

Nguyen, Anh, and Thang Nguyen. "Foreign direct investment in Vietnam: Is there any evidence of technological spillover effects." Available at SSRN 1117202 (2008).

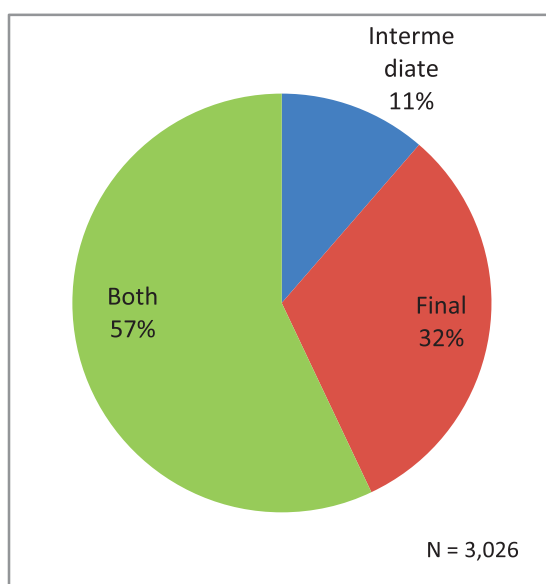
Tomohiro Machikita, Chi Binh Truong Thi, Yasushi Ueki, 2011." Technology Transfer to Vietnam for Process Innovation through Engineer Exchanges under China plus One Strategy, Firm-level Evidence," Working Papers 17, Development and Policies Research Center (DEPOCEN), Vietnam.

4 Backward Linkages: Technology Transfer from Customers

In addition to technology transfer and innovation arising from competition or worker mobility, firms can also get improved production technology or methods from suppliers or customers. An example may be an overseas customer that requires hygienic packaging conditions for food and sells the upstream Vietnamese supplier the technology to produce food with this packaging. The same packaging technology could be used in the supplier's other product lines. In this case, the technology transfer has not arisen through worker mobility or observation of other firms in the same sector but due to a linkage with a customer. Technology spillovers that arise from this kind of linkage are called "backward linkages" because the transfer of technology is from a customer back up the supply chain to a supplier.²Javorcik (2004) presents a compelling case that horizontal transfers are unlikely to arise because foreign firms that enter a sector compete with local firms; instead, she finds that the effect of backwards linkages between downstream foreign firms and their local suppliers create large and positive effects on local firms' productivity.

These linkages can occur for producers of both intermediate and final goods. Figure 4.1 shows that the majority of respondents (both firms that report spillovers and those that do not) produce both.

Figure 4.1: Composition of Output

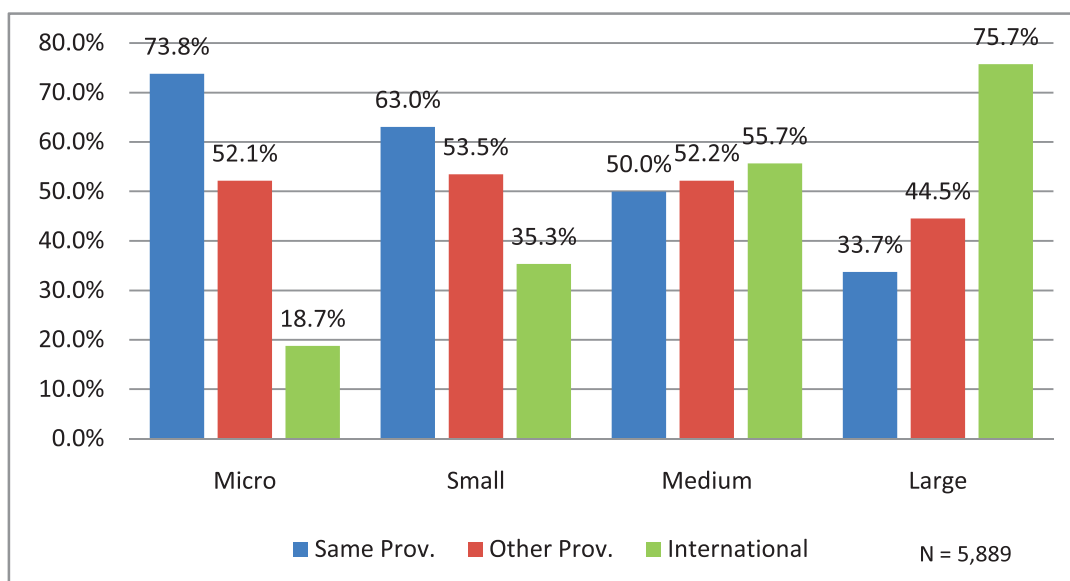


In the case of horizontal spillovers, a lot of emphasis is given to the degree of foreign presence in a given sector. Similarly, in the case of backwards linkages, we are interested in the share of respondents' output that is sold locally, nationally, or internationally (exported). Figure 4.2 below shows that the average share of the most important product sold internationally increases in the size

²Different sources use opposite labels for these linkages, depending on whether we look at the direction of the technology transfer from the perspective of the domestic or foreign firm. A backwards linkage from the domestic customer back up the supply chain is the same as a forward linkage from the perspective of the foreign supplier.

of the firm: larger firms are much more likely to derive most of their sales from exports (note that this is the average of the shares of output firms report selling to different locations, so the groups do not sum to 100%).

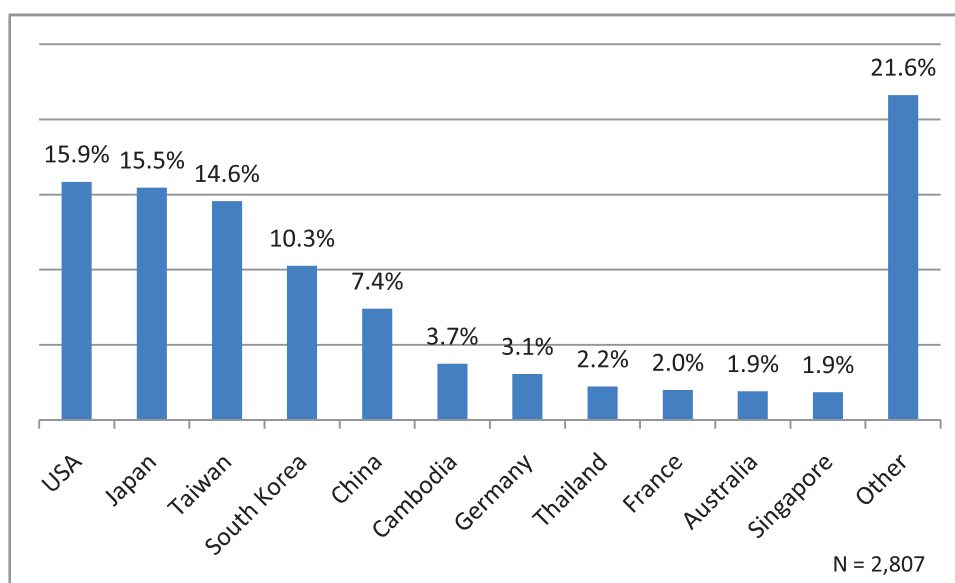
Figure 4.2: Sales Structure by Firm Size



Exporting is typically regarded as an important goal for domestic firms, and some research suggests that exporting (particularly manufactured exports) is an especially important driver of growth amongst low-income economies. Part of what makes exporting “good” is precisely that firms may capture the benefits of backwards linkages from international customers. In some cases, this manifests itself in industrial and trade policy through the objective of giving firms access to target markets. In some cases, the decision of local firms to export at all is motivated by foreign firms in the same sector. Anwar and Nguyen (2011), for example, present evidence from Vietnam that linkages between foreign and Vietnamese domestic firms cause local firms to export and increase their export shares. This can be desirable, and should be part of any coherent trade negotiation strategy. The TCS asks firms to list their most important export destination, which we summarise in Figure 4.3 below.³

³This is the share of exporting firms that listed the country as their most important export destination (not the share of exports to each country).

Figure 4.3: Most Important Country for Exports



Two unexpected findings are that lower-income emerging economies rank highly, and that the top ten most important destinations account for 78% of the exporters. Exporting to traditional high-value markets like the USA continues to be very important, but this should not crowd out emphasis on trade with other emerging economies. Finally, this suggests that a large number of (typically smaller) firms are successfully exporting to untraditional markets like Brunei, Uzbekistan, and North Korea.

Because export performance remains an important policy objective, we explore the determinants of whether a firm is able to export in a regression framework, the results of which are presented in Table 4.1 below.

In the final column of this table we account for both regional effects and sector effects (so we are looking at the determinants of whether a firm is an exporter while controlling for where it is located and which sector it operates in). Larger firms, as we saw in the graphical summary above, are significantly more likely to be exporters, but this is true of both medium and large firms when we control for geography and sector. Negative coefficients associated with firms' legal structures mean FDI firms are relatively more likely to be exporters. This may partially be due to foreign firms' use of Vietnam as a stop along a larger value chain; it may also simply indicate that Vietnamese firms are still learning how to compete internationally. In both cases, the export performance of domestic firms should continue to be tracked and benchmarked relative to FDI firms.

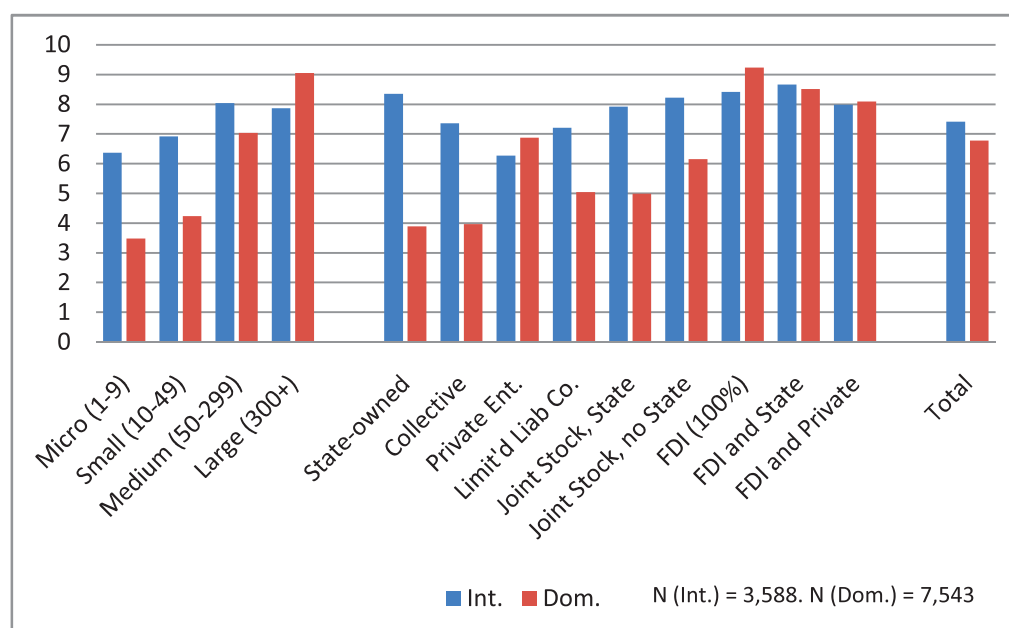
Table 4.1: Export Status by Firm Characteristic

Dependent variable is 1 if firm exports, 0 otherwise						
	(1)		(2)		(3)	
	coef	se	coef	se	coef	se
Micro (1-9)	-0.03+	(0.01)	-0.03+	(0.01)	-0.03+	(0.01)
Medium (50-299)	0.05+	(0.01)	0.08+	(0.02)	0.08+	(0.02)
Large (300+)	0.04+	(0.01)	0.08+	(0.03)	0.10+	(0.03)
State-owned	-0.05+	(0.01)	-0.04+	(0.01)	0.04+	(0.01)
Collective	-0.05+	(0.01)	-0.04+	(0.01)	-0.04+	(0.01)
Private Ent.	-0.06+	(0.00)	-0.05+	(0.00)	-0.05+	(0.00)
Limit'd Liab Co.	-0.06+	(0.01)	-0.05+	(0.01)	-0.05+	(0.01)
Joint Stock, no State	-0.06+	(0.00)	-0.04+	(0.00)	-0.04+	(0.00)
Joint Stock, State	-0.05+	(0.01)	-0.04+	(0.01)	-0.04+	(0.01)
FDI and State	-0.04+	(0.01)	-0.03*	(0.01)	-0.03*	(0.01)
FDI and Private	-0.03+	(0.01)	-0.02*	(0.01)	-0.02*	(0.01)
Observations	6,876		6,876		6,876	
Region Effect	N		Y		Y	
Sector Effect	N		N		Y	
Pseudo R-squared	0.087		0.12		0.14	
Marginal effects from Probit model, standard errors to right of coefficients clustered at firm level. Base: Small, FDI, Region 7 (HCMC), Food Processing (ISIC 15). Sector effects are at 2-digit level. Robust standard errors in parentheses. Coefficient on constant term not reported. + p<0.01, * p<0.05.						

A strong predictor for technology transfer is contract duration, which may proxy intangibles like trust and the strength of the working relationship between firms. Longer contracts suggest firms can deliver output of consistent quality, making contract duration both a proxy for firms' sophistication and one measure of how favourable conditions are for technology transfer.

Figure 4.4 below summarises average contract duration between firms in the sample and their customers: the duration increases in the size of the firm, but in no size grouping is the average contract longer than a year.

Figure 4.4: Average Contract Duration with Customers (Months)

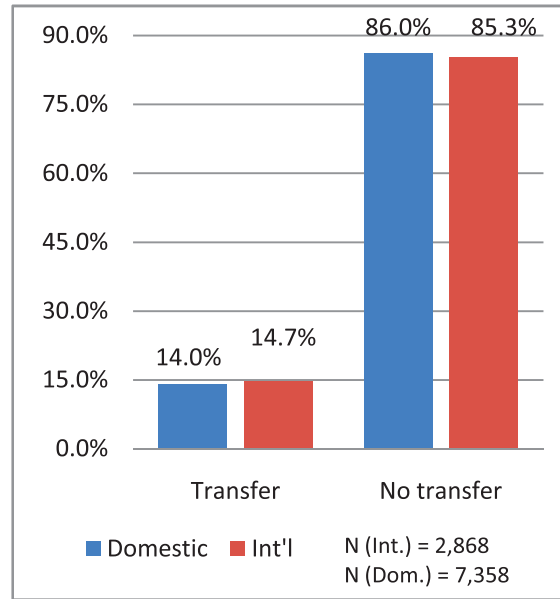


Average contract duration is quite short, limiting firms' ability to build sustainable, long-term relationships with customers and possibly limiting the chance of backward linkages (customers are unlikely to invest time and effort improving the quality of output for short-term supply arrangements). Contract duration appears to be longer amongst firms with some foreign involvement, but the average contract duration across the whole sample is just seven months.

Exporting and contract longevity are proximate factors associated with technology transfer from customers to suppliers. Most existing survey-based evidence about these linkages collects information at the sector-level, rather than the firm-level. The TCS is unique in that it directly captures information from firms about self-reported technology transfers, allowing policymakers to evaluate whether or not increased foreign investment actually creates the positive spillovers that are often simply assumed to exist.

Figure 4.5 below graphs the responses of firms about whether or not they experienced some kind of backward linkage (a transfer of technology from a customer). In both the case of domestic and international customers in samples of 2,868 and 7,358, respectively, roughly 14% of firms report some kind of technology transfer.

Figure 4.5: Technology Transfer from Customers

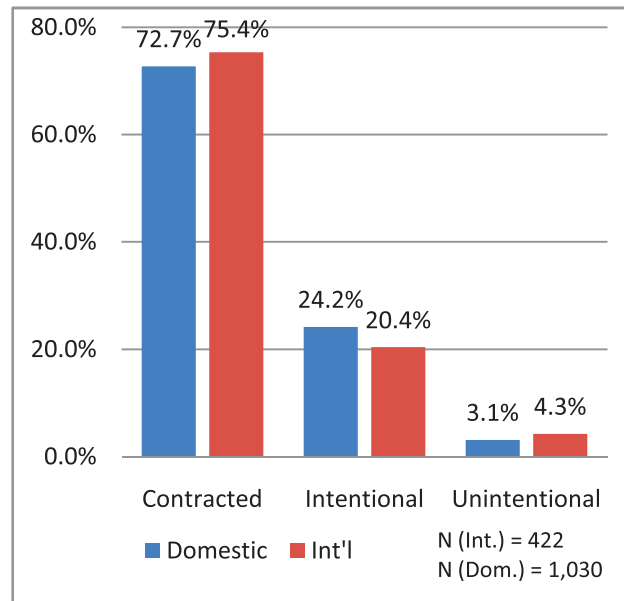


This indicates that a supply chain that includes some foreign presence (through either a foreign-invested firm in Vietnam or an international customer) may not be a more prolific source of technology diffusion than a local firm, in line with the evidence on the source of technology transfers reported above. The sample averages suggest that firms working with foreign companies are not much more likely to experience a backward linkage than firms working with local companies.

Figure 4.6 investigates how these transfers happen. In the sub-sample of firms reporting some kind of backward linkage, we see that the transfer is specified in the contract between the customer and the supplier in Vietnam in over 70% of both the international (sample size is 1,030) and domestic (422) cases. In the majority of the remainder of cases, the backward linkage is intentional, and in only a small minority of 3% of domestic transfers and 4% of transfers from international firms is the technology transfer “unintentional” (though of course we expect some reporting bias in the latter case).

As discussed in section 2 , Vietnam’s industrial policy is based in large part on the assumption that spillovers from foreign firms will occur. Based on simple survey averages, it seems that foreign customers are not more likely than domestic customers to transfer technology to suppliers, and that in both the domestic and international cases most of these transfers are mutually agreed. To analyse the effect of firm characteristics on the probability of whether or not a firm receives a transfer, we turn to regression analysis in Table 4.2.

Figure 4.6: Intentionality of Tech. Transfer from Customers



In this case, all three columns include both region and sector effects, so we are examining the effect of firm characteristics on the probability of reporting a backwards linkage while controlling for these factors. In the domestic case (column one), limited liability companies and joint stock companies are more likely to experience transfers. Simply put, domestic firms are more likely to report transfers from other domestic firms (relative to wholly FDI-financed firms, the base category). In the international case, there is no similarly strong pattern: once again, joint stock firms with no state involvement are more likely than other firm types to report a linkage, and collectives and private enterprises are less likely to do so.

When we combine information on both domestic and international backward linkages (the dependent variable in column three is whether the firm reported either a domestic or international linkage), the coefficients associated with legal structure are not precisely estimated. In the domestic and combined cases, larger firms are more likely to experience transfers than smaller ones.

The overall picture of backwards linkages in the 2012 TCS cross-section is mixed. There is some evidence that international customers are more likely to transfer technology to certain types of domestic firms, but international linkages are clearly not the only source of technology transfer from customers.

Table 4.2: Technology Transfer from Customers, Regression Analysis

Dependent variable is 1 if backward linkage reported, 0 otherwise						
	(1)		(2)		(3)	
	Int'l	se	Dom.	se	Either	se
Micro (1-9)	-0.03*	(0.01)	0.00	(0.01)	-0.02	(0.01)
Medium (50-299)	0.03+	(0.01)	0.02	(0.01)	0.02+	(0.01)
Large (300+)	0.06+	(0.02)	0.04+	(0.01)	0.05+	(0.02)
State-owned	0.12	(0.07)	0.07	(0.06)	0.07	(0.07)
Collective	0.03	(0.03)	-0.06+	(0.01)	-0.00	(0.03)
Private Ent.	0.04*	(0.02)	-0.08+	(0.01)	0.00	(0.01)
Limit'd Liab Co.	0.05+	(0.01)	0.01	(0.01)	0.01	(0.01)
Joint Stock, no State	0.07+	(0.02)	0.04+	(0.01)	0.02	(0.01)
Joint Stock, State	0.11+	(0.03)	0.03	(0.02)	0.04	(0.03)
FDI and State	0.04	(0.05)	-0.01	(0.04)	0.02	(0.04)
FDI and Private	0.03	(0.04)	0.03	(0.04)	0.01	(0.03)
Observations	8,109		8,109		8,082	
Region Effect	Y		Y		Y	
Sector Effect	Y		Y		Y	
Pseudo R-squared	0.045		0.18		0.037	
Note: Marginal effects from Probit model, standard errors to right of coefficients clustered at firm level. Base: Small, FDI, Region 7 (HCMC), Food Processing (ISIC 15). Sector effects are at 2-digit level. Robust standard errors in parentheses. + p<0.01, * p<0.05.						

On this evidence, policymakers should at least be cautious about assuming that international linkages automatically imply backwards linkages: domestic firms appear to be a rich source of useful technology for other local firms, a result that supports evidence presented above on horizontal spillovers.

References

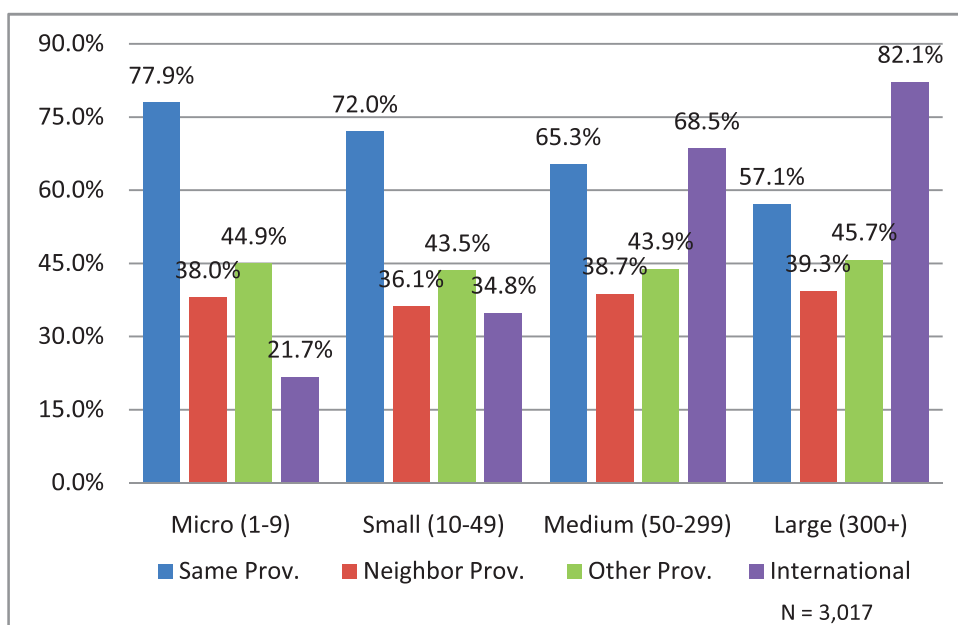
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5 Forward Linkages: Technology Transfer from Suppliers

Forward linkages are the counterpart to the backward linkages explored in section 4 above. These linkages represent technology transfers from suppliers to customers. This could happen, for example, if a firm in Vietnam gets access to new, cheaper, or higher-quality intermediate inputs produced by a foreign firm (either operating in Vietnam or overseas). The sample average of inputs bought in Vietnam reported by firms is 82%, with the remaining 18% procured overseas (sample was 8,107).

Figure 5.1 below shows that the average share of inputs from overseas increases in firm size, but firms in all size categories rely on domestic inputs (the columns are the average share of inputs from each source reported by size category, so need not sum to 100%). For most firms, the majority of inputs originate from the same or neighboring province, suggesting that if forward linkages arise they are more likely to be generated by domestic firms or foreign firms based in Vietnam than through contacts with international suppliers.

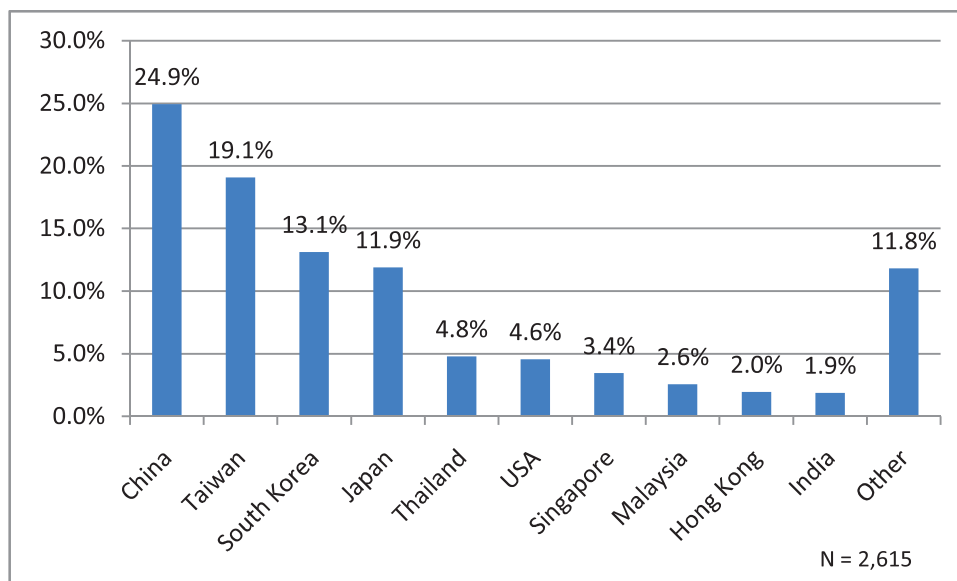
Figure 5.1: Source of Inputs



Given the relevance of these international supply contacts, we also examine the country reported as the “most important” source of inputs (either raw materials or intermediate goods) in Figure 5.2 below. As in the case of Figure 4.3 which showed the relative importance of export destinations, we see that the standard model of importing cheap inputs from low-income countries, processing them, and exporting them to higher-income countries is not necessarily dominant. While China is the most important source country for nearly 25% of the sample (of 2,615), some firms are importing inputs from higher-priced source countries like the USA and Japan. This likely is due in part to Vietnam’s

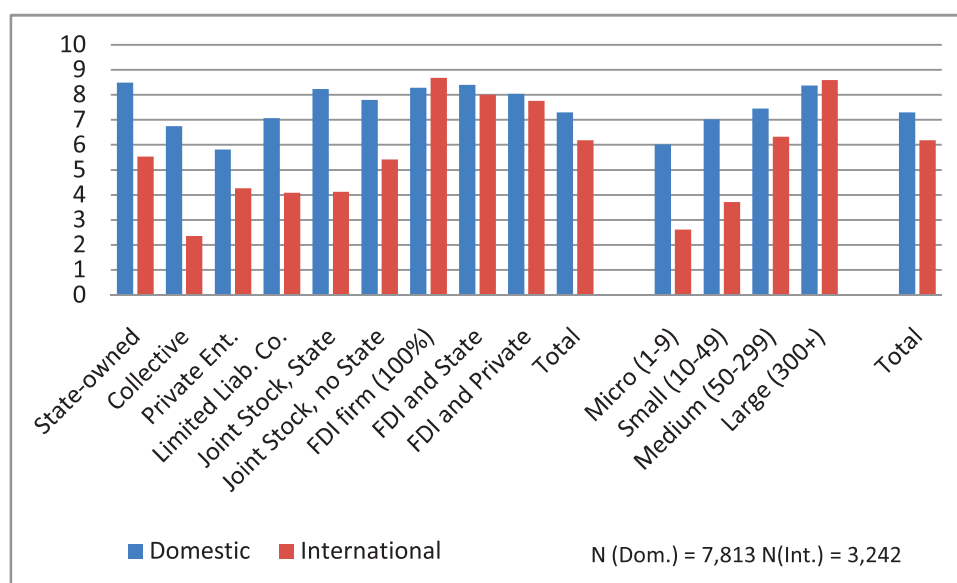
position along a value chain, in which high-quality intermediates are imported for transformation using relatively low-cost labour. Nevertheless, the TCS data from 2012 suggests a more nuanced picture of import sources and destination countries.

Figure 5.2: Most Important Country for Imported Inputs



Just as contract duration is an important indicator of the strength of ties between firms in the case of backward linkages, we examine the average contract duration between Vietnamese customers and their domestic and international suppliers (which may be correlated with forward linkages). Figure 5.3 shows that the average contract duration (measured in months) is, once again, remarkably short, with the average contract lasting less than a year regardless of firm type or size. The sample average (with 7,813 respondents for domestic contracts with suppliers and 3,242 for international contracts) is, in fact, shorter than in the case of relationships with customers. The overall picture of the supply chain relationships we can glean from the TCS data is therefore of relatively short-term production arrangements. The short duration of these arrangements, in turn, makes technology transfer less likely.

Figure 5.3: Average Contract Duration with Suppliers (Months)



Above, we examined the characteristics of firms related to being an exporter, because exporting may be “special” in the sense of producing positive externalities both for the exporting firms and other firms in the same sector. In Table 5.1, we turn to the related case of firms that import intermediate inputs. As in the case of exporters, while larger firms make up a minority of the sample, they are significantly more likely to import intermediate inputs. Relative to FDI firms (the base category), all other firm types are relatively less likely to be importers of intermediates. To the extent that importing intermediates is associated with a forward linkage between suppliers and customers in Vietnam, this pattern of results suggests the majority of potential benefits would accrue to foreign firms, rather than directly to Vietnamese firms. (This does not rule out a longer-run effect in which those gains then spillover to other firms, for example through a horizontal spillover from a single domestic firm to other firms in the same sector).

Table 5.1: Importers of Intermediate Inputs, Regression Analysis

Dependent variable is 1 if firm imports intermediates, 0 otherwise						
	(1)		(2)		(3)	
	coef	se	coef	se	coef	se
Micro (1-9)	-0.00	(0.01)	-0.00	(0.00)	-0.00	(0.00)
Medium (50-299)	0.03+	(0.00)	0.01+	(0.00)	0.01+	(0.00)
Large (300+)	0.06+	(0.00)	0.02+	(0.00)	0.02+	(0.00)
State-owned	-0.37+	(0.11)	-0.36+	(0.10)	-0.31+	(0.10)
Collective	-0.07	(0.04)	-0.02	(0.02)	-0.03	(0.02)
Private Ent.	-0.00	(0.01)	-0.01	(0.01)	-0.01	(0.01)
Limit'd Liab Co.	-0.11+	(0.01)	-0.05+	(0.01)	-0.05+	(0.01)
Joint Stock, no State	-0.25+	(0.03)	-0.10+	(0.02)	-0.10+	(0.02)
Joint Stock, State	-0.20+	(0.05)	-0.12+	(0.04)	-0.10+	(0.04)
FDI and Private	-0.03	(0.04)	-0.00	(0.02)	-0.01	(0.02)
Observations	8,038		7,814		7,814	
Region Effect	N		Y		Y	
Sector Effect	N		N		Y	
Pseudo R-squared	0.11		0.35		0.37	
Note: Marginal effects from Probit model, standard errors to right of coefficients clustered at firm level. Base: Micro, FDI, Region 7 (HCMC), Food Processing (ISIC 15). Sector effects are at 2-digit level. Robust standard errors in parentheses. + p<0.01, * p<0.05.						

Having explored indicators that could promote technology transfer through forward linkages, we turn to the firm-level data about whether companies actually experience these effects in Figure 5.4 below. Of the 2,620 firms with international suppliers that responded, nearly 20% reported some kind of positive spillover through a forward linkage; the figure is nearly 29% in a sample of 7,782 firms buying inputs from domestic suppliers. As in the case of backward linkages explored above, forward linkages apparently do not only arise through contact with international firms: domestic companies are more likely to report a backward linkage, and the total number of domestic firms with links to other domestic suppliers is, of course, larger. Of those firms that do experience some kind of technology transfer from suppliers, Figure 5.5 shows that in the majority of contacts between Vietnamese customers and both international and domestic suppliers, this transfer is agreed in the contract.

Figure 5.4: Technology Transfer from Suppliers

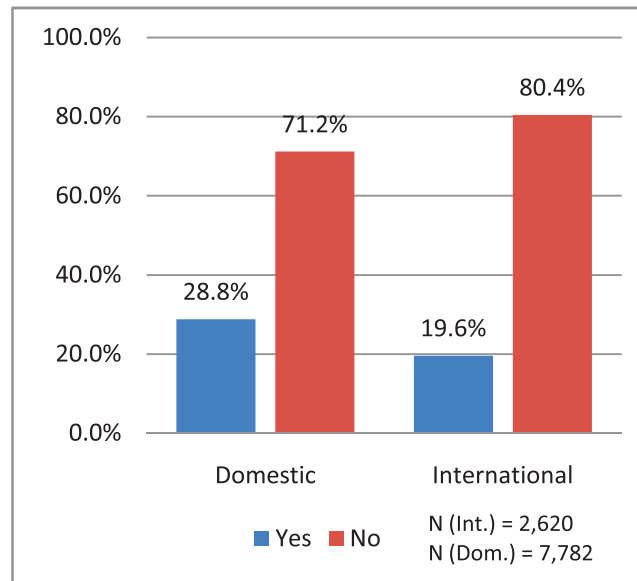
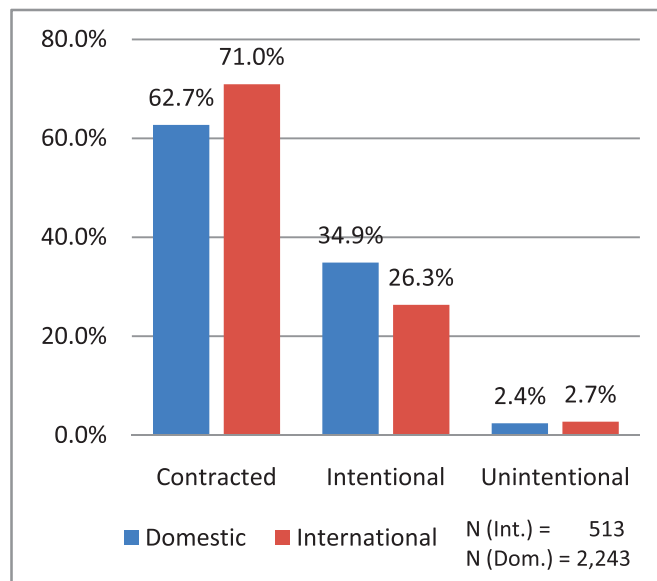


Figure 5.5: Intentionality of Tech. Transfer from Suppliers



A minority of roughly a third say the transfer is not explicitly agreed, while a very small minority of 2.4% in the domestic case and 2.7% in the international case responded that the transfer was unintentional and was not mutually agreed in a contract (samples were 2,243 firms for firms reporting links to domestic suppliers and 513 for firms with links to international suppliers).