Manufactures of plaiting material, basketwork, etc.
47	Pulp of wood, fibrous cellulosic material, waste etc
48	Paper, paperboard, articles of pulp, paper and board
49	Printed books, newspapers, pictures etc
50	Silk
51	Wool, animal hair, horsehair yarn and fabric thereof
52	Cotton
53	Vegetable textile fibres nes, paper yarn, woven fabri
54	manmade filaments
55	manmade staple fibres
56	Wadding, felt, nonwovens, yarns, twine, cordage, etc
57	Carpets and other textile floor coverings
58	Special woven or tufted fabric, lace, tapestry etc
59	Impregnated, coated or laminated textile fabric
60	Knitted or crocheted fabric
61	Articles of apparel, accessories, knit or crochet
62	Articles of apparel, accessories, not knit or crochet
63	Other made textile articles, sets, worn clothing etc
64	Footwear, gaiters and the like, parts thereof
65	Headgear and parts thereof
66	Umbrellas, walking-sticks, seat-sticks, whips, etc

Notes: The commodity code description above is from the United Nations Commodity Trade Statistics Database.

Table 3.8: Commodity description: from Code 67 to Code 99

Commodity Code	Commodity Descriptions
67	Bird skin, feathers, artificial flowers, human hair
68	Stone, plaster, cement, asbestos, mica, etc articles
69	Ceramic products
70	Glass and glassware
71	Pearls, precious stones, metals, coins, etc
72	Iron and steel
73	Articles of iron or steel
74	Copper and articles thereof
75	Nickel and articles thereof
76	Aluminium and articles thereof
78	Lead and articles thereof
79	Zinc and articles thereof
80	Tin and articles thereof
81	Other base metals, cermets, articles thereof
82	Tools, implements, cutlery, etc of base metal
83	Miscellaneous articles of base metal
84	Nuclear reactors, boilers, machinery, etc
85	Electrical, electronic equipment
86	Railway, tramway locomotives, rolling stock, equipmen
87	Vehicles other than railway, tramway
88	Aircraft, spacecraft, and parts thereof
89	Ships, boats and other floating structures
90	Optical, photo, technical, medical, etc apparatus
91	Clocks and watches and parts thereof
92	Musical instruments, parts and accessories
93	Arms and ammunition, parts and accessories thereof
94	Furniture, lighting, signs, prefabricated buildings
95	Toys, games, sports requisites
96	Miscellaneous manufactured articles
97	Works of art, collectors pieces and antiques
99	Commodities not specified according to kind

Notes: The commodity code description above is from the United Nations Commodity Trade Statistics Database.

Table 3.9: Descriptive statistics of Chinese firms in the WBIC 2003 data set and the Orbis data set

Variable	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	T-Test
	World Bank Data set			**Orbis Data Set**			
ALL Firms							
Sales	155833.2	857829.1	4744	6641206	1.04E+07	2007	-42.6
Exporter	0.200885	0.400705	4744	0.679123	0.4669299	2007	-42.6
Capital	133178.5	890621.6	4744	3164829	7068795	2007	-29
Labor	628.8215	3142.216	4744	9867.7	16689.25	2007	-36.6
input	70778.93	339856.1	4744	5407157	7893434	2007	-46.4
Exporters							
Sales	406926.9	1175738	953	6998943	1.04E+07	1363	-19.4
Capital	207965.1	725250.8	953	2556193	5444365	1363	-13.2
Labor	968.9612	1841.797	953	9811.291	16750.73	1363	-16.2
input	220581.7	661126.3	953	5640669	7228136	1363	-23.1
Non-exporters							
Sales	92712.01	744201.6	3791	5884071	1.03E+07	644	-34.2
Capital	114378.3	926702.7	3791	4452983	9521263	644	-27.3
Labor	543.3155	3386.405	3791	9987.087	16570.72	644	-31.5
input	33120.78	166412.3	3791	4912938	9129774	644	-32.9
Remain exporters							
Sales	458866	1334628	585	8010498	1.17E+07	912	-15.5
Capital	227523.3	782869	585	2705477	5781903	912	-10.3
Labor	1004.499	1865.24	585	10003.72	16877.67	912	-12.8
input	244755.4	722093.9	585	6448859	7989975	912	-18.7
New entrants							
Sales	190832.4	436431.6	70	4284173	4920823	32	-6.9
Capital	90412.87	181056.2	70	2049615	3733461	32	-4.4
Labor	563.8143	784.4877	70	7164.75	12576.97	32	-4.4
input	82378.34	169735	70	3748495	4191909	32	-7.3

Notes: Sales, capital and input are denominated in thousands of RMB. Capital is the annual tangible asset of firm, including land, building, plant, machinery, transport equipment, leased assets and other property. Labor is the number of employees of firm per year. Input is the sum of materials, outsourcing expenses and energy. 'T tests' is the mean comparison test between the World Bank data set and Orbis data set. 'Remain-exporters' are exporters both year t-1 and year t. 'New-entrants' are new exporters.

Table 3.10: Exporting and firm productivity (Firms in the WBIC 2003 data set)

	Premium	Premium	Learning	Learning	Learning	Entrant
	(OLS)	(Firm FE)	(OLS)	(IV)	(F.S)	(FD)
treated	.197***	.140***	-.004	-.070		.102*
	(.034)	(.054)	(.025)	(.078)		(.566)
lncapital	.157***	.052***	.060***	.058***	-.014	.058
	(.009)	(.018)	(.020)	(.010)	(.019)	
lnemployment	.260***	.180***	.100***	.008	.102***	
	(.014)	(.023)	(.020)	(.014) (.020)		
lninput	.573***	.440***	.400***	.407***	.002	.404***
	(.007)	(.011)	(.029)	(.008) (.016)		
Manageredu					.279***	
				(044)		
Managernat					.268***	
				(.049)		
Obs.	4744	4744	3123	3123	3123	3123
R^2	.856	.377	.309	.298	0.11	.30

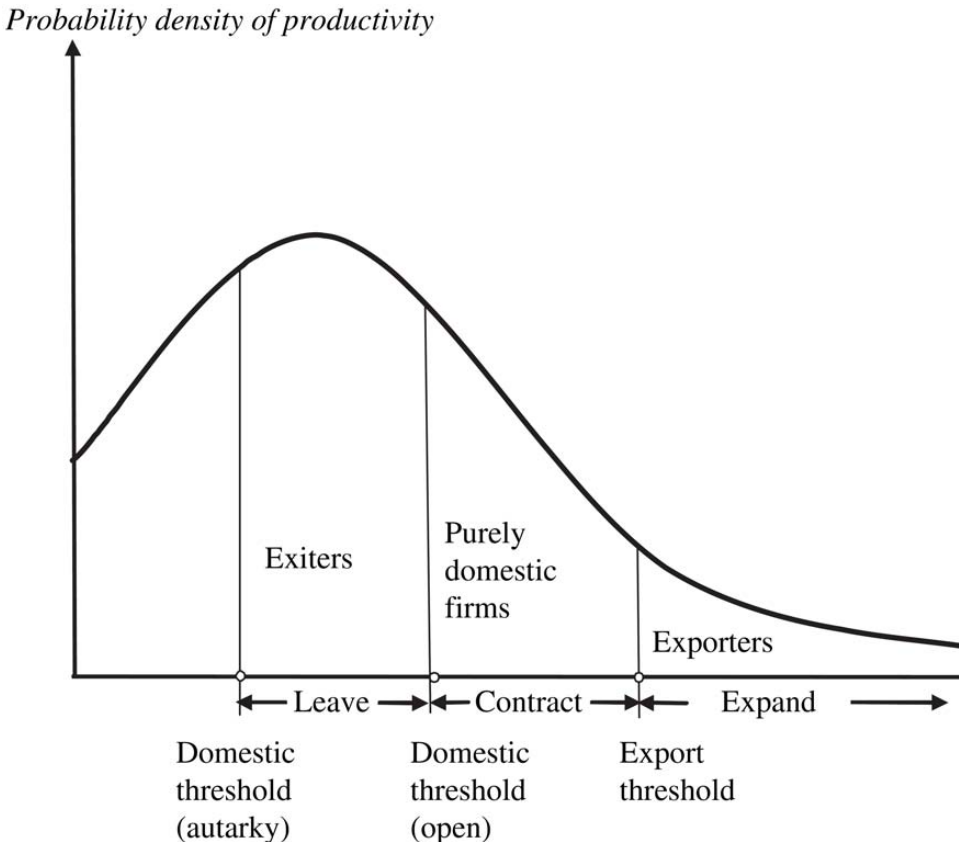
Notes: Significance levels: *: 0.10; **: 0.05; ***: 0.01. In column four the over identification test of instruments is 0.603, and Chi-sq(1) P-val = 0.4373. 'Exporter' in column 1 and 2 is a dummy equal to one if the firm is an exporter rather than a non-exporter, in column 3 and 4 is a dummy equal to one if the firm is an exporter in both year t and year t-1, in column 6 a dummy equal to one if the firm is a new exporter. Column 5 lists the first stage regression results of IV in column 4.

Table 3.11: Exporting and firm productivity, only considering 575 largest Chinese firms

	Premium	Premium	Learning	Learning	Entrant
	(Sector FE)	(Firm FE)	(Sector FE)	(C+S+Y FE)	(First Difference)
Exporter	.025	-.018	.0002	.0002	-.047
	(.015)	(.021)	(.014)	(.016)	(.036)
Capital	.054***	.040***	.055***	.055***	.055***
	(.006)	(.012)	(.014)	(.021)	(.014)
Labor	.028***	.030**	.061***	.061***	.054**
	(.007)	(.013)	(.016)	(.024)	(.016)
Input	.858***	.875***	.847***	.847***	.855***
	(.008)	(.011)	(.012)	(.033)	(.012)
Obs.	2007	2007	1537	1537	1356
R^2	.917	.932	.868	.86	.875

Notes: Significance levels: *: 0.10; **: 0.05; ***: 0.01. 'Exporter' in column 1 is a dummy equal to one if the firm is an exporter rather than a non-exporter, in column 3 and 4 is a dummy equal to one if the firm is an exporter in both year t and year t-1, and in column 5 is a dummy equal to one if the firm is a new exporter. 'C+S+Y FE' is country, sector and year fixed effects.

Figure 3.1: Productivity Uncertanity and Firm Entrant/Exit



Chapter 4

Export-Premium and Learning-by-Exporting: Evidence from Matched Firms

4.1 Introduction

As some of recent studies on exporting and firm productivity prefer using matched samples, this Chapter is an extension of Chapter 3 by using matched firms. The main purpose of this chapter is to investigate the export premium (exporters are more productive than non-exporters) and the learning effect (new export market entrants have higher productivity growth than non-exporters in the post-entry period up to three years). The matching method used in this chapter allows an adequate 'like-for-like' comparison. The propensity score matching method used in this Chapter is to adjust for observable differences of firm characteristics between exporters and non-exporters, allowing an adequate 'like-for-like' comparison. The difference in difference matching estimator is used to capture the magnitude of different productivity growth between matched new export market entrants and non-exporters in the post-entry period up to three years. The literature review and data sources in this chapter are very much the same as those in Chapter 3. Therefore, we do not repeat these two sections in this Chapter. In attempting to ruling out firms with limited company size, in this chapter we only consider firms with at least 15 employees. The first reason for this sample restriction is that we would like to focus on firms with a certain company size in our analysis. The second reason is the improvement of matching quality. Exporters usually hire more works, and by using the restriction of 15 employees those non-exporters with less than 15 employees will be ruled out. Overall, we believe that the matching quality will be improved. Therefore, firm samples are somewhat different from previous chapter, and we think it is better to redo the description of characteristics of firms. The remainder of this chapter is organized as follows.

First, Section 4.2 presents the descriptive statistics of data sets. We then describe the methodology undertaken in this study in Section 4.3, after which Section 4.4 shows the results. Finally, Section 4.5 gives concluding remarks.

4.2 Descriptive statistics

After ruling out those firms with number of employees less than 15 employees, in Table 4.1 we summarize the main features of 2340 Chinese firms from 2000 to 2002 in the World Bank investment climate survey 2003 data. It corresponds to a total of 6853 observations, out of which 1077 are exporters. In previous chapter our analysis of exporting and firm performance control the capital of firm and intermediate input, while there are many missing values in the intermediate input. In this chapter our analysis does not control the intermediate input, which allows more observations. It is apparent that most firm characteristics of exporters in the left panel of this table are, to some extent, larger than non-exporters in the right panel of the table. Moreover, 94% of exporters is in manufacturing, while 64% of non-exporters is in manufacturing. We complement the descriptive statistics of exporters and non-exporters by calculating the t-test of mean comparison, which captures the significance of different characteristics between exporters and non-exporters. The t-test results in Table 4.1 show, on average, exporters tend to sale more; are more capital-intensive; are willing to employ more workers, and are in younger age (most of them are at significant level).

In Table 4.2 we present the main features of 574 largest Chinese firms from 2002 to 2005 in the Orbis data set. It results in a total of 2014 observations, out

of which 1364 are exporters and 650 are non-exporters. It shows that the differences of firm characteristics between exporters and non-exporters in Table 4.2 are not as large as firms from the World Bank data set in Table 4.1. For instance, on average, exporters and non-exporters in the Orbis data set have the similar employment: 9827.8 and 10001.7, respectively. We also calculate the t-test of mean comparison of firm characteristics between exporters and non-exporters. The t-test results indicate that exporters tend to sell more, while non-exporters tend to have more sales per worker and are more capital-intensive (All of them are at significant level). The annual employment and ratio of firms in manufacturing are not significantly different between exporters and non-exporters. In this chapter we repeat the t-test of mean comparison, which is the same as in previous chapter. It shows that, on average, Chinese firms in the Orbis data set have more sales, inputs, capitals and employees than firms from the World Bank data set. Also, the percentage of firms in manufacturing in the Orbis data set is far larger than firms in the World Bank data set: 94% and 69%, respectively. Another important feature of this chapter is the different percentages of exporters in two data sets. 16% of total observations in the World Bank data are exporters, while 68% observations in the Orbis data are exporters.

4.3 Methodology

Since the propensity score matching approach (Rosenbaum and Rubin, 1983) was first conducted to examine the causal effect of exporting on firm size and labor productivity by Wagner (2002), the propensity score matching method and the

difference in difference matching estimator (Heckman et al., 1997, 1998) have been used to generate matched firms in a few recent papers. To the extent that non-matched samples are more diverse and less comparable than matched samples, the impact of exporting upon productivity is lower when the sample used in the paper is restricted to matched firms (Martins and Yang, 2009). In our chapter we examine the export premium hypothesis from a panel of matched firms, and test the learning by exporting hypothesis by using the difference in difference matching estimator.

4.3.1 Empirical models

The magnitude of different productivity between exporters and non-exporters - the export premium - is obtained from estimating an equation of the following type,

$$\tau_{ATT} = E[Y_{it}|\rho, D = 1] - E[Y_{it}|\rho, D = 0] \tag{4.1}$$

in which τ_{ATT}, the most important variable in the export premium equation used in this chapter, refers to the average productivity between matched exporters and non-exporters. Y_{it} refers to productivity of firm i in year t. The propensity score ρ is calculated by the given firm characteristics, including capital, employment, firm age, regional dummies, sector dummies and year dummies (These given firm characteristics are listed in the balancing properties description tables from 4.6 to 4.12). The propensity score allows obtaining the treated and untreated groups with some similar firm characteristics. D is a dummy equal to

one if the firm is an exporter, and it is equal to zero if the firm is a non-exporter.

Another aim of this chapter is to investigate the learning by exporting hypothesis, using the difference in difference matching estimator. The estimator allows capturing the magnitude of different productivity growth between new export market entrants and non-exporters in a given period after entry. Our main results from the analysis of learning by exporting are obtained from estimating the following equation,

$$DDM_{ATT} = E[Y_{it} - Y_{it'}|\rho, D = 1] - E[Y_{it} - Y_{it'}|\rho, D = 0] \tag{4.2}$$

in which $t^{'}$ refers to the entrant year; t is a given year after entry; $Y_{it} - Y_{it'}$ therefore measures the magnitude of different productivity growth of firm i in a given period after entry. D is a dummy equal to one if the firm is a new export market entrant, while it refers to zero if the firm remains a non-exporter. DDM_{ATT}, the most important variable in the learning by exporting model used in our chapter, captures the magnitude of different productivity growth between new export market entrants and non-exporters in a given period after entry. To explore this learning effect, this chapter extends the post-entry period by up to two years in the World Bank data set and three years in the Orbis data set.

Once the empirical models undertaken in our chapter are defined, our next step is to describe how to use the matching methods in terms of several dimensions that we regard as of particular interest to get matched treated and untreated groups.

4.3.2 Matching methods

The propensity score matching approach is used to adjust for pre-treatment observable differences between treated and untreated groups, and it has become a popular approach to estimate the causal treatment effects. There are a few matching methods available to generate matched firms. In particular, our chapter considers three different matching methods: kernel matching, radius and caliper matching and three nearest neighbours matching. However, our benchmark results are based on kernel matching. All these three matching are performed in STATA 10.0 using the software provided by Leuven and Sianesi (2004).

The kernel matching method is one of the most common matching approaches, automatic computed as a kernel weighted average of the propensity score ρ, to get balanced matched exporters and non-exporters. By using the kernel matching method, the control (untreated) observations will be assigned more weights if they are closer in terms of propensity score of a treated individual and lower weights on more distant observations (Caliendo and Kopeinig, 2008). The main results in our chapter are based on the kernel matching method with a bandwidth of 0.06.

One may argue that the matching could also result in some bad matched observations, if the closest neighbor is far away. One potential solution to amend this bad matching situation is to impose a propensity score distance requirement, namely, the caliper. The value inputted in caliper draws a maximum distance of matched firms in the treated and control groups that is closest in terms of the propensity score. Caliper is quite often conducted with radius matching to avoid the bad matching. Radius matching uses not only the nearest neighbour within each caliper but all of the comparison members within the caliper, and

it allows for usage of extra (fewer) units when good matches are not available (Caliendo and Kopeinig, 2008). The radius and caliper matching is used as the second matching method in our chapter.

Considering now another common matching method, the nearest neighbor matching (see the similar approach conducted in Greenaway and Kneller (2008)) is known to be one of the most straightforward matching methods. Each individual from the control group will be chosen as a matching partner for a treated individual that is closest in terms of propensity score. The 'one to one' nearest neighbor matching is often considered as an initial step in the propensity score matching method, choosing one observation from the control group as a matching partner for a treated observation that is closest in terms of propensity score. The k nearest neighbours matching allows the usage of k units in control group as matching partners for a treated individual. The three nearest neighbours matching is used as the third matching method in this chapter.

4.3.3 Identification

The simultaneous problem arises when there is a contemporaneous correlation between the exporting D_{it} and firm productivity residuals ϵ_{it}, generating biased estimates in the regression estimation. Most productive firms may self-select to pay the sunk cost in order to enter the trade market. Therefore, the previous productivity of firm will affect the general manager's decision on whether to export or not. That is to say firms with better performance will self-select into the export markets. In order to eliminate this 'self-selection' effect in the regression estimation, instrumental variable estimator (IV) comes to be a good

solution. Since it is known to be important but difficult to find instruments, most studies examined the export premium under the assumption of exogenous aspect (to some extent, overlook this self-selection effect in the exporting process). So far, few studies have ever used instrumental variables estimator to delete this self-selection effect (see Kraay (1999), Greenaway and Yu (2004) and Chapter 3). One may argue that the decision of entering the export market or not is partly affected by the previous firm performance. One approach is to use lags of firm performance as instruments, assuming there is no serial correlation in the firm performance, to delete the self-selection effect in the regression estimation. Chapter 3 is able to reach an extremely detailed panel data of Chinese firms from the World Bank investment climate survey 2003 data set that allows using the international experience of managers as instruments to delete this self-selection effect.

This simultaneous issue between exporting and firm productivity residuals is still known to be important in the difference in difference estimator in our chapter. We hold an assumption of no self-selection effect in our analysis. This assumption states that the productivity growth of firms will not affect the general manager's decision on whether to enter into the export market or not. Under this assumption, the DDM_{ATT} captured in equation 4.2 will be unbiased and refers to the learning effect from exporting on new export market entrants in the post-entry period up to three years.

4.3.4 Common support

In order to overcome the drawback of matching methods that some matched treated and untreated individuals are bad matched, the imposition of the common support comes to a good solution. The common support is conducted to avoid the matching bias and improve the matching quality. In statistics, common support is imposed to drop some treatment observations whose propensity scores are higher than the maximum or lower than the minimum of the propensity score of untreated group. Under this implementation, those treated individuals with the propensity score that are within the area (between the minimum and maximum propensity score of the untreated group) will be considered in the process of matching, while those treated individuals that are out of that area will not be regarded. One may argue that it would be the bad matching if the off-support treated group is large. Under this circumstance, those treated firms could not be regarded as representatives. After using the common support in our matching analysis, only a small number (around 15%) of treated firms from the Orbis data set are out of the area in the analysis of learning by exporting within three years after entry and it is regarded as the off-support treated group. While, apart from that, the off-support treated group was not found in the matching. Therefore, by using the common support, we improve the matching quality by excluding a small number of treated firms.

4.3.5 Propensity scores and matching quality

The propensity score ρ is equal to the $\Pr\{D = 1|X\}$ (the probability of being an exporter based on the given firm characteristics X), which ranges from zero to one. The ρ could be used to get a balanced sample of treated and untreated groups. One may argue that how to monitor the quality of the matching. It is crucial to identify treatment and control groups with substantial overlapped firms characteristics and to make matching on those given variables X precisely well, which allows generating an adequate 'like-for-like' comparison. One straightforward approach is to test the equality of the given firm characteristics after matching between treated and untreated groups and check how large differences of these two groups after conditioning on the propensity score. The t-test is used in this chapter to test the covariate balancing after matching that lets us know whether there are still significant differences in given covariate between matched treated and untreated groups. A good matching is evidenced if the equality of the given firm characteristics is not different at significant level, and it denotes that matched treated and untreated groups have more or less similar firm characteristics. Our chapter uses three different matching methods: kernel matching, radius and caliper matching and three nearest neighbors matching. Our benchmark results are based on kernel matching as it is most common approach. Most covariates between treated and untreated groups after kernel matching are similar (see the significance level p value in Table 4.6 to 4.12). Also, this chapter augments the quality test of matching by including the propensity score histogram of matched treated and untreated firms. The propensity score histogram allows us comparing the quantity of matched treated and untreated firms, which are

accumulated within a given number of intervals of the propensity score range. From figure 4.1 to 4.7, we do not have a high rate of overlapped propensity scores between treated and untreated firms, but, in most figures, at least a half of observations in the treated group could find matched firms in the untreated group with a similar propensity score. The t-test of covariate balancing after matching and propensity score histogram analysis conducted in our chapter demonstrate that the quality of matching is efficient.

4.4 Results

The main results, based on equation 4.1 and 4.2, are presented in Table 4.4 and 4.5. In both tables, the sales and sales per worker are used to be the outcome of the treatment. Also, three different matching methods are used in our analysis to examine the export premium hypothesis and learning by exporting hypothesis. The results in Table 4.4 are based on firms that are derived from the World Bank data set and the outcomes in Table 4.5 are based on firms from the Orbis data set.

The results from three different matching methods in the first panel of Table 4.4 -the export premium- show that exporters tend to have more sales than non-exporters with a large percentage, ranging from 19.4% to 22.3% (2 out of 3 estimates are at significant level). Moreover, sales per worker are around 20% higher in exporters (All estimates are at significant level). The export premium therefore is strongly evidenced in firms from the World Bank data. In terms of learning by exporting hypothesis, the estimates in the second panel of the table

show that the sales growth of new exporters in the entrant year is remarkably higher than non-exporters, ranging from 15.8% to 17.6% (all of them are at significant level). The results from three different matching methods in the third panel of the table indicate that there is around 30% (ranging from 27.2% to 38.3%) different sales growth between new export market entrants and non-exporters in the second year after entry (2 out of 3 estimates are at significant level). The results in the second and third panels of table also indicate there are no different sales per worker growth between new export market entrants and non-exporters in the first or second year after entry. We believe one possible reason of the insignificant productivity growth for new export market entrant is due to a large increase of employment in the first and second year after entry. In the second and third panel of table we use employment as performance indicators, and it is clear that new market entrants tend to hire more than non-exporters in the first and second year after entry. Although new market entrants tend to have more sales, labor productivity does not improved due to the large increase of employment. Overall, we have the clear evidence that, based on the significant sales growth in the post-entry period up to two years, once the firm has entered into the export market there is an additional productivity growth from learning effect.

This study complements the analysis of exporting effects on firm productivity by restricting samples to 574 largest Chinese firms from 2002 to 2005. The data are derived from the Orbis data set. Table 4.5 displays the results of the export premium and learning by exporting analyses on sales and sales per worker, using the same matching methods conducted in the analysis of exporting effects on firms from the World Bank data set in Table 4.4. The results in the first panel of Table 4.5 - the export premium - show that there is no significantly different

productivity between exporters and non-exporters (most of estimates on sales and sales per worker are positive but not at significant level). The export premium therefore is not found in largest Chinese firms. The remaining panels of the table present the estimates of learning effect on sales and sales per worker. The third panel of the table shows that there is significantly different sales per worker growth between new export market entrants and non-exporters in the second year after entry, ranging from 36.6% to 44.4% (all of them are at significant level). However, apart from this significant evidence, the results in panel 2, 3 and 4 of the table indicate that there is no significant difference in growth of both sales and sales per worker between new export market entrants and non-exporters in the post-entry period. Therefore, when the sample used in our chapter is restricted to largest firms, we cannot find any evidence of the export premium, and the learning effect is mixed and unclear (the significant productivity growth is only found in the second year after entry).

4.5 Concluding remarks

The 'open door' policy in the last three decades has made China become one of world's major exporters. China has become a country that has begun to manufacture everything or components across all sectors. The products of 'made-in-China' are sold in most countries. China has been undergoing a period of extremely high economic growth and this, in part, is due to the massive levels of trade. Moreover, given that the figure is likely to continue, China will still have

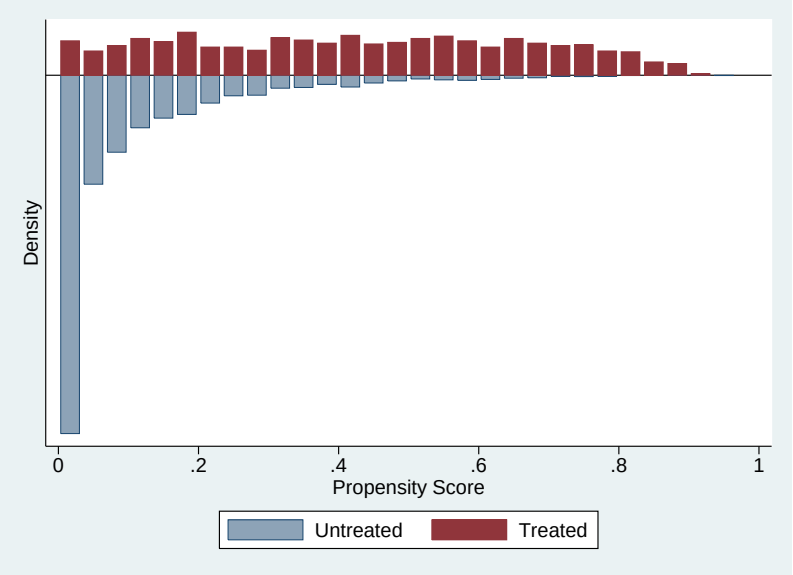
in the future very high levels of capital that may be used to enter the export market.

The main purpose of our chapter is to empirically test export premium hypothesis and learning by exporting hypothesis, based on 2340 Chinese firms from 2000 to 2002 and 574 largest Chinese firms from 2002 to 2005. The propensity score matching approach, used in the analysis of the export premium in our chapter, is to adjust for observable differences of firm characteristics between exporters and non-exporters, allowing an adequate 'like-for-like' comparison. Moreover, this is one of the first papers to use the difference in difference matching estimator to capture the magnitude of different growth between new export market entrants and non-exporters in a given post-entry period. Three different matching methods are used in our chapter, including kernel matching, radius and caliper matching, and three nearest neighbors matching. While, our benchmark results are based on kernel matching. The t-test of the covariate balancing after matching indicates that the treated and untreated individuals are matched well. Most characteristics of covariate (over 90% on average) between matched treated and untreated groups are similar. We need to admit that the propensity score histogram of matched firms in figure 4.1 to 4.7 shows some weakness of the quality of matching. For instance, the treated firms only have few untreated firms to be matched within the interval of 0.5 to 1.0 propensity score in figure 4.1. While in most figures, at least a half of treated observations could find untreated observations in the control group with a similar propensity score. Moreover, only a small number of treated individuals (off-support treated group) whose propensity score are higher than the maximum or lower than the minimum propensity score of untreated group. Overall, the quality of matching methods conducted in

our chapter is efficient, and the learning effect from the difference in difference matching estimator in our chapter is under the assumption of identification as mentioned in methodology Section. Robust to different matching methods, our study finds that 1) the evidence of export premium is obvious; 2) the learning by exporting is clear; and 3) there is no evidence of export premium and weak evidence of learning by exporting if the sample is restricted to some largest Chinese firms. The results of this chapter are similar as the findings in Chapter 3, which used the parametric approach to investigate the export premium and learning by exporting hypotheses. We all find that the exporting effects on productivity are becoming weak or unclear if the sample is restricted to some largest firms.

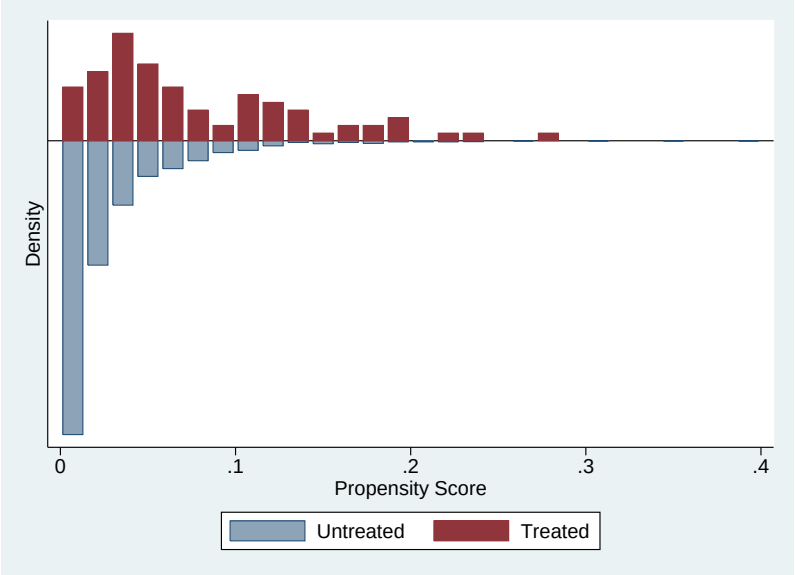
4.6 Tables and figures

Figure 4.1: The propensity score histogram of matched firms from the WBIC 2003 data set (the analysis of export premium); Matching method: kernel



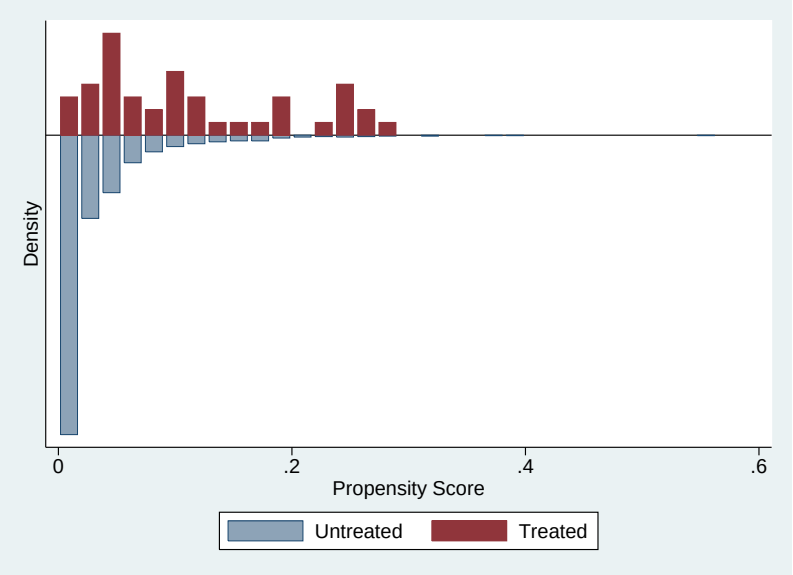
Notes: This propensity score histogram of matched firms in the analysis of export premium is based on the World Bank investment climate (WBIC) survey 2003 data set. 'Untreated' and 'Treated' are firms in the control group and treatment group, respectively (non-exporters are in the control group; exporters are in the treatment group).

Figure 4.2: The propensity score histogram of matched firms from the WBIC 2003 data set (the analysis of learning by exporting, the first year after entry); Matching method: kernel



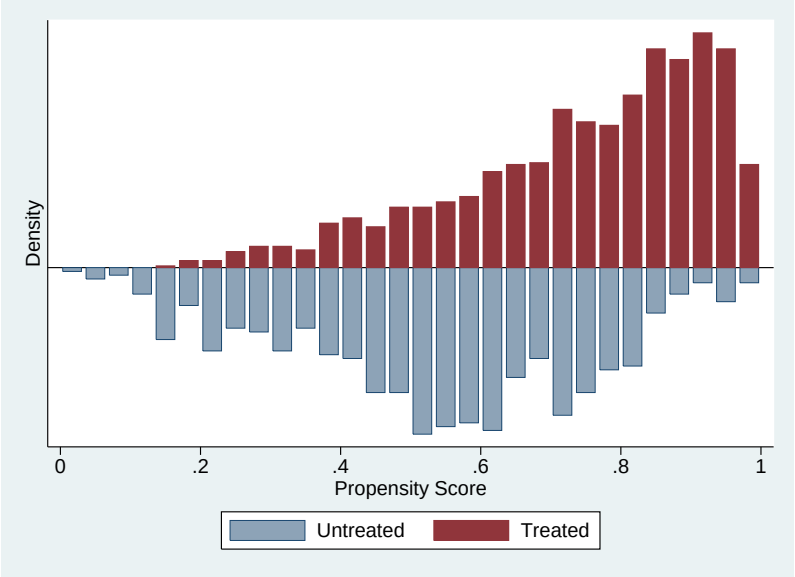
Notes: This propensity score histogram of matched firms in the analysis of learning by exporting in the first year after entry is based on the World Bank investment climate (WBIC) survey 2003 data set. 'Untreated' and 'Treated' are firms in the control group and treatment group, respectively (non-exporters are in the control group; new export market entrants are in the treatment group).

Figure 4.3: The propensity score histogram of matched firms from the WBIC 2003 data set (the analysis of learning by exporting, the second year after entry); Matching method: kernel



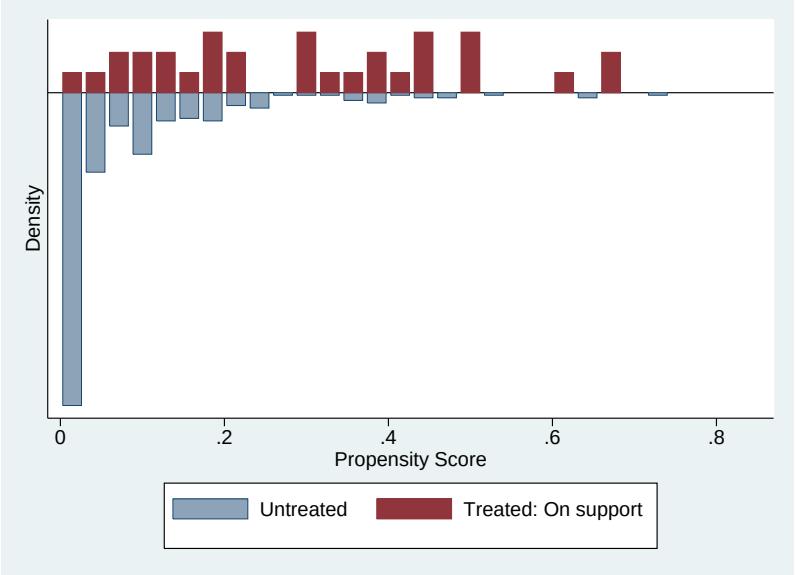
Notes: This propensity score histogram of matched firms in the analysis of learning by exporting in the second year after entry is based on the World Bank investment climate (WBIC) survey 2003 data set. 'Untreated' and 'Treated' are firms in the control group and treatment group, respectively (non-exporters are in the control group; new export market entrants are in the treatment group).

Figure 4.4: The propensity score histogram of matched firms from the Orbis data set (the analysis of export premium); Matching method: kernel



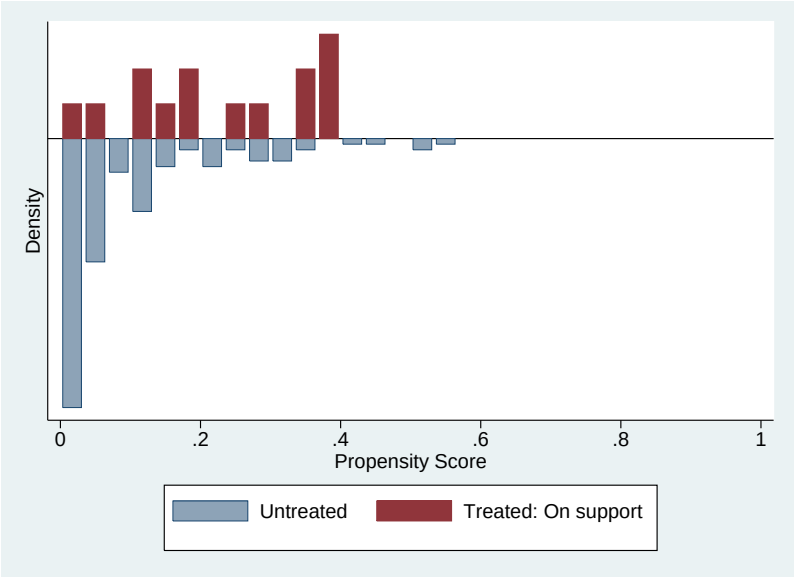
Notes: This propensity score histogram of matched firms in the analysis of export premium is based on the Orbis data set. 'Untreated' and 'Treated' are firms in the control group and treatment group, respectively (non-exporters are in the control group; exporters are in the treatment group).

Figure 4.5: The propensity score histogram of matched firms from the Orbis data set (the analysis of learning by exporting, the first year after entry); Matching method: kernel



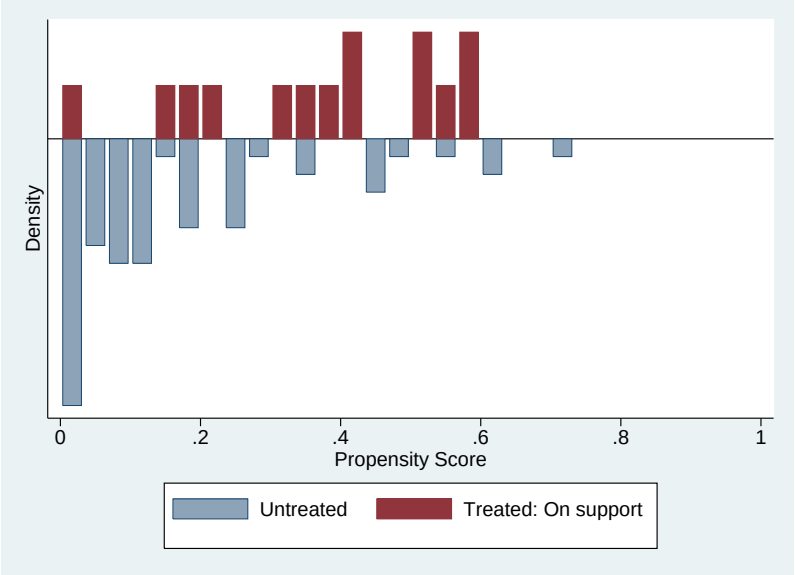
Notes: This propensity score histogram of matched firms in the analysis of learning by exporting in the first year after entry is based on the Orbis data set. 'Untreated' and 'Treated' are firms in the control group and treatment group, respectively (non-exporters are in the control group; new export market entrants are in the treatment group). 'Treated' in this figure is on support treatment group (one out of 32 treated firms are off support in the matching).

Figure 4.6: The propensity score histogram of matched firms from the Orbis data set (the analysis of learning by exporting, the second year after entry); Matching method: kernel



Notes: This propensity score histogram of matched firms in the analysis of learning by exporting in the second year after entry is based on the Orbis data set. 'Untreated' and 'Treated' are firms in the control group and treatment group, respectively (non-exporters are in the control group; new export market entrants are in the treatment group). 'Treated' in this figure is on support treatment group (five out of 19 treated firms are off support in the matching).

Figure 4.7: The propensity score histogram of matched firms from the Orbis data set (the analysis of learning by exporting, the third year after entry); Matching method: kernel



Notes: This propensity score histogram of matched firms in the analysis of learning by exporting in the third year after entry is based on the Orbis data set. 'Untreated' and 'Treated' are firms in the control group and treatment group, respectively (non-exporters are in the control group; new export market entrants are in the treatment group). 'Treated' in this figure is on support treatment group (five out of 19 treated firms are off support in the matching).

Table 4.1: Descriptive statistics of firms from 2000 to 2002 in the WBIC 2003 data set

	Treated			Control			
Variable	**Mean**	**Std. Dev.**	**Obs**	**Mean**	**Std. Dev.**	**Obs**	**T**
Sales	366638.0	1112624.0	1077	85630.2	645717.3	5775	11.46
Sales P W	461.6	4499.1	1077	287.7	2863.5	5760	1.65
Capital	191195.1	687791.9	1066	140427.4	1323609.0	5617	1.22
Employment	900.5	1750.2	1077	520.7	3267.0	5761	3.72
Firm Age	12.9	11.6	1077	15.7	14.9	5776	-5.81
Year	2001.1	0.8	1077	2001.0	0.8	5776	2.23
Manufacture	0.94	0.23	1077	0.64	0.48	5776	20.26
Capital^2	5.09E+11	5.63E+12	1066	1.77E+12	4.12E+13	5617	-1.00
Employment^2	3871189	2.33E+07	1077	1.09E+07	2.24E+08	5761	-1.03
Firm Age^2	300.2	578.2	1077	469.7	761.7	5761	-6.94

Notes: Firms in this descriptive statistics are based on the World Bank investment climate (WBIC) survey 2003 data set. 'Sales', 'Sales P W', and 'Capital' are denominated in thousands of RMB. '$Capital^{2\prime}$ is denominated in millions of RMB. 'Treatment' refers to the group of exporters. 'Control' refers to the group of non-exporters. 'Sales' is the annual turnover of the firm. 'Sales P W' is the average sales per worker per year. 'Capital' contains the value of buildings, production machinery and equipment, excluding IT, cars, vans and trunks. 'Employment' is the annual employment of the firm. 'Firm Age' refers to the number of years since the firm was established. 'Year' is the survey year of the firm. 'Manufacture' is a dummy equal to one if the firm is in manufacturing. '$Capital^{2\prime}$, '$Employment^{2\prime}$ and '$Firm\ Age^{2\prime}$ are the square of capital, employment and firm age. 'T' is the t test - the mean comparison test of firm characteristics between exporters and non-exporters.

Table 4.2: Descriptive statistics of largest Chinese firms from 2002 to 2005 in the Orbis data set

	Treated			Control			
Variable	**Mean**	**Std. Dev.**	**Obs**	**Mean**	**Std. Dev.**	**Obs**	**T**
Sales	6987861	1.04E+07	1364	5972320	1.03E+07	650	2.05
Sales P W	2324.2	8459.7	1363	3508.5	15054.4	647	-2.25
Capital	2534061	5425692	1364	4512817	9608446	650	-5.89
Employment	9827.8	16747.0	1363	10001.7	16549.7	647	-0.22
Manufacture	0.94	0.24	1364	0.95	0.22	650	-1.09
Year	2003.5	1.1	1364	2003.3	1.1	650	2.86
Capital^2	3.58E+13	2.77E+14	1364	1.13E+14	5.28E+14	650	-4.28
Employment^2	3.77E+08	1.63E+09	1363	3.74E+08	1.24E+09	647	0.05

Notes: Firms in this descriptive statistics are based on Orbis data set. 'Sales', 'Sales P W', and 'Capital' are denominated in thousands of RMB. '$Capital^{2\prime}$ is denominated in millions of RMB. 'Treatment' refers to the group of exporters. 'Control' refers to the group of non-exporters. 'Sales' is the annual turnover of the firm. 'Sales P W' is the average sales per worker per year. 'Capital' is the value of a set of land, building, plant and machinery, transport equipment, leased assets, and other property. 'Employment' is the annual employment of the firm. 'Manufacture' is a dummy equal to one if the firm is in manufacturing rather than service. 'Year' is the survey year of the firm. '$Capital^{2\prime}$ and '$Employment^{2\prime}$ refer to the square of capital and employment. 'T' is the t test - the mean comparison test of firm characteristics between exporters and non-exporters.

Table 4.3: Descriptive statistics of Chinese firms from the WBIC 2003 and the Orbis data sets

	WBIC			Orbis			
Variable	**Mean**	**Std. Dev.**	**Obs**	**Mean**	**Std. Dev.**	**Obs**	**T**
Sales	129799.1	745850.9	6852	6660105	1.04E+07	2014	-51.58
Sales P W	315.1	3177.7	6837	2705.4	11031.8	2010	-15.82
Treated	0.16	0.36	6853	0.68	0.47	2014	-52.62
Capital	148525.3	1244264	6683	3172687	7110125	2014	-33.13
Employment	580.5	3081.1	6838	9883.8	16679.8	2010	-43.66
Firm Age	15.3	14.5	6853				
Year	2001.0	0.8	6853	2003.4	1.1	2014	-110.00
Manufacture	0.69	0.46	6853	0.94	0.24	2014	-23.50
Capital^2	1.57E+12	3.78E+13	6683	6.06E+13	3.78E+14	2014	-12.56
Employment^2	9828721	2.06E+08	6838	3.76E+08	1.51E+09	2010	-19.40
Firm Age^2	443.0	738.4	6853				

Notes: Firms in this descriptive statistics are based on the World Bank investment climate (WBIC) survey 2003 data set and the Orbis data set. 'Sales', 'Sales P W', and 'Capital' are denominated in thousands of RMB. '$Capital^{2\prime}$ is denominated in millions of RMB. 'WBIC' are firms in the WBIC 2003 data set. 'Orbis' are firms in the Orbis data set. 'Sales' is the annual turnover of the firm. 'Sales P W' is the average sales per worker per year. 'Treated Group' is a dummy equal to one if the firm is an exporter. 'Capital' is the annual tangible asset of the firm. 'Employment' is the annual employment of the firm. 'Firm Age' refers to the number of years since the firm was established. 'Year' is the survey year of the firm. 'Manufacture' is a dummy equal to one if the firm is in manufacturing rather than service. '$Capital^{2\prime}$, '$Employment^{2\prime}$ and '$Firm\ Age^{2\prime}$ refer to the square of capital, employment and firm age. 'T' is the t test - the mean comparison test of firm characteristics between the World Bank data set and the Orbis data set.

Table 4.4: Export premium and learning by exporting (Firms from the WBIC 2003 data set); Matching methods: kernel matching, radius and caliper matching, and three nearest neighbors matching

Estimators	ATT	t-ratio(ATT)	Treated	Control
	Export Premium			
	(Sales)			
Kernel	0.223	2.10	1066	5604
Radius	0.224	2.13	1066	5604
Neighbors	0.194	1.64	1066	5604
	(Sales Per Worker)			
Kernel	0.206	2.78	1066	5604
Radius	0.206	2.80	1066	5604
Neighbors	0.188	2.26	1066	5604
	Learning By Exporting	**(First Year**	**After Entry)**	
	(Sales)			
Kernel	0.158	2.03	79	2610
Radius	0.159	2.05	79	2610
Neighbors	0.176	2.09	79	2610
	(Sales Per Worker)			
Kernel	0.076	0.97	79	2610
Radius	0.077	0.98	79	2610
Neighbors	0.086	1.01	79	2610
	(Employment)			
Kernel	0.077	3.43	79	2610
Radius	0.078	3.50	79	2610
Neighbors	0.067	2.58	79	2610
	Learning By Exporting	**(Second Year**	**After Entry)**	
	(Sales)			
Kernel	0.380	2.57	42	1126
Radius	0.383	2.59	42	1126
Neighbors	0.272	1.69	42	1126
	(Sales Per Worker)			
Kernel	0.227	1.53	42	1126
Radius	0.229	1.54	42	1126
Neighbors	0.167	1.03	42	1126
	(Employment)			
Kernel	0.147	2.78	42	1126
Radius	0.149	2.81	42	1126
Neighbors	0.122	2.12	42	1126

Notes: The results above are based on the World Bank investment climate (WBIC) survey 2003 data set. Three different matching methods are used, including kernel, radius, caliper, and three nearest neighbors. This table contains the results of export premium and learning effect on productivity in the post-entry period up to two years. 'ATT' refers to the average treatment effect for the treated in terms of outcome variables, including sales and sales per worker. 't-ratio (ATT)' is the t-ratios of the average treatment effect. 'Treated' and 'Control' are the number of firms in the treated group and untreated group, respectively (In the analysis of export premium, exporters are in the treatment group; non-exporters are in the untreated group. In the analysis of learning by exporting, new export market entrants are in the treatment group; non-exporters are in the untreated group).

Table 4.5: Export premium and learning by exporting (Firms from the Orbis data set); Matching methods: kernel matching, radius and caliper matching, and three nearest neighbors matching

Estimators	ATT	t-ratio(ATT)	Treated	Control
	Export Premium			
	(Sales)			
Kernel	0.106	1.32	1345	632
Radius	0.107	1.34	1345	632
Neighbors	0.071	0.80	1345	632
	(Sales Per Worker)			
Kernel	0.039	0.35	1345	632
Radius	0.044	0.40	1345	632
Neighbors	0.008	0.06	1345	632
	Learning By Exporting	**(First Year**	**After Entry)**	
	(Sales)			
Kernel	-0.107	-0.86	31	252
Radius	-0.110	-0.88	31	252
Neighbors	-0.062	-0.51	31	252
	(Sales Per Worker)			
Kernel	-0.075	-0.52	31	252
Radius	-0.071	-0.49	31	252
Neighbors	-0.046	-0.30	31	252
	Learning By Exporting	**(Second Year**	**After Entry)**	
	(Sales)			
Kernel	-0.056	-0.31	14	118
Radius	-0.055	-0.30	14	118
Neighbors	-0.028	-0.16	14	118
	(Sales Per Worker)			
Kernel	0.435	2.50	14	118
Radius	0.366	2.10	14	118
Neighbors	0.444	1.95	14	118
	Learning By Exporting	**(Third Year**	**After Entry)**	
	(Sales)			
Kernel	0.062	0.28	14	57
Radius	0.055	0.24	14	57
Neighbors	0.060	0.31	14	57
	(Sales Per Worker)			
Kernel	0.026	0.13	14	57
Radius	0.039	0.19	14	57
Neighbors	0.018	0.12	14	57

Notes: The results above are based on the Orbis data set. This table contains the results of export premium and learning effect on productivity in the post-entry period up to three years. See the footnote in table 4.4.

Table 4.6: Balancing properties of matched firms from the WBIC 2003 data set (Export premium analysis); Matching method: kernel

Variable	Sample	Mean		T Test	
		Treated	Control	t	p>t
Capital	Matched	10.050	10.127	-0.83	0.407
Employment	Matched	5.839	5.822	0.29	0.775
Firm Age	Matched	2.269	2.199	2.17	0.030
Capital^2	Matched	105.640	107.260	-0.84	0.404
Employment^2	Matched	35.970	35.852	0.16	0.872
Firm Age^2	Matched	5.684	5.407	1.75	0.081
Manufacture	Matched	0.947	0.921	2.36	0.019
Year=2000	Matched	0.304	0.300	0.19	0.848
Year=2001	Matched	0.329	0.326	0.16	0.871
Year=2002	Matched	0.367	0.374	-0.34	0.734
Sector 1	Matched	0.343	0.339	0.21	0.835
Sector 2	Matched	0.129	0.140	-0.70	0.482
Sector 3	Matched	0.185	0.160	1.55	0.122
Sector 4	Matched	0.064	0.055	0.86	0.388
Sector 5	Matched	0.163	0.157	0.40	0.687
Sector 6	Matched	0.017	0.025	-1.35	0.178
Sector 7	Matched	0.006	0.009	-0.93	0.353
Sector 8	Matched	0.004	0.008	-1.30	0.192
Sector 9	Matched	0.027	0.036	-1.21	0.227
Sector 10	Matched	0.009	0.015	-1.14	0.255
Sector 11	Matched	0.024	0.026	-0.27	0.787
Sector 12	Matched	0.004	0.004	0.03	0.980
Sector 13	Matched	0.023	0.023	0.00	0.999
Sector 14	Matched	0.001	0.003	-1.01	0.313
Region 1	Matched	0.007	0.007	-0.24	0.812
Region 2	Matched	0.032	0.032	-0.06	0.953
Region 3	Matched	0.054	0.048	0.68	0.499
Region 4	Matched	0.065	0.053	1.11	0.269
Region 5	Matched	0.083	0.069	1.18	0.237
Region 6	Matched	0.023	0.025	-0.18	0.855
Region 7	Matched	0.026	0.030	-0.50	0.616
Region 8	Matched	0.114	0.101	1.03	0.302
Region 9	Matched	0.109	0.137	-1.99	0.047
Region 10	Matched	0.027	0.028	-0.06	0.956
Region 11	Matched	0.006	0.010	-1.05	0.296
Region 12	Matched	0.099	0.101	-0.14	0.886
Region 13	Matched	0.021	0.032	-1.67	0.095
Region 14	Matched	0.131	0.121	0.75	0.452
Region 15	Matched	0.052	0.063	-1.09	0.275
Region 16	Matched	0.056	0.059	-0.24	0.813
Region 17	Matched	0.052	0.049	0.25	0.803
Region 18	Matched	0.043	0.036	0.86	0.391

Table 4.7: Balancing properties of matched firms from the WBIC 2003 data set (Learning by exporting analysis, one year after); Matching method: kernel

Variable	Sample	Mean		T Test	
		Treated	Control	t	p>t
Lag one. Capital	Matched	9.429	9.257	0.52	0.604
Lag one. Employment	Matched	5.456	5.323	0.64	0.522
Lag one. Firm Age	Matched	1.864	2.032	-1.22	0.226
Lag one. Capital^2	Matched	92.701	90.377	0.37	0.708
Lag one. Employment^2	Matched	31.263	30.143	0.48	0.630
Lag one. Firm Age^2	Matched	4.109	4.966	-1.37	0.172
Manufacture	Matched	0.911	0.827	1.57	0.119
Year=2001	Matched	0.456	0.483	-0.34	0.732
Year=2002	Matched	0.544	0.517	0.34	0.732
Sector 1	Matched	0.152	0.131	0.37	0.714
Sector 2	Matched	0.177	0.161	0.27	0.790
Sector 3	Matched	0.177	0.167	0.17	0.865
Sector 4	Matched	0.063	0.053	0.28	0.780
Sector 5	Matched	0.228	0.219	0.14	0.892
Sector 6	Matched	0.051	0.083	-0.80	0.425
Sector 9	Matched	0.038	0.090	-1.34	0.184
Sector 11	Matched	0.038	0.037	0.03	0.974
Sector 12	Matched	0.013	0.013	0.00	0.997
Sector 13	Matched	0.063	0.047	0.46	0.648
Region 1	Matched	0.038	0.039	-0.04	0.971
Region 2	Matched	0.076	0.078	-0.04	0.966
Region 3	Matched	0.025	0.045	-0.67	0.504
Region 4	Matched	0.139	0.121	0.33	0.741
Region 5	Matched	0.038	0.041	-0.08	0.934
Region 6	Matched	0.063	0.071	-0.19	0.851
Region 7	Matched	0.051	0.060	-0.27	0.790
Region 8	Matched	0.152	0.122	0.55	0.583
Region 9	Matched	0.025	0.031	-0.20	0.838
Region 10	Matched	0.038	0.060	-0.62	0.534
Region 12	Matched	0.051	0.047	0.11	0.916
Region 14	Matched	0.063	0.051	0.33	0.740
Region 15	Matched	0.038	0.032	0.20	0.841
Region 16	Matched	0.051	0.058	-0.20	0.839
Region 17	Matched	0.089	0.083	0.12	0.904
Region 18	Matched	0.063	0.062	0.03	0.973

Notes: This table shows balancing properties of matched firms in the analysis of learning by exporting in the first year after entry, and firms are based on the World Bank investment climate (WBIC) survey 2003 data set. 'Treated' and 'Control' are the treatment group and untreated group, respectively (new export market entrants are in the treatment group; non-exporters are in the untreated group). 'T Test' is the t-test to the equality of given firm characteristics between treated and untreated groups. 'Lag one.' is the value of the given variables in the last year.

Table 4.8: Balancing properties of matched firms from the WBIC 2003 data set (Learning by exporting analysis, two years after); Matching method: kernel

Variable	Sample	Mean		T Test	
		Treated	Control	t	p>t
Lag two. Capital	Matched	9.160	9.135	0.05	0.958
Lag two. Employment	Matched	5.446	5.361	0.30	0.763
Lag two. Firm Age	Matched	1.697	1.837	-0.72	0.473
Lag two. Capital^2	Matched	88.515	88.187	0.04	0.970
Lag two. Employment^2	Matched	31.184	30.486	0.22	0.826
Lag two. Firm Age^2	Matched	3.598	4.207	-0.74	0.461
Manufacture	Matched	0.905	0.845	0.83	0.411
Sector 1	Matched	0.095	0.089	0.10	0.919
Sector 2	Matched	0.214	0.201	0.14	0.886
Sector 3	Matched	0.167	0.178	-0.14	0.888
Sector 4	Matched	0.071	0.061	0.19	0.847
Sector 5	Matched	0.262	0.240	0.23	0.816
Sector 6	Matched	0.048	0.072	-0.46	0.648
Sector 9	Matched	0.048	0.084	-0.67	0.508
Sector 12	Matched	0.024	0.029	-0.15	0.882
Sector 13	Matched	0.071	0.047	0.48	0.634
Region 1	Matched	0.048	0.050	-0.04	0.966
Region 2	Matched	0.024	0.046	-0.55	0.582
Region 3	Matched	0.024	0.046	-0.56	0.580
Region 4	Matched	0.167	0.140	0.33	0.742
Region 5	Matched	0.024	0.025	-0.04	0.970
Region 6	Matched	0.024	0.033	-0.26	0.795
Region 7	Matched	0.048	0.054	-0.14	0.893
Region 8	Matched	0.143	0.128	0.20	0.845
Region 9	Matched	0.024	0.031	-0.19	0.847
Region 12	Matched	0.071	0.070	0.03	0.974
Region 14	Matched	0.071	0.060	0.21	0.833
Region 15	Matched	0.024	0.026	-0.06	0.950
Region 16	Matched	0.071	0.076	-0.08	0.939
Region 17	Matched	0.119	0.113	0.09	0.927
Region 18	Matched	0.119	0.102	0.24	0.809

Notes: This table shows balancing properties of matched firms in the analysis of learning by exporting in the second year after entry, and firms are based on the World Bank investment climate (WBIC) survey 2003 data set. 'Treated' and 'Control' are the treatment group and untreated group, respectively (new export market entrants are in the treatment group; non-exporters are in the untreated group). 'T Test' is the t-test to the equality of given firm characteristics between treated and untreated groups. 'Lag two.' is the value of the given variables in two years before.

Table 4.9: Balancing properties of matched Orbis firms (Export premium)

Variable	Sample	Mean		T Test	
		Treated	Control	t	p>t
Capital	Matched	13.728	13.729	0.00	0.997
Employment	Matched	8.425	8.357	1.41	0.159
Capital^2	Matched	190.700	190.990	-0.18	0.854
Employment^2	Matched	72.451	71.464	1.21	0.225
Manufacture	Matched	0.936	0.956	-2.31	0.021
Year=2002	Matched	0.259	0.276	-0.99	0.323
Year=2003	Matched	0.272	0.288	-0.92	0.356
Year=2004	Matched	0.215	0.182	2.15	0.032
Year=2005	Matched	0.254	0.254	-0.01	0.991
Sector 2	Matched	0.103	0.135	-2.57	0.010
Sector 3	Matched	0.075	0.067	0.80	0.423
Sector 4	Matched	0.062	0.092	-2.83	0.005
Sector 5	Matched	0.177	0.204	-1.81	0.070
Sector 6	Matched	0.199	0.126	5.17	0.000
Sector 7	Matched	0.037	0.042	-0.64	0.523
Sector 8	Matched	0.145	0.140	0.40	0.687
Sector 9	Matched	0.087	0.102	-1.35	0.176
Sector 10	Matched	0.051	0.049	0.23	0.816
Sector 12	Matched	0.064	0.044	2.31	0.021
Region 1	Matched	0.013	0.012	0.23	0.819
Region 2	Matched	0.028	0.050	-3.05	0.002
Region 3	Matched	0.013	0.016	-0.70	0.486
Region 4	Matched	0.022	0.016	1.22	0.223
Region 5	Matched	0.007	0.008	-0.35	0.728
Region 6	Matched	0.163	0.133	2.19	0.029
Region 7	Matched	0.004	0.003	0.41	0.679
Region 8	Matched	0.007	0.004	0.89	0.374
Region 10	Matched	0.038	0.042	-0.50	0.616
Region 11	Matched	0.020	0.028	-1.41	0.159
Region 12	Matched	0.040	0.031	1.32	0.185
Region 13	Matched	0.015	0.014	0.24	0.812
Region 14	Matched	0.019	0.038	-2.87	0.004
Region 15	Matched	0.006	0.007	-0.34	0.737
Region 16	Matched	0.163	0.156	0.47	0.637
Region 18	Matched	0.015	0.014	0.17	0.863
Region 19	Matched	0.054	0.043	1.32	0.185
Region 22	Matched	0.016	0.009	1.55	0.122
Region 23	Matched	0.108	0.093	1.32	0.187
Region 24	Matched	0.102	0.126	-1.98	0.048
Region 25	Matched	0.026	0.025	0.13	0.893
Region 26	Matched	0.018	0.017	0.11	0.909
Region 27	Matched	0.031	0.030	0.20	0.841
Region 28	Matched	0.001	0.000	0.29	0.771
Region 29	Matched	0.009	0.010	-0.25	0.801
Region 30	Matched	0.064	0.075	-1.11	0.265

Table 4.10: Balancing properties of matched firms from the Orbis data set (Learning by exporting analysis, one year after); Matching method: kernel

Variable	Sample	Mean		T Test	
		Treated	Control	t	p>t
Lag one. Capital	Matched	13.604	13.492	0.33	0.740
Lag one. Employment	Matched	7.964	7.949	0.04	0.966
Lag one. Capital^2	Matched	186.660	183.830	0.31	0.758
Lag one. Employment^2	Matched	65.009	64.920	0.02	0.987
Manufacture	Matched	0.903	0.942	-0.56	0.576
Sector 2	Matched	0.065	0.047	0.29	0.772
Sector 3	Matched	0.194	0.202	-0.09	0.932
Sector 4	Matched	0.032	0.036	-0.08	0.937
Sector 5	Matched	0.194	0.193	0.01	0.995
Sector 6	Matched	0.097	0.072	0.34	0.732
Sector 8	Matched	0.194	0.203	-0.09	0.930
Sector 9	Matched	0.097	0.131	-0.42	0.674
Sector 10	Matched	0.032	0.057	-0.47	0.641
Sector 12	Matched	0.097	0.058	0.56	0.576
Region 1	Matched	0.032	0.027	0.13	0.896
Region 2	Matched	0.032	0.039	-0.14	0.888
Region 5	Matched	0.032	0.037	-0.09	0.925
Region 6	Matched	0.161	0.129	0.35	0.725
Region 10	Matched	0.032	0.030	0.04	0.967
Region 12	Matched	0.129	0.128	0.02	0.987
Region 16	Matched	0.065	0.054	0.17	0.862
Region 23	Matched	0.258	0.284	-0.23	0.821
Region 24	Matched	0.032	0.027	0.12	0.906
Region 29	Matched	0.032	0.030	0.05	0.961
Region 30	Matched	0.194	0.215	-0.21	0.834

Notes: This table shows balancing properties of matched firms in the analysis of learning by exporting in the first year after entry, and firms are based on the Orbis data set. 'Treated' and 'Control' are the treatment group and untreated group, respectively (new export market entrants are in the treatment group; non-exporters are in the untreated group). 'T Test' is the t-test to the equality of given firm characteristics between treated and untreated groups. 'Lag one.' is the value of the given variables in the last year.

Table 4.11: Balancing properties of matched firms from the Orbis data set (Learning by exporting analysis, two years after); Matching method: kernel

Variable	Sample	Mean		T Test	
		Treated	Control	t	p>t
Lag two. Capital	Matched	13.366	13.328	0.07	0.946
Lag two. Employment	Matched	7.879	7.698	0.31	0.760
Lag two. Capital^2	Matched	180.420	179.800	0.04	0.968
Lag two. Employment^2	Matched	63.945	61.692	0.23	0.820
Manufacture	Matched	0.929	0.937	-0.08	0.933
Sector 2	Matched	0.071	0.075	-0.03	0.976
Sector 3	Matched	0.143	0.136	0.05	0.962
Sector 4	Matched	0.071	0.064	0.07	0.942
Sector 5	Matched	0.214	0.185	0.18	0.857
Sector 6	Matched	0.071	0.048	0.24	0.810
Sector 8	Matched	0.143	0.147	-0.03	0.977
Sector 9	Matched	0.143	0.172	-0.20	0.845
Sector 10	Matched	0.071	0.110	-0.34	0.739
Sector 12	Matched	0.071	0.063	0.08	0.933
Region 1	Matched	0.071	0.053	0.20	0.846
Region 2	Matched	0.071	0.010	0.79	0.438
Region 6	Matched	0.071	0.063	0.08	0.937
Region 12	Matched	0.000	0.034	-0.67	0.510
Region 16	Matched	0.143	0.116	0.20	0.842
Region 23	Matched	0.357	0.428	-0.36	0.719
Region 24	Matched	0.071	0.059	0.12	0.902
Region 29	Matched	0.071	0.053	0.19	0.851
Region 30	Matched	0.143	0.184	-0.28	0.784

Notes: This table shows balancing properties of matched firms in the analysis of learning by exporting in the second year after entry, and firms are based on the Orbis data set. 'Treated' and 'Control' are the treatment group and untreated group, respectively (new export market entrants are in the treatment group; non-exporters are in the untreated group). 'T Test' is the t-test to the equality of given firm characteristics between treated and untreated groups. 'Lag two.' is the value of the given variables in two years before.

Table 4.12: Balancing properties of matched firms from the Orbis data set (Learning by exporting analysis, three years after); Matching method: kernel

Variable	Sample	Mean		T Test	
		Treated	Control	t	p>t
Lag three. Capital	Matched	13.366	13.397	-0.06	0.955
Lag three. Employment	Matched	7.879	7.663	0.39	0.700
Lag three. Capital^2	Matched	180.420	181.490	-0.07	0.942
Lag three. Employment^2	Matched	63.945	60.837	0.34	0.740
Manufacture	Matched	0.929	0.925	0.04	0.971
Sector 2	Matched	0.071	0.042	0.32	0.750
Sector 3	Matched	0.143	0.162	-0.14	0.891
Sector 4	Matched	0.071	0.091	-0.18	0.856
Sector 5	Matched	0.214	0.227	-0.08	0.938
Sector 6	Matched	0.071	0.033	0.44	0.665
Sector 8	Matched	0.143	0.141	0.02	0.988
Sector 9	Matched	0.143	0.178	-0.24	0.809
Sector 10	Matched	0.071	0.050	0.23	0.820
Sector 12	Matched	0.071	0.075	-0.04	0.971
Region 1	Matched	0.071	0.072	-0.01	0.994
Region 2	Matched	0.071	0.028	0.51	0.613
Region 6	Matched	0.071	0.053	0.19	0.848
Region 12	Matched	0.000	0.085	-1.10	0.283
Region 16	Matched	0.143	0.099	0.34	0.733
Region 23	Matched	0.357	0.445	-0.46	0.652
Region 24	Matched	0.071	0.033	0.45	0.659
Region 29	Matched	0.071	0.082	-0.11	0.917
Region 30	Matched	0.143	0.103	0.31	0.760

Notes: This table shows balancing properties of matched firms in the analysis of learning by exporting in the third year after entry, and firms are based on the Orbis data set. 'Treated' and 'Control' are the treatment group and untreated group, respectively (new export market entrants are in the treatment group; non-exporters are in the untreated group). 'T Test' is the t-test to the equality of given firm characteristics between treated and untreated groups. 'Lag three.' is the value of the given variables in three years before.

Part II

Multinationality and Firm Performance

Chapter 5

Multinationality-Performance Relationship: A Meta-Analysis

5.1 Introduction

Multinational firms may have opportunities to achieve greater returns from internalizing intangible assets of the firm, and create intra-firm markets thereby lowering the costs of organizing and transacting business when they expand their subsidiaries into overseas market, leading to significant performance improvements (Buckley and Casson, 1976; Dunning, 1988; Helpman et al., 2004; Rugman, 1982). Given its potential relevance, the multinationality-Performance correlation (hereafter called as M-P relationship) has become one of core research in international business. The theories of foreign direct investment (Buckley and Casson, 1976; Dunning, 1981; Hymer, 1976; Rugman, 1986) explain the conditions under which it is beneficial for a firm to expand its affiliate into overseas markets, and analyze when, why and how a firm should go abroad; the learning theory (Johanson and Vahlne, 1977) proposes that internationalization is the product of a series of incremental decisions and resources committed to foreign market which affect the firm's perceived learning process, opportunities and risks, the resource-based view of the firm (Barney, 1991; Wernerfelt, 1984) aims to explain the determining factors for firms to invest abroad.

The research on relationship between multinationality and firm performance (hereafter called as M-P relationship) at firm level has risen considerably since the mid-1970s. However, the empirical findings are still unclear, in part because different studies adopt different methodologies. In fact, a recent survey (Li, 2007) indicates that there have been inconsistent empirical findings on the M-P relationship as result of the Sampling and Methodological heterogeneity. Because of the crucial role that the foreign direct investment has played in the internation-

alization process and the apparent discrepancy of findings across the empirical literature, it is important to assess the validity of empirical evidence on M-P relationship.

This chapter follows the Meta-analysis approach by Stanley and Jarrell (1989), Card and Krueger (1995), Ashenfelter et al. (1999), Görg and Strobl (2001), Pereira and Martins (2004) and Martins and Yang (2009), using Meta-analysis regression (MAR). The first aim of this chapter tries to understand if there are systematic relationships between the characteristics of each study and its estimated result of the M-P relationship. In fact, there are several dimensions in which a specific paper can differ from other studies including the range of country coverage, the performance measurement, the multinationality measurement, the characteristics of sample, and the estimation methods[1]. The second interesting aspect of this chapter concerned the possibility of publication bias[2].

Much of recent research has a focus on curvilinear relationships where analyses indicate an inverse U-shaped performance relationship (which suggests an initially negative M-P relationship, before the positive returns of foreign direct investment are realized) (Gomes and Ramaswamy, 1999; Qian et al., 2008) while others found a U-shaped relationship (which suggests that multinationality beyond an optimal desirable level is again detrimental to performance, and results in a negative slope) (Qian, 1997; Ruigrok and Wagner, 2003). Curvilinear relationships suggest that, beyond a certain degree of multinationality, the M-P will reverse. However, one may argue that if firms reaching that certain degree of multinationality are few, to the extent those firms cannot be representative, and the finding of curvilinear

[1]See also the Meta-analysis results presented in Bausch and Krist (2007), most of which are descriptive statistics analysis in nature.

[2]See more details about publication bias in section 2.2.

M-P relationship based on these firms may be misleading. The third aim of this chapter tries to find out how much percent of firms can reach that certain degree of multinationality in those papers that find curvilinear M-P relationships, and whether findings on curvilinear M-P relationships are misleading.

The next section describes the econometric approach undertaken in the studies that we analyse and then explains our own methodology. Section 5.3 describes the studies that this Meta study examines, while section 5.4 analyzes the main findings. Finally, section 5.5 gives the conclusions and discussions.

5.2 Methodology

Our Meta analysis is primarily concerned with firm-level studies that examine the MN-Performance relationship that estimate equations of the following type:

$$Y_{it} = \beta M_i + \lambda X_{it} + \gamma_t + e_{it} \tag{5.1}$$

, where Y_{it} is accounting-based or market-based firm performance[1] of firm i for a given period t. M_i refers to the degree of multinationality of firm over the same period. The equation may also include other control variables, such as firm characteristics (X_{it}), and/or controls for business cycle effects (γ_t).

The key parameter of interest to this study is β, which indicates the strength of the MN-Performance relationship. We then relate the estimates of β reported

[1] A group of studies used other dependent variables, such as innovation, patent and technical efficiency. However, in order to focus our analysis on comparable studies, we consider only those that use accounting/market-based performance.

by the different studies to the characteristics of that study. Thus, the main results from meta-analysis are obtained by estimating an Eq 5.2, in which $\hat{\beta}_j$ is the reported estimate of the j^{th} study and Z_{jk} are the variables that measure the characteristics of that same estimate and that were described above.

$$\hat{\beta}_j = \alpha_0 + \sum_{k=1}^{K} \alpha_k Z_{jk} + e_j \tag{5.2}$$

Z_{jk} contains the dimensions that are of particular interest which may influence the value of β that is obtained in a systematic (non-random) way. The dimensions we considered are:

1. Country of origin : Differences in country of origin may tend to be systematically related to the MN-Performance relationship. An overwhelming majority of the studies are based on US data (more than 70% of studies), while the remaining sample from other economies. This may bias results for two reasons. First, the US is a large economy where the exploitation of proprietary advantages domestically is as likely to generate superior returns as their exploitation through international diversification. Firms outside the US (e.g. from Europe) are less likely to enjoy such scale economies from their domestic markets. The value of internationalising is likely to be correspondingly higher. Secondly, it is well documented that firms from Asia have used internationalisation abroad as a strategy to learn from overseas clients or competitors. We examine the role of country of origin by introducing a dummy variable that is equal to one if the study does not sample from the US.

2. Estimation method : Thee estimation method may also have an impact upon the size of β. While the standard approach to the estimation in Eq. 5.1 is

regression analysis, some papers compare means of performance based on ANOVA methods or t-tests across firms with different degrees of multinationality. One may argue that the latter (non-regression) methods may lead to biased estimates as they do not take account of cross-correlations between multinationality and other variables. In order to take account of this factor we create a dummy variable that takes value one if the analysis uses non-regression methods.

3. Measurement of multinationality : The most common approach to measure the degree of multinationality is the ratio of foreign to total sales (FSTS). Some studies use other measures, such as the ratio of foreign to total assets, the number of overseas subsidiaries and the number of overseas countries. The MN-Performance relationship may be influenced by the measure of multinationality used in the study. To control for this possibility we create a dummy variable equal to one if the study does not use the FSTS to measure multinationality.

4. Sample heterogeneity : Most studies draw on large firms, while some studies sample small firms, and this may lead to different results. Large firms have ability to internationalize often because of slack resources and other ownership advantages which allows them to exploit internationalisation more effectively. In contrast, small firms are likely to be further away from the frontier of technological knowledge, but may learn more from overseas clients or competitors which could be reflected in their long term performance. To investigate this possibility we create a dummy variable taking value one for estimates based on large firms.

5. Measurement of performance : The most common indicators used to measure firm performance are return on sales/equity/asset (accounting-based indicators) or market capitalisation/Tobin Q (market-based indicators). Accounting-based indicators are likely to be related to the existing size of firms and capture

short-term performance, while market-based indicators are related to valuation of the firm by the market based upon its long-term performance. To investigate the influence of performance measurement on the MN-performance relationship, we create a dummy variable that takes value one if the reported estimate is based upon a market-based indicator.

6. Time period : The MN-Performance relationship is not necessarily constant across years, particularly as globalization has profoundly affected a great number of countries. This process of widening globalisation in the last two decades may mean that multinational firms have become a larger, more similar group of firms, thus eroding performance advantages that are presumably generated by overseas investment. To test this possibility we construct a variable which measures the average year of the data sample underpinning each estimate. Thus for a study using data between 1995-2000, the time period variable would take value 1997.5.

All the above six characteristics can be obtained from the information reported in the papers. Although Meta-analysis typically weight each study equally, one may also argue that papers published in comparatively higher ranking journals are likely to be of greater importance and thus deserve a greater weighting. Under this assumption, we attribute different weights to each estimate, depending on the ranking of the journal in which the paper and the estimate appear. In particular, we consider two different rankings: those listed in Association of Business School (ABS) ranking 2008 and a second ranking based on the simple average of Aston 2006, Kent 2005, Cranfield 2005, Durham 2006 and citation impact rankings. All these ranking information is available in Harvey et al. (2008). For those publications with no ranking, we assign 0.5 to it. A second correction is that some papers present more estimates than others. In order to prevent a small

number of papers with large number of estimates from dominating the findings disproportionately, this study divides the weight of the ranking (if we are using one) by the number of estimates in the paper. However, our benchmark results are based on an unweighted analysis of the estimates.

5.2.1 Assessing the curvilinear MN-Performance relationships

Curvilinear MN-Performance relationships have attracted much attention and controversy, though the number of studies on this subject is still few (18 in all). Such relationships are studied using equations of the following type: 5.3, in which M_{it}^2 refer to square of degree of multinationality of firm i for a given period t and other variables are the same as those in Eq. 5.1.

$$Y_{it} = \beta_1 M_{it} + \beta_2 M_{it}^2 + \lambda X_{it} + \gamma_t + e_{it}, \tag{5.3}$$

Curvilinear relationships report not one but two estimates of MN-performance, viz. β_1 and $\beta_{2)}$. Based on these two estimates we can also calculate the peak or the trough multinationality which will result in the 'turning point' in the MN-performance relationship. In addition, studies on curvilinear MN-performance have reported both U-shaped and inverted U-shaped relationships.

We exploit the fact that most papers consider the degree of multinationality to be distributed normally–this is the implicit assumption in estimating Eq. 3 using regression methods. If the degree of multinationality can be characterised as a normal distribution: (i) The degree of multinationality corresponding to either the peak on inverted-U shaped curve or the trough on U-shaped curve can also be

calculated as [-$\beta_1/2\beta_2$]. (ii) We can account for 68%(95%) of multinationality's distribution by one(two) standard deviation from the mean of multinationality and the value of multinationality corresponding to (i) should lie between one or two standard deviations from the mean, otherwise it is an outlier. We use these two properties to assess the results of studies on a curvilinear relationship. In particular we show that for some studies the points of multinationality identified may emerge as outliers when a normal distribution is assumed.

5.3 Descriptive statistics

By searching studies in Google scholar, Econlit and ABI-Inform, we are able to find 70 studies that address the M-P relationship. It is important to note that alternative methods, concerning the M-P relationship, have been employed in previous studies. In order to focus our analysis on comparable studies, this study only considers those estimates in equation 5.1, and those papers using innovation, patent, technical efficiency as performance measures are ruled out. In addition, papers are excluded if they do not give sufficient information for our Meta analysis regression equation. After restricting the studies to those that have estimates in equation 5.1, there are 51 studies that were included in this Meta analysis study, 46 of which are published in academic journals and 5 are working papers.

Table 5.1 and 5.2 list the papers used in the Meta-analysis, alongside some of their main characteristics. These include average estimates, and as mentioned above, many papers present more than one estimate of the relationship between multinationality and firm performance. Other typical data is listed, including the

estimate β of each study as mentioned in equation 5.1; whether the paper adopts non-regression methods other than regression analysis; whether the country upon which the estimates are based is US or non-US; whether multinationality is measured as the ratio of non-foreign sales to total sales or the ratio of the foreign capital to total capital; whether the firm performance is long-term firm performance (market-based financial indicators) or short term firm performance (accounting-based financial indicators); the average survey year of the firm sample; journal weights; and the number of estimates reported in the paper. Finally, the study indicates the weights carried by each paper (which, in some specifications, is then divided by the number of estimates to generate the weight of each estimate).

Table 5.3 describes the 315 estimates included in our analysis, of which 26% are sampling non-United States firms; 59% use market-based financial indicators to measure the firm performance; 50% use other multinationality measurements rather than the ratio of foreign sales to total sales; 7% of all estimates implement non-regression econometric techniques; 43% are restricted to large firm samples, 32% use the multinationality dummy rather than incremental multinationality. The average number of observations in each sample is around 2631 and the average survey year of the firm sample is 1988.

We are able to find 53 estimates from 14 papers that test the curvilinear M-P relationships. Table 5.7 and 5.8 present main characteristics of multinationality of each paper, including means and standard deviation of multinationality and the multinationality corresponding to the peak/trough on curves. 'Hypothesis 1' refers to one if the multinationality corresponding to the peak/trough on curve is within 68% of the distribution of multinationality (one standard deviation from the mean of multinationality), and is zero if it is not within the given

range. 'Hypothesis 2' refers to one if the multinationality corresponding to the peak/trough on curve is within 95% of the distribution of multinationality (two standard deviations from the mean), and is zero if it is not within the given range.

5.4 Results

The main results, based on the estimation of equation 5.2, are presented in Tables 5.4 and 5.5. In both tables, the first column does not assign any weight to each estimate, while the remaining two columns consider assigning separate weight to different papers. The weight is based on the ranking of the journal in which the paper was published.

The results in Table 5.4 show that papers sampling non-United States tend to generate higher estimates of M-P relationship (significant level at least at 5% in all columns). Non-regression estimation method, however, tends to have lower estimates (significant level at least at 5% in all columns). The M-P relationship is negatively correlated with the multinationality measurement if the paper uses the ratio of foreign sales to total sales to measure the multinationality rather than foreign capital aspects (significant level at 10% in all weighted columns). When the firm performance is measured by the market-based indicators (long-term performance), it tends to produce lower estimates, one of which is significant (significant level at 5% in the unweighted column). Finally, the survey year of firm samples tends to have a negative effect upon the M-P relationship with significant level at 5%.

This chapter complements the Meta analysis by including the standard error of the estimate. In fact, bigger point estimates may be less significant than smaller estimates, so that our previous results in Table 5.4 may be misleading (in terms of the effects of different characteristics of the studies). As most estimates from non-regression estimators do not reveal standard error, 192 observations with information on the standard error are remained. By controlling for the standard error, we address this possibility. Once we do this (see Table 5.5), we find more covariates are significantly related to the M-P relationship. In particular, in the case of the model without journal weights, the chapter finds that market-based financial dependent variables (long term performance), non-FSTS as the multinationality measurement, large firm sample and recent survey year result in a lower M-P relationship (most of them are significant at 10% and 5%).

Considering now the remaining sets of estimates based on different types of weights - columns 2 to 3 in Table 5.5 - the study finds that all of the results above are robust. Indeed, the single result that appears to be generally unchanged across the different weights, at least in qualitative terms, concerns the role of development. Across all columns, non-United States countries display higher estimates of the M-P relationship. In fact, the estimate ranges between 0.364 and 0.453 and all coefficients are significant, at least 10% level. There are four other results that also suggest a relatively clear relationship between the respective study characteristics and the ensuing estimate of the M-P relationship. These additional variables are measurement of multinationality, sample heterogeneity, measurement of performance and time period. The estimates from non-FSTS (the ratio of foreign sales to total sales) generate a 0.344 lower M-P relationship. The estimates from market-based firm performance (economic of firms) generate

a lower M-P relationship, ranging from -0.423 to -0.641. In addition, large firms and recent survey data all contribute toward a lower effect of M-P relationship, ranging from -0.292 to -0.689 and from -0.023 to -0.034, respectively. Most of them are significant at least 5% level.

5.4.1 Publication bias

Following the meta-analysis literature (Card and Krueger, 1995; Görg and Strobl, 2001; Martins and Yang, 2009), this chapter also tests whether there is a publication bias in research concerning M-P relationship. Indeed, one may expect that studies on this or any other topic are more likely to be published if they obtain significant effects. In this case, the evidence one would obtain from studying the literature could be severely biased.

Ruling out those unpublished papers, we search for evidence of publication bias in our sample by regressing the t-ratio of each estimate on the same set of controls as in equation 5.2 plus a control for the square root of the number of observations used for that same estimate. The rationale for this analysis is that in the absence of publication bias, the studies with a relatively small number of observations are more likely to be published if they have a high t-ratio. As Card and Krueger (1995) put it, 'If studies are only published if they achieve a t-ratio of 2 or more, and if researchers choose their specification in part to achieve statistically significant results, then the early studies [in the minimum-wage literature] may tend to have high t ratio despite their small samples.' (page 239).

The results are presented in Table 5.6. The study finds that, consistent with

the publication bias case, a typically very significant and positive relationship between sample size and the t-ratio (see Table 5.6 and it is significant at 1% level). Two papers (Denis et al., 2002; Lu and Beamish, 2004), sampling a large number of firms, reach remarkable significant results (t-ratios of which are over 10), which should be located at the upper right corner and are quite far from other papers in figure 5.1. Once these two papers are removed from the analysis to have a clear figure of publication bias, we actually find positive relationship between sample size and the t-ratio in figure 5.1. This chapter therefore concludes that there is no evidence of publication bias in the literature concerning the M-P relationship.

5.4.2 Curvilinear relationship

The evidence on curvilinear M-P relationship could be misleading when the multinationality of firm corresponding to the peak/trough on curve is not within 68% or 95% distribution of multinationality. In order to prevent a small number of papers with large number of estimates from dominating the findings disproportionately, this study divides the result of hypothesis test by the number of estimates used from the paper. In Table 5.9, we find that the multinationality corresponding to the peak/trough on curves in six studies (Andersen, 2008; Capar and Kotabe, 2003; Hitt et al., 1997; Li and Qian, 2005; Ruigork et al., 2007; Ruigrok and Wagner, 2003) fall within both 68% and 95% of the multinationality's distribution. In study (Lu and Beamish, 2001) 40% of multinationality corresponding to the peak/trough on curves is within 68% of the distribution of multinationality, and 70% is within 95% distribution. 17% of multinationality are within 68% distribu-

tion in Christophe and Lee (2004), and 50% of multinationality are within both 95% and 68% in Qian et al. (2008). However, the multinationality of firm corresponding to the peak/trough on curve are not both 68% and 95% distribution of multinationality in a few other papers, including Haar (1989), Gomes and Ramaswamy (1999), Qian (2002), Lu and Beamish (2004) and Li and Qian (2005). Therefore, we believe the evidence on curvilinear M-P relationship is misleading in these papers.

5.5 Discussions and conclusions

Research on M-P relationship has risen considerably since the mid-1970s. However, the empirical findings are still unclear. Meta-analysis techniques are useful in this context as there are many studies tending to have different characteristics, making it difficult to discern clear patterns in their findings. From conducting different robust analyses it is clear that the results are consistent. The M-P relationship is higher 1) when samples are from outside the United States; 2) when the accounting-based financial indicators were employed as firm performance; 3) when the multinationality is measured by FSTS; 4) when samples were retrieved from earlier surveys; 5) at small and medium size firms and 6) at the estimates in the simple comparison test as opposed to regression analysis. The M-P relationship in prior research was not influenced by the publication bias. These findings can stimulate further discussion regarding the reasons for various estimates that are due to differences in cross-country, sample heterogeneity in the context of firm size, sample heterogeneity in the context of US or non-US firm sample, different

measurements of performance and multinationality as well as time period of the firm sample. Equally important, surveying 14 papers and over 50 estimates that test curvilinear M-P relationships, we find that the evidence of curvilinear M-P relationship is somewhat misleading in some papers.

This chapter finds evidence for the propositions in methodology section that six variables significantly affect performance gains associated with internationalization: country of origin, time period, firm size, multinationality measures, performance measures, and estimation method. Three findings we think are particular worth noting: the importance of expansions to overseas markets for the performance of firms in those countries outside the United State, in earlier years, and for small and medium firms. On a more technical level, the above findings presented in this chapter suggest that one should be careful when comparing estimates from studies that adopt different methodologies and sampling choices.

Those firms from non_US face the constraints of limited size of the domestic market and the upward shortage of resource. Unlike multinational enterprises from other countries, firms from the US can draw on a huge home market and does not have to take the additional risk and costs of expansions by its affiliates into overseas market activities in order to gain from economies of scale. American multinational firms have undertaken a long period of internationalization, while for American firms the learning process and performance gains attributable to the incremental multinationality are less than those firms from other countries.

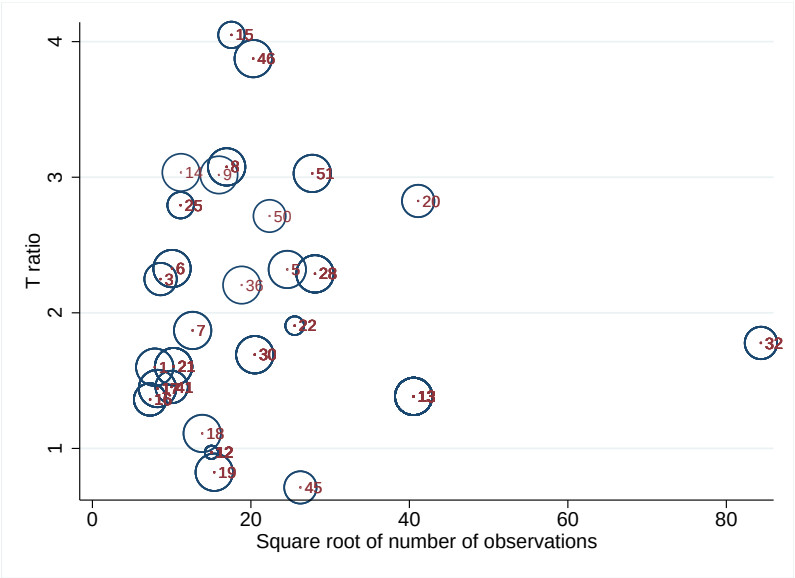
Interestingly, survey year is an important factor that causes different estimated result of the M-P relationship. In the event of market imperfections or market failure, a multinational firm will possess intangible assets and create intra-firm markets thereby lowering the costs of organizing and transacting business

when they expand their subsidiaries into overseas market. However, the market imperfection has been improved, particularly as globalization affects more profoundly a wider set of countries, thus eroding the performance advantage that is presumably generated by overseas investment.

Among other results, we find firm size is another important factor. Although large firms may have strong ownership advantage, for those multinational enterprises in small and medium size the benefits due to internationalization seem to outweigh the cost. Small and medium firms are in an advantageous position to capitalize on the learning opportunities. It may be relatively easier to communicate, and obtain buyin, of learning as an objective (Pangarkar, 2008; Qian et al., 2008). This chapter also finds that the estimated M-P coefficients are different with respect to different multinationality measures, performance measures and estimation methods.

5.6 Tables and figures

Figure 5.1: T-ratios and the square root of number of observations



Notes: Size of circle is proportional to the weight of the journal in which the paper was published. The weighting in this Meta analysis study is based on Academic Journal Quality Rankings by British Association of Business School (ABS) that was edited at Harvey et al. (2008). The weighting used in this figure is derived from the ranking of citation impact. See text for more details.

Table 5.1: List of 51 studies and some of their characteristics

Paper.	Reference	Coef.	N-US	N-REG	M. P	N-FSTS	Obs	S.Year	W.1
1	Severn and Laurence (1974)	0.87	0.0	0.0	0.0	1.0	62.0	1962.5	4
2	Hughes et al. (1975)	0.04	0.0	1.0	1.0	0.0	384.0	1971.5	4
3	Siddharthan and Lall (1982)	-0.40	0.0	0.0	0.0	0.0	74.0	1977.5	3
4	Kim and Lyn (1986)	0.00	0.0	0.0	0.0	0.5	458.0	1976.0	4
5	Michel and Shaked (1986)	-0.05	0.0	1.0	1.0	0.0	656.5	1979.3	4
6	Shaked (1986)	0.03	0.0	1.0	0.0	0.0	101.0	1981.0	4
7	Buhner (1987)	4.72	1.0	0.0	0.3	0.0	160.0	1973.5	4
8	Grant (1987)	2.95	1.0	0.5	0.0	0.0	287.0	1978.0	4
9	Grant et al. (1988)	3.84	1.0	0.0	0.0	0.0	255.0	1978.0	4
10	Geringer et al. (1989)	0.65	0.5	1.0	0.0	0.0	181.0	1979.0	4
11	Collins (1990)	-0.09	0.0	1.0	1.0	0.0	92.0	1980.5	4
12	Soenen (1990)	0.04	0.0	0.0	1.0	0.7	240.0	1982.0	.5
13	Morck and Yeung (1991)	-0.04	0.0	0.0	1.0	1.0	1644.0	1978.0	4
14	Kim et al. (1993)	0.26	0.0	0.0	0.0	1.0	125.0	1984.0	4
15	AL-Obaidan and Scully (1995)	-0.01	0.6	0.0	0.0	0.0	308.0	1979.0	2
16	Sambharya (1995)	-0.24	0.0	0.0	0.0	0.7	53.0	1985.5	3
17	Allen and Pantzalis (1996)	-0.01	0.0	0.0	1.0	1.0	84.4	1991.0	4
18	Tallman and Li (1996)	0.03	0.0	0.0	0.0	0.5	192.0	1987.0	4
19	Hitt et al. (1997)	0.04	0.0	0.0	0.0	0.3	257.3	1989.0	4
20	Qian (1997)	0.02	0.0	1.0	0.0	1.0	1690.0	1985.5	3

Notes: All variables are averaged for each paper. 'Coef.' is the coefficient of each paper. 'N-US' is a dummy variable equal to one if the sample is from non-United States. 'N-REG' is a dummy variable if the paper adopts simple comparison of M-P relationship across different multinationalities rather than regression analysis. 'M. P' is a dummy variable equal to one if the firm performance is the market-based indicators rather than accounting-based financial indicators. 'N-FSTS' is a dummy variable equal to one if the study uses the ratio of foreign sales to total sales to measure the multinationality rather than others, such as foreign assets ratio or foreign subsidiaries ratio. 'Obs' the average number of observations in the study. 'S.Year' is survey year of the study. 'W.1' is an indication of the total weight assigned to the paper by the citation impact from Harvey et al. (2008).

Table 5.2: List of 51 studies and some of their characteristics [Cont's]

Paper.	Reference	Coef.	N-US	N-REG	M. P	N-FSTS	Obs	S.Year	W.1
21	Mishra and Gobeli (1998)	0.34	0.0	0.0	1.0	1.0	105.0	1987.0	4
22	Qian (1998)	0.06	0.0	0.0	0.0	0.0	656.0	1986.5	1
23	Bodnar et al. (1999)	0.02	0.0	0.0	1.0	0.0	17951.0	1990.0	
24	Delios and Beamish (1999)	0.06	1.0	1.0	0.0	1.0	266.0	1993.0	4
25	Doukas et al. (1999)	0.18	0.0	0.0	1.0	1.0	144.8	1991.0	2
26	Gomes and Ramaswamy (1999)	0.01	0.0	0.0	0.0	1.0	570.0	1992.5	4
27	Click and Harrison (2000)	-0.11	0.0	0.0	0.6	0.6	28789.2	1992.9	
28	Geringer et al. (2000)	-0.04	1.0	0.0	0.0	0.0	891.0	1987.0	4
29	Zahra et al. (2000)	0.18	0.0	0.0	0.0	0.0	321.0	1993.0	4
30	Pantzalis (2001)	0.03	0.0	0.0	0.0	1.0	420.0	1990.0	4
31	Ramírez-Alesón and Espitia-Escuer (2001)	0.11	1.0	0.0	0.5	1.0	515.0	1993.0	3
32	Christophe and Pfeiffer (2002)	0.26	0.0	0.0	1.0	1.0	7118.0	1992.0	3
33	Dastidar (2002)	-0.03	0.7	0.0	1.0	0.0	1299.6	1994.1	
34	Denis et al. (2002)	-0.17	0.0	0.0	1.0	0.0	24656.6	1989.2	4
35	Kotabe et al. (2002)	-0.01	0.0	0.0	0.0	0.0	294.0	1990.5	4
36	Qian (2002)	2.61	0.0	0.0	0.0	0.0	355.0	1991.0	4
37	Capar and Kotabe (2003)	-0.11	1.0	0.0	0.0	0.0	243.0	1998.0	4
38	Contractor et al. (2003)	0.02	0.6	0.0	0.0	1.0	436.4	1985.5	4
39	Goerzen and Beamish (2003)	0.09	1.0	0.0	1.0	1.0	580.0	1999.0	4
40	Ruigrok and Wagner (2003)	-0.33	1.0	0.0	0.0	0.0	252.0	1995.0	3
41	Christophe and Lee (2004)	-0.19	0.0	0.0	1.0	0.8	100.0	1999.0	3
42	Thomas and Eden (2004)	-0.62	0.0	0.0	0.5	0.8	755.0	1992.0	1
43	Lu and Beamish (2004)	-0.90	1.0	0.0	0.5	1.0	17868.0	1991.5	4
44	Andersen (2005)	0.98	0.0	0.0	0.0	1.0	603.8	1998.0	
45	Li (2005)	-0.59	0.0	0.0	0.0	0.0	1268.5	1999.0	3
46	Hitt et al. (2006)	0.05	0.0	0.0	0.0	1.0	412.0	1995.5	4
47	Castellani and Zanfei (2007)	0.13	1.0	0.7	0.0	1.0	2942.3	1995.0	3
48	Ruigork et al. (2007)	0.20	1.0	0.0	0.0	0.0	696.0	2001.5	3
49	Andersen (2008)	-0.02	0.0	0.0	0.0	1.0	433.1	1998.0	
50	Pangarkar (2008)	0.02	1.0	0.0	0.0	0.0	500.0	2004.0	3
51	Qian et al. (2008)	0.22	0.0	0.0	0.0	0.0	770.0	1998.0	4

Notes: see footnote in table 5.1.

Table 5.3: Descriptive statistics

Variable	Mean	Std. Dev.	N
Coefficient	0.16	1.15	315
Country of Origin (non-US=1)	0.26	0.43	315
Estimation Method (non-regression=1)	0.07	0.26	315
Measurement of Multinationality (non-FSTS=1)	0.59	0.49	315
Sample Heterogeneity (large Firm=1)	0.43	0.5	315
Measurement of Performance (market-based=1)	0.5	0.5	315
Time Period	1988.16	7.58	315
No. Observation	2631.71	6831.86	315
St. Error	0.21	0.53	192
Weight 1	3.18	1.22	231
Weight 2	3.03	2.48	231

Notes: 'Coefficient' is the estimate of MN-Performance relationship in each study; 'St. Error' is the standard error of the estimate of MN-Performance relationship in each study. See text for more details about the meaning of each variable.

Table 5.4: Meta analysis regression

	No-Weight	Weight1	Weight2
	(1)	(2)	(3)
Country of Origin	.522**	1.039***	1.019***
	(.229)	(.386)	(.383)
Estimation Method	-.525**	-.738**	-.845***
	(.237)	(.298)	(.326)
Measurement of Multinationality	-.116	-.457**	-.383**
	(.113)	(.200)	(.176)
Sample Heterogeneity	.147	-.080	.037
	(.151)	(.177)	(.149)
Measurement of Performance	-.279*	-.069	-.155
	(.144)	(.158)	(.156)
Time Period	-.034**	-.043**	-.040**
	(.015)	(.017)	(.015)
$\sqrt{No.Observation}$	-8.12e-06	-.004**	-.004**
	(.0009)	(.002)	(.002)
Obs.	315	231	231
R^2	.102	.193	.211

Notes: Significance levels: *: 0.10; **: 0.05; ***: 0.01. 'Country of origin' is a dummy variable that is equal to one if the study does not sample from the US. 'Estimation method' is a dummy variable that takes value one if the analysis uses non-regression methods. 'Measurement of multinationality' is a dummy variable equal to one if the study does not use the FSTS to measure multinationality. 'Sample heterogeneity' is a dummy variable taking value one for estimates based on large firms. 'Measurement of performance' is a dummy variable that takes value one if the reported estimate is based upon a market-based indicator. 'Time period' is a variable which measures the average year of the data sample underpinning each estimate.

Table 5.5: Meta analysis regression (including standard errors)

	No-Weight	Weight1	Weight2
	(1)	(2)	(3)
Country of Origin	.448**	.453**	.364*
	(.190)	(.183)	(.189)
Measurement of Multinationality	-.118	-.344*	-.072
	(.120)	(.185)	(.143)
Sample Heterogeneity	-.292*	-.689***	-.376*
	(.177)	(.265)	(.199)
Measurement of Performance	-.423***	-.583***	-.641***
	(.162)	(.197)	(.210)
Time Period	-.026**	-.034***	-.023**
	(.011)	(.011)	(.009)
$\sqrt{No.Observation}$	.0004	-.0009	.0007
	(.0007)	(.001)	(.001)
St. Error	1.945***	2.046***	2.074***
	(.194)	(.138)	(.136)
Obs.	192	174	174
R^2	.719	.799	.815

Notes: Significance levels: *: 0.10; **: 0.05; ***: 0.01. 'country of origin' is a dummy variable that is equal to one if the study does not sample from the US. 'Estimation method' is a dummy variable that takes value one if the analysis uses non-regression methods. 'Measurement of multinationality' is a dummy variable equal to one if the study does not use the FSTS to measure multinationality. 'Sample heterogeneity' is a dummy variable taking value one for estimates based on large firms. 'Measurement of performance' is a dummy variable that takes value one if the reported estimate is based upon a market-based indicator. 'Time period' is a variable which measures the average year of the data sample underpinning each estimate.

Table 5.6: Publication bias

	No-Weight	Weight1	Weight2
	(1)	(2)	(3)
$\sqrt{No.Observation}$	.108***	.111***	.117***
	(.012)	(.011)	(.011)
Country of Origin	-1.093**	-1.868***	-2.152***
	(.543)	(.558)	(.615)
Estimation Method	-.891	-1.249**	-1.589***
	(.572)	(.532)	(.596)
Measurement of Multinationality	-1.837***	-2.337***	-1.855***
	(.504)	(.572)	(.592)
Sample Heterogeneity	.795**	1.095***	1.571***
	(.364)	(.403)	(.399)
Measurement of Performance	-.249	-.130	-.371
	(.318)	(.331)	(.327)
Time Period	.034	.035	.060***
	(.023)	(.023)	(.023)
St. Error	.141	.209	.295
	(.334)	(.301)	(.274)
Obs.	174	174	174
R^2	.728	.772	.789

Notes: Significance levels: *: 0.10; **: 0.05; ***: 0.01. 'country of origin' is a dummy variable that is equal to one if the study does not sample from the US. 'Estimation method' is a dummy variable that takes value one if the analysis uses non-regression methods. 'Measurement of multinationality' is a dummy variable equal to one if the study does not use the FSTS to measure multinationality. 'Sample heterogeneity' is a dummy variable taking value one for estimates based on large firms. 'Measurement of performance' is a dummy variable that takes value one if the reported estimate is based upon a market-based indicator. 'Time period' is a variable which measures the average year of the data sample underpinning each estimate.

Table 5.7: List of 14 studies on the curvilinear MN-Performance relationship and some of their characteristics of multinationality of firm samples

Paper	Reference	Mean	SD	P/T	H.1	H.2
1	Haar (1989)	0.29	0.21	16666.00	0	0
1	Haar (1989)	0.37	0.18	250000.00	0	0
2	Hitt et al. (1997)	0.47	0.39	0.55	1	1
2	Hitt et al. (1997)	0.47	0.39	0.35	1	1
3	Gomes and Ramaswamy (1999)	0.42	0.26	1.20	0	0
4	Lu and Beamish (2001)	0.97	1.61	4.25	0	0
4	Lu and Beamish (2001)	1.24	2.35	5.00	0	1
4	Lu and Beamish (2001)	1.24	2.35	2.50	1	1
4	Lu and Beamish (2001)	0.97	1.61	13.50	0	0
4	Lu and Beamish (2001)	0.97	1.61	1.25	1	1
4	Lu and Beamish (2001)	1.24	2.35	2.50	1	1
4	Lu and Beamish (2001)	1.24	2.35	4.50	0	1
4	Lu and Beamish (2001)	1.24	2.35	0.50	1	1
4	Lu and Beamish (2001)	1.24	2.35	1.93	1	1
4	Lu and Beamish (2001)	0.97	1.61	8.00	0	0
4	Lu and Beamish (2001)	0.97	1.61	3.50	0	1
4	Lu and Beamish (2001)	0.97	1.61	3.75	0	1
4	Lu and Beamish (2001)	0.97	1.61	5.00	0	0
4	Lu and Beamish (2001)	1.24	2.35	0.50	1	1
4	Lu and Beamish (2001)	0.97	1.61	6.00	0	0
4	Lu and Beamish (2001)	0.97	1.61	4.50	0	0
4	Lu and Beamish (2001)	1.24	2.35	3.50	1	1
4	Lu and Beamish (2001)	1.24	2.35	5.50	0	1
4	Lu and Beamish (2001)	1.24	2.35	2.50	1	1
4	Lu and Beamish (2001)	0.97	1.61	3.50	0	1
5	Qian (2002)	0.39	0.34	1.19	0	0
6	Capar and Kotabe (2003)	0.18	0.26	0.36	1	1
7	Ruigrok and Wagner (2003)	0.60	0.15	0.54	1	1
7	Ruigrok and Wagner (2003)	0.60	0.15	0.61	1	1
7	Ruigrok and Wagner (2003)	0.60	0.15	0.58	1	1
7	Ruigrok and Wagner (2003)	0.60	0.15	0.54	1	1

Notes: P/T is the peak/trough point. See text in Section 5.2 and 5.4 for more details about the meaning of each variable.

Table 5.8: List of 14 studies on the curvilinear MN-Performance relationship and some of their characteristics of multinationality of firm samples [Cont's]

Paper	Reference	Mean	SD	P/T	H.1	H.2
8	Christophe and Lee (2004)	0.30	0.14	2.20	0	0
8	Christophe and Lee (2004)	0.58	0.19	1.30	0	0
8	Christophe and Lee (2004)	0.04	0.11	4.00	0	0
8	Christophe and Lee (2004)	0.39	0.14	1.83	0	0
8	Christophe and Lee (2004)	1.99	0.53	2.60	0	1
8	Christophe and Lee (2004)	0.68	0.20	2.75	0	0
9	Lu and Beamish (2004)	0.04	0.07	0.58	0	0
10	Li (2005)	0.30	0.20	0.40	1	1
10	Li (2005)	0.30	0.20	0.44	1	1
11	Li and Qian (2005)	0.47	0.26	1.59	0	0
11	Li and Qian (2005)	0.47	0.26	1.86	0	0
11	Li and Qian (2005)	0.47	0.26	1.72	0	0
11	Li and Qian (2005)	0.47	0.26	1.79	0	0
12	Ruigork et al. (2007)	0.61	0.28	0.39	1	1
13	Andersen (2008)	0.36	0.48	0.80	1	1
13	Andersen (2008)	0.36	0.48	0.28	1	1
13	Andersen (2008)	0.36	0.48	0.78	1	1
13	Andersen (2008)	0.36	0.48	0.07	1	1
14	Qian et al. (2008)	0.36	0.18	1.08	0	0
14	Qian et al. (2008)	0.36	0.18	0.36	1	1
14	Qian et al. (2008)	0.36	0.18	0.33	1	1
14	Qian et al. (2008)	0.36	0.18	1.11	0	0

Notes: P/T is the peak/trough point. See text in Section 5.2 and 5.4 for more details about the meaning of each variable.

Table 5.9: The curvilinear M-P relationship

Paper	Reference	Relationships	H.1	H.2	N
1	Haar (1989)	Inverted U	0.00	0.00	2
2	Hitt et al. (1997)	Inverted U	1.00	1.00	2
3	Gomes and Ramaswamy (1999)	Inverted U	0.00	0.00	1
4	Lu and Beamish (2001)	U	0.40	0.70	20
5	Qian (2002)	Inverted U	0.00	0.00	1
6	Capar and Kotabe (2003)	Inverted U	1.00	1.00	1
7	Ruigrok and Wagner (2003)	U	1.00	1.00	4
8	Christophe and Lee (2004)	Inverted U	0.00	0.17	6
9	Lu and Beamish (2004)	U	0.00	0.00	1
10	Li (2005)	Inverted U	1.00	1.00	2
11	Li and Qian (2005)	Inverted U	0.00	0.00	4
12	Ruigork et al. (2007)	Inverted U	1.00	1.00	1
13	Andersen (2008)	Inverted U	1.00	1.00	4
14	Qian et al. (2008)	Inverted U	0.50	0.50	4

Notes: All variables are averaged for each paper. 'Paper' is the number assigned to each paper; 'H. 1/2' how much percentage of estimates in the given paper meet the hypothesis. 'N' indicates the number of estimates from the given paper. See text for more details.

Chapter 6

Location Choices of Overseas Investment and Firm Performance

6.1 Introduction

The research toward the economic implication of globalization is of growing concern to many aspects in the literature, and one of prominent aspects has been focused on the relationship between multinationality and firm performance (hereafter called M-P), and other most important aspects include international trade, productivity spillovers, and offshoring among others - all of which have grown significantly in recent years[1]. This chapter is focused on the relationship between multinationality and firm performance.

Given that many firms have considered foreign direct investment a promising strategy in the business agenda, and the M-P correlation have become one core research in international business, a large number of studies have looked into the micro level M-P relation since 1970s. However, findings are still contradictory and little consensus has emerged among researchers as to the nature of this M-P relationship. A recent survey paper (Li, 2007) and Meta analysis papers (Bausch and Krist, 2007; Wagner and Ruigrok, 2004; Yang, 2009) find that there have been inconsistent empirical findings on the M-P relationship as result of the sampling and methodological heterogeneity. Studies that find the positive correlation between multinationality and firm performance (Shaked (1986), Kim et al. (1993), Tallman and Li (1996), Geringer et al. (2000), Goerzen and Beamish (2003), Castellani and Zanfei (2007), and Pangarkar (2008) among others) argue that firms have opportunities to achieve greater returns from internalising

[1]International trade has been studied by Bernard et al. (2003), Clerides et al. (1998), Helpman et al. (2004), Melitz (2003), and Martins and Yang (2009) among others; offshoring / outsourcing by Budd et al. (2005) and Kirkegaard (2007), Greenaway et al. (2008) among others; productivity spillovers have studied Görg and Strobl (2001), Görg and Greenaway (2004), Liu et al. (2000), and Wei and Liu (2000) among others.

their intangible assets and market power, from achieving economies of scale, and from seeking less expensive inputs abroad. Studies that find the negative correlation with performance (Siddharthan and Lall (1982), Michel and Shaked (1986), Collins (1990), and Denis et al. (2002) among others) argue that multinational firms may face the liability from increased coordination and management cost, and from cultural diversify. Most recently, studies that find the curvilinear relationship (Grant et al. (1988), Hitt et al. (1997), Qian (2002), Contractor et al. (2003), Christophe and Lee (2004), Lu and Beamish (2004), Ruigork et al. (2007), and Qian et al. (2008) among others) argue that the slope of M-P relationship will reverse on a threshold.

There is a wide literature on the subject related to multinationality and firm performance. Our chapter departs from existing empirical articles in two major aspects. First, one common aspect of the empirical analysis conducted in the last 30 years is that the study samples a single country or a small group of countries, moreover over 50 percent studies sample multinational enterprises from the United States (see the list of country of origin in Table 6.1, 6.2 and 6.3), and to the extent that the evidence from US are not representative of all other countries. In this context, our chapter makes an important and original contribution to the literature by presenting comparable evidence for a very large number of firms (16,533 in total from almost all sectors in standard industrial classification codes) from 46 countries, including members of G8, EU, OECD and most popular developing nations. Li (2007) summarizes the liabilities of internationalization, including the liability of foreignness (e.g. unfamiliar with local information, local culture, host governments, customers and suppliers) (Zaheer, 1995; Zaheer and Mosakowski, 1997), liability of newness of installing facilities, es-

tablishing internal management systems and external business network (Lu and Beamish, 2004; Stinchcombe, 1965), increased internal coordination, the complexity of managing foreign exchange fluctuations and adapting to multiple host institutions (Guisinger, 2001; Kostova and Zaheer, 1999; Sundaram and Black, 1992). There is still a controversial argument concerning whether cross-border activities are correlated with performance in a positive or negative way. The relevant empirical studies on risk of MNE activities such as Rugman (1979), Michel and Shaked (1986), Kim and Lyn (1986) and Morck and Yeung (1991), are particularly worthy of note. Essentially, they all find that there still remain considerable risks of international diversification that to the extent the gains of international diversification are reflected in the cost of liabilities. Our chapter aims to examine whether the FDI operation is value creating or destroying for a multinational firm, and whether the M-P relationship is a linear or curvilinear type.

Second, we argue that a multinational firm differs with respect to the different location choices of overseas investment. In the last 10 years cross-border investment into developing countries has led to better performance. There are abundant resources, less competition and local incentives by host countries. A recent world investment report (WIR, 2008) indicates that in the period of 1998 to 2007 the inward FDI stock in developed countries has increased from $ 2,875 to $ 10,458 billion, while the FDI stock in developing countries has increased from $ 1,276 to $ 4,752 billion. It is quite obvious that developing countries contribute at least equal as developed countries to the World inward FDI. However, existing studies on this issue have yet considered how firm's location choices may interact to the firm performance? This is an important consideration, given that there are sub-

stantial differences across developed and developing countries locations in terms of market potential, infrastructure, political, economic, social issues, technology-intensive, environment and legal that are likely to influence the performance of a multinational firm. In this chapter we specifically address the importance of the location choices of overseas investment, and examine whether there are significant differences in firm performance associated with heterogeneous firm's abroad investments in developed and developing country locations.

The remainder of our chapter is organized as follows. We begin Section 6.2 by providing literature review on the M-P relationship by focusing on the foreign investment location choice, and develop the key hypotheses to be tested by the study. We, then, go on to Section 6.3 to discuss the methodological aspects of the study, followed by defining estimation equations used in our analysis. The subsequent Section 6.4 provides a description of the data sources and the sample characteristics, and Section 6.5 describes the results and robustness checks. We conclude the chapter in Section 6.6 by summarizing our findings, discussing and indicating the implications, identifying the limitations of the study and the directions for further research.

6.2 Literature review and research question

6.2.1 Theory

Analysis of studies on a microeconomic perspective on MNE shows that one could distinguish three prevalent research streams. The theories of foreign direct

investment (Buckley and Casson, 1976; Dunning, 1981; Hymer, 1960; Rugman, 1986; Vernon, 1966) explain the conditions under which it is beneficial for a firm to expand its affiliate into overseas markets, and analyze when, why and how a firm should go abroad; the learning theory (Johanson and Vahlne, 1977) proposes that internationalization is the product of a series of incremental decisions and resources committed to foreign market which affect the firm's perceived learning process, opportunities and risks; the resource-based view of the firm (Barney, 1991; Wernerfelt, 1984) aims to explain the determining factors for firms to invest abroad. Details of the theoretical review are in section 1.4 of the introduction chapter.

6.2.2 Foreign location choices

Though a considerable number of studies have tested the M-P relationship, almost all of them have used aggregate measures to calculate a firm's multinationality - including the ratio of foreign to total sales (FSTS), the ratio of foreign to total assets (FATA), the ratio of number of overseas subsidiaries in relation to total subsidiaries (OSTS), or the total number of foreign nations in which firms have subsidiaries (see the list of multinationality measures in Table 6.1,6.2, 6.3 and survey papers (Annavarjula and Beldona, 2000; Li, 2007; Osegowitsch and Zalan, 2005; Sullivan, 1994)). These proxies have been regressed against a measure of firm performance to make conclusions about the overall M-P relationship. However, these measures of international involvement cannot analyze how different location choices interact with the M-P relationship. Multinational firms may be different with respect to costs and benefits associated with various country en-

vironments. Therefore, our chapter takes different location choices of overseas investment into consideration (for recent studies that consider foreign location choices, see Pantzalis (2001), Berry (2006) and Qian et al. (2008)). Consider both the UN definition of a developed economy and level of income and welfare, the location choices of overseas investment that are available to firms have been categorized into developed and developing countries. Developed countries generally include the members of G8 (except Russia), most EU members, Norway, Iceland, Switzerland, and New Zealand, Australia, Bermuda, Israel, Japan, Taiwan (China), South Korea, Hong Kong (China). In contrast, the developing countries generally include all other countries in the world.

One representative study that has considered how a firm's performance differs with respect to different location choices of overseas investment (Pantzalis, 2001) argues that market imperfection associated with the international transaction of multinational firm-specific intangible assets is considered to be a central determinant of foreign direct investment. Pantzalis's work highlights the difference in the degree of integration between the US market and overseas markets in countries where US multinational firms may create opportunities to bypass segmentations, and transfer their intangible advantages to overseas subsidiaries, and ultimately increase the profit. The results indicate that MNCs with FDI presences in countries with developing economies have significantly higher performance than MNCs that operate only in countries with developed economies, and the result is consistent with the notion that internalizing markets for the cross-border transfer of intangibles leads to competitive advantages. Market imperfections are more prevalent when MNCs' operations span more overseas markets, and advantages derived from internal markets and/or the MNC network are

more likely to be exploited when MNCs operate in developing countries. Main criticism of Pantzalis's work comes from recent study by Berry (2006) who states that the majority of MNC investment occurs in advanced country locations, and it is hard to imagine that the positive M-P relationship is derived by developing country investment. Berry's paper also argues that because direct investment in developing countries is riskier than in developed countries, there is little value increase when international expansion is operated into developing countries until the firm has experience from previous international investments and capabilities to better manage and hedge the higher levels of risk and uncertainty. A recent empirical paper (Qian et al., 2008) reaches a similar conclusion that firms of developed countries maximize their performance when they operate across a moderate number of developed regions and a strictly limited number of developing regions.

Developing countries locations are more likely to provide firms with access to higher income consumers, higher education citizens, stable political, technology-intensive business, while developing countries locations are more likely to provide firms with access to lower costs, abundant sources of input, economies of scale, and higher returns. Given quick globalization pace, the location choices reacted to performance is an important consideration. Different performance that multinational firms achieve with respect to different foreign location choices in recent years is an important consideration. Multinational enterprises are expected to make a selectively strategic decision of expanding business abroad and also willing to entry into more attractive markets that maintain their high returns from that market. The attractiveness of markets in developed countries has been characterized in terms of their technological or knowledge advantage, and in terms of managerial capability that allows an extension of the value chain of foreign

multinational enterprise into this market (host countries with market conditions similar to the home market is preferable) or allows technological acquiring (especially in merge and acquisition investment from developing to developed countries). In contrast, the attractiveness of markets in developing countries has been featured in terms of their market potential and low labor expenses. The international expansion by its subsidiaries into overseas countries is expected to achieve a long-term high return to a multinational firm from developed countries through the opportunity to achieve economies of scale and consequently lower marginal cost of production; is expected to extend the overseas market for a multinational firm from developing countries through the advantages of psychic distance and preference of similar markets. Along with globalization pace, developing countries have more and more good knowledge of the people and the business practice which are positive to the inward FDI activities. The achievement of economies of scale and low marginal cost are expected to be most important compensation and benefit to the overseas strategy of a multinational firm. Therefore, we believe that the M-P relationship will be higher if the FDI host country is in developing economies, which is the same as the findings in Pantzalis's paper. Our chapter reestimates this point by using a large number sample from 46 countries in the period of 1997-2007. We propose that for firms with foreign expansions the environment the firm faces in developing countries is likely to internalize their intangible assets, which leads to higher influences on firm performance.

Hypothesis 1: There is a tight and positive M-P relationship, while there are significant differences in firm performance associated with heterogeneous firm's abroad investments in developed and developing country locations. The correla-

tion is higher when a firm considers more FDI presences in developing countries.

6.2.3 Incremental internationalization

The M-P relationship has been investigated since 1970s; while much of the recent research suggests that the relationship between these two constructs is curvilinear. The Uppsala model by Johanson and Vahlne (1977) suggests that a firm strives to increase its long-term profit and keep risk-taking at a low level, and the incremental risk is implied by an incremental addition to operations on foreign market. The M-P relationship could be the linear-shaped model until the multinationality reaches a threshold (either the maximum point on an inverted U-shaped curve or the minimum point on the U-shaped curve) which could be caused by liabilities of internationalization. Once a firm reaches the threshold the M-P relationship will be reverse. Our chapter argues that multinational firms maximize their performance from economies of scale, scope and locations when they increase their FDI presences in developing countries. In contrast, an optimal level of international expansion by its subsidiaries into developed countries will lower the marginal cost and achieve a positive marginal benefit, but a high level of overseas presence in developed countries is not associated with performance increases.

Hypothesis 2: The international expansion by the subsidiaries of a MNE into developed countries is correlated with performance in an inverted U-shaped model, with the slope positive at low and medium levels of international expansion into developed countries, and negative at high levels.

Hypothesis 3: The international expansion by the subsidiaries of a MNE into developing countries is linear and positively correlated with performance.

6.3 Methodology

Once the hypotheses are developed, the next step is to describe the empirical models used in our analysis. The following are the main variables considered in this study.

1. *Firm Performance*

   During the last 30 years, the performance measures in the literature on M-P relationship are various, including innovation, patent, technical efficiency, accounting-based firm performance (return on assets, return on sales, and return on equity among others) and market-based (Tobin's q, and risk-adjusted return among others) financial indicators in the earlier studies, while the relevant literature (see Table 6.1, 6.2 and 6.3) has shown that there has been a predominant use of accounting-based and market-based financial indicators in the earlier studies. Because of the problem of a severely reduced sample size if we use market-based performance, we only consider accounting-based firm performance. Originally, return on equity was also considered as a possible measure of firm performance. However, in the end it was ruled out because to the extent that it is sensitive to capital structure differences (Hitt et al., 1997; Li et al., 2007; Qian et al., 2008), which will be used as an independent variable in our estimation equation, and similar

consideration for return on asset indicator. In addition, the results from ROA and ROS generate similar findings and they were highly correlated (r=0.91) (Capar and Kotabe, 2003; Hitt et al., 1997). Therefore, a firm's ROS value is used to measure firm performance in our chapter. ROS is defined as the after-tax profits (before extraordinary items) divided by total sales, which indicates how much net income is produced by each sale, and it is widely used as an indicator of firm performance in economic research and in the international business literature. We understand that there are differences in tax rates across countries then this may affect the results. To correct or alleviate a potential problem of performance indicators, we control for the country fixed effect in our analysis. We believe the control for country fixed effect will alleviate the problem of different tax rates across 46 countries included in our analysis.

2. *Multinationality Measure*

The problem with the most common aggregate multinationality measure - foreign to total sales ratio - is that a firm's sales in foreign countries always include both export and sales of foreign subsidiaries, and it may lead to upward biased M-P correlation. The records of each company include information on whether the company has ownership stake in its subsidiaries and where the subsidiary locates in the latest year released in the Orbis dataset, which indicate the multinationality of a firm. Our chapter uses the information on the overseas subsidiaries to measure the multinationality of the firm, as a similar approach by Pantzalis (2001) and Lu and Beamish (2004) among others (see Table 6.1 to 6.3 for more details on multinational-

ity measures of relevant studies on the M-P relationship). Multinationality of a firm in our chapter is measured in three ways to reflect international engagements, including overall geographic diversification, international expansions by firm's subsidiaries into developing countries, and international expansions by firm's subsidiaries into developed countries. Multinationality (A) is reflected by the ratio of number of overseas subsidiaries in relation to its total subsidiaries. Multinationality (B) refers to the ratio of number of subsidiaries in developing countries in relation to its total subsidiaries, and Multinationality (C) is the ratio of number of subsidiaries in developed countries in relation to its total subsidiaries. The later two multinationality constructs are likely to capture how much difference a firm makes when it establishes an overseas presence in different regions of development.

3. *Intangible Assets*

   For firms with international expansions their overseas subsidiaries have opportunities to achieve greater returns from internalizing intangible assets of the multinational firm, and better intangible assets allow better position to bargain with host governments for tax breaks or other concessions. Following other studies, expenditures on research & development capture a firm's endowment of unique technological knowledge that is an important determinant of intangible assets. It is generally firms-specific and should be more easily transferable across countries by international expansions (Dunning, 1988; Rugman, 1986). The expenditure on R&D are used as a proxy for intangible assets (Allen and Pantzalis, 1996; Berry, 2006; Li et al., 2007; Lu and Beamish, 2004; Pantzalis, 2001), as the effect of R&D can persist

over time. Because of the problem of a severely reduced sample size if we limit our sample to those firms reporting their R&D expenditure, we use investment expenditure as a proxy for R&D expenditure as our measure of technology assets. In those studies examining intangibles control for firm-specific advantages that are associated with performance of international expansions, it is also common to include firm size that represents the physical and financial resources of a firm, and is frequently used as a proxy for competitive positioning within an industry (Qian, 2002). The firm size is commonly measured by the natural log of the total assets (Pantzalis, 2001) and the actual number of employees that are working in a firm transformed into natural logarithms (Elango, 2004; Qian et al., 2008), which are used to control for the potential effect of scale economy differences.

4. *Other Control Variables*

Consistent with previous studies (e.g., Gomes and Ramaswamy (1999), Capar and Kotabe (2003) and Contractor et al. (2003) among others), we control for a number of other variables that may also influence firm performance, including firm age, ownership structure and business cycle effects. Firm age is measured as the actual duration of existence of a firm since the starting year of its operations (Qian et al., 2008). In addition, ownership structure is controlled for by calculating the ratio of shares owned by foreign firms in relation to total shares (Pantzalis, 2001). We also include business cycle effects including industry, regional and year effects.

6.3.1 Estimation equation

Taken together variables mentioned above, the relationship between multinationality and firm performance in our analysis could be built as follows,
Performance=f[Multinationality(3), Intangibles, Age, Ownership, Business cycle effects],
in which Multinationality(3) denotes three different multinationality measures as mentioned in the text. In the context of this study, the functional M-P relationship above can be transformed into the following equation form model to be estimated:

$$Y_{it} = \beta_1 OSTS_{it} + \beta_2 OSTS\_dev_{it} + \beta_3 OSTS\_devel_{it} + \lambda X_{it} + \gamma_{it} + e_{it}, \quad (6.1)$$

where Y_{it} is the return on sales of firm i for a given period t in ratios. $OSTS_i$ refers to the ratio of number of foreign subsidiaries in relation to total subsidiaries over the same period. $OSTS\_dev_{it}/(\_devel_{it})$ is the ratio of number of overseas subsidiaries in developed/(developing) countries in relation to total subsidiaries. The equation also includes other control variables, including intangible assets, firm age, ownership structure, and controls for business cycle effects (γ_{it}). An important parameter concerning this study is β_1, which indicates the average change in performance for firms associated with the incremental multinationality. Equally important, β_2 and β_3 show the average change in performance associated with the incremental increase in overseas presence in developed and developing countries, respectively. Another important concern in our chapter is to test the

curvilinear M-P relationship, and it could be examined by the following equation:

$$\begin{aligned} Y_{it} = \beta_1 OSTS_{it} + \beta_2 OSTS_{it}^2 + \beta_3 OSTS\_dev_{it} + \beta_4 OSTS\_dev_{it}^2 \\ + \beta_5 OSTS\_devel_{it} + \beta_6 OSTS\_devel_{it}^2 + \lambda X_{it} + \gamma_{it} + e_{it}, \end{aligned} \tag{6.2}$$

in which square of $OSTS_{it}$, $OSTS\_dev_{it}$ and $OSTS\_devel_{it}$ are included that allow the curvilinear M-P relationship test.

6.4 Data

The empirical analysis presented in this chapter is derived from a commercial database named Orbis, collected by the consultancy Bureau van Dijck [1]. The records of each company include information on whether the company has ownership stake in its subsidiaries (path of minimal 25.01 % shares control over its overseas subsidiary) and where the subsidiary locates in the latest year released in the Orbis dataset. Therefore, it is possible to calculate the ratio of subsidiaries in foreign countries in relation to its total subsidiaries, which is most important variable in our chapter indicating the multinationality of a firm. Financial and operational information of samples in our data is available for 1997 through 2007,

[1] Orbis is a global product that integrates information held across BvDEP's company information product range. It includes full searching facilities and global standard report format for in-depth international searching and analysis. The information is sourced from many different information providers (IPs) and all experts in their regions or disciplines. As well as descriptive information and the company financials, Orbis contains further detail such as news, market research, ratings and country reports, scanned reports, ownership and MA data. Orbis has a number of different reports per company. For listed companies, banks and insurance companies plus major private companies more detailed information is available.

but the information on multinationality is not time-dimension and we cannot follow the multinationality changes during the sample period. Due to variation in national reporting (e.g., monetary), all monetary measures are reported in the Orbis in home currencies. However, we convert them to euro using international monetary fund annual exchange rates to have a consistent monetary measure that is crucial in our analysis, and variables are comparable across different countries. We retrieve firms on the basis of information available on expenditure on investment, employees, assets and firm age. In attempting to assessing the relationship between multinationality and firm performance, domestic firms are ruled out. Moreover, for firms without any one of these information we cannot include them in our sample. Although there is severely reduced sample size - in particular Canada, Liechtenstein, Mexico and India, we do not believe that this is a serious problem and we still have a considerable number of firms from most important countries. From Table 6.5 to 6.8 the country distribution of firms in our cross-section data is listed, alongwith most important variables used in our analysis. Firms are concentrated in some EU countries, most G8 countries and some developing countries with significant number in France, Germany, Italy, Japan, UK, US and South Korea. The pattern of firm locations looks broadly consistent with typical patterns of investment: Taken together firms from US, UK, France, Germany, Italy and Japan, account for 55.2% of the sample.

Summary statistics for the data are presented in Table 6.4, and there are 16,533 in total. The key variables are return on sales (ROS), the ratio of foreign subsidiaries in relation to total subsidiaries (OSTS), the ratio of number of foreign subsidiaries in developed countries in relation to total subsidiaries (OSTS_dev), and the ratio of number of foreign subsidiaries in developing countries in relation

to total subsidiaries (OSTS_devel). The left panel of table is the descriptive statistics of firms with at least one subsidiary in overseas country, and right panel contains firms with at least one subsidiary. The left panel shows that on average a multinational firm has 20 subsidiaries in total, out of which nine are located in overseas and around seven are located in countries with developed economies. From a multinational firm 58% of subsidiaries are located in overseas markets, 38% are located in countries with developed economies, and 20% are located in developing countries. It is clear that on average multinational firms (the left panel of table) are suggestive of more productive. The average return on sales for multinational firms is 0.084, and for all firms is 0.077. Other attractive features are: multinational firms are established earlier (36 years to 31 years); more technology-intensive (116 million USD to 64 million USD); more capital-intensive (1,372 million USD to 875 million USD), and willing to hire more workers (4,807 to 2,908). Although the sample collection from the Orbis is limited to very large firms in each country, our samples have a large variability, and the standard deviations for most variables are times greater than the mean. These dispersions are also clear from figure 6.1, 6.2, 6.3 and 6.4, which depict the normal distributions of our performance measure and three different multinationality measures. We notice that two of popular points in the distribution are 1 and 0.5. We argue that our results on returns to multinationality are different in that the firm has one domestic plant. We complement our analysis of return to multinationality by using the log of number of foreign affiliates.

6.5 Results

Table 6.9 reports our estimates of equation 6.1, where all columns include a full set of business cycle effects including sector, regional and year fixed effects. For all these fix-effects specification, each column reports for each regressor a coefficient estimates and its standard error. The positive coefficients are unchanged from the ratio of number of foreign subsidiaries in relation to total subsidiaries- and the ratio of number of foreign subsidiaries in developed countries in relation to total subsidiaries- to the ratio of number of foreign subsidiaries in developing countries in relation to total subsidiaries. Therefore, the tight and positive M-P relationship results are evident through column 2 to 4, with incremental internationalization significantly positively correlated with performance. But there is a stronger statistical support that the correlation is higher when a firm considers more FDI presences in developing countries, and the coefficient is 0.016, with a p-value of 0.003. It is higher than the average M-P correlation (0.013 in column 2, with significant level at 1%), and also higher than the correlation between performance and the level of FDI presence in developing countries (0.03 in column 3, with insignificant level). In column 5 we repeat the analyses, but put all three multinationality measures together. It shows that the qualitative patterns of correlations between multinationality and firm performance are higher and significant. The correlation between performance and the level of FDI presence in developed countries is 0.01 (with significant level at 1%), while the correlation between performance and the level of FDI presence in developing countries is 0.02 (with significant level at 1%). That said, it seems plausible to expect higher FDI involvement in developing countries the stronger is M-P relationship.

Table 6.10 reports our estimates of equation 6.2 and tests our M-P curvilinear relationship hypotheses. In column 1 curvilinear relationship is evident and statistically significant at 5% level, with the slope positive at low levels of multinationality, and negative at high levels. In column 2 and column 3 of this table we repeat the analyses, but put different multinationality measures, and they are our preferred specifications. The relationship between the level of FDI presence in developed countries and firm performance is again evident at standard significant levels, with the slope positive at low levels of FDI presences, and negative at high levels. However, this inverted U-shaped model is not evident in column 3 when we use the ratio of number of subsidiaries in developing countries in relation to its total subsidiaries as a multinational measure. Taken together these two multinationality measures, column 4 of this table shows that the curvilinear relationship is only evidenced between the level of FDI presences in developed countries and firm performance.

The elasticity estimates in Table 6.9 imply that every 1% increase in multinationality is correlated with 0.013% increase in return on sales; every 1% increase in the level of FDI presence in developed/(developing) countries is correlated with 0.010%/(0.020%) increase in ROS. In terms of economic significance, by our estimates the relationship between multinationality and performance is by somewhere between 0.010% and 0.020%. Comparing with average mean of ROS of our sample (Return on Sales=0.084 in Table 6.4), every percent increase in multinationality accounts for a substantial amount performance increase. Moreover, our estimates from different multinationality measures mean that firms are more productive if they operate high FDI involvement in developing countries, which seems plausible. In terms of economic meaning, FDI operation in devel-

oping countries achieves the long-term economies of scale and market shares of multinational firms, thus we think that the performance gains attributable to overseas direct investment are largely contributed by the overseas expansion into developing countries.

6.5.1 Robustness

In order to verify the robustness of the evidence and our interpretations of tables 6.9 and 6.10, we check different specifications. It has been documented that over our sample analysis, overall, firm's overseas expansions into developing countries have higher performance, and there is an inverted U-shaped model correlation between the level of FDI presence in developed countries and performance. In Table 6.4 it shows that most firms in our sample are from developed countries (Dev=0.75), thus a reasonable question is whether the M-P correlation is different in terms of different locations of multinational firms.

We reestimated equation 6.1 and 6.2 on the sample of firms from developed countries, and we get 11,726 firms in total. In Table 6.11 it is again evident that on the sample of firms in developed countries the M-P correlation of interest is higher when firms operate high level of FDI presence in developing countries, and correlation between the level of FDI presence in developed countries and firm performance is an inverted U-shaped model. These estimation results are reported through column 2 to column 5, it shows that every 1% increase in multinationality is likely to be correlated with 0.015% more profit. Although in column 3 the level of FDI presences in developed countries is not statically significant correlated with performance, It is significant and positive once repeating the analysis

by adding the OSTS_devel (the level of FDI presences in developing countries), and in column 4 it is evident that the level of FDI presence in developing countries is likely to associated with higher performance. For subsample of firms from developed countries our results are robust to the previous finding: all three multinationality measures-performance elasticities in Table 6.11 are higher than in the comparable specifications in Table 6.9, and the curvilinear relationship between the level of FDI presence in developed countries and firm performance is again documented in column 4 of Table 6.12.

To further substantiate the evidence, our second robustness check is to reestimate the equation 6.1 and 6.2, but only consider firms from developing countries, and we get 4,177 firms in total. We expect the M-P elasticity should be lower as firms from developing countries are less diverse, and the cross-border expansion into developed countries is typical technology acquiring, and is less likely to have performance gains in short-term run. These expectations are evident in Table 6.13 and 6.14. Through column 2 to 4 of Table 6.13 they show that overall, the M-P relationship is positive in the subsample of firms from developing countries, but the elasticity is less than those in Table 6.9 and 6.11, and also in Table 6.14 there is still an inverted U-shaped relationship between the level of FDI presences in developed countries and performance. Therefore, these two robustness checks are consistent with our main findings.

We complement our analysis of the return to multinationality by using different multinationality measure. In table 6.15 and 6.16 we reestimated equation 6.1 and 6.2 by using log of number of foreign affiliates as a measure of multinationality, where all columns include a full set of business cycle effects including sector, regional and year fixed effects. The results in the second column of table 6.15

indicate that there is still a tight and positive M-P relationship results. Moreover the MN-Performance relationship is higher when a firm considers more FDI presences in developing countries, and the coefficient is 0.004, with a p-value of 0.001. It is higher than the average M-P correlation (0.002 in column 2, with significant level at 1%), and also higher than the correlation between performance and the level of FDI presence in developed countries (0.03 in column 3, with insignificant level). The results in column 5 again evidence that M-P relationship is higher if the multinational firm consider more FDI presence in developing countries. However, there is no evidence of curvilinear M-P relationship in table 6.16 when we use number of overseas affiliates to measure the multinationality. We believe that the number of affiliates may not a good indicator to measure the multinationality, as it may overlook consider the internal management systems and external business network and increased internal coordination between domestic and overseas subsidiaries.

6.6 Discussions and conclusions

The large literature on M-P relationship is almost exclusively focused within single countries as shown in column 2 of Table 6.4. In this chapter we use a sample of 16,533 firms from 46 countries to examine the linear and curvilinear M-P correlations and tests whether a multinational firm differs with respect to different location choices of overseas investment. Robust to different specifications and sample choices, our central finding is that a positive and statistically significant relationship between multinationality and performance is evident, and our esti-

mates of multinationality elasticity of performance vary between approximately 0.010 and 0.024, which falls in the range estimated by the M-P literature as shown in column 5 of Table 6.1 and 6.2. If we take our average elasticity to be 0.017, then every 1% increase in multinationality is associated with 0.017% increase in return on sales, which accounts a lot comparing with the average of firm performance in our sample (ROS=0.08). Equally important, our results also document that the M-P correlation is higher when a firm considers more FDI presence in developing countries, and the international expansion by its subsidiaries into developing country is correlated with firm performance in an inverted U-shaped model, with the slope positive at low and medium levels of international expansion into developed countries, and negative at high levels. Our results are important additions to the literature on M-P relationship.

Why are these results important? The majority of existing studies examining the correlation between a firm's international expansion and firm performance use very aggregate measures of foreign investment, without considering location choices of overseas investment which are likely to influence multinational firm's performance. In many countries some factors to moderate the M-P relationship have been investigated and explained, including the advertising intensity, research and development intensity, and firm size, while our chapter looks into a different dimension that the performance of a multinational firm could be different due to difference in the patterns of geographic diversifications. Our chapter makes it possible to develop a better understanding of foreign investment behavior. Internationalization in the last 10 years has spurred more cross-border investments into developed and developing countries. Developing countries contribute at least equal as developed countries to the World inward FDI, and performance gains

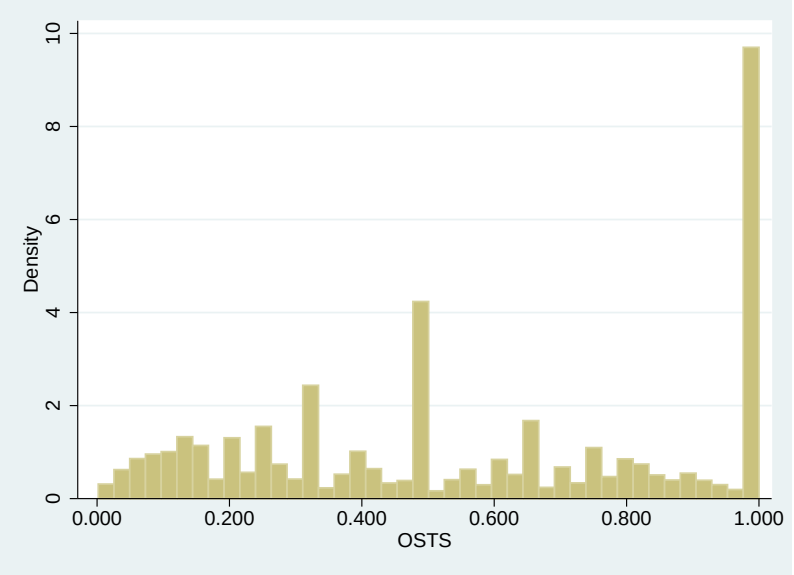
attributable to inward FDI is larger when firm consider more overseas expansions into developing countries. There are abundant resources, less competition and local incentives by host countries. We also think this chapter could be useful in decision making in the multinational firm with regard to its overseas expansion operation. The comparison of different geographic diversification with performance gains is often overlooked. Using a large number of samples, robust to different specifications, our findings provide the evidence that the interaction of location factors with firm-specific intangibles is associated with higher performance gains especially in the case of developing locations. The result is consistent with internalization theory that intangible assets are more valuable when the transfer occurs in imperfect markets, and is also consistent with findings of Pantzalis's work.

As this study is cross-section in nature, the main limitation of this study is that we cannot follow the multinationality changes during the sample period and data is not time-dimension, but a simple extension of this study would be to test for the stability of the results by repeating the tests for different years. An interesting extension would be an examination of the causality effect from international expansions on firm performance. Another possible extension is to reestimate the equation by using different multinationality and performance measures, which will be nice robust checks. A related argument is that multinationals firms are often blamed for focusing too much on performance and not taking into account the welfare of local countries, in particular if these countries are developing economies. Although this point is not investigated in this chapter, this may pose further research on issues of multinational firms and corporate social responsibility. Equally important, our results document the difference in performance

caused by the selection of region to diversify, and a negative slope correlation between high level of FDI presences in developed countries and firm performance. This carries important implications for both policy and increasingly global nature of market. For example, it may help to explain why multinational firms tend to invest in developing countries to achieve their long-term plan of economies of scale. We also believe our findings are relevant for literature on inward FDI movements in macro aggregates. Since 2000s, inward FDI in developing countries increases times, which is consistent with this chapter's findings.

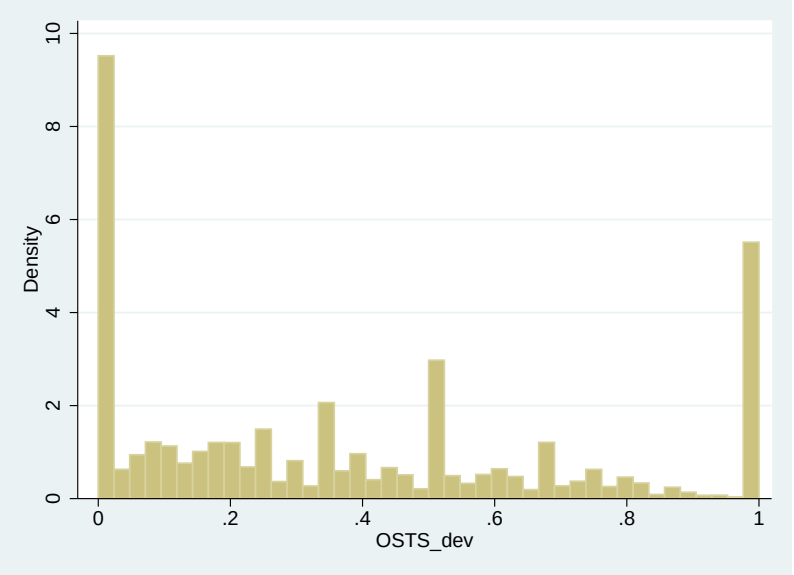
6.7 Tables and figures

Figure 6.1: The distribution of multinationality [OSTS]



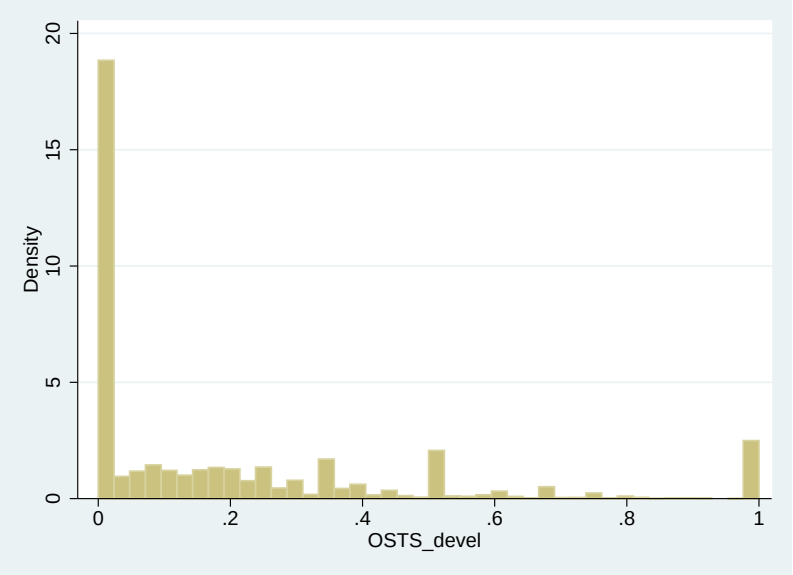
Notes: OSTS is the ratio of number of overseas subsidiaries in relation to its total subsidiaries.

Figure 6.2: The distribution of multinationality [OSTS_dev]



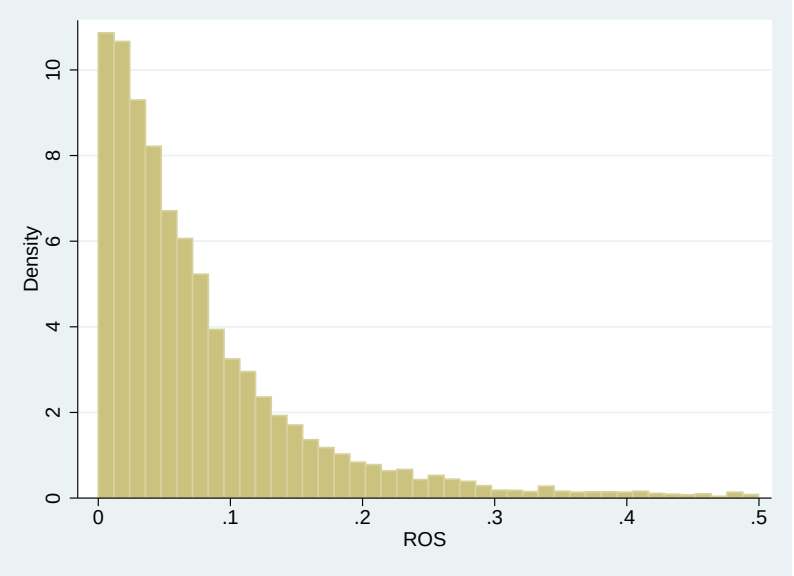
Notes: OSTS_dev is the ratio of number of subsidiaries in developed countries in relation to its total subsidiaries.

Figure 6.3: The distribution of multinationality [OSTS_devel]



Notes: OSTS_devel is the ratio of number of subsidiaries in developing countries in relation to its total subsidiaries.

Figure 6.4: The distribution of ROS



Notes: ROS refers to return on sales.

Table 6.1: List of studies on M-P relationship and some of their characteristics

Reference	Multinationality Measurements	Performance Indicators	Countries
Severn and Laurence (1974)	Forgin assets	Profitability	US
Hughes et al. (1975)	Foreign sales	Risk adjusted returns	US
Siddharthan and Lall (1982)	Foreign sales	Growth of sales	US
Kim and Lyn (1986)	Foreign sales/subsidiaries	Excess market	US
Michel and Shaked (1986)	Forgin sales	Risk adjusted returns	US
Shaked (1986)	Foreign sales	ROA	US
Buhner (1987)	Foreign sales, Herfindahl-type	ROA, ROE, Risk	Germany
Grant (1987)	Foreign sales	ROS, ROA, ROE	UK
Grant et al. (1988)	Forgin sales	ROS	UK
Geringer et al. (1989)	Foreign sales	ROS, ROA	World(1)
Collins (1990)	Foreign sales	Average rate of return	US
Soenen (1990)	Foreign sales/asset/profit	Systemtaic risk, PE	US
Morck and Yeung (1991)	Forgin subsidiaries/countries	Tobin Q	US
Kim et al. (1993)	Foreign countries	ROA	US
AL-Obaidan and Scully (1995)	Foreign sales	Scale/Technical efficiency	World(2)
Sambharya (1995)	Foreign sales/asset/subsidiaries	ROS, ROA, ROE	US
Allen and Pantzalis (1996)	Foreign countries	Excess valuation	US
Tallman and Li (1996)	Foreign sales/subsidiaries	ROS	US
Hitt et al. (1997)	Foreign sales/subsidiaries	ROA	US
Qian (1997)	Foreign subsidiaries/countries	ROA, ROE	US
Mishra and Gobeli (1998)	Foreign subsidiaries	Tobin Q	US
Qian (1998)	Foreign sales	ROE	US
Bodnar et al. (1999)	Foreign sales	Excess value	US
Delios and Beamish (1999)	Foreign subsidiaries	ROS, ROA, ROE	Japan
Doukas et al. (1999)	Foreign subsidiaries	Excess value	US
Gomes and Ramaswamy (1999)	Foreign sales/assets/subsidiaries	ROA	US

Notes: ROA, ROS and ROE refer to return on assets, return on sales and return on equity, respectively. OCTS and TFP are operating cost in total sales and total factor productivity, respectively. Country groups: (1): US and Europe; (2): Argentina, Austria, Brazil, Belgium, Chile, Colombia, Finland, France, India, Italy, Japan, Korea, Mexico, Netherlands, Norway, Philippines, Portugal, Spain, Taiwan, UK, USA; (3): 42% of firm sample from US and the rest 58% from other nations; (4): US 42%, the rest 58%; (5): US, Europe and Japan. 'Coef.' is the average coefficient of each paper. More details on average of coefficients and survey year of each paper could be seen in Table 5.1 and Table 5.2.

Table 6.2: List of studies on M-P relationship and some of their characteristics [Cont's]

Reference	Multinationality Measurements	performance indicators	Countries
Click and Harrison (2000)	Foreign sales/affiliates/countries	ROA, Tobin Q	US
Geringer et al. (2000)	Foreign sales	ROS	Japan
Zahra et al. (2000)	Foreign sales	ROE	US
Pantzalis (2001)	Foreign affiliates	Tobin Q, Excess Q	US
Ramírez-Alesón and Espitia-Escuer (2001)	Foreign affiliates	Tobin Q, Opearting profit	Spain
Christophe and Pfeiffer (2002)	Foreign sales	Tobin Q	US
Dastidar (2002)	Foreign sales	Excess value	UK
Denis et al. (2002)	Foreign sales	Excess value	US
Kotabe et al. (2002)	Foreign sales	ROA	US
Qian (2002)	Foreign sales	ROS	US
Capar and Kotabe (2003)	Foreign sales	ROS	Germany
Contractor et al. (2003)	Foreign sales/employees/countries	ROS	World (3)
Goerzen and Beamish (2003)	Foreign affilites/countries	Jensen's alpha	Japan
Ruigrok and Wagner (2003)	Foreign sales	OCTS	Germany
Christophe and Lee (2004)	Foreign sales/assets/affiliates Foreign top managers	Tobin Q	US
Thomas and Eden (2004)	Foreign sales/assets Foreign affiliates/countries	ROA, ROE, Avg./Excess market value	US
Lu and Beamish (2004)	Foreign affiliates/countries	ROA, Tobin Q	Japan
Andersen (2005)	Foreign countries	ROA	US
Li (2005)	Foreign sales	ROS	US
Castellani and Zanfei (2007)	Foreign affiliates	Value added, TFP	Italy
Ruigork et al. (2007)	Foreign sales	ROA	US
Andersen (2008)	Foreign countries	ROA	US
Pangarkar (2008)	Foreign sales	ROS, ROA, Profit	Singapore
Qian et al. (2008)	Foreign sales/countries	ROS, ROA	US

Notes: See the footnote in table 6.1.

Table 6.3: List of studies on M-P relationship and some of their characteristics [Cont's]

Reference	Multinationality Measurements	Performance	Countries
(a) Curvilinear-[U-shaped]			
Grant et al. (1988)	Foreign sales	ROS	UK
Lu and Beamish (2001)	Foreign subsidiaries/countries	ROA	Japan
Capar and Kotabe (2003)	Foreign sales	ROS	Germany
Contractor et al. (2003)	Foreign sales/employees/offices	ROS	World (4)
Ruigrok and Wagner (2003)	Foreign sales	OCTS	Germany
Thomas and Eden (2004)	Foreign sales/assets/employees	ROA, ROE	US
	Foreign countries/subsidiaries	Market value	
Lu and Beamish (2004)	Foreign subsidiaries/countries	ROA Tobin Q	Japan
Andersen (2008)	Foreign countries	ROA	US
(c) Curvilinear-[inverted U-shaped]			
Haar (1989)	Foreign sales	ROS	World (5)
Hitt et al. (1997)	Foreign sales	ROA	US
Gomes and Ramaswamy (1999)	Foreign sales/assets/subsidiaries	ROA	US
Qian (2002)	Foreign sales	ROS	US
Christophe and Lee (2004)	Foreign sales/assets/subsidiaries	Tobin Q	US
	Foreign top managers		
Li (2005)	Foreign sales/assets/employees	ROA ROS	US
Li and Qian (2005)	Foreign sales	ROS	US
Li et al. (2007)	Foreign countries	ROA	US
Ruigork et al. (2007)	Foreign sales	ROA	US
Qian et al. (2008)	Foreign sales	ROA ROS	US

Notes: See the footnote in table 6.1.

Table 6.4: Descriptive statistics

Variable	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs
	Multinational Firms			ALL Firms		
Sales	1233.11	10652.29	16531	778.87	8579.14	38291
Return on Sales	0.084	0.10	16533	0.077	0.10	38294
Subsidiaries	20.82	51.92	16533	12.13	37.27	38294
Overseas Subsidiaries	9.91	28.74	16533	4.28	19.51	38294
Dev	0.75	0.43	16533	0.73	0.44	38294
OS_dev	6.98	22.16	16533	3.01	14.96	38294
OS_devel	2.92	8.98	16533	1.26	6.08	38294
OSTS	0.58	0.32	16533	0.25	0.35	38294
OSTS_dev	0.38	0.34	16533	0.16	0.29	38294
OSTS_devel	0.20	0.28	16533	0.08	0.21	38294
$OSTS^2$	0.43	0.38	16533	0.19	0.33	38294
$OSTS\_dev^2$	0.26	0.34	16533	0.11	0.26	38294
$OSTS\_devel^2$	0.11	0.25	16533	0.05	0.17	38294
Firm Age	36.35	34.14	16533	31.56	30.84	38294
Investment	115.55	615.67	16533	64.69	423.17	38294
Employment	4808.10	24471.92	16533	2908.18	16705.14	38294
Total Assets	1372.64	11423.60	16533	875.44	9177.06	38294
Foreign Ownership	12.24	26.95	16533	10.13	26.45	38294
Sector	43.51	19.86	16533	46.04	20.39	38294

Notes: All monetary variables are denominated in millions of euro. 'Multinational Firms' are firms with at least one subsidiary in overseas market, which are considered as the sample in our analysis. 'All Firms' are firms with at least one subsidiary. 'Subsidiaries' refers to the total number of subsidiaries; 'Overseas Subsidiaries' refers to the number of subsidiaries in foreign countries; 'Dev' describes the ratio of firms from developed countries in relation to its total firms; 'OS_dev/(_devel)' refers to number of subsidiaries in developed/(developing) countries; OSTS refers to the ratio of number of overseas subsidiaries in relation to total subsidiaries; OSTS_dev/(_devel) is an indication of the ratio of number of subsidiaries in developed/(developing) countries in relation to total subsidiaries.

Table 6.5: Descriptive statistics of main variables for each country

Country	N(id)	ROS	Sub	O.Sub	OSTS	OSTS_dev	OSTS_devel
Australia	87	0.16	30.45	15.70	0.50	0.32	0.17
Austria	198	0.07	9.45	5.13	0.59	0.39	0.21
Belgium	694	0.06	14.67	9.46	0.63	0.49	0.14
Bulgaria	150	0.09	5.83	2.35	0.52	0.00	0.52
Canada	2	0.17	15.50	12.00	0.66	0.60	0.06
China	218	0.09	21.04	3.65	0.30	0.12	0.18
Czech Republic	63	0.07	2.10	1.60	0.90	0.49	0.41
Denmark	640	0.09	13.88	9.71	0.70	0.54	0.17
Estonia	46	0.11	3.85	1.50	0.70	0.13	0.57
Finland	351	0.08	15.64	9.56	0.60	0.33	0.27
France	1,478	0.08	12.89	6.56	0.61	0.46	0.15
Germany	885	0.07	16.94	7.87	0.52	0.42	0.09
Greece	377	0.08	5.89	3.16	0.64	0.08	0.56
Hong Kong	64	0.29	28.56	12.95	0.39	0.10	0.29
Hungary	17	0.08	20.59	8.59	0.44	0.29	0.14
Iceland	20	0.10	12.10	8.50	0.64	0.25	0.39
Indonesia	15	0.18	12.33	2.73	0.76	0.68	0.08
Ireland	109	0.08	29.54	16.33	0.51	0.49	0.02
Italy	2,411	0.06	10.31	4.55	0.51	0.28	0.22
Japan	1,373	0.07	13.94	9.23	0.89	0.80	0.09
Lativa	19	0.06	3.00	1.21	0.57	0.12	0.46
Liechtenstein	1	0.09	28.00	28.00	1.00	0.89	0.11
Lithuania	185	0.06	2.12	2.05	0.99	0.01	0.98
Luxembourg	17	0.12	52.35	49.35	0.89	0.58	0.31

Notes: All monetary variables are denominated in millions of euro. 'Sub' refers to the total number of subsidiaries; 'O.Sub' refers to the number of subsidiaries in foreign countries; 'Dev' is the ratio of firms from developed countries; 'OS_dev/(_devel)' refers to number of subsidiaries in developed/(developing) countries; OSTS refers to the ratio of number of overseas subsidiaries in relation to total subsidiaries; OSTS_dev/(_devel) is an indication of the ratio of number of subsidiaries in developed/(developing) countries in relation to total subsidiaries.

Table 6.6: Descriptive statistics of main variables for each country

Country	N(id)	ROS	Sub	O.Sub	OSTS	OSTS_dev	OSTS_devel
Malaysia	43	0.11	10.56	4.51	0.66	0.46	0.20
Mexico	2	0.01	6.50	2.00	0.39	0.05	0.34
Netherland	766	0.08	24.20	15.86	0.65	0.49	0.16
New Zealand	12	0.14	15.92	8.58	0.55	0.42	0.13
Norway	190	0.14	16.02	8.13	0.53	0.46	0.07
Philippines	5	0.18	2.00	1.60	0.80	0.60	0.20
Poland	79	0.07	6.70	2.18	0.50	0.35	0.15
Portugal	79	0.06	12.57	4.04	0.41	0.30	0.11
Romania	13	0.10	4.38	1.08	0.45	0.38	0.08
Russia	69	0.14	11.75	3.41	0.43	0.10	0.34
Sigapore	53	0.17	15.19	9.42	0.75	0.50	0.26
Slovenia	9	0.10	4.67	4.67	1.00	0.16	0.84
South Africa	24	0.12	12.42	6.79	0.57	0.27	0.31
South Korea	41	0.06	7.83	3.63	0.44	0.37	0.07
Spain	690	0.08	27.65	9.92	0.44	0.27	0.17
Sweden	694	0.10	24.79	14.78	0.62	0.50	0.12
Switzeland	140	0.10	44.24	36.53	0.72	0.60	0.12
Taiwan	1,171	0.09	6.44	2.72	0.55	0.03	0.52
Thailand	28	0.14	16.54	3.32	0.64	0.29	0.35
Turkey	16	0.10	16.44	7.19	0.68	0.43	0.25
UK	1,367	0.10	42.26	12.55	0.35	0.31	0.05
US	1,622	0.12	53.77	24.55	0.47	0.37	0.10

Notes: All monetary variables are denominated in millions of euro. 'Sub' refers to the total number of subsidiaries; 'O.Sub' refers to the number of subsidiaries in foreign countries; 'Dev' is the ratio of firms from developed countries; 'OS_dev/(_devel)' refers to number of subsidiaries in developed/(developing) countries; OSTS refers to the ratio of number of overseas subsidiaries in relation to total subsidiaries; OSTS_dev/(_devel) is an indication of the ratio of number of subsidiaries in developed/(developing) countries in relation to total subsidiaries.

Table 6.7: Descriptive statistics of main variables for each country [Cont's]

Country	Sales	Age	Investment	Employment	Asset	For.Own	Sector
Australia	1202.19	34.30	108.26	3846.66	1742.19	13.89	44.03
Austria	559.77	29.47	30.46	2083.54	489.98	20.01	41.36
Belgium	2597.41	31.22	93.41	2017.50	2470.07	17.98	45.71
Bulgaria	58.42	30.11	3.55	755.16	63.97	4.97	44.70
Canada	2294.50	32.00	127.40	16315.00	6872.89	6.53	54.50
China	1329.18	12.36	114.47	11947.22	1342.60	3.94	35.56
Czech Republic	331.53	13.35	23.33	1915.98	328.25	32.73	35.52
Denmark	390.82	26.63	30.94	2584.64	354.69	11.28	51.86
Estonia	61.77	16.24	10.08	741.96	97.70	29.10	38.22
Finland	703.18	34.02	52.78	2452.21	581.71	12.20	40.75
France	717.27	37.63	81.49	2255.86	674.76	14.12	44.12
Germany	1616.73	47.31	114.69	5953.49	1659.61	15.41	45.76
Greece	209.12	26.80	20.37	785.49	246.21	12.26	37.49
Hong Kong	957.03	51.63	236.24	9612.38	2242.09	17.16	49.89
Hungary	1038.79	26.35	115.10	3887.35	922.74	22.40	37.47
Iceland	290.16	35.00	17.49	1940.10	425.31	2.59	37.45
Indonesia	446.36	36.20	65.75	6640.80	630.17	18.64	33.20
Ireland	1388.18	34.57	160.32	3219.25	1543.75	20.91	48.43
Italy	309.15	28.03	19.80	950.19	363.12	5.50	40.57
Japan	2202.44	64.38	243.69	7441.72	2478.90	7.06	38.98
Lativa	82.13	12.95	1.36	588.05	43.78	22.99	42.26
Liechtenstein	2290.98	66.00	555.06	17250.00	2050.30	0.00	35.00
Lithuania	19.64	12.77	0.65	256.79	19.56	5.07	44.89
Luxembourg	1313.23	32.12	223.47	9894.59	2345.79	30.17	47.53

Notes: All monetary variables are denominated in millions of euro. 'For.Own' refers to foreign ownership.

Table 6.8: Descriptive statistics of main variables for each country [Cont's]

Country	Sales	Age	Investment	Employment	Asset	For.Own	Sector
Malaysia	372.22	24.49	78.09	4953.19	659.48	8.54	37.49
Mexico	205.15	20.50	14.97	2394.50	166.91	0.00	35.50
Netherland	1395.46	36.30	112.23	4383.77	1238.30	23.17	44.84
New Zealand	2226.62	27.50	306.96	6628.83	2567.78	16.51	37.75
Norway	790.27	27.12	73.64	1885.96	785.09	14.15	41.41
Philippines	86.23	40.20	8.44	2743.60	98.46	2.48	38.00
Poland	441.38	29.25	35.27	2482.75	460.92	16.76	38.84
Portugal	431.45	37.71	26.56	1974.76	377.44	13.86	44.05
Romania	179.46	20.62	14.58	2463.62	140.41	0.05	44.00
Russia	1310.62	33.99	168.00	15420.20	2522.51	3.66	37.75
Sigapore	471.68	25.32	132.92	3405.32	723.97	19.69	48.74
Slovenia	726.44	74.78	29.28	5410.44	691.15	15.90	41.33
South Africa	594.10	37.75	81.16	5512.96	1234.92	3.33	46.50
South Korea	483.98	24.46	28.13	748.49	483.70	2.69	37.46
Spain	898.08	30.96	108.08	3185.21	1150.16	18.89	46.19
Sweden	613.68	40.16	50.99	2761.65	633.27	12.91	50.83
Switzeland	2455.95	72.28	377.04	11086.22	2704.90	18.63	44.95
Taiwan	289.89	22.25	45.09	2896.90	314.40	2.15	34.53
Thailand	2405.99	34.25	161.84	8925.11	1798.25	12.94	32.07
Turkey	1343.58	37.38	205.93	6812.13	1354.11	10.68	38.38
UK	1543.17	32.27	135.49	6926.04	2212.62	17.95	50.19
US	3400.35	49.07	350.79	15011.96	3796.85	14.09	45.71

Notes: All monetary variables are denominated in millions of euro. 'For.Own' refers to foreign ownership.

Table 6.9: Multinationality and firm performance

	A	B	C	D	E
	(1)	(2)	(3)	(4)	(5)
OSTS		.013***			
		(.003)			
OSTS_dev			.003		.010***
			(.003)		(.003)
OSTS_devel				.016***	.020***
				(.003)	(.003)
Investment	.005***	.005***	.005***	.005***	.005***
	(.0004)	(.0004)	(.0004)	(.0004)	(.0004)
Employment	-.022***	-.023***	-.022***	-.023***	-.023***
	(.0007)	(.0007)	(.0007)	(.0007)	(.0007)
Total Assets	.023***	.023***	.023***	.023***	.023***
	(.0008)	(.0008)	(.0008)	(.0008)	(.0008)
Firm Age	.001	.001*	.001	.001	.001*
	(.0008)	(.0008)	(.0008)	(.0008)	(.0008)
Foreign Ownership	.00007***	.00006**	.00007***	.00006**	.00006**
	(.00003)	(.00003)	(.00003)	(.00003)	(.00003)
Const.	-.385***	-.402***	-.388***	-.393***	-.403***
	(.093)	(.093)	(.093)	(.093)	(.093)
Obs.	16533	16533	16533	16533	16533
R^2	.228	.229	.228	.229	.23

Notes: Dependant variable is return on sales. OSTS refers to the ratio of number of overseas subsidiaries in relation to its total subsidiaries; OSTS_dev/(_devel) refers to the ratio of number of subsidiaries in developed/(developing) countries in relation to its total subsidiaries. 'Firm Age', 'Investment', 'Employment' and 'Total Assets' are in logarithm. All columns above include a full set of fixed effects, including sector, regional and country and year dummies. Values in parentheses are standard errors. Significance levels: *: 0.10; **: 0.05; ***: 0.01.

Table 6.10: Curvilinear M-P relationship

	A	B	C	D
	(1)	(2)	(3)	(4)
OSTS	.028***			
	(.007)			
$OSTS^2$	-.013**			
	(.006)			
OSTS_dev		.025***		.032***
		(.006)		(.006)
$OSTS\_dev^2$		-.017***		-.020***
		(.006)		(.006)
OSTS_devel			.003	.009
			(.006)	(.006)
$OSTS\_devel^2$			.005	.005
			(.006)	(.007)
Investment	.006***	.006***	.006***	.006***
	(.0003)	(.0003)	(.0003)	(.0003)
Employment	-.013***	-.013***	-.013***	-.013***
	(.0005)	(.0005)	(.0005)	(.0005)
Total Assets	.014***	.014***	.013***	.014***
	(.0006)	(.0006)	(.0006)	(.0006)
Firm Age	-.00004	-.0003	-.0002	-.00005
	(.0006)	(.0006)	(.0006)	(.0006)
Foreign Ownership	.00008***	.00009***	.00009***	.00008***
	(.00002)	(.00002)	(.00002)	(.00002)
Const.	-.224***	-.209***	-.205***	-.221***
	(.024)	(.024)	(.024)	(.024)
Obs.	15712	15712	15712	15712
R^2	.173	.171	.170	.173

Notes: Dependant variable is return on sales. OSTS refers to the ratio of number of overseas subsidiaries in relation to its total subsidiaries; OSTS_dev/(_devel) refers to the ratio of number of subsidiaries in developed/(developing) countries in relation to its total subsidiaries. $OSTS^2$, $OSTS\_dev^2$ and $OSTS\_devel^2$ are OSTS squared, OSTS_dev squared and OSTS_devel squared, respectively. 'Firm Age', 'Investment', 'Employment' and 'Total Assets' are in logarithm. All columns above include a full set of fixed effects, including sector, regional and country and year dummies. Values in parentheses are standard errors. Significance levels: *: 0.10; **: 0.05; ***: 0.01.

Table 6.11: Multinationality and firm performance; Firms from developed countries

	A	B	C	D	E
	(1)	(2)	(3)	(4)	(5)
OSTS		.015***			
		(.003)			
OSTS_dev			.004		.011***
			(.003)		(.003)
OSTS_devel				.019***	.024***
				(.004)	(.004)
Investment	.005***	.005***	.005***	.005***	.005***
	(.0005)	(.0005)	(.0005)	(.0005)	(.0005)
Employment	-.024***	-.024***	-.024***	-.024***	-.024***
	(.0009)	(.0009)	(.0009)	(.0009)	(.0009)
Total Assets	.024***	.024***	.024***	.024***	.024***
	(.001)	(.001)	(.001)	(.001)	(.001)
Firm Age	.0009	.001	.0009	.001	.001
	(.001)	(.001)	(.001)	(.001)	(.001)
Foreign Ownership	.00004	.00003	.00004	.00003	.00003
	(.00003)	(.00003)	(.00003)	(.00003)	(.00003)
Const.	-.233**	-.249**	-.236**	-.237**	-.248**
	(.098)	(.098)	(.098)	(.098)	(.098)
Obs.	12356	12356	12356	12356	12356
R^2	.232	.234	.232	.234	.235

Notes: Dependant variable is return on sales. OSTS refers to the ratio of number of overseas subsidiaries in relation to its total subsidiaries; OSTS_dev/(_devel) refers to the ratio of number of subsidiaries in developed/(developing) countries in relation to its total subsidiaries. 'Firm Age', 'Investment', 'Employment' and 'Total Assets' are in logarithm. All columns above include a full set of fixed effects, including sector, regional and country and year dummies. Values in parentheses are standard errors. Significance levels: *: 0.10; **: 0.05; ***: 0.01.

Table 6.12: Curvilinear M-P relationship; Firms from developed countries

	A	B	C	D
	(1)	(2)	(3)	(4)
OSTS	.031***			
	(.009)			
OSTS^2	-.015**			
	(.007)			
OSTS_dev		.028***		.035***
		(.007)		(.007)
OSTS_dev^2		-.019***		-.022***
		(.007)		(.007)
OSTS_devel			.005	.009
			(.007)	(.008)
OSTS_devel^2			.005	.007
			(.008)	(.008)
Investment	.006***	.006***	.006***	.006***
	(.0004)	(.0004)	(.0004)	(.0004)
Employment	-.015***	-.015***	-.015***	-.015***
	(.0006)	(.0006)	(.0006)	(.0006)
Total Assets	.015***	.015***	.015***	.015***
	(.0007)	(.0007)	(.0007)	(.0007)
Firm Age	-.0007	-.0009	-.0008	-.0007
	(.0007)	(.0007)	(.0007)	(.0007)
Foreign Ownership	.00006**	.00006***	.00007***	.00006**
	(.00002)	(.00002)	(.00002)	(.00002)
Const.	-.248***	-.233***	-.227***	-.244***
	(.024)	(.024)	(.024)	(.024)
Obs.	11726	11726	11726	11726
R^2	.175	.173	.172	.175

Notes: Dependant variable is return on sales. OSTS refers to the ratio of number of overseas subsidiaries in relation to its total subsidiaries; OSTS_dev/(_devel) refers to the ratio of number of subsidiaries in developed/(developing) countries in relation to its total subsidiaries. $OSTS^2$, $OSTS\_dev^2$ and $OSTS\_devel^2$ are OSTS squared, OSTS_dev squared and OSTS_devel squared, respectively. 'Firm Age', 'Investment', 'Employment' and 'Total Assets' are in logarithm. All columns above include a full set of fixed effects, including sector, regional and country and year dummies. Values in parentheses are standard errors. Significance levels: *: 0.10; **: 0.05; ***: 0.01.

Table 6.13: Multinationality and firm performance; Firms from developing countries

	A	B	C	D	E
	(1)	(2)	(3)	(4)	(5)
OSTS		.008*			
		(.004)			
OSTS_dev			.002		.006
			(.004)		(.005)
OSTS_devel				.007	.010*
				(.005)	(.006)
Investment	.005***	.005***	.005***	.005***	.005***
	(.0007)	(.0007)	(.0008)	(.0008)	(.0008)
Employment	-.018***	-.018***	-.018***	-.018***	-.018***
	(.001)	(.001)	(.001)	(.001)	(.001)
Total Assets	.017***	.018***	.017***	.018***	.018***
	(.002)	(.002)	(.002)	(.002)	(.002)
Firm Age	.003*	.003*	.003*	.003*	.003*
	(.002)	(.002)	(.002)	(.002)	(.002)
Foreign Ownership	.0001***	.0001***	.0001***	.0001***	.0001***
	(.00005)	(.00005)	(.00005)	(.00005)	(.00005)
Const.	-.241***	-.247***	-.279***	-.245***	-.285***
	(.087)	(.087)	(.086)	(.087)	(.086)
Obs.	4177	4177	4177	4177	4177
R^2	.224	.225	.224	.225	.225

Notes: Dependant variable is return on sales. OSTS refers to the ratio of number of overseas subsidiaries in relation to its total subsidiaries; OSTS_dev/(_devel) refers to the ratio of number of subsidiaries in developed/(developing) countries in relation to its total subsidiaries. 'Firm Age', 'Investment', 'Employment' and 'Total Assets' are in logarithm. All columns above include a full set of fixed effects, including sector, regional and country and year dummies. Values in parentheses are standard errors. Significance levels: *: 0.10; **: 0.05; ***: 0.01.

Table 6.14: Curvilinear M-P relationship; Firms from developing countries

	A	B	C	D
	(1)	(2)	(3)	(4)
OSTS	.028**			
	(.013)			
OSTS^2	-.015			
	(.011)			
OSTS_dev		.021**		.028***
		(.010)		(.010)
OSTS_dev^2		-.015		-.018*
		(.010)		(.010)
OSTS_devel			.002	.010
			(.009)	(.010)
OSTS_devel^2			.005	.002
			(.011)	(.011)
Investment	.006***	.006***	.006***	.006***
	(.0005)	(.0005)	(.0005)	(.0005)
Employment	-.006***	-.006***	-.006***	-.007***
	(.001)	(.001)	(.001)	(.001)
Total Assets	.008***	.007***	.007***	.008***
	(.001)	(.001)	(.001)	(.001)
Firm Age	.002*	.002	.002	.002*
	(.001)	(.001)	(.001)	(.001)
Foreign Ownership	.00008**	.00009***	.00009**	.00008**
	(.00003)	(.00003)	(.00003)	(.00003)
Const.	-.104***	-.090***	-.092***	-.101***
	(.031)	(.031)	(.031)	(.031)
Obs.	3939	3939	3939	3939
R^2	.144	.142	.141	.144

Notes: Dependant variable is return on sales. OSTS refers to the ratio of number of overseas subsidiaries in relation to its total subsidiaries; OSTS_dev/(_devel) refers to the ratio of number of c in developed/(developing) countries in relation to its total subsidiaries. $OSTS^2$, $OSTS\_dev^2$ and $OSTS\_devel^2$ are OSTS squared, OSTS_dev squared and OSTS_devel squared, respectively. 'Firm Age', 'Investment', 'Employment' and 'Total Assets' are in logarithm. All columns above include a full set of fixed effects, including sector, regional and country and year dummies. Values in parentheses are standard errors. Significance levels: *: 0.10; **: 0.05; ***: 0.01.

Table 6.15: Multinationality and firm performance

	A	B	C	D	E
	(1)	(2)	(3)	(4)	(5)
OS		.002***			
		(.0007)			
OS_dev			.002**		.003**
			(.0008)		(.001)
OS_devel				.004***	.004**
				(.001)	(.001)
Investment	.005***	.005***	.005***	.005***	.005***
	(.0004)	(.0004)	(.0005)	(.0006)	(.0009)
Employment	-.022***	-.023***	-.025***	-.025***	-.031***
	(.0007)	(.0007)	(.0008)	(.001)	(.001)
Total Assets	.023***	.022***	.024***	.021***	.024***
	(.0008)	(.0008)	(.001)	(.001)	(.002)
Firm Age	.001	.0009	.002*	.0002	.001
	(.0008)	(.0008)	(.0009)	(.001)	(.001)
Foreign Ownership	.00007***	.00007***	.00006**	.00008**	.00005
	(.00003)	(.00003)	(.00003)	(.00004)	(.00005)
Const.	-.385***	-.377***	-.236**	-.319***	-.388***
	(.093)	(.093)	(.095)	(.100)	(.117)
Obs.	16533	16533	12912	9339	5718
R^2	.228	.228	.235	.249	.274

Notes: Dependant variable is return on sales. OS refers to number of overseas subsidiaries in logarithm; OS_dev/(_devel) refers to number of subsidiaries in developed/(developing) countries. 'Firm Age', 'Investment', 'Employment' and 'Total Assets' are in logarithm. All columns above include a full set of fixed effects, including sector, regional and country and year dummies. Values in parentheses are standard errors. Significance levels: *: 0.10; **: 0.05; ***: 0.01.

Table 6.16: Curvilinear M-P relationship

	A	D	F	G
	(1)	(2)	(3)	(4)
OS	.001*			
	(.0005)			
OS^2	.009***			
	(.002)			
OS_dev		.002***		.002
		(.0006)		(.002)
OS_dev^2		.005**		.016**
		(.002)		(.007)
OS_devel			.002*	-.0003
			(.0008)	(.002)
$OS\_developing^2$			.008***	.045***
			(.003)	(.011)
Investment	.006***	.006***	.006***	.007***
	(.0003)	(.0004)	(.0004)	(.0006)
Employment	-.013***	-.015***	-.015***	-.019***
	(.0005)	(.0006)	(.0007)	(.0009)
Total Assets	.014***	.014***	.013***	.015***
	(.0006)	(.0007)	(.0008)	(.001)
Firm Age	-.0002	.0003	-.0007	.0005
	(.0006)	(.0007)	(.0008)	(.001)
Foreign Ownership	.00008***	.00008***	.0001***	.0001***
	(.00002)	(.00002)	(.00003)	(.00004)
Const.	-.221***	-.204***	-.156***	-.260***
	(.020)	(.026)	(.030)	(.066)
Obs.	15712	12279	8869	5436
R^2	.171	.172	.191	.212

Notes: Dependant variable is return on sales. OS refers to number of overseas subsidiaries in logarithm; OS_dev/(_devel) refers to number of subsidiaries in developed/(developing) countries. OS^2, OS_dev^2 and OS_devel^2 are OS squared, OS_dev squared and OS_devel squared, respectively. 'Firm Age', 'Investment', 'Employment' and 'Total Assets' are in logarithm. All columns above include a full set of fixed effects, including sector, regional and country and year dummies. Values in parentheses are standard errors. Significance levels: *: 0.10; **: 0.05; ***: 0.01.

Chapter 7

Conclusions

7.1 A Summary

Since the middle of 1970s, studies on the literature about performance gains attributable to exporting and FDI have witnessed a considerable rise. However, the empirical findings are still unclear, and there is a large amount of heterogeneity across existing studies. Meta-analysis techniques used in this thesis are useful in this context as the many studies available tend to have different characteristics, including sampling and methodological heterogeneity that makes it difficult to discern clear patterns in their findings. Drawing on a new and global database that contains the characteristics of each study and its results, this PhD thesis finds that there are systematic relationships between the characteristics of each study and its results. In particular, the results indicate the impact of exporting upon productivity is higher in developing than in developed countries, an important result from the point of view of the economic analysis of globalization and economic policy in general. Global trade is undergoing consecutive annual growth in the period of 2000-2005. In particular, China has been undergoing a period of high economic growth and this is likely to be due, in part, to the massive levels of international trade. Drawing on more than 3,000 Chinese firms in the period of 2000-2005, we find the existence of export premium, and once the firm has entered there is additional productivity growth in post-entry period. The literature on the link between multinationality and firm performance has generally disregarded the role of location choices. However, such choices are particularly important as globalisation has been opening up new destinations for FDI. The new destinations opened up for FDI in developing countries typically exhibit considerable heterogeneity in their characteristics, including variables typically regarded as

important in terms of determining the success of the foreign venture. Drawing on a sample of 16,533 multinationals in the period 2000-2005 from 46 countries, the results indicate that multinational firms with more FDI presence in developing countries have significantly higher performance than developed countries.

In Chapter 2 by conducting a Meta-analysis of more than 30 studies that analyze the causal relationship between exporting and firm productivity, we find that the impact of exporting upon firm performance is higher in developing economies than in developed economies, a finding robust to a large set of different specifications. We also find that this 'learning-by-exporting' effect 1) is higher in the first year that firms start exporting than at later years; and 2) is lower when only matched firms are considered in the study. Moreover, there is no evidence of publication bias.

In Chapter 3 by using different econometric analysis, aiming at finding the evidence on performance gains attributable to exporting, on more than three thousand Chinese firms from 2000 to 2005, we find that 1) the export premium is obvious and once the firm has entered there is additional productivity growth in the entrant year; 2) the learning by exporting in the post-entry period is unclear, and 3) there is no evidence of the export premium and the entrant effect if only large firms are considered in the analysis. In Chapter 4 by using propensity score matching method and the difference in difference matching estimator on same Chinese firms as in Chapter 3, we find the evidence of export premium and once the firm has entered there is additional productivity growth from learning effect, while there is no evidence of export premium and weak evidence of learning by exporting (the significant productivity growth is only found in the second year after entry) if the sample is restricted to some largest firms. Research on the link

between exporting and firm performance in these two chapters indicate that there is the existence of export premium, and once the firm has entered there is additional productivity growth in post-entry period. The results are consistent with the findings in Kraay (1999), using a panel of 2105 Chinese industrial enterprises.

In Chapter 5 by conducting the same kind of Meta analysis on 51 papers that explore the linear relationship between multinationality and firm performance, it indicates that the relationship between multinationality and performance is higher 1) outside the United States; 2) when the accounting-based financial indicators were employed as firm performance (compared to market-based financial indicators); 3) when the degree of multinationality is measured by the ratio of foreign sales to total sales (compared to other indexes, such as the ratio of foreign subsidiaries to total subsidiaries); 4) when samples were retrieved from earlier surveys; 5) when the sample used in the paper was not restricted to large firms and 6) when the estimates were calculated using simple comparison tests rather than regression analysis. These findings are also shown to be generally robust to different specifications and to different weights, based on different rankings of the journals in which the estimates are published. Moreover, there is no evidence of publication bias. Equally important, surveying 14 papers and over 50 estimates that test curvilinear M-P relationships, we find that the evidence of curvilinear M-P relationship is misleading in some papers.

In Chapter 6 by using 16,533 multinational firms from 46 countries in the period of 2000-2005, we find a tight and positive correlation between multinationality and firm performance, while there are significant differences in firm performance associated with heterogeneous firm's abroad investments in developed and developing country locations. The correlation is higher when a firm

considers more FDI presence in developing countries. Equally important, our results indicate that the international expansion by its subsidiaries into developed countries is correlated with firm performance in an inverted U-shaped model, with the slope positive at low and medium levels of international expansions into developed countries, and negative at high levels. In contrast, the international expansion by its subsidiaries into developing countries is linear and positively correlated with performance. These results are robust to different specifications. Taken together, it suggests that firms in a high level of FDI presence in developed countries should consider more investments in developing countries. Our main result - geographical diversification into developing countries may be an important source of competitive advantages that lead to higher performance - is consistent with that of Pantzalis (2001).

7.2 Discussions

In this section we would like to discuss main results found in this thesis. Surveying all related studies that address the causal relationship between exporting and firm productivity, a recent survey (Wagner, 2007*a*) indicates that the evidence on this 'learning effect' is "mixed and unclear". Motivated by this survey, we did a Meta analysis on the same topic. We depart from this survey paper in one major aspect. The surveys could summarize the large literature written on one topic, give coherence to the complex, and serve as a springboard for new ideas; however they are hardly to explain the variations in results of a number of similar empirical studies concerned with one research topic (Stanley and Jarrell, 1989). Under the Meta analysis approach, we aim to understand if there are

any systematic relationships between the characteristics of each study and its results. Overall, our results emphasize the importance of access to international markets for the performance of firms from developing countries, and this is due to the greater distance to the technological frontier that tends to characterize such firms. Our results also support 'learning by exporting' models, in that they tend to suggest that the greater impact from exports will arise precisely when firms begin their internationalization process. On the other hand, the present state of knowledge does not allow one to disentangle other specific characteristics of developing countries from their level of development - longitudinal studies that relate the 'learning effect' across firms and their country's level of development will be useful in this respect. On a more technical level, the findings presented in our chapter suggest that one should be careful when comparing estimates from papers that adopt different methodologies: OLS/FE estimates and/or estimates based on matched samples are likely to indicate lower effects of exporting when compared to estimates based on different methodologies and/or non-matched samples, as non-matched samples are more diverse and less comparable than matched samples (when the sample is restricted to firms with similar matching values). We believe these results could rise further discussion in the literature.

In the period of 2000 to 2007 the trade flows across the world have increased from $ 6,230 to $ 12,170 billion. In percentage terms, the growth in volume of world merchandise exports on average is 5.5% (WTO, 2008). China has been undergoing a period of extremely high economic growth and this, in part, is due to the massive levels of trade. A membership in the WTO is expected to exert great impetus on the international trade and development of China's economy. In fact, Kraay (1999) has ever investigated whether firms learn from

exporting, using a panel of 2105 Chinese industrial enterprises between 1988 and 1992. It finds that these learning effects are most pronounced among established exporters. For new entrants to export markets, learning effects are insignificant and occasionally negative. In this PhD thesis, we believe that an updated research on performance gains attributable to exporting in the post WTO entry period is worth of note. China is a large market that exhibits a tougher competition, resulting in lower average mark-ups and higher aggregate productivity. Under this competitive market, large firms have a strong comparative advantage, including scale of economies, consumer preference and other advantages, and they can draw on a huge home market and do not have to take the additional risk and cost of international trade in order to gain from the economies of scale. However, small and medium firm's marginal cost is relative higher than large firms, and marginal revenue is lower. Moreover, they are constrained by the lower mark-ups in the integrated markets; therefore the performance gains attributable to trade may be higher in the sample of small and medium firm size than the sample of large size. Equally important, small and medium firms are in an advantageous position to capitalize on the learning opportune. It may be relatively easier to communicate, and obtain buyin, of learning as an object. Therefore, the performance gains attributable to exporting are higher in those small and medium Chinese firms. We believe this provides useful evidence that is particularly suited to the further analysis of trade and heterogeneous firms.

In Part II we move from exporting-performance research to multinationality-performance topic. Motivated by a recent survey (Li, 2007) that indicates that there have been inconsistent empirical findings on the M-P relationship as result of the sampling and methodological heterogeneity. In fact, there is a Meta pa-

per by Bausch and Krist (2007), which uses t-test to compare estimated result of papers with respect to different sampling and methodological heterogeneity. However, we think the Meta-analysis used their study could be improved. We follow the Meta-analysis approach by Stanley and Jarrell (1989), Card and Krueger (1995), Ashenfelter et al. (1999), Görg and Strobl (2001), Pereira and Martins (2004) and Martins and Yang (2009). Overall, our results emphasize the importance of expansions to overseas markets for the performance of firms in those countries outside the United State, in earlier years, and for small and medium firms. Firms outside the United States face the constraints of limited size of the domestic market and the upward shortage of resource, and performance gains from economies of scale by overseas expansions are higher than American firms. The market imperfection has been reduced, particularly as globalization affects more profoundly a wider set of countries, thus eroding the incentive to invest abroad. Therefore, the M-P relationship is getting weaker in recent years. Small and medium firms are in an advantageous position to capitalize on the learning opportunities. It may be relatively easier to communicate, and obtain buyin, of learning as an objective, and it fosters productivity once firms invest in overseas market. On a more technical level, the above findings presented in this thesis suggest that one should be careful when comparing estimates from studies that adopt different methodologies and sampling choices. We believe this provides useful evidence that is particularly suited to explain performance gains from FDI in recent trends.

The large empirical evidence on M-P relationship literature is almost exclusively focused within single countries, and the majority of existing studies have generally disregarded the role of location choices. Studies that consider foreign

location choices include Pantzalis (2001), Berry (2006) and Qian et al. (2008), while all these studies use firms from a single country in their analysis. Drawing on many thousands of multinational firms from 46 countries in the period of 2000-2005, in this thesis we aim to exam an important question whether performance gains from FDI different with respect to the location choice made by multinational firms. This could be an important contribution to the literature if we consider the country converge of our analysis. Overall, our results emphasize that the performance gains attributable to overseas investment is higher if a multinational firm considers more expansions into developing countries, which is consistent with findings in Pantzalis (2001). We believe that it makes it possible to develop a better understanding of foreign investment behaviour. Internationalization in the last 10 years has spurred more cross-border investments into developed and developing countries. Developing countries contribute at least as much as developed countries to the World inward FDI (UNCTAD, 2008), and performance gains attributable to inward FDI is larger when firm consider more overseas expansions into developing countries. There are abundant resources, less competition and local incentives by host countries. We also think it carries important implications for both policy and increasingly global nature of market. For example, it may help to explain why multinational firms tend to invest in developing countries to achieve their long-term plan of economies of scale. The result is also consistent with internalization theory that intangible assets are more valuable when the transfer occurs in developing countries where imperfection in markets are higher.

7.2.1 Restriction of data

One important issue is the quality of data in exporting chapters. Chinese firm-level data set from the annual report of industrial enterprises statistics compiled by the State Statistical Bureau of China (NBS), covering all state-owned firms and other types of firms with an annual turnover of over 5 million Renminbi (about US $ 0.6 million), is the most official dataset we are aware of to find the evidence of performance gains attributable to Chinese exporting. Although Chinese exports information in the Orbis dataset and World Bank Investment Climate Survey dataset is in the good quality, we plan to have a try on NBS dataset in future if we have this chance. The other issue is the causality effect from foreign direct investment on firm performance. As overseas operational data in the Orbis is cross-section in nature, the main limitation is that we cannot follow the multinationality changes during the sample period and data is not time-dimension. Therefore, we only could predict the relationship between these two constructs rather than the causality effect from foreign direct investment on firm performance. Constrained by limited information on overseas operational data across different years, all studies in this literature we are aware of only predicting the relationship between overseas direct investment and firm performance. However, a simple extension we plan in future would be to test for the stability of the results by repeating the tests for different years and examine the causality effect from overseas expansions on firm performance if we have the access to that information.

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