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General Statistics Office (GSO)

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FIRM-LEVEL TECHNOLOGY AND COMPETITIVENESS IN VIETNAM EVIDENCE FROM 2010-2014 SURVEYS

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Preface

This report summarises information from the Vietnam Technology and Competitiveness Survey (TCS) that has been conducted every year since 2010, concluding with 2014. The TCS has been a collaborative effort of the Central Institute for Economic Management (CIEM), the General Statistics Office (GSO) and the Development Economics Research Group (DERG) of the Department of Economics (DoE), University of Copenhagen.

The data used in this report is based on four survey rounds, and, with the addition of future rounds of the survey, aims to give researchers and policymakers a detailed understanding of the dynamics of technology, productivity and profitability of Vietnam's growing private sector. This report provides readers with an introduction to the main features of the dataset and an overview of the main trends among the firm from the manufacturing sector in Vietnam. As the report does not provide a complete description of the full range of information collected in all survey rounds, both interested readers and researchers are encouraged to review the survey questionnaire and explore the full survey dataset.

Acknowledgements

1. Introduction

The Vietnam Technology and Competitiveness Survey (TCS) is a part of the GSO Vietnam Enterprise Survey (VES) that focuses on enterprise innovation and technology. The questions about innovation and technology are administered to a subset of firms surveyed in VES (more details are provided in subsection 1.2). While VES provides general information about firm characteristics, financial accounts, production and output, the TCS collects firm-level data on topics ranging from corporate social responsibility to technology, investment and innovation. All enterprises included in the TCS are a part of the VES, which enables analysing not only the benefits and the use of technology but also firm performance depending on the level of technology.

This report focuses specifically on the panel data evidence generated from the 2010-2014 survey rounds, which, as the survey is backwards-looking, contain information about previous calendar years, that is, 2009-2013. In the remainder of the report, the year labels represent the year of the data, not the survey round unless it is explicitly stated that the year refers to the survey round. Descriptive reports containing information about each of the 2010-2013 survey rounds separately are available from the Central Institute of Economics Management (CIEM) in Vietnam, while the information about the 2014 survey round features only in this report.

The TCS re-interviews a consistent cross-section of firms each year, which has allowed a comprehensive panel dataset to be created. The longitudinal nature of the dataset and the level of detail in the information collected, represent a rare and valuable data source, enabling the analysis of changes within individual firms over time. This type of rich data source is unique not only for Vietnam but also for other emerging countries. The panel data give the possibility to look at the country's performance of manufacturing sector over time through a series of carefully chosen indicators.

The link between technology transfer and sustainable development has been promoted at the highest international governance levels. The Rio Declaration says that states should cooperate '… by enhancing the development, adaptation, diffusion and transfer of technologies, including new and innovative technologies' (UNEP, 1992). It is precisely the development of a country's innovative and technological capabilities that brings competitive edge in a market economy. Thus, policy tools to facilitate technology transfer cannot be considered in isolation from creation of appropriate climate for investment and economic development. This report therefore specifically looks at channels through which technology enters productive sector in Vietnam, be it through transfer from suppliers, customers and competitors, or through adaptation of existing technologies and innovation, that is, investment in research and development of new technologies.

1.1. Focus on Innovation

Investment in research and development (R&D), adaptation of new technologies and innovation by firms are regarded as crucial elements of sustainable economic growth (Fagerberg et al., 2010). Emphasis on these areas is evident from the examination of several indicators of competitiveness and innovation used in country-level and cross-country reports shown in Table 1.1. While the listed indicators focus mainly on calculations and ranking based on aggregate sector data, the TCS is focused on firm-level measures of

investments in technology innovation and corporate social responsibility. This allows an in-depth examination of the channels through which firms improve methods, processes and physical equipment used in production. Additionally, the survey examines the transfer of technologies and the spillovers in the productive economy. This gives a thorough overview of the levels of technology and competitiveness in Vietnam measured outside of the traditional indicators shown in Table 1.1.

The panel dimension of the dataset allows for a variety of longitudinal analyses. Policymakers can, for example, follow the pattern of changes over time within specific manufacturing sectors and firm categories in terms of technological development, or mutually compare different sectors and firm types in terms of technology transfers.

Table 1.1: Selected Innovation Indicators

Author	Indicator
Viet Nam Industrial Competitiveness Report 2011 (MoIT and UNIDO, 2011)	Manufacturing value added (MVA) per capita Manufactured export capacity Share in world manufactured exports Share of MVA in GDP Share of manufactured exports in total exports
The Industrial Competitiveness of Nations (UNIDO, 2013)	Manufacturing value added per capita Manufacturing export per capita Industrialisation intensity Export quality Impact of country on world manufacturing value added Impact of country on world manufactures trade
Science and Technology Innovation in Europe 2013 Edition (European Commission, 2013)	Research and development expenditure Science and technology workers Number & kind of innovative enterprises Number of patents Number of high-tech manufacturing and services enterprises
The Global Competitiveness Report 2014-2015 (World Economic Forum, 2014)	Environmental and social sustainability Internet penetration Quality of scientific institutions Company spending on research and development (R&D) Availability of scientists and engineers

1.2. The Vietnam Technology and Competitiveness Survey

The 2010-2014 surveys examined technology development and adaptation along six key dimensions summarised in Table 1.2. Development of the survey questionnaire was undertaken collaboratively by the Development Economics Research Group (DERG) of the University of Copenhagen, the GSO and the Central Institute of Economic Management (CIEM)[1] within the Ministry of Planning and Investment (MPI). The

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[1] With more than 100 full-time research staff in seven distinct research departments, CIEM is a leading producer of economic analysis and policy evaluation for the Government of Vietnam.

questionnaire was developed in English, but the survey was implemented in Vietnamese. The final version of the questionnaire was translated back into English to assure consistency of the survey instrument. [2]

The TCS is implemented as an additional part of the GSO's annual Enterprise Survey, for which the firms are sampled based on the 2005 census of all registered firms with 10 or more employees. In addition, only registered firms with more than 30 employees in 2005 from urban areas of Ha Noi and Ho Chi Minh City were included in the survey. The survey was carried out by approximately 300 enumerators in face-to-face interviews with enumeration completed by hand. The enumerators were guided by 75 supervisors. The data were digitised, extensively cleaned and checked for consistency.

Table 1.2: Structure of Survey Questionnaires

Section	Description
Taking stock of technologies and technological basis	Capturing the status-quo of the firm's level of technological investment and sophistication through questions about the age, cost, and type of current production technologies.
Input and supplier relations	The details of major suppliers' locations and the value of inputs obtained, differentiated across domestic and international suppliers.
Output and customer relations	The details of major customers' locations and value of outputs sold, differentiated between domestic and international customers.
Innovation and technology capacities	Diagnostic questions targeting the constraints affecting technology adaptation and level of the firms' investment in technology transfers or research and development.
Competitors	Number and location of competitors, and dimensions (cost / quality) along which competition occurs.
Corporate Social Responsibility (CSR)	Questions relating to formal and informal commitment to CSR practices.

1.3. Sampling and Cleaning

To prepare the data for the analysis, a standard set of procedures was applied to remove duplicate entries and non-responses. Consistency checks were also performed to exclude firms whose figures for assets and revenue were recorded as zero or missing, or whose figures for assets and revenue were inconsistent. The cleaned TCS module was combined with the data from the Vietnam Enterprise survey from 2010-2014 survey rounds, yielding a panel dataset with 38,731 observations and on average 7,746 firms per year. The balanced panel contains 25,110 observations and on average 5,022 firms per year.

The survey data are organised hierarchically by sector and location in which a firm operates. The firms located within a specific sector operate across 58 provinces and 5 major municipalities, 63 geographical units in total. The information about the firm location is used with a tax code to create the firm's unique identifier. In terms of size, firms are classified as micro, small, medium or large in line with the employee thresholds specified in Table 1.3.

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[2] Interested parties can obtain copies of survey instruments from the authors.

Table 1.3: Definition of Firm Size Categories

Size category	Number of employees
Micro	0–10
Small	10–50
Medium	50–300
Large	300 or more

Table 1.4 shows that the majority of the sample, 78% is made from small or medium firms, with only 15% categorised as large and 7% classified as micro-sized enterprises in the unbalanced sample. The share of large firms is 17% and the share of micro firms is 5% in the balanced sample, which implies a greater rate of firm creation and destruction among smaller enterprises. Even though the share of large firms in the sample is low, these firms employ 73% of workers from the sample, with other firm categories comprising the remaining 27%, both in unbalanced and balanced panel. These figures emphasise the need to examine the distribution of firm sizes and employees by firm size when analysing firm growth and employment.

Table 1.4: Sample Size Categories

	Micro		Small		Medium		Large		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
a) Unbalanced panel										
2009	275	0.71	3,112	8.03	3,089	7.98	1,169	3.02	7,645	19.74
2010	452	1.17	3,269	8.44	2,998	7.74	1,185	3.06	7,904	20.41
2011	603	1.56	3,355	8.66	3,130	8.08	1,164	3.01	8,252	21.31
2012	628	1.62	3,044	7.86	2,843	7.34	1,117	2.88	7,632	19.71
2013	711	1.84	2,829	7.3	2,666	6.88	1,092	2.82	7,298	18.84
Total	2,669	6.89	15,609	40.3	14,726	38.02	5,727	14.79	38,731	100
b) Balanced panel										
2009	123	0.47	2,061	7.93	2,238	8.61	859	3.31	5,281	20.33
2010	209	0.8	1,996	7.68	2,147	8.26	912	3.51	5,264	20.26
2011	278	1.07	1,968	7.57	2,031	7.82	897	3.45	5,174	19.91
2012	349	1.34	1,947	7.49	1,976	7.61	877	3.38	5,149	19.82
2013	434	1.67	1,909	7.35	1,894	7.29	877	3.38	5,114	19.68
Total	1,393	5.36	9,881	38.03	10,286	39.59	4,422	17.02	25,982	100

Firms are further compared in terms of their equity, which informs about firms' incentives and cost structure. Table 1.5 shows the categories of legal structure into which firms are categorised in response to the GSO's Vietnam enterprise survey questionnaire. These categories have been changing over the years (with some additional categories added in 2013 in particular), but the conversion and aggregation of categories between years is straightforward.

Table 1.5: Legal Structure Categories

Legal structure	Description
State-owned	Wholly state-owned

Collective	Cooperatively-owned and managed
Private enterprise	Domestically-owned private
Private limited liability	Domestically-owned, incorporated
Joint stock, no state	Publicly-held firm without government ownership
Joint stock, with state	Publicly-held firm with government ownership
Foreign (100%)	Wholly foreign-owned
JV foreign and state	Joint venture with government and FDI ownership
JV foreign and private	Joint venture with private and FDI ownership

Figure 1.2 shows the sample distribution in terms of nine legal structure categories. It is easily noticeable that private limited liability companies dominate the business environment, comprising around 40% of the firms in the balanced sample. Foreign-owned enterprises comprise around 20% of the sample, while private and joint stock firms without state involvement each comprise 15% of the sample. The share of firms in different categories has remained stable in the observed time period. Only a small rise is observed for joint stock firms without state capital whose share increased from 14.5% in 2009 to 16.3% in 2013, as shown in Figure 1.2.

Figure 1.1: Sample Distribution by Firm Legal Structure: Comparison of Balanced and Unbalanced Panel 2009-2013
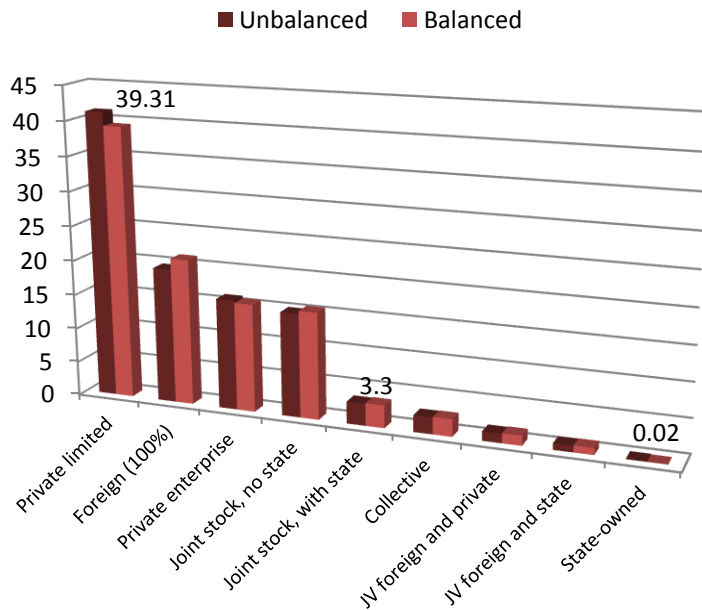
Note: Column labels are for the balanced panel, 2009-2013

Figure 1.2: Sample Distribution by Firm Legal Structure: Balanced Panel
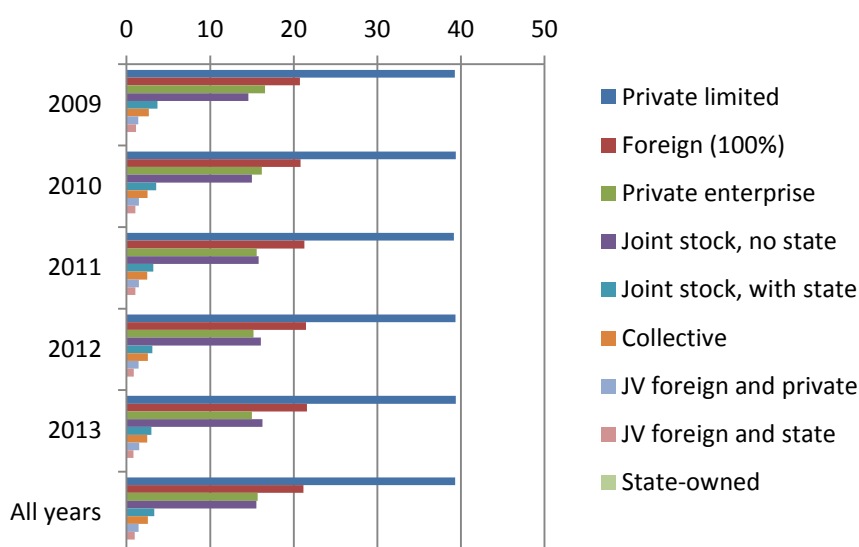
The data also contain information on the industry the firm operates in, based on the four-digit level from the Vietnamese Standard Industry Classification (VSIC) system. Table 1.6 shows the classification of the manufacturing sectors at the two digit-level, while Figure 1.3 provides a breakdown of the activities undertaken by surveyed firms in each manufacturing sector. In each individual survey round, the food and beverage production (VSIC 10) dominates, with 14% of manufacturing firms operating in this sector. Other well-represented sectors are fabricated metal (VSIC 25), non-metallic minerals (VSIC 23), rubber (VSIC 22) and apparel (VSIC 14), with fewest firms engaged in production of computers (VSIC 26), motor vehicles (VSIC 29) and pharmaceutical products (VSIC 21).

Table 1.6: VSIC 2007 2-Digit Sector Code and Description

Sector code	Sector description
10	Manufacture of food products
11	Manufacture of beverages
12	Manufacture of tobacco products
13	Manufacture of textiles
14	Manufacture of wearing apparel
15	Manufacture of leather and related products
16	Manufacture of wood and produces of wood and cork (except furniture, etc.)
17	Manufacture of paper and paper products
18	Printing and reproduction of recorded media
19	Manufacture of coke and refined petroleum products
20	Manufacture of chemicals and chemical products
21	Manufacture of pharmaceuticals, medicinal chemical and botanical products
22	Manufacture of rubber and plastics products
23	Manufacture of other non-metallic mineral products
24	Manufacture of basic metals
25	Manufacture of fabricated metal products, except machinery and equipment
26	Manufacture of computer, electronic and optical products

27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment n.e.c.
29	Manufacture of motor vehicles, trailers and semi-trailers
30	Manufacture of other transport equipment
31	Manufacture of furniture
32	Other manufacturing

In order to look at the data by region, key administrative units are combined into eight regions. In Vietnam, economic activity is concentrated in specific areas of the North and South leading to an uneven distribution across country. Figure 1.4 summarises firm activity by region. We observe that the economic activity mostly takes place in the Southeast, with 9,768 observations in this region. Slightly fewer observations (7,447) are from Red River Delta, which is consistent with the economic geography of Vietnam. The 2014 survey round included 2,706 firms (1,919 remaining in balanced panel) from the Southeast and 2,132 firms (1,427 remaining in balanced panel) from Red River Delta. Figure 1.4 also shows a slight upward trend in firm numbers in the Southeast and a slight decline in Mekong River Delta, South Central and North Central Coast.

Figure 1.3: Sample Distribution by Sector 2009-2013
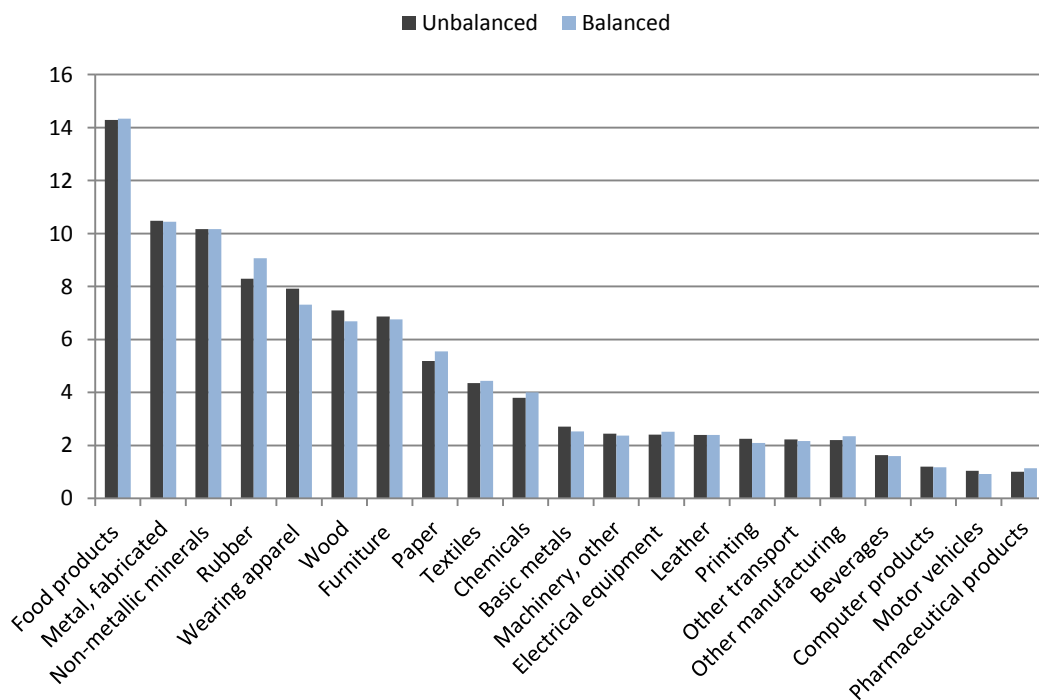
Note: Sectors with less than 10 observations are excluded from the figure (tobacco and refined petroleum).

Figure 1.4: Sample Distribution by Region (Balanced Panel)
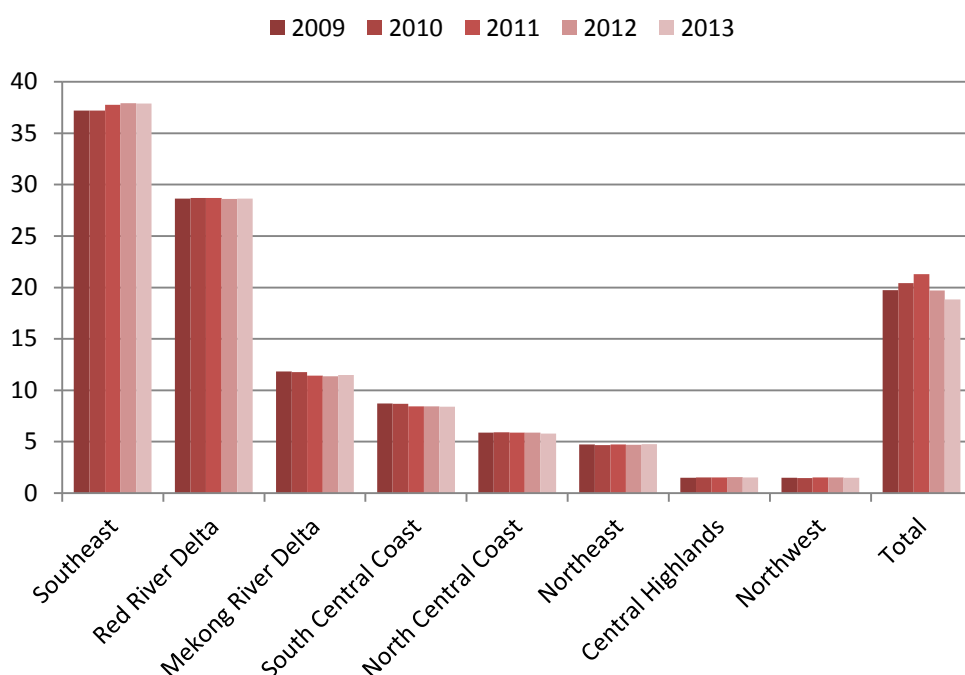
1.3.1 Firm Exit

Taking into consideration that dynamics are one of the key indicators of sector competitiveness and growth potential, this sub-section takes a closer look at the rate of firm exits. Low productivity firms are less likely to survive and prosper than their more efficient counterparts, raising the industry productivity in aggregate (Foster et al., 2008). Similarly, the entry of new firms in innovative sectors makes a contribution to aggregate productivity growth, while in mature industries productivity growth is driven more by within-firm efficiency improvements and by the exit of obsolete firms (O'Mahony and Vecchi, 2009).

Table 1.7 shows exit rates by firm size, legal ownership and location. Around 4% of all firms surveyed since 2009 have closed their business by 2013. This translates to the yearly exit rate of 0.92%. Above average exit probabilities were observed among small and medium firms, while micro and large firms show higher resilience to exit. This partly confirms earlier studies of Vietnamese non-farm enterprises, showing that smaller firms have lower likelihood of survival (Hansen et al., 2009; Vijverberg and Haughton, 2004).

Table 1.7: Exit Rates by Size, Legal Ownership and Location, 2009-2013

		Number	Percent
Year			
	2009	1,230	16.09
	2010	184	2.33
	2011	219	2.65
	2012	6	0.08
	2013	9	0.12
Size			
	Micro (1-9 employees)	171	6.41
	Small (10-49 employees)	723	4.63
	Medium (50-299 employees)	552	3.75
	Large (300 and above employees)	202	3.53

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Legal			
	State	14	4.72
	Joint stock, with state	62	5.25
	Collective	39	3.47
	Private enterprise	237	3.52
	Private limited	767	2.66
	Joint stock, no state	209	1.83
	Foreign (100%)	277	1.75
	JV, state and foreign	21	5.38
	JV, private and foreign	22	4.72
Region			
	Southeast	684	35.0
	Red River Delta	592	4.98
	Mekong River Delta	156	4.07
	Northeast	69	3.82
	Northwest	18	4.81
	North Central Coast	38	3.58
	South Central Coast	53	3.65
	Central Highlands	38	5.80
Total		1,648	4.25

Note: Mean estimates of exit rates (unweighted).

Looking at legal status, it can be seen that private limited companies, followed by fully foreign-owned companies, had higher exit rates than other legal ownership types in the observed period. Disaggregation by firm location shows that firms located in Southeast and Red River Delta regions were much more likely to exit than their counterparts located in other areas of Vietnam.

As Table 1.8 illustrates, there are sizeable differences between sectors in terms of exit. It is visible that, compared to other sectors, food processing (VSIC 10) has the highest exit rate. The second highest turnover rate is observed in sectors for fabricated metal products (VSIC 25) and apparel (VSIC 14). The findings tell that larger sectors have higher exit rates, but there are few exceptions, such as paper (VSIC 17), chemicals (VSIC 20) and basic metals (VSIC 24), which show lower than expected exit rates considering the size.

Table 1.8 Exit Rates by Sector, 2009-2013

Sector code	Sector description	Number	Percent	Total number
10	Food products	218	3.94	5,533
11	Beverages	33	5.21	633
13	Textiles	75	4.45	1,686
14	Wearing apparel	165	5.38	3,066
15	Leather	43	4.62	931
16	Wood	122	4.44	2,749
17	Paper	68	3.38	2,011
18	Printing	48	5.50	872
20	Chemicals	56	3.8	1,473
21	Pharmaceutical products	10	2.58	388
22	Rubber	129	4.02	3,212
23	Non-metallic minerals	124	3.15	3,935
24	Basic metals	41	3.91	1,049

25	Metal, fabricated	177	4.36	4,059
26	Computer products	28	6.03	464
27	Electrical equipment	40	4.28	934
28	Machinery, other	51	5.40	945
29	Motor vehicles	20	4.99	401
30	Other transport	63	7.32	861
31	Furniture	97	3.64	2,662
32	Other manufacturing	37	4.35	851
	Total	1,648	4.25	38,731

Note: Unbalanced panel. Sectors with less than 10 observations are excluded from the table (tobacco and refined petroleum). Sector codes are from the Vietnamese Standard Industrial Classification (VSIC).

Next, we investigate how traditional determinants affect firm exit probabilities. Table 1.9 shows the rates of exit by the number of years since a firm started to operate. For the ease of exposition, the firms have been categorised in five groups where the first group contains firms that have been operating for more than 31 years; the second group comprises firms with 21 to 30 years of experience; the third group contains firms established 11 to 20 years ago; the fourth group comprises firms with six to 10 years of business experience and the fifth group contains new entrants, defined as firms operating for five years or less. Sorting the firms in this way has allowed identifying unusually low exit rates among the new entrants, whereby only 4% of all exits can be attributed to these firms. This finding is contradictory to the existing literature, which maintains that young firms (defined as firms operating one to five years) tend to have lower likelihood of survival (Ericson and Pakes, 1995; Hansen et al., 2009; Jovanovic, 1982). Our findings, however, may serve as an evidence of higher determination of new entrants to succeed in light of weak outside options for firm owners.

In our sample, the exit is highest among the firms that were established 11 to 20 years ago. These firms account for just over one third of all exits in our sample. Firms starting business six to 10 years ago appear to be as vulnerable to exit as firms that operate for more than 31 years. Almost one third of exits took place in these firm age categories. Further on, our sample shows high resilience to exit of firms operating between 21 and 30 years. Apart from this firm age category, the data show that a threat of exit appears after firms have been doing business for six or more years. This result is not in accordance with previous studies showing that household enterprises in Vietnam have higher probability of survival the older they are (Vijverberg and Haughton, 2004).

Table 1.9: Exit Rates by Years of Operation

	No	Yes	Total
Operating more than 31 years	8,974	500	9,474
	(23.33)	(29.12)	(23.58)
Operating 21 – 30 years	1,445	51	1,496
	(3.76)	(2.97)	(3.72)
Operating 11 – 20 years	15,289	586	15,875
	(39.75)	(34.13)	(39.51)
Operating 6 – 10 years	12,458	510	12,968

	(32.39)	(29.7)	(32.28)
Operating less than 5 years	293	70	363
	(0.76)	(4.08)	(0.9)
Total	38,459	1,717	40,176
	(100)	(100)	(100)

Note: Percentages are shown in parentheses.

Apart from measuring the number of firms that have ceased to operate, firm turnover can be measured by sector switching. Especially in developing countries, firms have been shown to switch the sector in which they produce as a part of their survival strategy (Newman et al., 2013). Overall, our sample shows that the share of switching between different sectors was around 3% in the past four years. The sectors with highest prevalence of switching were fabricated metal, furniture, wood and rubber. The sectors with least rate of switching were food processing, leather and non-metallic minerals. Newman et al. (2013) have found that firms who switch to production in a different sector tend to be less productive and smaller, but more labour-intensive than their counterparts in the sector which they are leaving.

Table 1.10: Sector Switching, 2010-2013

	2010		2011		2012		2013		All years		Total
	Number	Share	Number	Share	Number	Share	Number	Share	Number	Share	Number
Food products	6	0.65	3	0.30	4	0.38	2	0.19	15	0.37	4,004
Textiles	23	8.49	25	8.01	9	2.75	9	2.81	66	5.37	1,230
Wearing apparel	13	2.69	16	2.95	11	1.87	5	0.88	45	2.06	2,180
Leather	13	7.22	0	0.00	0	0.00	0	0.00	13	1.96	664
Wood	27	6.35	28	5.52	15	2.83	10	1.95	80	4.05	1,974
Paper	10	2.99	12	3.24	5	1.27	6	1.55	33	2.22	1,488
Printing	11	7.75	5	3.11	4	2.41	5	3.29	25	4.03	621
Chemicals	13	5.51	10	3.76	6	2.09	4	1.39	33	3.07	1,076
Rubber	22	4.01	29	4.94	18	2.91	13	2.17	82	3.48	2,353
Non-metallic minerals	6	0.92	6	0.83	4	0.52	1	0.14	17	0.59	2,884
Basic metals	11	6.59	9	4.57	11	5.31	6	3.06	37	4.82	767
Metal, fabricated	26	4.17	43	5.78	25	3.17	13	1.72	107	3.67	2,912
Computer products	10	13.89	6	7.32	2	2.38	5	5.81	23	7.10	324
Electrical equipment	11	7.53	9	5.17	5	2.69	3	1.67	28	4.08	686
Machinery, other	16	11.11	16	9.41	10	5.71	9	5.03	51	7.63	668
Motor vehicles	14	24.14	17	20.73	2	2.38	5	6.49	38	12.62	301
Furniture	31	7.60	41	8.45	18	3.32	15	2.87	105	5.37	1,957
Other manufacturing	13	9.35	11	6.79	5	3.14	6	3.73	35	5.64	621
Total	288	4.59	300	4.24	158	2.11	126	1.74	872	3.11	28,053

Note: Unbalanced panel. Sectors with less than 10 observations are excluded from the table (tobacco, refined petroleum, beverages, other transport and pharmaceutical products)

These results are explored further in Table 1.11 that shows the results of a probit estimation for determining exit probabilities of firms in the Vietnamese manufacturing industries using the correlates of location, legal ownership form, sector and size. The expected negative relationship between firm size and probability of exit is readily observed. Non-micro firms have 3-4% lower probability of exit than micro-sized firms. This corresponds well with the results obtained in most of the studies on firm dynamics. The effect is well determined in specifications with and without sector controls.

Then, looking at other firm characteristics, it is visible that ownership structure also appears to be important factor in firm exit. Private limited companies and all types of enterprises with state involvement show higher likelihood of exit compared to foreign-owned enterprises when size differences are taken into account. Location also significantly determines firm exit. All regions except Red River Delta and Central Highlands show higher exit probabilities than Southeast. The similarity in exit rates between Red River Delta and Southeast is conceivably due to high competitive pressures in Ho Chi Minh City and Hanoi. Indeed, higher competition in urban areas was found in previous studies on SMEs in Vietnam (Hansen et al., 2009). The same rate of exits in Central Highlands reflects perhaps the lack of extensive business opportunities. As compared to the base sector (food processing), exits are more likely only in tobacco and wearing apparel sectors and less likely in the production of non-metallic mineral, pharmaceutical and paper products, when controlling for size, location and legal structure (not reported). However, note that these traditional determinants explain only 2-3% of the variation in exit probabilities.

Table 1.11: Exit Determinants

		Exit (without sector)		Exit (with sector)	
		Marginal effects	z-stat	Marginal effects	z-stat
Firm Size	Small	-0.026***	(0.005)	-0.025***	(0.005)
	Medium	-0.041***	(0.005)	-0.041***	(0.005)
	Large	-0.043***	(0.006)	-0.046***	(0.006)
Ownership	State	0.164***	(0.023)	0.154***	(0.024)
	JSC with state involvement	0.024***	(0.007)	0.029***	(0.007)
	Collective	0.006	(0.009)	0.009	(0.009)
	Private enterprise	0.001	(0.005)	0.003	(0.005)
	Private limited	0.012***	(0.004)	0.013***	(0.004)
	JSC without state	0.003	(0.005)	0.006	(0.005)
	JV state and foreign	0.028**	(0.012)	0.030**	(0.012)
	JV private and foreign	0.008	(0.011)	0.008	(0.011)
Region	Red River Delta	0.003	(0.003)	0.001	(0.003)
	Mekong River Delta	-0.020***	(0.005)	-0.021***	(0.005)
	Northeast	-0.019***	(0.006)	-0.020***	(0.006)
	Northwest	-0.037***	(0.011)	-0.036***	(0.011)
	North Central Coast	-0.050***	(0.008)	-0.049***	(0.008)
	South Central Coast	-0.054***	(0.007)	-0.054***	(0.007)
	Central Highlands	0.001	(0.009)	0.000	(0.009)
	Sector controls	No		Yes	
	Observations	31,433		31,424	
	Pseudo R^2	0.024		0.028	

Note: Base categories are micro enterprises, foreign enterprises and Southeast region.

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2. Technology and innovation policies in Vietnam

An extensive legal framework in Vietnam supports scientific activities, innovations and technology transfer, so the objective of this section is to give an overview of relevant policies. A broad range of policies suggests that government supports transfer of scientific and technological activities, particularly linked with foreign investments.

Industrialization and modernization of Vietnam have been an inseparable part of the socio-economic development agenda since the political and economic reforms in late 1980s. These tendencies are embodied in the Science and Technology Development Strategy 2011-2020, which voices Vietnam's determination to base the sustainable development of the country on science and modern technology. The strategy promulgates increase of investment in science and technology at the level of 1.5% of GDP by 2015 and over 2% by 2020 (Government of Vietnam, 2012).

The Law on Technology Transfer in 2006 (National Assembly, 2006) and the Law on High Technology from 2008 (National Assembly, 2008) set forth the legal framework for the involvement of foreign investors and high-technology activities, ranging from manufacturing and production to education and training. The Decision No. 677/QD-TTg from 10/05/2011, approves the national technological renewal program through 2020 (Government of Vietnam, 2011). Some of the goals set forth include: upgrading technology at a rate of 15% per year; mastering advanced production technology and training 80,000 engineers, technicians and managers who are employed in SMEs in technology management and administration.

Further support for scientific and technological activities is embodied in the Law on Science and Technology from 18/06/2013 (National Assembly, 2013a) and the Decree No. 87/2014/ND-CP from 22/09/2014 on attraction of scientists from overseas (National Assembly, 2014a). The Law on Science and Technology (2013) stipulates the financial support from the state budget for implementing science and technology activities. Firms can receive financial support of up to 30% of total investment if they implement projects which apply scientific results to create new products or to increase productivity, product quality and product competitiveness. The same activities can result in recuperation of 50% of total investment costs for projects in disadvantaged socio-economic regions or up to 50% of total investment costs for projects that carry out national-level science and technology tasks in target areas.

In addition, the International Technology Search and Transfer Programme, issued according to Decision No. 1069/QD-TTg from 04/07/2014, aims to put responsibility for technology transfer to a network of experts, which are to search globally for advanced technologies, transfer and apply them in Vietnam (National Assembly, 2014b). The emphasis is on technologies for new product and service development, increase of productivity and quality of goods produced by Vietnamese enterprises.

The National Technology Innovation Fund was established in the Inter-Ministerial Circular No. 120/2014/TTLT-BTC-BKHCN from 25/08/2014 issued by the Ministry of Finance and the Ministry of Science and Technology. The Fund has a charter capital of VND1 trillion from the state budget and it finances scientific and technological research conducted by enterprises, imports of technologies and hiring of experts for research (National Assembly, 2014c). Approximately one half of total funds are set to be used for guaranteeing loans or lending with the goal to contribute to enhancing the innovation among Vietnamese businesses.

Firms who are established and operated under Vietnamese laws and who decide to use own equity for innovation and transfer of technologies can benefit from a deduction of a maximum of 10% of their taxed income to form a science and technology development fund (Article 17, Law on Corporate Income Tax) or a deduction of up to 10% of the income tax for depreciation of equipment attributed to technology investment. Other forms of support for technology transfer can be seen in beneficial rates of value-added tax, export-import tax and corporate income tax, as stipulated in the Law on Investment (National Assembly, 2005) and the Law on Corporate Income Tax (National Assembly, 2013b).

Overall, the increasing number of new policies to support firms reflects the urgency of accelerating technology transfer and innovation in Vietnam. As subsequent chapters of the report will demonstrate, the policies on science, innovation and technology transfer have unfortunately had only a limited reach in the everyday activities of Vietnamese enterprises. The majority of firms included in the TCS still carry out technology innovation and improvement with their own equity, indicating no relevant changes compared to previous years, even though the National Technology Innovation Fund has come into effect. It is expected, however, that the technology transfer from FDI projects into Vietnam could improve in the coming years with larger focus on partnerships with other Asian countries. The analysis of the reach and the efficiency of such initiatives requires a more comprehensive study in the future.

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3. Technology and Competitiveness: Evidence from the 2010-2014 Survey Rounds

Technological progress raises the potential for economic growth by increasing the availability of a wider number of new products and production processes for which the role of private sector investment in innovation and new technologies cannot be overemphasized. While firms may be aware of the benefits from innovation, they may lack the capacity and resources to put in place technological improvements, such as updating equipment and machinery. Figure 3.1 thus shows an overview of the constraints faced by firms in improving their economic performance. The figure captures responses from over seven thousand firms repeatedly surveyed since 2010.

The constraints that the surveys focused on comprise financial and human capital issues, as well as some macroeconomic issues, such as basic infrastructure. Categories of constraints that were looked at stayed the same over the years with the exception of 2010 survey, leaving the 2009 data without the information about constraints. Firms were asked to assess constraints to the economic performance they face on a ten-point scale and the overview of the scores is shown in Figure 3.1. The temporal aspect of the dataset allows observing changes in perceptions that took place over time. First to note is that financial constraints dominate, with the average score around six in all years, followed closely by the lack of skilled labour and access to equipment. Second, there is a very slow movement of scores within each category with only one exception: The latest values for basic infrastructure constraints are lower than in 2010. Finally, firms do not seem gravely constrained by labour availability, or deficiencies in transport and communication infrastructure.

While the results show slight improvements in relieving the basic infrastructure constraints, it appears that the most important constraints for economic performance of firms in Vietnam remain unresolved for years. Whether this will be the case in the future depends on the potential of policies to cater for the needs of firms who operate in Vietnam.

Figure 3.1: Constraints on Firms' Economic Performance
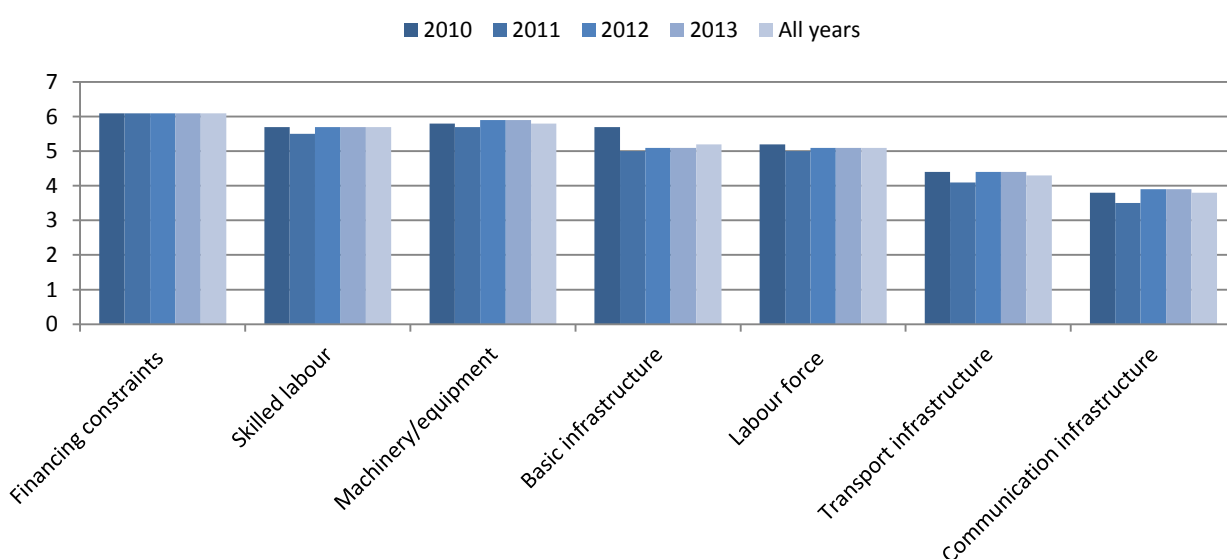
Note: The figure is based on the unbalanced panel data. The relationships also hold for the balanced panel.

The information provided in Figure 3.1 gives simple averages of the range of challenges faced by firms in our sample. These averages fall short of giving adequate information about the factors affecting firms' perceptions of the constraints and the concentration of constraints within particular segments of firms. The effects of the constraints on firms can be analysed successfully in a regression framework. Such an analysis provides results that can correctly inform policymakers.

Table 3.1 shows the regression of the average score for constraints reported by each firm against factors that could explain those constraints. Coefficients of interest and their standard errors are shown one over another and they are reported relative to the base categories of micro-sized, wholly foreign-owned firms in Ho Chi Minh City. The basic specification is in column one, while the second and the third column include additional controls for region- and sector-specific effects. This approach allows observing the effect of firm characteristics on total constraints regardless of the sectors and regions firms operate in. Columns (4) to (6) show the analysis performed on a balanced panel with and without the inclusion of relevant region and sector controls.

Table 3.1: Determinants of Firm Constraints (Marginal Effects)

	Unbalanced panel			Balanced panel		
	(1)	(2)	(3)	(4)	(5)	(6)
Small	0.109	0.117	0.113	0.133	0.183*	0.179*
	(0.077)	(0.074)	(0.074)	(0.113)	(0.107)	(0.107)
Medium	0.371***	0.415***	0.411***	0.483***	0.586***	0.571***
	(0.083)	(0.081)	(0.081)	(0.120)	(0.115)	(0.115)
Large	0.625***	0.670***	0.671***	0.681***	0.795***	0.773***
	(0.099)	(0.096)	(0.099)	(0.134)	(0.130)	(0.133)
State-owned	0.192	0.151	0.073	-0.914**	-0.574	-0.432
	(0.566)	(0.588)	(0.614)	(0.409)	(0.352)	(0.323)
JSC with state involvement	0.463***	0.394***	0.392***	0.457***	0.428***	0.454***
	(0.130)	(0.131)	(0.133)	(0.162)	(0.165)	(0.167)
Collective	0.477***	0.237	0.221	0.453**	0.347*	0.331*
	(0.153)	(0.150)	(0.152)	(0.195)	(0.194)	(0.195)
Private enterprise	0.247***	0.154*	0.139	0.196*	0.140	0.119
	(0.083)	(0.084)	(0.088)	(0.106)	(0.108)	(0.113)
Private limited	0.390***	0.382***	0.371***	0.341***	0.353***	0.336***
	(0.068)	(0.069)	(0.072)	(0.084)	(0.086)	(0.089)
JSC without state	0.542***	0.451***	0.442***	0.507***	0.431***	0.435***
	(0.078)	(0.081)	(0.084)	(0.096)	(0.101)	(0.105)
JV state and foreign	0.238	0.117	0.111	0.270	0.175	0.178
	(0.233)	(0.229)	(0.231)	(0.276)	(0.266)	(0.270)
JV private and foreign	-0.261	-0.267	-0.268	-0.281	-0.255	-0.245
	(0.177)	(0.183)	(0.183)	(0.218)	(0.226)	(0.226)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Province	No	No	Yes	No	No	Yes
Sector	No	Yes	Yes	No	Yes	Yes
Observations	32,081	32,081	32,081	20,753	20,753	20,753
Pseudo-R^2	0.003	0.014	0.015	0.004	0.015	0.015

Note: Tobit estimates, left censored. Base categories are micro enterprises, foreign enterprises and Ho Chi Minh City. Sector effects are at 2-digit level. Coefficients on constant term not reported. Robust standard errors clustered at the firm level are in parentheses, * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

The results of the regression analysis show that firm size seems to matter for the severity of constraints experienced. In particular, large firms tend to express higher discontent with the impediments to the economic performance than all other firm categories. As large firms employ over 70% of workers in our sample, the insight into the constraints presents a valuable input for policies targeted at improving the position of these firms, especially given their importance for job creation. Firm's legal structure is also important, with private companies, private limited liability firms and joint stock companies with and without state involvement mentioning more constraints. As around 40% of firms are private limited liability firms, specific policy targeted at these companies could also be appropriate. The results hold when location and sector are controlled for. The analysis performed on the balanced panel confirms the results from the unbalanced panel with just one exception. The balanced panel result from column (4) shows that state-owned enterprises face fewer constraints than private enterprises, but the coefficient becomes insignificant when the effects of sector and region are controlled for. Year dummies are significantly different from zero for all years, indicating more severe constraints faced by firms compared to 2009 (coefficients not reported).

This section has shown that a lot of firms perceive themselves to be constrained, but one single type of constraints cannot be isolated. The policy message of the findings is a need for a multidimensional set of actions aimed simultaneously at several types of constraints. While the implementation of such an approach may be challenging, it is likely that it can improve firm performance in different sectors and areas of the country at the same time.

3.1. Technology Transfer

Firms can attribute a large share of their success to innovation and creation of higher value added products, which can be greatly facilitated through transfer of technology among firms operating in a specific sector or location. Technology transfer can take several forms: from gaining knowledge about better production processes to purchase of advanced machinery and equipment. If these increase productivity,[3] firms can produce more efficiently, compete better and produce higher quality goods, ultimately improving wages and work conditions. Technology transfer can take several directions: forward, backward and horizontal, as indicated in Table 3.2 and it is usually associated with interactions with foreign firms (Harding and Javorcik, 2012; Javorcik, 2008). Engaging with foreign firms and international customers may encourage transfer of specific types of behaviour to domestic producers, including socially responsible practices.

The importance of backward linkages for the transfer of new knowledge and technology has been previously documented. In this way, domestic firms can achieve gains in productivity (Haskel et al., 2007). They are also incentivized to improve the quality of their inputs and final goods (Javorcik, 2004). A study on Vietnamese firms shows a significant variation in technology transfer across regions with a strong positive impact of backwards spillovers in the Red River Delta, South Central Coast, South East and Mekong River Delta and negative or insignificant impacts in all other regions (Anwar and Nguyen, 2013).

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[3] The evidence is available in, for example, Aitken and Harrison (1999), Javorcik (2004), De Loecker (2007; 2013), Arnold and Javorcik (2009) and Newman, Rand, Talbot and Tarp (forthcoming).

There is also a solid amount of evidence on the importance of forward linkages in providing technological improvements. Through interaction with foreign suppliers, domestic firms learn and become more productive if the inputs sourced from foreign firms are advanced and accompanied by services or other forms of support (Grossman and Helpman, 1993; Javorcik, 2004). Using the TCS 2010 to 2012, Newman et al. (forthcoming) find evidence of productivity spillovers from FDI through forward linkages from foreign input suppliers, attributing the part of this spillover to technology transfers from FDI to domestic firms.

The existing literature is, however, still looking for unambiguous empirical evidence on horizontal spillovers from FDI. Gorodnichenko et al. (2014) found limited benefits from horizontal spillovers for older firms in service sectors. A recent meta-analysis comprising firms from 45 countries shows that horizontal spillovers are on average zero, but highly dependent on the characteristics of the domestic economy and foreign investors (Irsova and Havranek, 2013).

Table 3.2: Types of Technology Transfer

Direction	Description
Forward linkage	The firm based in Vietnam is a customer. Technology is transferred from suppliers.
Backward linkage	The firm based in Vietnam is a supplier. Technology is transferred from customers.
Horizontal linkage	The firm based in Vietnam is a competitor. Technology is transferred from a foreign firm or a foreign-owned domestic competitor to the firm based in Vietnam.

The TCS gathers information on the prevalence and the importance of five different technology transfer channels in Vietnam, asking the surveyed firms to rank the technology transfer channels on a 10-point scale. The five different channels include: *embodied technology*, which refers to purchase of new equipment or machinery; *purchase*, indicating that firms have bought technology, such as licensing rights to a new production process; *group*, where technology transfer originated from an entity within the firm; *supplier/customer* technology transfer and *new employees*, capturing gains in human capital from employing workers with knowledge and skills acquired in previous occupations that can be transferred to the new employer.

Figure 3.2 shows the average ranking scores of the most important technology transfer channels. It is easily visible that purchase of any form of embodied technology, whether it is goods, machinery or equipment, is the most relevant technology transfer channel. Technology in the form of skills and experience absorbed from new employees also plays an important role. The time dimension of the dataset enables observing that the technology transfer sources have not changed to a large extent over the past five years. The only exception is the role of new employee skills and experience, which has peaked in 2012, but declined in importance afterwards compared to embodied technology. It therefore appears that firms perceive both physical technology transfers and horizontal spillovers to be the highly beneficial in improving productivity.

Figure 3.2: Ranking of Transfer Channels by Year
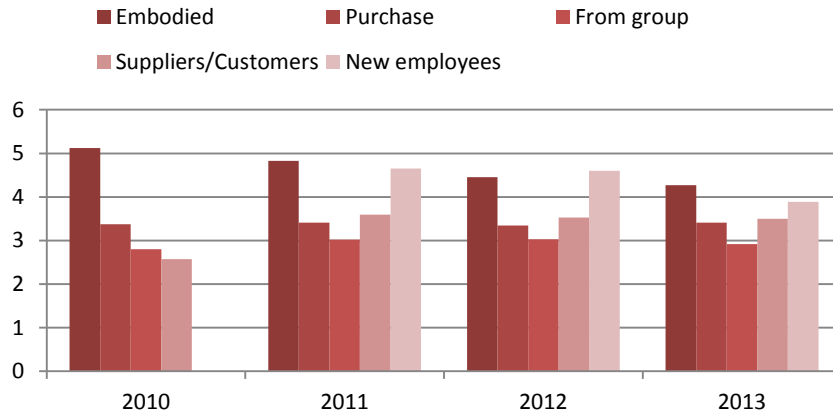
Note: The question about technology transfer from new employees was introduced in 2011, so the data are not available for 2010. Balanced panel.

Figure 3.3 summarises the average importance of each technology transfer channel by firm size and Figure 3.4 does the same by firm legal structure. It is easily noticeable that the importance of each type of technology transfer varies depending on firm size and type. As in the yearly values, technology transfer from embodied technology dominates, followed closely by transfers from shareholders or other entities within same group. This especially holds for micro and small firms, for which other channels do not have as high influence. Large firms show greatest ability to use technology from different sources together. These firms have almost identical values for embodied technology and group transfers. Transfer of technology from suppliers is also more relevant for large than other firms, which is consistent with the results found in Newman et al. (forthcoming).

Figure 3.3: Ranking of Transfer Channels by Firm Size
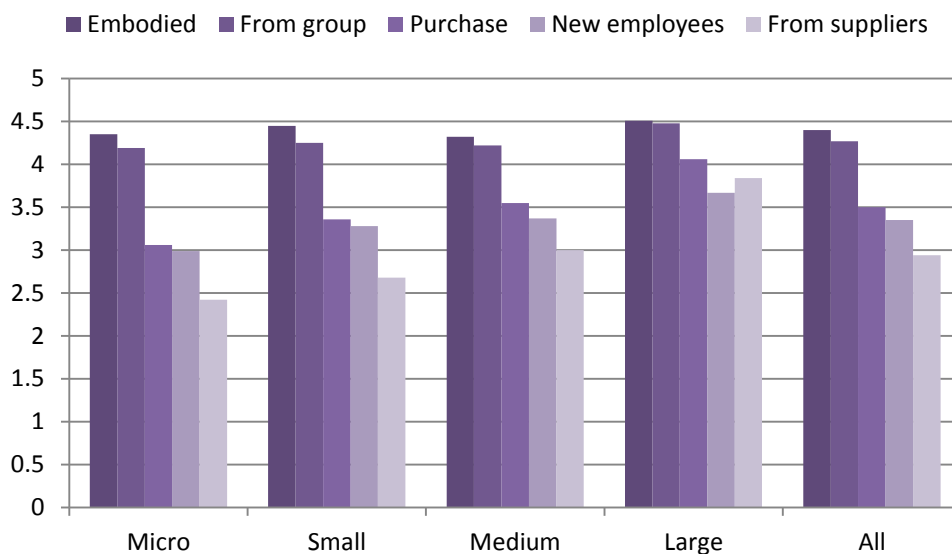
Note: The figure is based on the unbalanced panel data. The relationships also hold for the balanced panel.

In terms of legal ownership, joint stock companies lead in terms of embodied technology transfer. These firms together with collectives, private and foreign firms tend to source technology from suppliers to a greater extent than other firm types. Foreign companies and joint ventures between foreign and state investors stand out as they rely on technology purchase more than other firm categories.

Figure 3.4: Ranking of Transfer Channels by Legal Structure
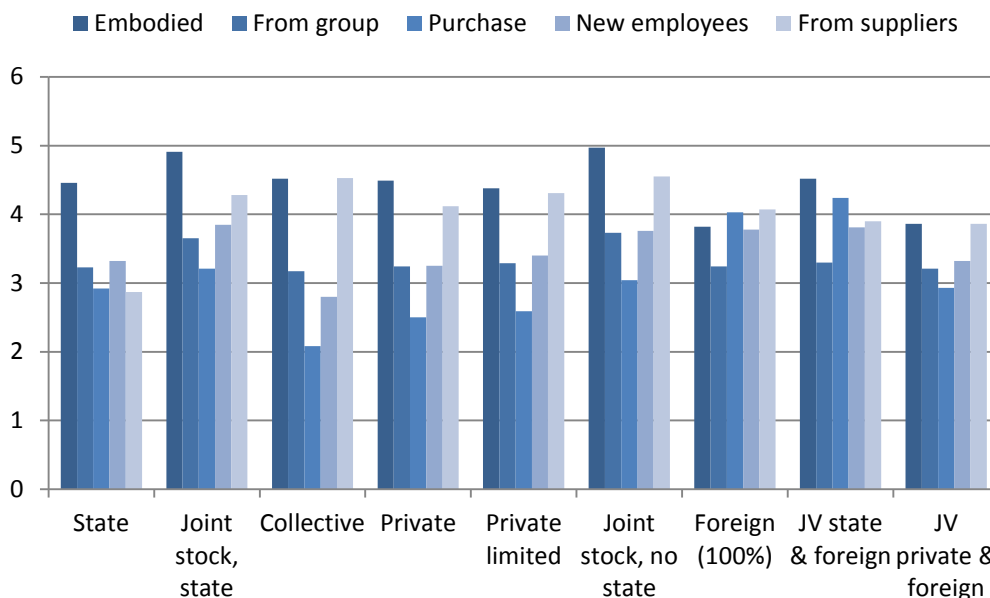
Note: The figure is based on the unbalanced panel data. The relationships are preserved in the balanced panel.

3.2. Horizontal Spillovers

The presence of foreign firms is usually associated with the know-how transfers to domestic firms operating in the same sector. These transfers or horizontal spillovers occur through three channels: competition effect, demonstration effect and labour turnover.[4] The competition effect works through competitive pressure brought by foreign firms, whereby domestic firms get forced to use their inputs more efficiently, which raises their productivity. The demonstration effect appears when foreign firms bring more advanced technology, which domestic firms imitate or adopt. Finally, the labour turnover arises from the interaction of foreign firms with local labour force through training and experience with modern technology that can later be taken to domestic employer. Looking at the importance of FDI on technical efficiency of Vietnamese firms, Nguyen et al. (2008) find limited evidence of labour turnover, but strong evidence of competition and demonstration effects. Newer evidence, however, casts doubt on the existence of horizontal spillovers among manufacturing firms in Vietnam (Newman et al., forthcoming), which is consistent with much of the international literature on this topic. The lack of horizontal spillovers could be a consequence of direct competition between foreign and domestic firms, having strong incentives to prevent technological advantage of their local competitors.

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[4] Irsova and Havranek (2013) and Gorodnichenko et al. (2013) provide an excellent overview.

Spillovers are a common rationale for the tax break policies, which are put in place to attract FDI in expectation that domestic firms in the same sectors benefit from knowledge brought by foreigner investors. Thus, we look at the extent to which reported technology transfers through embodied technologies and new employees originate from foreign firms operating in Vietnam or from other domestic producers. This information is shown in Figure 3.5.

Figure 3.5: Main Supplier of Technology
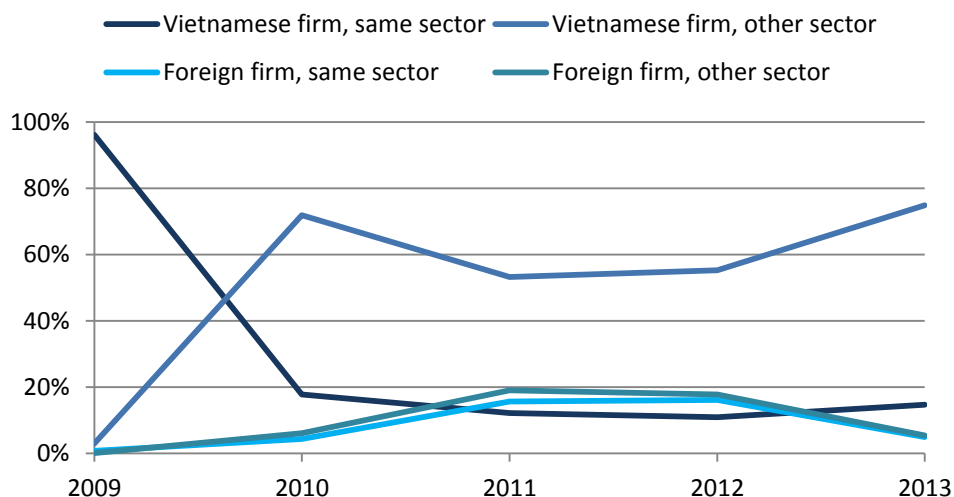
It is evident from the figure that technology advancements usually come from other domestic firms. Slightly over 80% of technology transfers took place between domestic firms in the past five years, if both firms from the same and different sectors are taken into consideration. Foreign firms in the same and other sectors have been responsible for just below 20% of technology transfers to domestic firms in the observed period. Some changes between years are apparent. While only 1% of technology came from foreign firms in 2009, foreign firms became responsible for 10% of technology transfers in 2013. Transfer from foreign firms rose to 35% in 2011 and 2012, but it has since decreased to a third of that level. Some of the possible explanations for such a pattern may lie in mostly competitive nature of the relationships between foreign and domestic firms. Local crowding is a threat because domestic firms base their strategy on copying and adapting practices of foreign-invested firms who do not easily concede the know-how.

It is not possible to assess the labour turnover effects directly in this report, as the data do not capture the complete work history of each employee. It is, however, possible to assess the extent to which employees who are Vietnamese nationals are reported as the most important source of technology transfer. This analysis brings information about the origin of spillovers from labour mobility. Among the firms for which skills and experience of new employees are an important source of technology transfer, 84% enjoys spillovers from Vietnamese nationals, 15.5% from foreigners working in Vietnam and 0.5% from repatriates observed over the 2009-2013 period. The total number of responses was 26,420 in unbalanced panel and 18,284 in balanced panel. Looking at the time trend, it is visible that compared to 2009 there was a slight decrease of spillovers from domestic labour and a modest increase from foreign nationals in 2013. This finding tells that spillovers from technology transfer in Vietnam come not from foreign but local sources in the case of worker turnover just as in the case of new technology.

Figure 3.6: Technology Transfer by Employee Category
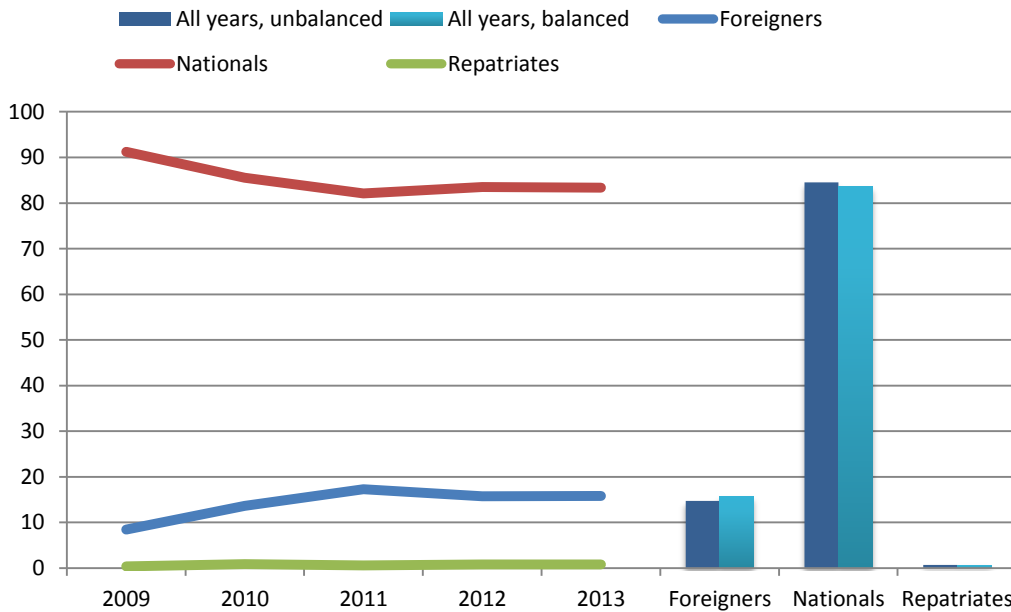
The level of competition within a particular market has implications for the distribution and the strength of spillovers. The entry of foreign firms can lead to greater competition, which in turn can either increase productivity of domestic firms by reducing inefficiencies or decrease productivity by reducing market shares. How these forces play in the Vietnamese manufacturing sector is an empirical question beyond the scope of this report.

The panel data from 2009 to 2013 of the TCS summarised in Figure 3.7 indicate that competition levels differ between sectors. Some sectors appear highly competitive, with firms in 11 sectors reporting more than 15 competitors on average, and firms in five sectors reporting an average of more than 20. These are: manufacture of furniture (VSIC 31), pharmaceutical industry (VSIC 21), petroleum refining (VSIC 19), printing (VSIC 18) and paper industry (VSIC 17). The largest share of competition is intra-provincial, with the most competitive industries, such as pharmaceutical and petroleum production more exposed to national competition. International competition is the most severe in manufacturing of motor vehicles (VSIC 29), special machinery and equipment (VSIC 28) and pharmaceutical industry (VSIC 21), but overall at much lower levels than local competition. This may be a consequence of infrastructure constraints and specialisation of domestic firms in products that are not attractive to foreign firms and markets.

Coupled with the extremely low levels of exports, these findings indicate that the expansion of domestic firms to non-local domestic and foreign markets is not highly prioritised in Vietnam. While reaping the gains from exporting perhaps makes a more difficult goal of the two, reaching non-local domestic markets is the first step, which should take a more prominent place in industrial policy plans.

Figure 3.7: Proportion of Competitors by Sector
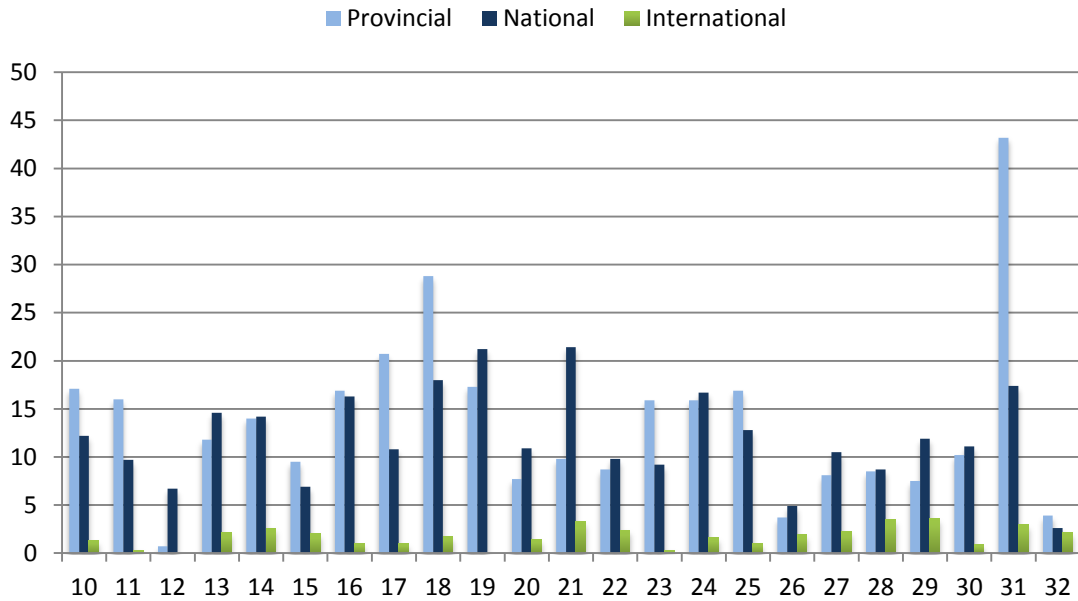
Overall, technology transfer primarily takes place among domestic firms in Vietnam, suggesting that FDI may not be as effective way toward technological advancements as believed. Domestic firms are, at the same time, likely to use inferior technology compared to foreign firms, making the role of foreign firms as a source of highly advanced technological solutions thus more important. Whether interactions between domestic firms affect firm performance is a question that cannot be answered within the current report, but calls for future investigation.

The lack of learning between foreign and domestic firms suggests that additional policy efforts in attracting and managing FDI may be required for capturing productivity spillovers. Although exporting is regarded as important for firm performance, growth and innovation, our results suggest that in the Vietnamese case a more appropriate step for domestic firms would be the expansion to non-local domestic markets. This is possibly a more achievable goal for these firms in the short run, equipping them to enter and survive in export markets in the long run.

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4. Backward Linkages: Technology Transfer from Customers

This section focuses on the potential for technology transfer through backward linkages. Positive backward linkages are understood as spillovers to suppliers of intermediate inputs through connections with their clients. Domestic suppliers can potentially benefit from transfers of knowledge or technology improvements from foreign firms, including both the ones operating in Vietnam and the ones operating internationally. Alternatively, customers may place requirements for producing higher quality products, motivating production and process improvements and thus creating spillovers through backward linkages. Finally, increased demand from foreign firms can increase competition in a particular market, leading to improved economies of scale, categorised also as spillovers.

Positive backward linkages have found more support in literature than horizontal spillovers. This could be founded in the incentives for foreign customers to both improve competitiveness of the market for their inputs and to transfer technology for producing higher quality inputs. Indeed, horizontal spillovers in the form of technology leakage that may benefit domestic competitors tend to be actively prevented, while the incentives to transfer knowledge vertically commonly occur (see, for example, Newman et al., forthcoming).

All rounds of TCS contain information about firms' self-reported technology transfers and the type of firms that the transfers originate from. This can help policymakers to accurately evaluate the prevalence and the origin of technology transfers, required for effective industrial policy that encourages positive spillovers.

The proportion of firms who produce intermediate, final goods or both is shown in Figure 4.1. Over 80% of firms produce final goods, with 20% of these firms also producing intermediates. Only 18% of the sampled firms exclusively produce intermediate goods. It is precisely the firms that produce intermediates used by the firms in downstream sectors that have the potential to benefit from backward linkages with FDI firms. The situation over time has not changed discernibly, as the main output types tended to stay in the same category in 2013 as in 2009.

Figure 4.1: Composition of Output
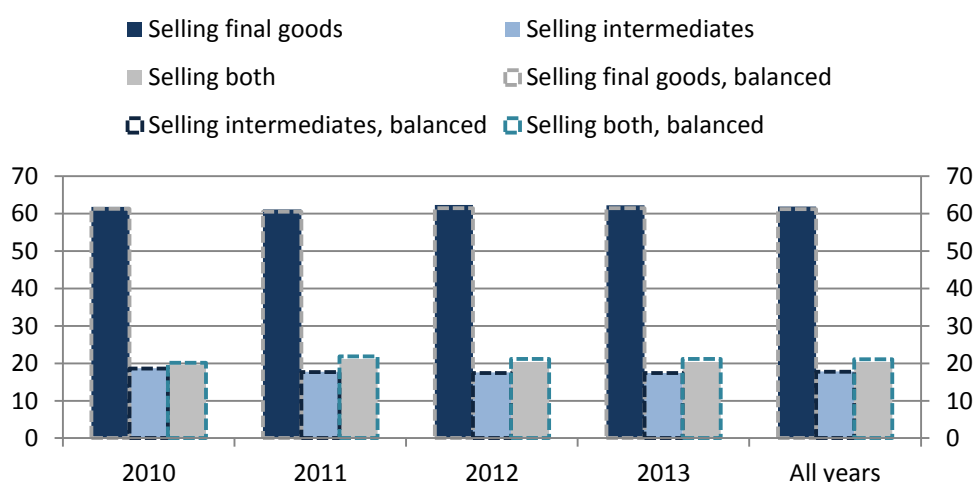
Figure 4.2 shows the share of firms' output sold locally, nationally or internationally by firm size. The proportion of the sample supplying foreign firms is important given the potential for large productivity gains from these relationships (Anwar and Nguyen, 2013). There is a strong effect of firm size, with larger firms much more likely to export the majority of their output.[5]

Figure 4.2: Sales Structure by Firm Size
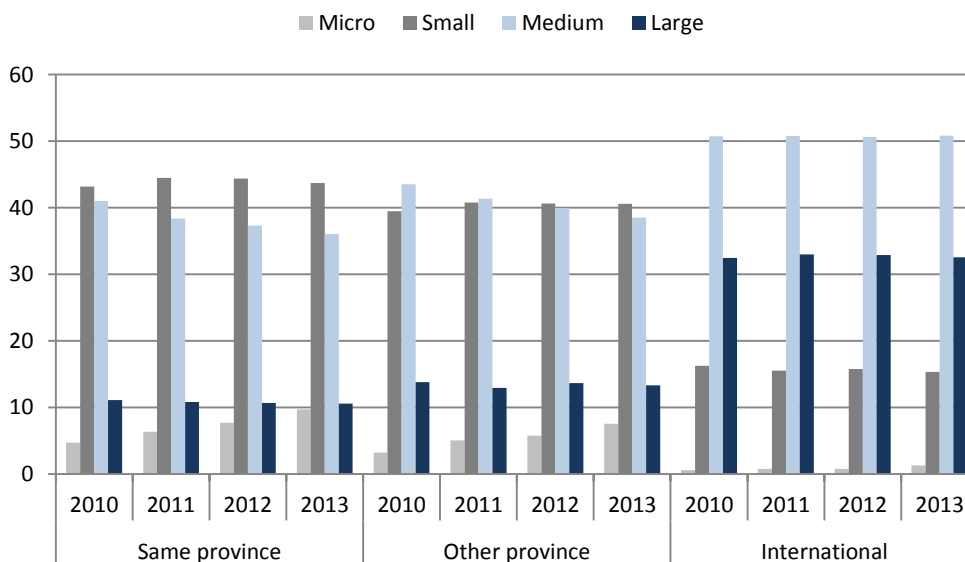
Note: The figure is based on the unbalanced panel data. The relationships are preserved in the balanced panel.

Domestic firms may benefit from backward linkages by exporting, as this increases the level of direct contact with international customers. De Loecker (2007) finds large productivity gains for export entrants compared to their domestic counterparts and observes that the gap in productivity between exporters and non-exporters widens over time. Using earlier rounds of the TCS data, Newman et al. (forthcoming) find that Vietnamese firms who export also get productivity gains. These gains are, however, observed only for firms that embrace quality improvements and production process innovations.

Some 34% of firms in unbalanced panel of 38,731 firms (38% of 25,110 in balanced panel) are exporters. The TCS asks the firms about their most important export destination, results of which are summarised in Figure 4.3.[6] The top ten most important destinations account for over 75% of exports among which traditionally high-value markets such as the US, Japan and South Korea take the largest share. The importance of the US market increased highly, with 8% of firms stating that the US is the most important market in 2009, compared to 20% in 2013. The role of Japan has declined by around five percentage points between 2009 and 2010, remaining the most important market for around 20% of firms. Analogous is observed for Taiwan and China, which comprise 18% and 10% responses for the most important export destination.

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[5] Note that this is the average of the share of output of their most important product that firms report selling to different locations, so the groups do not sum to 100%.
[6] This is the share of exporting firms that listed the country as their most important export destination (not the share of exports to each country).

Vietnamese firms also supply emerging economies, such as Thailand and Cambodia. Benefits from traditional export destinations have been documented to result in learning effects but newer evidence shows that spillovers can also accrue from exporting to emerging economies (Kubny and Voss, 2014). The explanation of this effect is that a lower technology gap ensures the transfer of more appropriate technologies than from developed economies.

Figure 4.3: Most Important Country for Exports
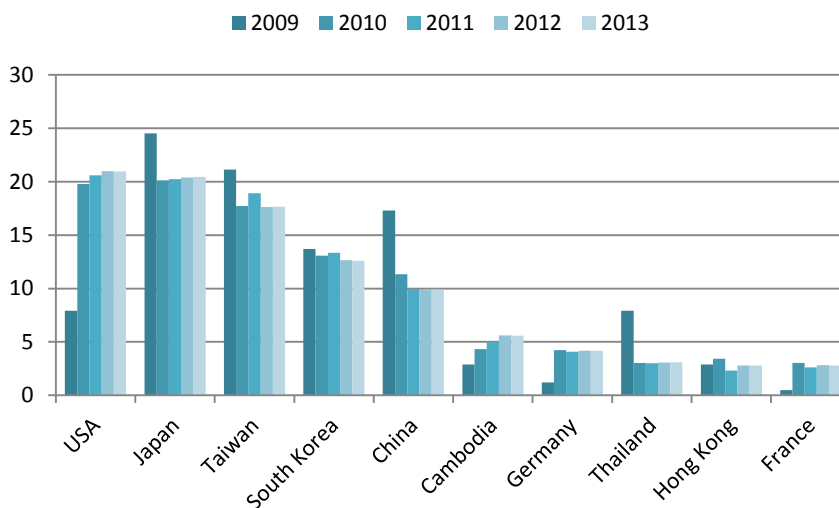
Note: The figure is based on the unbalanced panel data. The relationships are preserved in the balanced panel.

We explore which firm characteristics successfully determine firm's export status in a probit model using both unbalanced and balanced panel data. The results are presented in
Table **4.1**. Columns (1)-(3) show results for unbalanced panel while columns (4)-(6) show results for balanced panel. That larger firms had higher chances of exporting was shown in Figure 4.2 and this is confirmed in a more rigorous manner in columns (3) and (6) in Table 4.1, where controls for sector and province are introduced, allowing to explore export determinants regardless of the sector and location in which a firm operates. All categories of firms in terms of size have higher chances of becoming exporters than micro firms, with larger coefficient magnitudes for large firms. In addition, negative coefficients are observed for all types of firms in terms of legal structure, showing that none of the firm categories are as likely to export as FDI firms. This could indicate that Vietnamese firms could still be lacking skills and technologies needed for successful entry and competition in the export markets. The year dummies are positive and significantly different from zero (not reported), indicating an increase in export opportunities each year since 2009.

Backward linkages can also be assessed by examining contract duration between trade partners. Longer-lasting contracts allow stronger working relationships and trust between contract parties to be formed. This can serve as an indicator for whether a firm will benefit from backward linkages and for the quality of technology transfer. The average contract duration between firms and their customers is summarised in Figure 4.4. On average, all contracts last less than 10 months. The time trend of the contract duration among Vietnamese firms is clearly negative, decreasing from 8.3 months in 2010 to 7.6 months in 2013 (8

to 7.4 months in balanced panel). Short contracts may in fact limit the benefits from backwards spillovers for domestic firms due to limited time for establishing well-functioning working relationships. The option to move freely between suppliers leaves little incentive for customers to invest in improving the capabilities of suppliers.

Table 4.1: Determinants of Export Status (Marginal Effects)

	Unbalanced			Balanced		
	(1)	(2)	(3)	(4)	(5)	(6)
Small	0.082***	0.083***	0.083***	0.098***	0.091***	0.093***
	(0.013)	(0.012)	(0.012)	(0.019)	(0.019)	(0.019)
Medium	0.269***	0.249***	0.231***	0.303***	0.278***	0.260***
	(0.013)	(0.013)	(0.012)	(0.020)	(0.020)	(0.020)
Large	0.469***	0.443***	0.389***	0.508***	0.477***	0.416***
	(0.014)	(0.014)	(0.014)	(0.021)	(0.021)	(0.021)
State	-0.415***	-0.392***	-0.331***	-0.193**	-0.191*	-0.190
	(0.065)	(0.065)	(0.065)	(0.083)	(0.104)	(0.125)
JSC with state involvement	-0.332***	-0.277***	-0.237***	-0.326***	-0.277***	-0.239***
	(0.018)	(0.018)	(0.017)	(0.024)	(0.023)	(0.022)
Collective	-0.409***	-0.318***	-0.330***	-0.387***	-0.297***	-0.313***
	(0.029)	(0.028)	(0.028)	(0.036)	(0.034)	(0.034)
Private enterprise	-0.371***	-0.326***	-0.329***	-0.387***	-0.335***	-0.337***
	(0.011)	(0.012)	(0.012)	(0.015)	(0.016)	(0.016)
Private limited	-0.299***	-0.256***	-0.256***	-0.309***	-0.263***	-0.260***
	(0.008)	(0.009)	(0.009)	(0.010)	(0.011)	(0.011)
JSC without state	-0.371***	-0.290***	-0.267***	-0.382***	-0.295***	-0.268***
	(0.010)	(0.011)	(0.011)	(0.013)	(0.014)	(0.014)
JV state and foreign	-0.241***	-0.195***	-0.152***	-0.255***	-0.208***	-0.160***
	(0.031)	(0.030)	(0.028)	(0.038)	(0.037)	(0.034)
JV private and foreign	-0.078***	-0.051*	-0.040	-0.084**	-0.052	-0.038
	(0.027)	(0.026)	(0.027)	(0.035)	(0.034)	(0.034)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Province	No	Yes	Yes	No	Yes	Yes
Sector	No	No	Yes	No	No	Yes
N	38,731	38,731	38,720	25,110	24,920	25,110
Pseudo R-squared	0.281	0.319	0.351	0.303	0.342	0.375

Note: Probit model. Base categories are micro enterprises, foreign enterprises and HCMC. Standard errors clustered at firm level shown in parentheses. Sector effects are at 2-digit level. Significance levels: * p<0.10, ** p<0.05, *** p<0.01.

Figure 4.5 shows that both domestic and international contracts tend to be shorter than one year, regardless of firm size. Overall, international contracts are two months shorter than domestic. A positive relationship between firm size and contracts is clearly visible. It is also visible that the trend for international contracts in on the rise for large firms at the expense of their domestic arrangements. Regarding the legal structure of firms, foreign-owned firms have the longest duration of international contracts, while joint ventures with foreign investment have the longest duration of domestic contracts. If contract duration acts as a proxy for higher quality goods and processes evident in foreign-owned firms, it is vital that industrial policy puts focus on increasing these capabilities among domestic firms.

Figure 4.4: Average Contract Duration (Months)
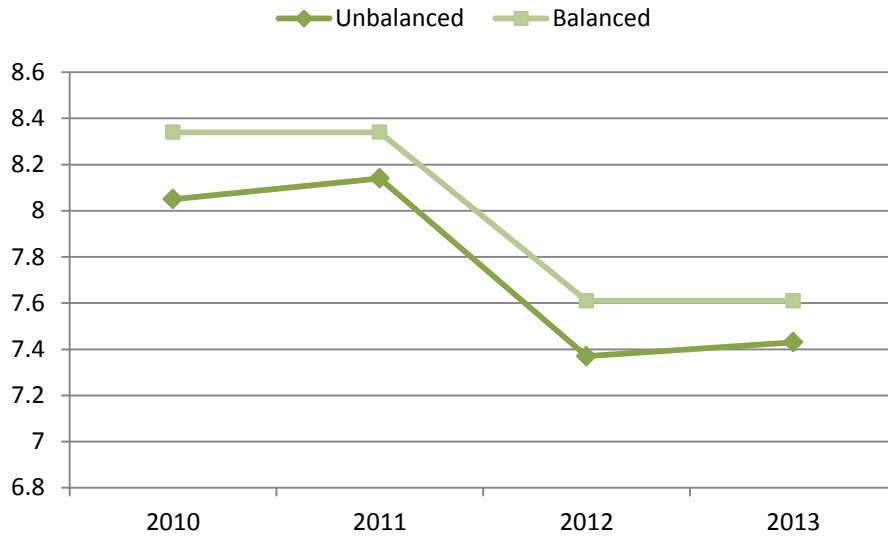
Figure 4.5: Average Contract Duration by Destination Market and Firm Type (Months)
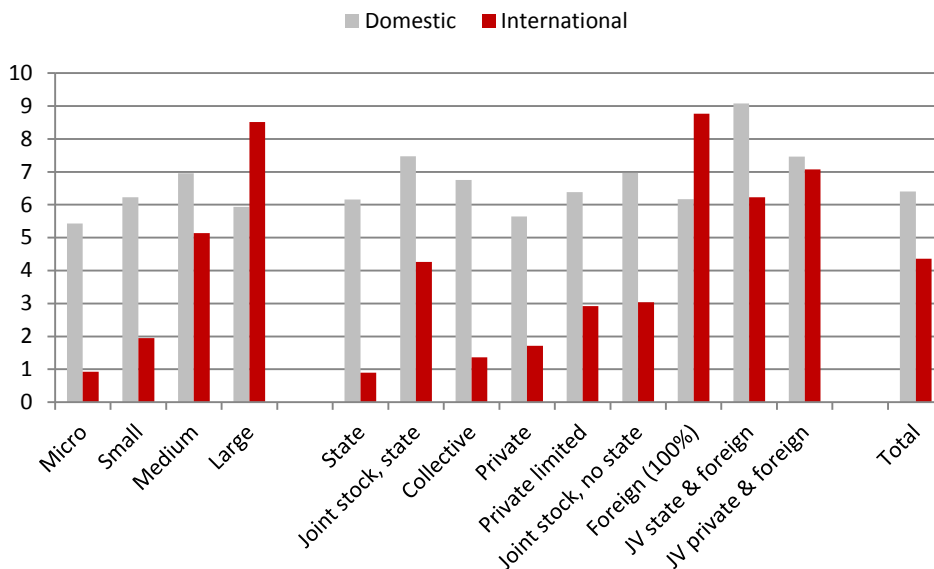
Note: The figure is based on the unbalanced panel data. The ratio of magnitudes is preserved in the balanced panel.

Figure 4.6 shows the responses of firms on experiencing backward linkages, that is, a transfer of technology from customers. The information about technology transfer is divided by the origin of transfers (from domestic or international customers). Firms have reported receiving technology transfers from domestic customers in 11% of the cases (out of 4,162 observations in unbalanced panel and 2,725 observations in balanced panel) and from international customers in 4.5% of the cases (out of 1,683 observations in unbalanced panel and 1,182 observations in balanced panel). This indicates that the main route of technology transfers is again through trading relationships with domestic firms and, not as anticipated, with foreign firms who either operate in Vietnam or abroad.

Figure 4.6: Technology Transfer from Customers
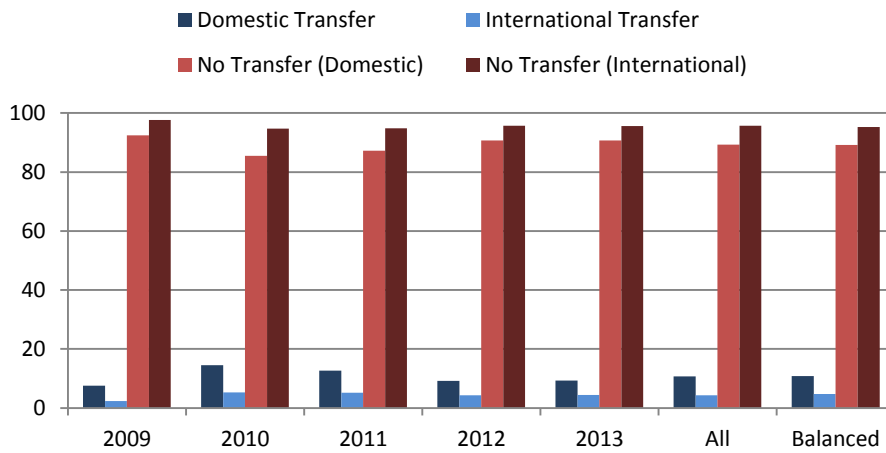
Figure 4.7 investigates how technology transfers from customers occur. Using the information from the sub-sample of firms who reported a backward linkage, we see that the majority of transfers are though contracts. This holds for both domestic and international customers. Around 72% (out of 3,585 observations in unbalanced and 2,343 observations in balanced panel) of technology transfers from domestic and 76% (out of 1,500 observations in unbalanced and 1,051 observations in balanced panel) of transfers from foreign customers are contracted. Only 2.5% of transfers were unintentional, with the remainder purposefully carried out by the client.

Figure 4.7: Intentionality of Technology Transfer from Customers
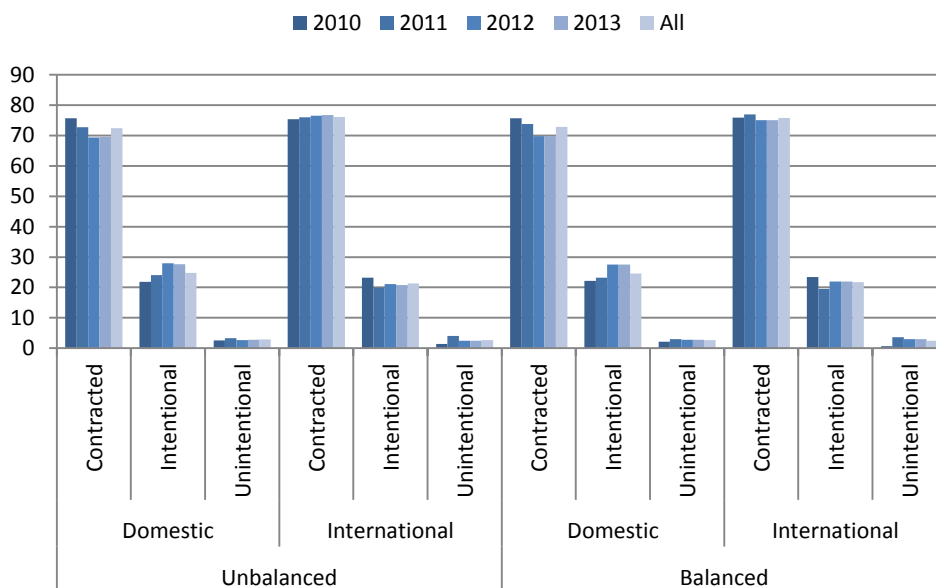
The average rates of technology transfer presented so far show little evidence of large technology transfers and especially little evidence of spillovers from relationships with foreign firms. The majority of positive

spillovers through backward linkages are formally specified in contracts, while the indirect benefits from interacting with foreign firms in the same sector or region appear scarcely. To understand how firm characteristics affect the probability of accruing spillovers from foreign or domestic customers through backward linkages, we estimate a probit model using both unbalanced and balanced panel data. Results are shown in Table 4.2. Columns (1)-(3) show the results for unbalanced panel for domestic, international and both categories of customers, while columns (4)-(6) show results for the same categories of customers using balanced panel data. All columns include controls for location and sector effects, which enable examining the effect of firm characteristics irrespective of the province and sector a firm operates in.

Table 4.2: Determinants of Technology Transfer from Customers (Marginal Effects)

	Unbalanced			Balanced		
	Domestic	International	Both	Domestic	International	Both
	(1)	(2)	(3)	(4)	(5)	(6)
Small	0.038***	0.005	0.042***	0.041***	0.026*	0.052***
	(0.009)	(0.007)	(0.010)	(0.013)	(0.013)	(0.015)
Medium	0.066***	0.044***	0.086***	0.072***	0.072***	0.101***
	(0.009)	(0.007)	(0.010)	(0.014)	(0.014)	(0.015)
Large	0.080***	0.065***	0.118***	0.089***	0.095***	0.138***
	(0.011)	(0.008)	(0.012)	(0.015)	(0.014)	(0.017)
State	0.150***	0.015	0.110*	0.199***	0.085***	0.190**
	(0.053)	(0.028)	(0.062)	(0.067)	(0.026)	(0.079)
JSC with state involvement	0.071***	-0.012	0.032**	0.081***	-0.011	0.046***
	(0.012)	(0.008)	(0.014)	(0.016)	(0.010)	(0.018)
Collective	0.036**	-0.037***	-0.004	0.059***	-0.017	0.028
	(0.017)	(0.013)	(0.018)	(0.020)	(0.015)	(0.022)
Private enterprise	0.028***	-0.050***	-0.018*	0.045***	-0.047***	0.002
	(0.009)	(0.007)	(0.010)	(0.011)	(0.010)	(0.013)
Private limited	0.051***	-0.026***	0.012	0.064***	-0.022***	0.028***
	(0.007)	(0.004)	(0.008)	(0.009)	(0.005)	(0.010)
JSC without state	0.070***	-0.024***	0.031***	0.081***	-0.018***	0.044***
	(0.008)	(0.005)	(0.009)	(0.010)	(0.007)	(0.011)
JV state and foreign	0.061***	-0.009	0.013	0.067***	0.004	0.022
	(0.019)	(0.012)	(0.022)	(0.025)	(0.015)	(0.028)
JV private and foreign	0.034**	0.003	0.014	0.057***	0.006	0.026
	(0.017)	(0.010)	(0.019)	(0.021)	(0.012)	(0.023)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes	Yes
Observations	38,715	38,260	38,715	25,075	24,425	25,075
Pseudo R^2	0.066	0.137	0.064	0.073	0.134	0.068

Note: Base categories are micro enterprises, foreign enterprises and HCMC. Standard errors clustered at firm level shown in parentheses. Sector effects are at 2-digit level. Significance levels: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

The results are in favour of the size effect, with medium and large firms being most likely to receive transfers from any customer category. Coefficients on legal structure are well determined and in case of domestic transfers, all firm types appear more likely to benefit from domestic customers than foreign-owned firms. None of the firm types performs better than foreign-owned firms in terms of technology transfers from international customers. Private firms are not likely to experience larger benefits from technology transfer than foreign-owned firms when both domestic and international customers are

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accounted for. Several firm categories, however, experience on average higher spillovers from domestic and international customers combined than foreign-owned firms, for example: state owned, joint stock companies, private limited companies and joint ventures with and without state involvement.

This section has presented an overview of the ways in which domestic firms in Vietnam link with international customers: through export markets, long-term contracts and self-reported technology transfers. The proportion of firms with linkages of this kind has remained small over the observed period. While this may seem as a missed opportunity for productivity improvement of the domestic sector, recent evidence shows that linkages with downstream foreign-invested firms do not always yield significant productivity improvements for upstream domestic firms without accompanying innovations to processes, quality and technologies (Newman et al., forthcoming). This suggests that industrial policy should simultaneously address spillovers through backward linkages and innovation in order to boost productivity of the domestic sector.

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5. Forward Linkages: Technology Transfer from Suppliers

Forward linkages refer to technology transfers between domestic customers and foreign firms, who are either local FDI firms or international suppliers of intermediate inputs. It is assumed, for example, that higher standards are provided by foreign to domestic firms, which might improve efficiency and performance of domestic firms. Opposite from backward linkages, forward linkage spillovers refer to benefits to the downstream sector. The literature on forward spillovers from FDI is still scarce, but studies report positive forward linkage effects. After examining results from 93 empirical studies, a recent meta-analysis on vertical spillovers finds positive and significant effect of forward linkages (Havranek and Irsova, 2011). Earlier evidence tells, however, that it is more difficult for a domestic firm to gain efficiency spillovers from a foreign firm when it is in an upstream relationship with the foreign firm, than when it is in a downstream relationship (Gorodnichenko et al., 2014) and that forward spillovers occur mainly for domestic firms who purchase inputs from foreign-invested companies oriented to domestic market (Girma et al., 2008).

The TCS data show that the inputs for domestic firms predominantly come from Vietnam, with around 70% of firms sourcing inputs exclusively from domestic market. Only 5% of firms purchase inputs exclusively abroad, while around 15% of firms source inputs from both domestic and foreign markets. Figure 5.1 presents sourcing practices of domestic firms in terms of raw materials and intermediate inputs. The location categories in the figure are non-exclusive, meaning that firms could indicate any input origin, which is why the shares do not necessarily add up to 100%. It is immediately visible that the main source of raw materials is local: around 60% of firms reported purchasing raw materials from the same province, while 44% reported sourcing from neighbouring province and 22% reported sourcing from other provinces. Exactly 20% of firms reported that they import raw materials. A similar pattern is observed for intermediate inputs where 63% of firms purchase intermediates in the same province, 49% in the neighbouring province and 24% source intermediates from other provinces, while 22% import intermediates. This indicates that forward linkages are more likely to be generated through contacts with domestic firms, or foreign firms based in Vietnam than through direct contacts with foreign suppliers located abroad.

Figure 5.1: Source of Raw Materials and Intermediate Inputs

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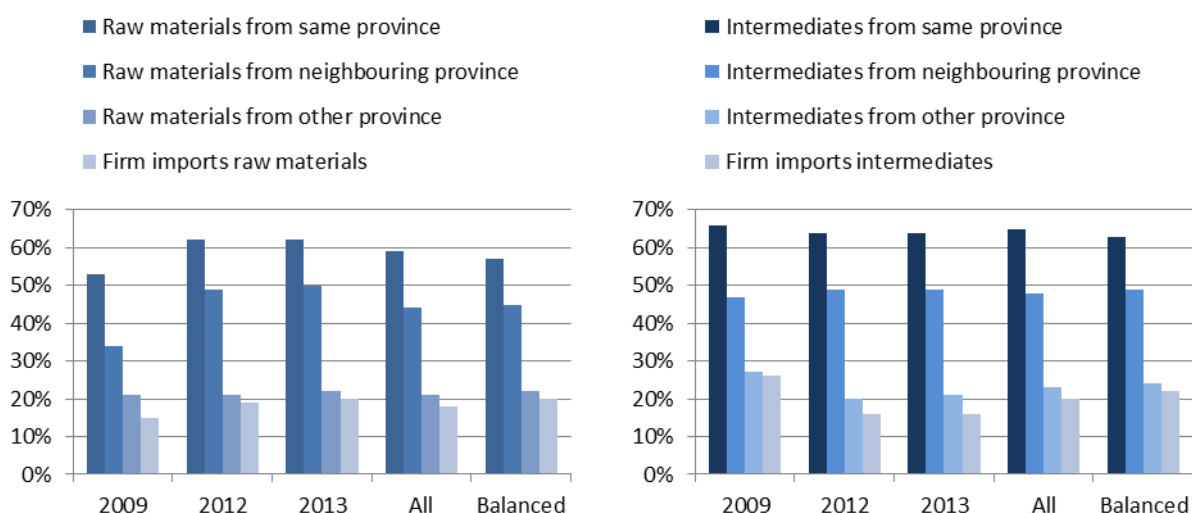
Figure 5.2 shows how input origins differ by firm size. Again, the location categories are non-exclusive, reporting the average share of inputs from each source, so need not sum to 100%. The overall message is that the average share of inputs purchased outside the same province increases with firm size. While large firms import 68% of inputs, micro and small firms import 6% and 14%, respectively. The sourcing of inputs from the same province declines with firm size, where micro firms source 82% of inputs from nearest suppliers and large 64%. While large firms do not give advantage to one single source of inputs and combine local and imported inputs, smaller firms show a clear dependence on local inputs. The figures are very similar for unbalanced and balanced panel.

Figure 5.2: Source of All Inputs by Firm Size
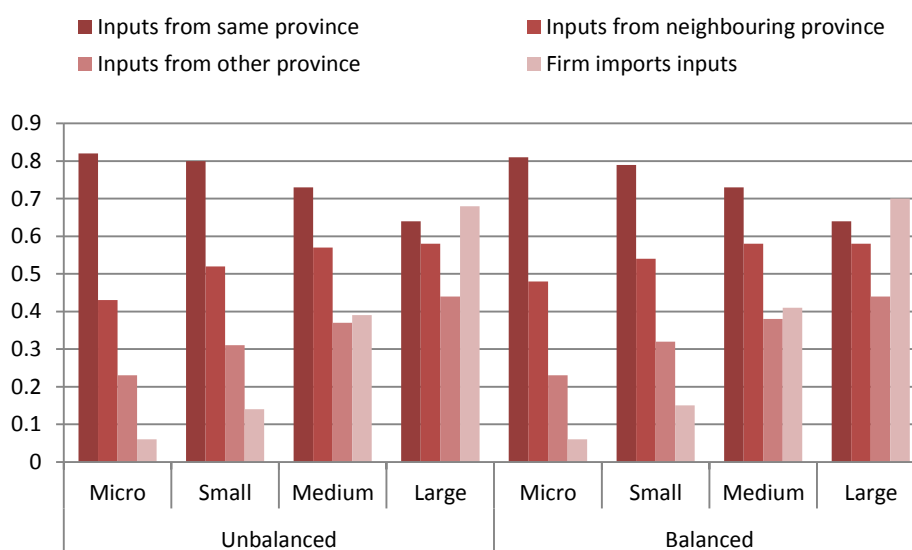
Figure 5.3 takes a closer look at interactions between domestic firms and international input markets. It shows which countries have been reported as the most important source of inputs, combining information for both raw materials and intermediate goods. By far the most important source of inputs for Vietnamese firms is China, with 25% of firms (2,450 in unbalanced and 1,748 in balanced panel) sourcing from there. This is not surprising given China's reputation as a source of affordable goods. However, we also observe firms importing from high cost countries such as Japan, South Korea and the US. This suggests that one fraction of Vietnamese firms transforms higher value inputs into high quality outputs using cheap labour and that other fraction of firms sources inputs from traditionally cheap markets for value addition through processing.

Just as in the case of backward linkages, contract duration can be used to measure the strength of forward linkages, that is, the strength of ties between Vietnamese customers and their international or domestic suppliers. It is expected that long-term contracts provide better opportunities for mutual benefits of the contract parties, such as unintentional spillovers or mutual agreements through bargaining with suppliers, which could lead to intentional spillovers defined by contracts. The average contract duration in the sample of firms from Vietnam is just over seven months for domestic contracts and just over six months for

contracts with international suppliers. The averages for unbalanced panel do not differ by much from balanced panel averages, as shown in Figure 5.4.

Figure 5.3: Most Important Country for Imported Inputs
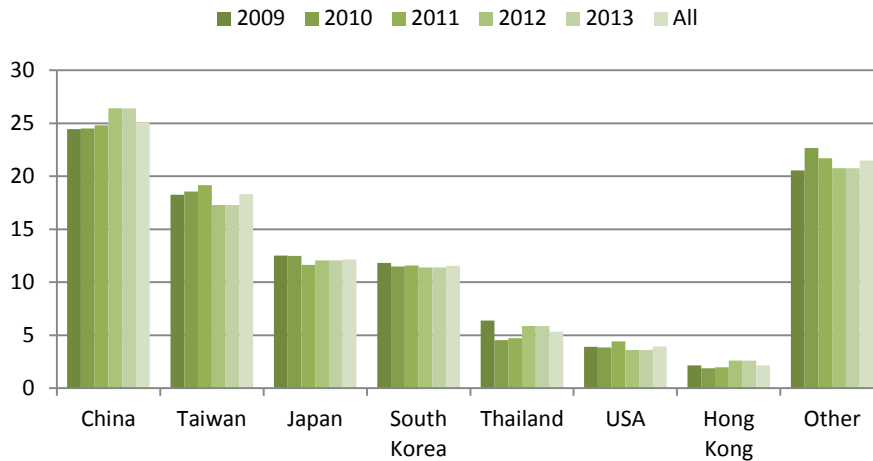
Note: Figure is based on balanced panel data.

Figure 5.4 shows a clear link between firm size and contract duration, whereby large firms opt for contracts that last two months longer than for other firm categories. Longer duration of contracts is also observed for firms with total or partial foreign ownership. These are, on average, twice as long as contracts signed by private firms. In case of both wholly owned foreign and large firms, contracts with international last longer than contracts with domestic suppliers. Supplier contracts are on average shorter than contracts with customers described in Section 4, testifying about relatively short-term production arrangements, which decrease the chances of technology transfer between trade partners.

Figure 5.4: Average Contract Duration with Suppliers (Months)
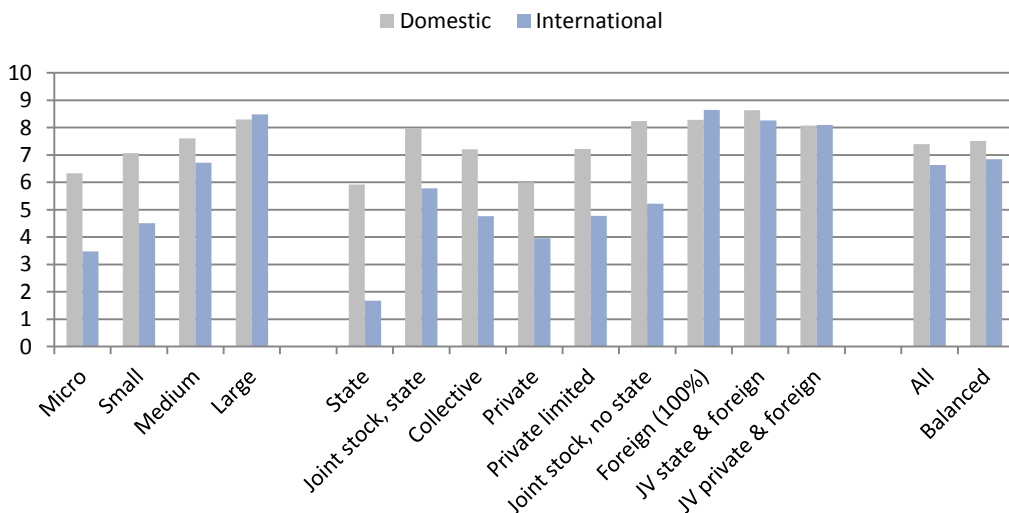
Note: Number of observations is 14,084 for domestic contracts and 5,839 for international contracts in unbalanced panel. Number of observations in balanced panel is 8,765 for domestic and 4,046 for international contracts.

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Firms who import intermediate inputs and other firms in the same sector are likely candidates for forward spillovers, so we examine which firm characteristics predict import status in a probit model. The results shown in Table 5.1 are similar to those for exporters. Firm size effect is established again, whereby all firm types have significantly higher chances of importing intermediate inputs than micro firms. Compared to foreign-owned firms, other legal ownership structures are not nearly as likely to be importers. This is consistent with earlier evidence that forward linkages are less likely to accrue to domestic firms than foreign subsidiaries (see, for example, Girma et al., 2008). While the immediate benefits from forward linkages are not observed for domestic firms, they could occur in the long-run via horizontal spillovers. The year effects are positive for 2010, but in 2012 and 2012 negative import probabilities are observed.

Table 5.1: Characteristics of Importers of Intermediate Inputs

	Unbalanced			Balanced		
	(1)	(2)	(3)	(4)	(5)	(6)
Small	0.091***	0.086***	0.084***	0.117***	0.112***	0.113***
	(0.013)	(0.013)	(0.013)	(0.022)	(0.022)	(0.021)
Medium	0.229***	0.207***	0.210***	0.265***	0.246***	0.253***
	(0.014)	(0.013)	(0.013)	(0.022)	(0.022)	(0.021)
Large	0.348***	0.337***	0.338***	0.386***	0.378***	0.380***
	(0.015)	(0.014)	(0.014)	(0.023)	(0.023)	(0.022)
State	-0.422***	-0.390***	-0.319***	-0.239***	-0.168**	-0.068
	(0.056)	(0.057)	(0.057)	(0.078)	(0.082)	(0.087)
JSC with state involvement	-0.280***	-0.214***	-0.178***	-0.291***	-0.223***	-0.196***
	(0.016)	(0.015)	(0.015)	(0.021)	(0.021)	(0.020)
Collective	-0.551***	-0.438***	-0.382***	-0.567***	-0.447***	-0.392***
	(0.030)	(0.029)	(0.029)	(0.039)	(0.039)	(0.038)
Private enterprise	-0.459***	-0.371***	-0.310***	-0.472***	-0.377***	-0.315***
	(0.011)	(0.011)	(0.011)	(0.014)	(0.015)	(0.015)
Private limited	-0.338***	-0.289***	-0.249***	-0.344***	-0.292***	-0.254***
	(0.007)	(0.007)	(0.007)	(0.009)	(0.009)	(0.010)
JSC without state	-0.353***	-0.271***	-0.228***	-0.381***	-0.285***	-0.243***
	(0.009)	(0.009)	(0.009)	(0.011)	(0.012)	(0.012)
JV state and foreign	-0.073**	-0.037	-0.004	-0.066*	-0.028	0.007
	(0.029)	(0.029)	(0.027)	(0.040)	(0.039)	(0.035)
JV private and foreign	-0.088***	-0.059***	-0.034*	-0.061**	-0.036	-0.014
	(0.023)	(0.022)	(0.020)	(0.030)	(0.029)	(0.028)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Region	No	Yes	Yes	No	Yes	Yes
Sector	No	No	Yes	No	No	Yes
Observations	38,731	38,632	38,632	25,110	24,925	24,925
Pseudo R-squared	0.313	0.356	0.383	0.316	0.363	0. 390

Note: Base categories are micro enterprises, foreign enterprises and Southeast region. Standard errors clustered at firm level shown in parentheses. Sector effects are at 2-digit level. Significance levels: * p<0.10, ** p<0.05, *** p<0.01.

To discern whether forward linkages can result in technology transfer, we investigate firm responses about the prevalence of these linkages, distinguishing between spillovers to domestic customers from their domestic and international suppliers. Figure 5.5 shows the share of firms that reported receiving some kind of a technology transfer from all suppliers and from suppliers with long-term contracts.[7] Of 38,731 firms in

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[7] The reason for presenting data in two figures is that the way of asking the question changed between the years.

unbalanced panel, 24% of firms have experienced a spillover through a forward linkage with domestic suppliers. Only 10% of transfers was through long term contracts. The share is the same for balanced panel with 25,110 observations. Around 7% of firms report technology transfers through a forward linkage with international suppliers, both for all suppliers and transfers through contracts. As in the case of backward linkages, the evidence shows that technology transfers through forward linkages are more likely to occur from contact with domestic, not international firms.

Figure 5.5: Technology Transfer from Suppliers
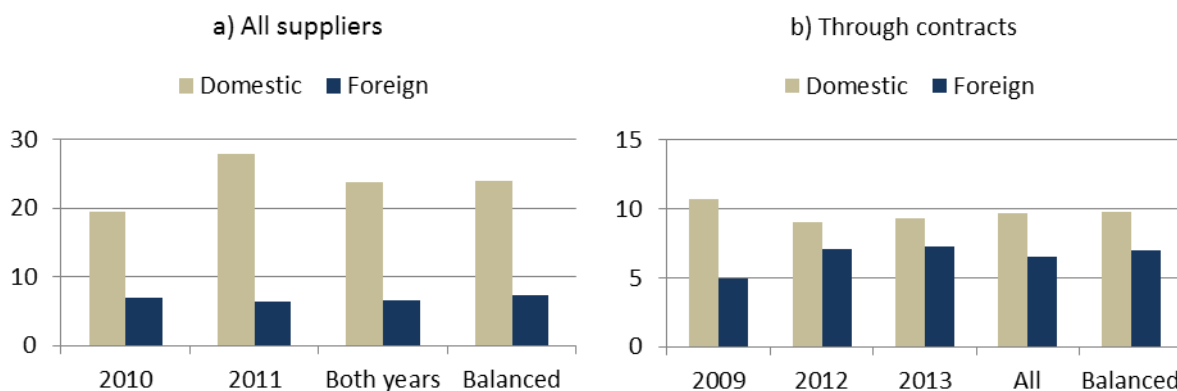
Note: The figure shows different years because the question refers to technology transfer from all suppliers in 2010 and 2011 and only to suppliers with long-term contracts in 2009, 2012 and 2013 data.

Whether specific firm characteristics play a role in international and domestic forward linkages is analysed with a probit model on unbalanced and balanced panel data. The results are shown in Table 5.2 in which column (1) shows the coefficients for technology transfer from domestic suppliers, column (2) for transfers from international suppliers and column (3) for transfers from both types of suppliers combined. The size effect is strong again, whereby larger firms show higher likelihood of technology transfer from all types of suppliers. Several types of firms in terms of legal structure are more likely to experience technology transfer from domestic firms than wholly foreign-owned firms, for example: state-owned companies, joint stock and joint venture companies with state capital, private limited companies and joint ventures between foreign and private entities. Only private enterprises have lower chances of positive spillovers from domestic suppliers than foreign-owned firms. As column (2) shows, all ownership categories except joint ventures with state and foreign capital are less likely to report transfers of technology from international suppliers than foreign-owned firms. Year effects are positive for 2009 and 2010, after which they turn negative in case of transfers from domestic suppliers. Year effects from international suppliers are positive in all years, indicating improved conditions over time. The results using balanced panel largely confirm these findings and additionally show that state-owned firms can also benefit from international suppliers. The lack of technology transfer from international suppliers is worthy of policy attention as it points to an area where productivity gains could be achieved in the future.

Section 5 described the reach of forward linkages in the Vietnamese case. Similar to backward linkages, domestic firms accrue spillovers from forward linkages mostly through contact with domestic partners, while foreign firms capture the gains from interaction with international partners. These findings call for

more intensive policy efforts in attracting foreign investment into upstream sectors that supply inputs to downstream Vietnamese firms, as this is the likely source of productivity gains.

Table 5.2: Technology Transfer from Suppliers with Long-Term Contracts

| | Unbalanced | | | Balanced | | |
| | Domestic | International | Both | Domestic | International | Both |
	(1)	(2)	(3)	(4)	(5)	(6)
Small	0.056***	0.032***	0.061***	0.058***	0.038**	0.066***
	(0.012)	(0.011)	(0.013)	(0.017)	(0.017)	(0.019)
Medium	0.085***	0.073***	0.101***	0.095***	0.093***	0.117***
	(0.012)	(0.011)	(0.013)	(0.017)	(0.017)	(0.019)
Large	0.120***	0.106***	0.141***	0.128***	0.125***	0.153***
	(0.014)	(0.013)	(0.015)	(0.019)	(0.018)	(0.021)
State	0.111**	-0.030	0.094*	0.205***	0.163***	0.205***
	(0.051)	(0.044)	(0.056)	(0.022)	(0.019)	(0.025)
JSC with state involvement	0.030**	-0.006	0.017	0.047***	-0.008	0.024
	(0.014)	(0.011)	(0.015)	(0.017)	(0.014)	(0.020)
Collective	-0.022	-0.094***	-0.045**	0.008	-0.077***	-0.017
	(0.019)	(0.026)	(0.021)	(0.023)	(0.029)	(0.025)
Private enterprise	-0.026**	-0.049***	-0.043***	-0.014	-0.051***	-0.036**
	(0.011)	(0.009)	(0.011)	(0.013)	(0.012)	(0.015)
Private limited	0.006	-0.031***	-0.011	0.020**	-0.026***	-0.000
	(0.008)	(0.006)	(0.008)	(0.009)	(0.008)	(0.010)
JSC without state	0.021**	-0.025***	0.003	0.036***	-0.018*	0.018
	(0.009)	(0.007)	(0.010)	(0.011)	(0.009)	(0.012)
JV state and foreign	0.046**	0.009	0.020	0.071***	0.025	0.045
	(0.022)	(0.016)	(0.024)	(0.027)	(0.019)	(0.030)
JV private and foreign	0.023	-0.005	-0.000	0.046**	0.010	0.023
	(0.019)	(0.014)	(0.021)	(0.022)	(0.017)	(0.024)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Region	Yes	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,499	21,959	22,499	14,892	14,637	14,898
Pseudo R^2	0.074	0.116	0.080	0.074	0.114	0.078

Note: Probit model. Base categories are micro enterprises, foreign enterprises and HCMC. Standard errors clustered at firm level shown in parentheses. Sector effects are at 2-digit level. Significance levels: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

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6. Alternative Paths to Innovation: Research, Adaptation, and Modification

Technology transfer through interaction with buyers, sellers and competitors described in previous sections is one way in which firms can improve their technological capabilities. Firms can alternatively invest in research and development to generate new technology which is not yet available in the market or adapt some of the existing technologies to their needs. Innovative R&D projects are risky, highly expensive and capital intensive (including both physical and human capital). Given that emerging economies are at a distance from the technological frontier, it is possible that firms realise productivity improvements simply by investing in the existing technology. According to one strand of literature, R&D and technology transfer are complements: In-house R&D activities can improve firm productivity and increase efficiency of technology transfer (Hu et al., 2005). According to another strand of literature, they are substitutes: Basant & Fikkert (1996) found that investments in existing technologies provide a better return for firms than innovative research.

Around 9% of 38,731 firms in our sample invested in some form of R&D since 2009. The number and the type of R&D activities have been fluctuating between years, as shown in Figure 6.1. We see first that the number of firms investing in R&D has declined between 2009 and 2013. From 769 firms investing in R&D in 2009, only 477 reported doing so in 2013. The difference in the number of firms between unbalanced and balanced panel is quite high, signalling a particularly high rate of exit among firms that invest in R&D. In 2009, firms were mostly focused on research that is new to the enterprise, while in 2013, majority of research expenditure (53%) became dedicated to developing technology that is new to the market. Frontier research – the type of research dedicated to generating a product new to the world – represents only 3% of research expenditure (of 3,470 firms in unbalanced and 2,392 firms in balanced panel).

Figure 6.1: Originality of Research Output
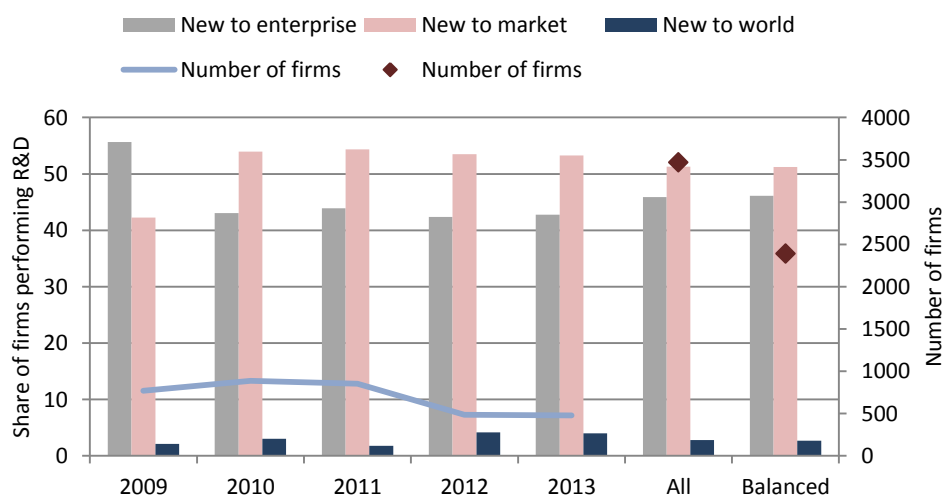
It is therefore apparent that firms in Vietnam invest in research and developing technology that may already be available on a global or national level. What follows is that firms may be better off investing in the existing technology and adapting it for use within the firm than investing in R&D, as adaptation can perhaps surpass high failure rates and costliness of R&D. Indeed, it is worth considering an industrial policy

that recognises that the payoffs to adopting existing technology could be higher than the payoffs from original research over the short term. This view is put forth by Chuang & Lin (1999) who examine R&D, FDI and spillovers for Taiwanese firms. They found that R&D initiatives are more successful in an environment where firms have already advanced their technical capabilities through technology transfer.

Industrial policy can alternatively provide good conditions for boosting Vietnam's attractiveness to international R&D investments. A good starting point would be to understand what determines the location choice of R&D and innovation by multinational enterprises. Earlier studies have shown that the success of attracting foreign R&D investment depends on the local knowledge base that combines public and private expertise, clustering of R&D activities for facilitating knowledge spillovers and investment promotion policies tailored to investors from different countries (Hervas Soriano et al., 2014; OECD, 2011).

Figure 6.2 shows how the research and development activities are financed. New research is funded primarily from firms own equity (84% of 1,546 firms in balanced panel) and credit (12%) with limited state assistance for research into new technologies (2%). To overcome R&D funding difficulties, firms could work together with other similar firms, suppliers, customers, intuitions or research centres to develop new products or technology. The evidence shows that cooperation with research centres and consumers leads to higher sales of products that are novel to the market and that even cooperation with competitors can increase labour productivity of firms (Belderbos et al., 2004).

Figure 6.2: Financing Research and Development
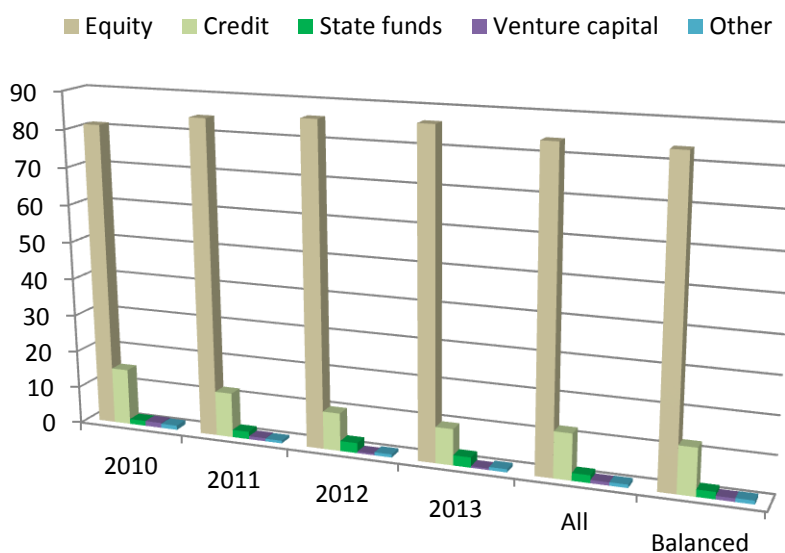
Given the relevance of R&D for innovation and technological advancement, it is important to determine which firm characteristics correlate with undertaking research activities. Results of the probit model are shown in Table 6.1 for both unbalanced and balanced data. In terms of firm size, there is a higher likelihood that all firm types invest in R&D than micro firms. Compared to foreign-owned firms, private limited companies, joint stock companies and joint ventures are more likely to engage in R&D. Year effects point to an overall negative trend in the adoption of R&D activities (coefficients not reported).

Table 6.1: Determinants of Research and Development (Marginal Effects)

	Unbalanced			Balanced		
	(1)	(2)	(3)	(4)	(5)	(6)
Small	0.026***	0.028***	0.032***	0.038***	0.041***	0.049***
	(0.009)	(0.009)	(0.009)	(0.014)	(0.013)	(0.013)
Medium	0.068***	0.075***	0.081***	0.080***	0.090***	0.102***
	(0.010)	(0.010)	(0.010)	(0.014)	(0.014)	(0.014)
Large	0.096***	0.114***	0.120***	0.114***	0.135***	0.146***
	(0.011)	(0.011)	(0.011)	(0.015)	(0.015)	(0.015)
JSC with state involvement	0.132***	0.122***	0.112***	0.156***	0.145***	0.127***
	(0.010)	(0.010)	(0.010)	(0.014)	(0.014)	(0.014)
Collective	-0.000	0.018	0.015	0.020	0.041*	0.033
	(0.017)	(0.017)	(0.017)	(0.022)	(0.022)	(0.022)
Private enterprise	-0.016*	-0.001	0.001	0.003	0.019	0.016
	(0.009)	(0.009)	(0.009)	(0.012)	(0.012)	(0.012)
Private limited	0.034***	0.043***	0.038***	0.053***	0.062***	0.053***
	(0.006)	(0.007)	(0.007)	(0.008)	(0.009)	(0.009)
JSC without state	0.079***	0.079***	0.071***	0.099***	0.100***	0.084***
	(0.007)	(0.007)	(0.008)	(0.009)	(0.009)	(0.010)
JV state and foreign	0.084***	0.069***	0.058***	0.088***	0.073***	0.060**
	(0.020)	(0.019)	(0.019)	(0.025)	(0.025)	(0.024)
JV private and foreign	0.070***	0.072***	0.067***	0.089***	0.089***	0.078***
	(0.017)	(0.016)	(0.017)	(0.021)	(0.021)	(0.021)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Region	No	No	Yes	No	No	Yes
Sector	No	Yes	Yes	No	Yes	Yes
Observations	38,731	38,726	38,667	25,104	25,104	25,055
Pseudo R^2	0.066	0.089	0.107	0.071	0.095	0. 116

Note: Probit model. Base categories are micro enterprises, foreign enterprises and HCMC. State enterprises omitted in the balanced panel estimation. Standard errors clustered at firm level shown in parentheses. Sector effects are at 2-digit level. Significance levels: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

6.1. Adaptation and Modification

An alternative to investing in R&D with uncertain returns is to purchase already existing technology and to adapt it to firm's needs and circumstances. What distinguishes this process from technology transfer through horizontal and vertical linkages is the intentional seeking and investment in new and more efficient technologies rather than receiving transfers from commercial interactions. The 2009-2013 TCS panel data contains repeated information about research and adaptation for around seven thousand firms. As we see in Figure 6.3, majority of surveyed enterprises do not engage in any technology adaptation or R&D activities. Around 7% of firms pursue either R&D or adaptation, while 3% of firms in the balanced panel pursue both R&D and adaptation.

Figure 6.3: Share of Firms Doing Research and Adaptation
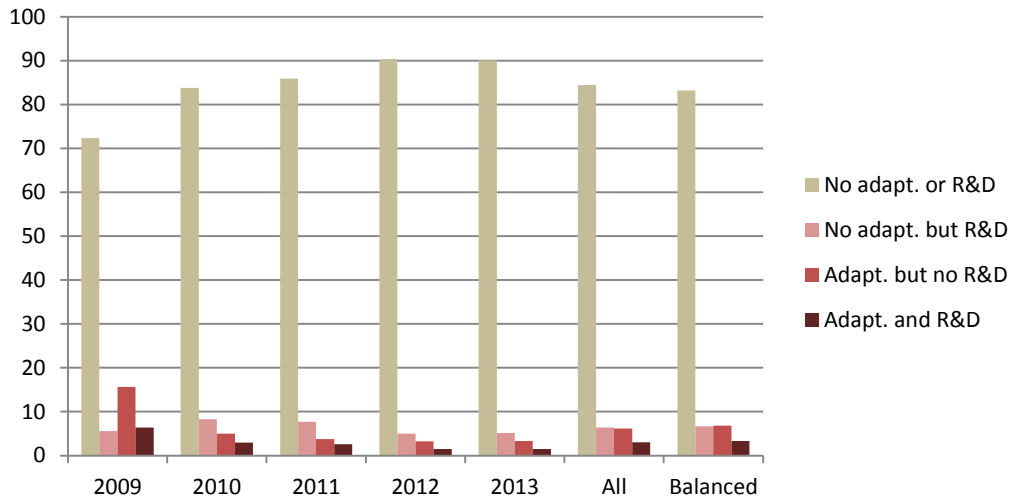
Compared to 2009, we notice a declining trend in any form of adaptation and R&D activities, with adaptation declining sharply from 16% to 3% in 2013. R&D activities have returned to 5% after peaking at 8% in 2010. Overall, 83% of firms do not have an adaptation or R&D strategy. Complementary with the goals for increasing productivity of the Vietnamese manufacturing sector, the findings presented so far suggest that industrial policies should offer stronger support for firms to invest in adaptation of technology, as adaptation appears to be more cost-effective in the short run. With productivity gains attributed to advanced technologies, it is possible that greater policy support of adaptation would lead to increased productivity among manufacturing enterprises.

We estimate a probit model to evaluate the role of firm characteristics in the decision to invest in research or adaptation. The results in Table 6.2 show that both research and adaptation are more likely for medium and larger than for smaller firms. As with R&D only, micro firms are at a clear disadvantage in the combined estimation of research and adaptation activities. All types of firms in terms of legal structure are more likely to invest in R&D and adaptation than foreign-owned firms, which may indicate that new technology is developed and sourced from abroad. Year effects indicate an overall declining trend in the probability of R&D and adaptation (coefficients not reported).

Finally, we look at the experience of firms with technology adaptation. The questionnaire administered to firms within TCS asks firms about their past, failed and desired adaptations in the future. Figure 6.4 shows the main motives for technology adaptation among which improving quality appears to be the most important. Apart from quality improvements, firms want to expand product variety and to introduce new technology. These motives have also been the main part of unsuccessful adaptations, while past adaptations have focused more on addressing the capacity restrictions. Strong focus on quality and new technology could be due to increasing levels of competitiveness in the economy, which necessitates product improvements if firms are going to enter and compete in higher value-added markets.

Table 6.2: Determinants of Research and Adaptation (Marginal Effects)

	Unbalanced			Balanced		
	(1)	(2)	(3)	(4)	(5)	(6)
Micro	0.061***	0.061***	0.058***	0.089***	0.088***	0.086***
	(0.011)	(0.011)	(0.011)	(0.017)	(0.016)	(0.016)
Medium	0.111***	0.117***	0.119***	0.139***	0.147***	0.153***
	(0.011)	(0.011)	(0.011)	(0.017)	(0.017)	(0.017)
Large	0.147***	0.166***	0.169***	0.179***	0.200***	0.207***
	(0.013)	(0.013)	(0.013)	(0.019)	(0.019)	(0.018)
JSC with state involvement	0.178***	0.157***	0.143***	0.218***	0.193***	0.173***
	(0.013)	(0.014)	(0.013)	(0.017)	(0.018)	(0.017)
Collective	0.002	0.016	0.011	0.031	0.047**	0.042*
	(0.018)	(0.018)	(0.018)	(0.023)	(0.023)	(0.023)
Private enterprise	0.029***	0.031***	0.017*	0.060***	0.062***	0.040***
	(0.010)	(0.010)	(0.010)	(0.013)	(0.013)	(0.013)
Private limited	0.034***	0.037***	0.033***	0.058***	0.061***	0.052***
	(0.007)	(0.008)	(0.008)	(0.010)	(0.010)	(0.010)
JSC without state	0.092***	0.083***	0.074***	0.117***	0.109***	0.094***
	(0.009)	(0.009)	(0.009)	(0.011)	(0.011)	(0.012)
JV state and foreign	0.112***	0.088***	0.076***	0.120***	0.095***	0.080***
	(0.025)	(0.024)	(0.024)	(0.032)	(0.032)	(0.031)
JV private and foreign	0.074***	0.069***	0.067***	0.098***	0.092***	0.086***
	(0.021)	(0.020)	(0.020)	(0.026)	(0.025)	(0.025)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Region	No	No	Yes	No	No	Yes
Sector	No	Yes	Yes	No	Yes	Yes
Observations	38,731	38,731	38,731	25,104	25,104	25,065
Pseudo R^2	0.069	0.085	0.104	0.073	0.088	0. 110

Note: Probit model. Base categories are micro enterprises, foreign enterprises and HCMC. State enterprises omitted in the balanced panel estimation. Standard errors clustered at firm level shown in parentheses. Sector effects are at 2-digit level. Significance levels: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Figure 6.4: Reasons for Adaptation
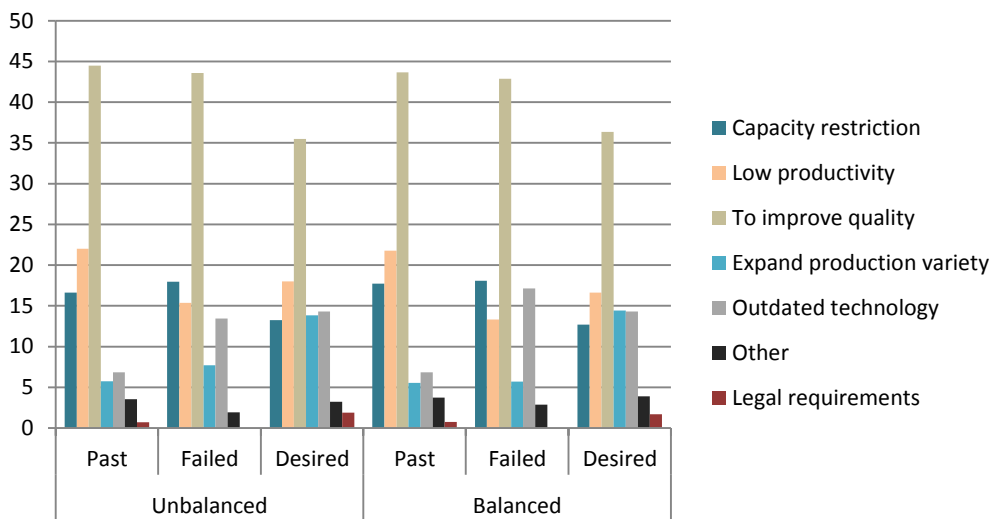
Note: Number of observations is 1,266 in unbalanced and 935 in balanced panel for past adaptations; 136 in unbalanced and 105 in balanced panel for failed adaptations and 1,482 in unbalanced and 999 in balanced panel for desired adaptations.

6.2. Constraints to Technology Adaptation

The low rates of investment in innovation, such as technology research and adaptation among the surveyed firms and the skewness of investment towards larger firms could be a consequence of different constraints faced by firms. Understanding these constraints should concern policymakers, particularly if adaptation is to be advocated as a cost-effective way of technological advancements. Thus, we look at why firms engage in adaptation and which constraints prevent them from doing so.

Figure 6.5 shows which constraints to investment in technology were labelled as the 'most severe' by surveyed firms. It is visible that financial constraints play the largest obstacle in innovation: Around 60% of 934 firms that responded to the question stated that they adapted technology rather than purchased new due to high costs. Financial constraints are common in emerging economies and they disproportionately burden small and medium enterprises (World Bank, 2013). In that regard, reforming access to financial instruments for smaller enterprises is seen as highly favourable for economic development. This is where domestic industrial policy could assist by, for example, developing loan schemes specifically for investments in new technology or adaptation.

Figure 6.5: Reasons for Technology Adaptation Rather than Purchase
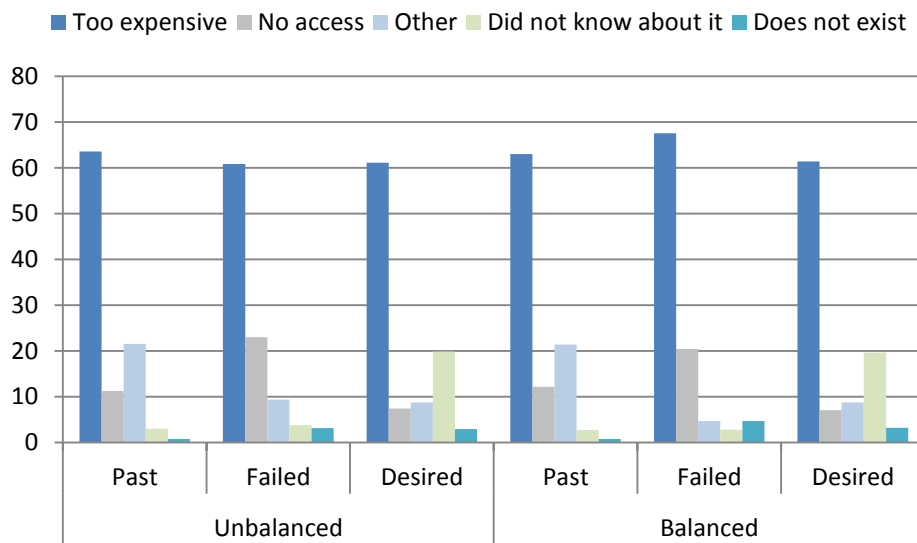

Note: Number of observations is 1,265 in unbalanced and 934 in balanced panel for past adaptations; 161 in unbalanced and 108 in balanced panel for failed adaptations and 1,482 in unbalanced and 998 in balanced panel for desired adaptations.

The need for improved access to finance is clearly demonstrated by the TCS panel data. Figure 6.6 shows which funding mechanisms are judged as most important for financing adaptation, broken down by past, current and desired adaptations. It is immediately noticeable that firms primarily rely on equity to finance adaptation. This holds for over 80% of unsuccessful and 70% of past investments in adaptation. This implies that firms' investments in technology depend on available internal capital, such as retained earnings.

Figure 6.6: Financing of Adaptation
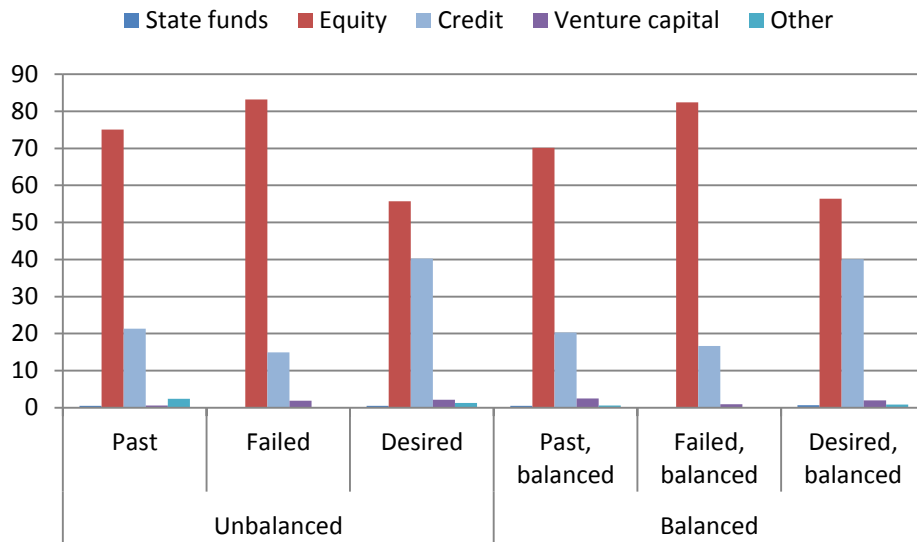
Note: Number of observations is 1,634 in unbalanced and 1,206 in balanced panel for past adaptations; 161 in unbalanced and 108 in balanced panel for failed adaptations and 1,874 in unbalanced and 1,239 in balanced panel for desired adaptations.

It is also visible from Figure 6.6 that there is a gap between actual and desired financing from credit, which again indicates non-negligible financial constraints in technology adaptation. Faced with financial constraints, firms could be investing in technology adaptation that is suboptimal in terms of production improvements. A possible way forward would be to introduce credit schemes that are transparent, widely available and preferential compared to standard borrowing rates. This is certainly an important consideration for industrial policy aiming for better performance of Vietnamese enterprises.

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7. Corporate Social Responsibility (CSR)

Corporate social responsibility (CSR) refers to the socially responsible part of firms' operations. McWilliams and Siegel (2001) state that a CSR action is the one made to advance some social good, which is beyond the direct interests of the firm and which is beyond what is legally required. The UN Global Compact set the foundation of core CSR values in its ten principles for ensuring responsible supply chain management through practices such as respecting basic labour rights and working against corruption. Immediately after, the CSR Compass expressed a view of CSR a set of voluntary initiatives for businesses to integrate social and environmental considerations into their operations and stakeholder relationships. Both of these views are used in the analysis of CSR in this report. Kitzmueller and Shimshack (2012) show that profit maximization and philanthropy, such as improving social and environmental performance, can simultaneously be reasons for adopting CSR. For example, firms invest in community-based activities to improve relationships with the local community, public reputation or efficiency by providing additional motivation to the employees (Bagnoli and Watts, 2003).

The main CSR topic in Asia during the 2000s was undoubtedly environment (Chapple and Moon, 2007), but CSR nowadays includes a wide range of issues, such as: fair governance, business and labour practices; environment; human rights and community participation (UNIDO, 2011). A recent report shows a growing awareness of different aspects of CSR among the Vietnamese SMEs (UNIDO, 2013), but reaching this level of awareness was a slow process that entailed a broad network of actors. The first requirements for CSR in Vietnam came through a number of codes of conduct designed by customers in foreign markets or multi-national companies (Nguyen, 2007). After that, several initiatives started encouraging domestic firms to follow global trends within human rights, labour standards, environment protection and anti-corruption are in place. For example, the Global Compact Network Vietnam was launched in 2007 as the cooperation between the United Nations, the Vietnam Chamber of Commerce and Industry, the Spanish Agency for International Cooperation and Unilever Viet Nam (UN, 2014). Furthermore, the United Nations Industrial Development Organization motivates integration of Vietnamese SMEs into global supply chains through adoption of CSR (UNIDO, 2011).

7.1. Measuring Corporate Social Responsibility (CSR)

To capture different aspects of CSR practices, the TCS collects information about (i) the extent to which a firm complies with voluntary labour and environmental standards, assessed based on four indicators, (ii) the management commitment to acting beyond the regulatory scope that is reflected in the CSR strategy, measured by four indicators and (iii) the engagement in community-based activities not directly linked to firm operations, measured by eight indicators. These indicators are used to generate a CSR index that shows the overall amount of CSR activities per firm. Consistent with literature, the indicators used in the analysis in this report capture the key manifestations of CSR activities. A distinction is made between CSR strategies that fulfil only the required legal aspects of CSR and those that go beyond mandatory policies. Which firm characterises affect the adoption of CSR practices is analysed in the final subsection of the chapter.

The three components of CSR: management, labour and community are measured through a number of specific indicators, which are shown in Table 7.1. Labour related responsibilities are measured with 4

indicators, which are classified as 'compliance' indicators. These capture the mandatory legal requirements of the firm. Examples are the provision of official contracts, access to trade unions and paying health insurance, which in general measure compliance with current labour regulations. Management related responsibilities are measured with 4 indicators, which are categorised as 'beyond compliance' indicators. These indicators look at whether CSR represents a focal point of a firm's business strategy by verifying whether a firm has written CSR policies, CSR committee, CSR promotion activities and CSR certification. Finally, community related responsibilities, measured with 8 indicators are classified as 'beyond compliance' indicators. These address firm's engagement with local community at the level that is beyond what is required by law and that does not benefit company in a strictly commercial sense.

Table 7.1 shows the proportion of firms that have adopted a range of CSR practices between 2011 and 2013,[8] disaggregated by indicators described above. It is visible that firms in Vietnam mostly implement compliance CSR activities.

Table 7.1: Corporate Social Responsibility (CSR) Indicators

CSR indicator	2011 (%)	2012 (%)	2013 (%)	Unbalanced (%)	Balanced (%)
Labour (compliance)					
1. All permanent employees have a written labour contract?	93.31	95.47	95.49	96.05	96.55
2. Enterprise has a local/plant level trade union?	49.79	49.54	50.45	48.98	53.56
3. Enterprise pays contribution to social insurance for employees?	72.73	72.37	72.92	72.01	76.25
4. Enterprise pays contribution to health insurance for employees?	73.26	72.62	73.08	72.42	76.40
Management (beyond compliance)					
1. Has committee/board overseeing CSR practices?	35.97	47.05	47.42	41.29	43.12
2. Has written down CSR policy?	71.76	74.31	74.73	72.98	74.26
3. Member of groups or has agreements that promote CSR standards?	2.31	3.21	3.25	2.81	3.28
4. Has been awarded CSR type certifications or awards?	9.95	9.43	9.56	9.80	10.80
Community (beyond compliance)					
1. Environmental protection	26.42	24.00	24.21	24.96	25.67
2. Education	8.75	8.25	8.45	8.23	8.80
3. Infrastructure development	7.79	7.15	7.25	7.44	7.84
4. Health care services	5.02	4.87	4.96	4.83	5.10
5. Youth development	3.25	3.42	3.30	3.23	3.29
6. Poverty alleviation	21.46	19.37	19.54	19.91	20.74
7. Local heritage	3.33	3.17	3.15	3.10	3.11
8. Sporting events	5.28	5.25	5.22	5.16	5.32
Number of observations	8,251	7,632	7,298	31,062	20,088

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[8] The question about written contracts for permanent employees used to create labour CSR indicators in the 2011 survey round was asked differently compared to other survey rounds, so the information about CSR activities in 2010 is not included in the analysis.

However, it is positive to note that the implementation of labour regulations is especially high, with 96% of firms having written labour contracts for all employees. A large share of firms from the sample also provides social and health insurance, indicating that labour contracts are in accordance with current laws. Around two-thirds of surveyed firms have a written CSR policy and around one quarter of firms engages in environmental protection. Compared to 2011, little change can be observed in CSR compliance activities, implying that firms in Vietnam largely conform to legal minimum. Some improvements of CSR activities that are 'beyond compliance' have taken place since 2011, especially for management CSR. It appears that more firms in Vietnam integrate CSR principles into their strategy. Worryingly, community CSR activities are in decline since 2011, with firm engagements in environment protection and poverty alleviation showing the largest decline.

Starting with labour indicators, we investigate how CSR performance varies among firms of different characteristics by firm size and ownership. These results are shown in Table 7.2 and Table 7.3.

Table 7.2: Corporate Social Responsibility (CSR) Indicators by Firm Size

CSR indicator	Micro (%)	Small (%)	Medium (%)	Large (%)
Labour				
1. All permanent employees have a written labour contract?	93.99	95.66	95.44	95.29
2. Enterprise has a local/plant level trade union?	11.28	29.4	68.57	91.64
3. Enterprise pays contribution to social insurance for employees?	35.79	60.79	89.15	97.38
4. Enterprise pays contribution to health insurance for employees?	34.97	60.84	89.11	97.49
Management				
1. Has committee/board overseeing CSR practices?	29.56	33.8	50.21	64.36
2. Has written down CSR policy?	63.4	68.54	77.64	86.87
3. Member of groups or has agreements that promote CSR standards?	1.12	1.38	3.04	9.72
4. Has been awarded CSR type certifications or awards?	3.57	6.34	11.58	20.11
Community				
1. Environmental protection	18.45	25.59	26.55	26.45
2. Education	4.28	7.77	9.42	12.6
3. Infrastructure development	4.49	8.12	8.26	6.76
4. Health care services	1.63	3.44	6.17	8.43
5. Youth development	1.12	2.44	4.09	4.67
6. Poverty alleviation	17.43	21.78	21.61	18.98
7. Local heritage	1.83	3.41	3.13	3.42
8. Sporting events	2.55	3.32	6.38	8.80
Number of observations	981	5,662	5,778	2,635

Note: Figures are for balanced panel, 2011-2013.

It is visible that almost all permanent work force has written labour contracts, independent of firm size and legal ownership form. However, social and health insurance payments are more likely to be made by larger firms and those owned by the state or foreign entities than smaller, private firms. Nearly 97% of state

owned firms are unionised, which is also the case with 90% of large firms. This is similar to developed countries where large and public sector organisations have much higher prevalence of unions (OECD, 2015). In addition, the proportion of micro firms with established trade union has increased from 8% in 2011 to 12% in 2013.

Next, we look at performance of different firm categories in terms of CSR management indicators. A substantial increase across all firm sizes and legal structures can be observed in the number of firms reporting to have a CSR committee or board. This indicates an increasing awareness about CSR among firms, especially as there is an increase in the number of firms who have a written CSR policy. However, official CSR certification has been undertaken by relatively few firms. The highest prevalence of certification is observed in state owned and large firms (around 20%) and almost no change in certification levels can be observed relative to 2011. This could clearly be an area where policy could bring improvements.

Table 7.3: Corporate Social Responsibility (CSR) Indicators by Ownership Category

CSR indicator	Private (%)	State (%)	Foreign (%)
Labour			
1. All permanent employees have a written labour contract?	95.82	93.39	94.90
2. Enterprise has a local/plant level trade union?	43.23	98.08	81.72
3. Enterprise pays contribution to social insurance for employees?	68.74	97.44	98.58
4. Enterprise pays contribution to health insurance for employees?	68.5	98.29	98.97
Management			
1. Has committee/board overseeing CSR practices?	41.13	68.23	54.45
2. Has written down CSR policy?	72.66	86.99	80.01
3. Member of groups or has agreements that promote CSR standards?	2.80	8.10	4.77
4. Has been awarded CSR type certifications or awards?	8.36	20.26	15.43
Community			
1. Environmental protection	28.20	33.48	16.52
2. Education	9.86	21.11	4.35
3. Infrastructure development	9.25	11.30	2.48
4. Health care services	5.02	16.63	3.96
5. Youth development	3.71	11.51	0.94
6. Poverty alleviation	24.58	36.03	6.58
7. Local heritage	3.74	5.54	0.69
8. Sporting events	5.55	15.57	3.20
Number of observations	10,559	469	3,311

Note: Figures are for balanced panel, 2011-2013. Category 'Private' includes private enterprises, private limited liability companies and joint stock companies without state involvement. Category 'State' includes wholly state-owned enterprises and joint stock companies with state involvement. Category 'Foreign' includes wholly foreign-owned enterprises.

Firms can contribute to local communities through various social and economic activities, which go 'beyond compliance' of national regulatory framework. Tables 7.1-7.3 show the range of community activities firms engage in. Two most common forms of community activities are environmental protection and poverty

alleviation. Even though these are very important issues in Vietnam, the engagement of firms in these activities is declining. Table 7.2 shows that micro firms lag behind larger firms in environmental protection. Surprisingly, largest firms do not show higher commitment to poverty alleviation and infrastructure development than small and medium firms. They do, however, dedicate more resources to education, health care and youth development. State-owned enterprises show overall highest level of engagement in community CSR activities, while foreign firms show the lowest level of indicators, reinforcing the impression that CSR activities which are beyond compliance with existing regulations are not widely implemented.

Figure 7.1 shows the types and sources of support firms receive for complying with CSR requirements. The range of support instruments is limited and overall, only a tiny share of firms received any form of support since 2011. There was, however, a substantial increase in firms reporting to receive subsidies in 2013. The largest share of support comes from government, with NGOs, chambers of commerce and trade associations having limited reach.

Figure 7.1: Types and Sources of Support for CSR (Share of Firms Having CSR)
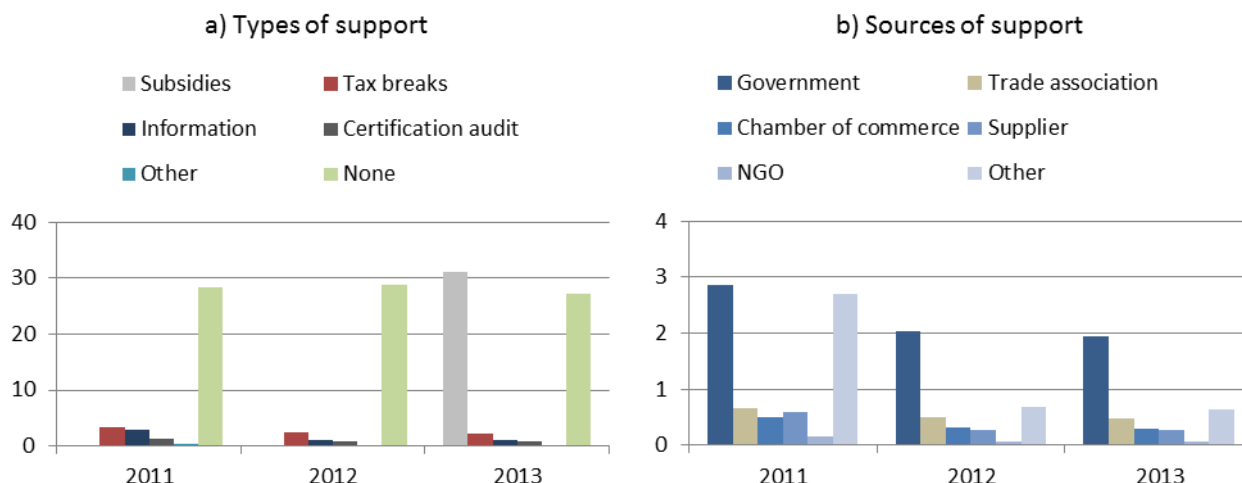
Note: Figures are for unbalanced panel, 2011-2013.

7.2. What are the Characteristics of CSR-adopting Firms?

This section analyses which firm characteristics determine the adoption of CSR practices. The variables of interest identified in the literature as important determinants of CSR measure include firm size (measured as a natural logarithm of full-time employment), firm age (natural logarithm), a binary indicator variable for research and development (with a value of one if R&D takes place in-house and zero otherwise), as well as the indicators for producing intermediate or final goods. Ownership characteristics, location and sector dummies are included as well. The dependent variable in this analysis is the CSR index, which is an aggregate index taking values from 0 to 16, based on the indicators described in Table 7.1. The results are shown in Table 7.4 and the results disaggregated by CSR sub-indices are shown in Table 7.5.

Table 7.4 shows that firm size positively determines CSR adoption: the larger the firm, the more likely it is to engage in CSR practices measured as the aggregate CSR index. Also, CSR adoption is more likely as firms

accumulate experience, measured by firm age. State firms are more likely to adopt CSR than private firms, which is consistent with the descriptive evidence presented in Table 7.3. The effect of foreign ownership is also positive, but it is not well determined in the balanced panel estimation which controls for the firm heterogeneity. Firms producing for final goods market are more likely to engage in CSR activities compared to firms that produce intermediate products. This tells that CSR activities tend to be used as a signal of credibility to attract customers. Firms carrying out research and development activities are more likely to adopt CSR practices, but due to a possibility of omitted variable bias, the interpretation of this relationship will be a subject of future research. As we have not found particularly high variation between sectors in the prevalence of CSR practices, we do not report sector-level statistics in Table 7.4.

Table 7.4: Determinants of CSR Adoption

	(1) OLS	(2) OLS	(3) FE, unbalanced	(4) FE, balanced
Firm size (ln)	0.686***	0.635***	0.635***	0.646***
	(0.012)	(0.012)	(0.013)	(0.015)
Firm age (ln)	0.340***	0.286***	0.286**	0.169**
	(0.039)	(0.039)	(0.030)	(0.036)
Firm engages in R&D activities		1.260***	1.260***	1.229***
		(0.065)	(0.098)	(0.084)
Output sold as final goods		0.122***	0.122*	0.129*
		(0.038)	(0.030)	(0.032)
State firm		0.576***	0.576**	0.518**
		(0.100)	(0.076)	(0.060)
Foreign firm		0.074*	0.074**	-0.037
		(0.038)	(0.014)	(0.017)
Year dummies	Yes	Yes	Yes	Yes
Province controls	Yes	Yes	Yes	Yes
Sector controls	Yes	Yes	Yes	Yes
Observations	17,892	17,892	17,892	11,628
R^2	0.284	0.307	0.307	0.303

Note: Dependent variable: CSR Index (0-16). Category 'State firm' includes wholly state-owned enterprises and joint stock companies with state involvement. Category 'Foreign firm' includes wholly foreign-owned enterprises. Base categories are HCMC for province controls and food and beverages sector for sector controls. Robust standard errors are in parentheses. Significance levels: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 7.5 shows the results of the adoption of different types of CSR activities disaggregated by CSR sub-indices. This approach tells how important compliance CSR, and in particular labour requirements, are for the overall CSR performance. While the size effect remains significant in all specifications, firm age is important only for labour CSR. Selling final goods matters for the adoption of labour and community CSR practices, but not for management CSR, reconfirming the message that CSR plays a role in firm's market visibility. Very weak engagement of foreign firms in beyond compliance activities (see Table 7.3) gets reaffirmed. The relationship between foreign ownership and CSR adoption is positive for CSR management and labour, but significantly negative for CSR community. Congruent with low levels of technology transfer from foreign firms, low level of local engagement calls for reconsideration of the way in which foreign firms participate in local economy. These aspects of interaction with foreign firms should be a subject of future in-depth research.

Apart from knowing the rates of CSR adoption, it is interesting to learn about the intensity of CSR activities over time. Figure 7.2 shows the change in the number of CSR activities, measured as deviation from the average value of the CSR index. A firm whose CSR index is around the mean value for all firms is classified as having average CSR performance. Firms with CSR index above (below) the mean for all firms are classified as having above (below) average CSR performance. We can observe that 13% (14.5% for balanced panel) had above average number of CSR activities in 2013, which is a decline of seven percentage points (six in balanced panel) compared to 2011. At the same time, the proportion of 'below average' performing firms has declined, while the proportion of firms in the 'average' category has remained stable.

Table 7.5: Determinants of Adoption of Different CSR Categories

	(1)		(2)		(3)	
	CSR management		CSR labour		CSR community	
	OLS	FE	OLS	FE	OLS	FE
Firm size (ln)	0.165***	0.180***	0.357***	0.346***	0.118***	0.123***
	(0.005)	(0.005)	(0.006)	(0.010)	(0.008)	(0.006)
Firm age (ln)	0.034**	0.010	0.227***	0.141**	0.024	0.022
	(0.016)	(0.009)	(0.018)	(0.017)	(0.025)	(0.023)
Firm engages in R&D activities	0.445***	0.441***	0.313***	0.317***	0.516***	0.479**
	(0.026)	(0.015)	(0.024)	(0.006)	(0.047)	(0.062)
Output sold as final goods	0.015	0.018	0.061***	0.066**	0.040*	0.041**
	(0.016)	(0.014)	(0.019)	(0.008)	(0.023)	(0.008)
State firm	0.069*	0.064**	0.223***	0.152**	0.287***	0.309***
	(0.037)	(0.007)	(0.034)	(0.034)	(0.079)	(0.016)
Foreign firm	0.128***	0.095***	0.316***	0.242***	-0.370***	-0.365***
	(0.019)	(0.007)	(0.018)	(0.004)	(0.023)	(0.013)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Province controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	17,996	11,675	17,947	11,647	17,997	11,675
R^2	0.171	0.173	0.447	0.437	0.137	0.148

Note: Dependent variable: CSR sub-indices. OLS estimates are pooled. FE estimates are based on balanced panel. Category 'State firm' includes wholly state-owned enterprises and joint stock companies with state involvement. Category 'Foreign firm' includes wholly foreign-owned enterprises. Base categories are HCMC for province controls and food and beverages sector for sector controls. Robust standard errors are in parentheses. Significance levels: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

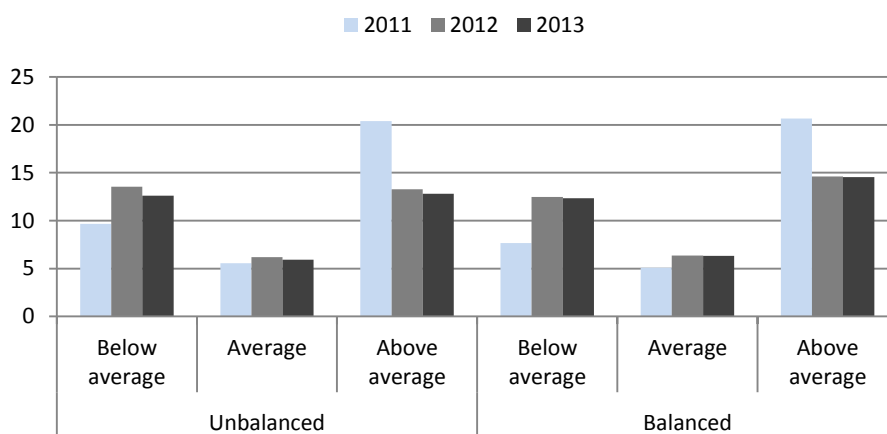Figure 7.2: CSR Activity Variation over Time

Table 7.6 shows the variation in CSR activities for firms of different size and legal structure. The size effect is immediately visible, as larger firms tend to be placed more frequently into the 'above average' category. State firms have the lowest share of 'below average' performers, while both state and foreign firms perform better than private firms. The analysis of the variation in the intensity of CSR activities has revealed an overall declining trend in the intensity of CSR activities for firms of all size and ownership categories.

Table 7.6: CSR Intensity Variation over Time by Size and Ownership Category, 2011-2013

Firm type	CSR performance	2011 (%)	2012 (%)	2013 (%)
Micro	Below average	20.51	25.01	26.22
	Average	4.24	3.45	5.23
	Above average	6.23	4.24	4.87
Small	Below average	14.73	19.05	17.21
	Average	6.54	5.78	5.21
	Above average	15.12	8.29	8.08
Medium	Below average	5.22	9.11	8.26
	Average	5.73	7.21	6.87
	Above average	25.3	16.66	15.63
Large	Below average	1.16	3.41	3.59
	Average	3.15	6.29	5.82
	Above average	30.26	23.46	22.86
Private	Below average	11.97	15.99	14.86
	Average	5.64	5.65	5.37
	Above average	18.23	11.35	10.94
State	Below average	0.94	2.02	2.02
	Average	3.10	4.31	4.04
	Above average	32.88	26.15	24.53
Foreign	Below average	2.53	6.54	6.25
	Average	5.64	8.71	8.52
	Above average	26.41	18.04	17.36

Note: Figures are for unbalanced panel, 2011-2013.

7.3. Future Research
As CSR culture still has not spread widely among the Vietnamese firms, it is not unexpected that the majority of firms do not go beyond the legally mandated minimal amount of CSR activities. Firms have especially weak performance in terms of community engagement, which are going to gain more importance with the increase in industrialisation and economic development. Which actions can be taken to improve these aspects CSR is not clear at the moment and call for in-depth research. It was beyond the scope of the report to analyse the effect of CSR practices on firm performance. Whether these practices simply add to operational costs or increase revenue for compliers is an issue that can be addressed in an in-depth study.

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8. Conclusion

This report documents the findings from five rounds of the Technology and Competitiveness Survey module, implemented from 2010 to 2014 as a part of the Vietnam's General Statistics Office (GSO) larger enterprise census. A large sample of approximately eight thousand firms per year was surveyed over the years, generating a comprehensive panel dataset with information on several aspects of business environment in Vietnam. It is one of the only data sources in Vietnam on technological capabilities of firms, foreign investment and firms' social engagements. These attributes make the TCS a unique tool for both researchers and policymakers.

The core areas of the report focus on the levels of competitiveness, technology transfer, innovation and corporate social responsibility activities of firms in Vietnam. Thanks to the panel data structure, it was possible to see how the parameters of interests have changed over time. The results of the report identify several areas worth of policy attention, where targeted actions could lead to desired benefits.

Firms are aware of the benefits of investment in technology and they already invest in improving product quality. Primarily financial constraints inhibit firms in realising the full productivity potential of innovation and technology transfer. It clearly follows that relieving some of the financial constraints could increase the rate at which Vietnamese enterprises innovate and upgrade technology.

Apart from wholly foreign-owned firms based in Vietnam and firms who export, majority of domestic firms are not receiving technology transfers from interaction with foreign firms, either as suppliers, customers or competitors. Instead, technology tends to be transferred from domestic firms, which tells that the policy focus should emphasise not only FDI, but also domestic technology transfer channels.

Investment in research and development is low among domestic firms due to financial constraints, so for the most part, firms tend to adapt or modify the existing technologies. Given the productivity gains from improved technology, policies to stimulate both domestic and foreign investments and cooperation in R&D and technology adaptation should be given serious consideration.

CSR practices in Vietnam rarely go beyond the legal minimum. This seems as a missed opportunity to benefit the external community and stakeholders, whose concerns should be integrated in a successful business strategy. As such, it is not expected that Vietnamese firms accrue particular gains from their current CSR activities. Policies that support 'beyond compliance' CSR practices could potentially improve this.

Finally, the overall impression from the five rounds of TCS is that the operating environment and firms' circumstances are largely unchanged. The improvements could come from policies targeted at loosening the constraints for innovation and investment.

This report does not offer a final say on many topics related to innovation and technology. It is rather an invitation to researchers and policy makers for further in-depth investigations. Repeated surveying of Vietnamese enterprises on the issues related to innovation and technology since 2010 has resulted in a unique panel database that can be used to provide rigorous evidence on the changes in the Vietnamese

manufacturing sector. The areas that are worth investigating further include: productivity effects of technology transfers, productivity effects of upstream and downstream linkages with foreign and domestic enterprises, productivity effects of technology transfer policies, productivity effects of R&D activities, productivity effects of innovation and productivity effects of CSR practices.