Technology transfer through capital imports: Firm-level evidence*

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August 2013

Abstract

What is the effect of imported technology on firm productivity? To study this question, we estimate production functions in Hungarian firm-level data which directly control for the technology content of imported capital. Our preliminary results indicate that (i) the share of imported capital is strongly positively related to productivity both within and across firms; (ii) firms which import capital from a country are more likely to subsequently start importing intermediate inputs from the same country. These findings suggest that foreign technology diffuses to the firm importing capital, and that it is complementary with intermediate inputs.

JEL codes: D24, F14, F43, O33

Keywords: capital import, firm productivity, technology diffusion

*This research is carried out within the Center for Firms in the Global Economy (CEFIG). Financial support from the FP7 program SCIFI-GLOW is gratefully acknowledged.

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1 Introduction

Identifying when and how technology diffuses across borders is central to understanding cross-country productivity differences. To shed light on this issue, a large literature explores in aggregate data the extent to which trade, foreign direct investment and other mechanisms carry technology across borders.[1] While these papers generally document a positive association between international activity and improvements in productivity, potential omitted variables make it difficult to ascertain the extent to which such comovement represents the causal effect of international activity. Aggregate data is also silent on—potentially policy-relevant—microeconomic questions about technology diffusion: which firms benefit, does the transferred knowledge benefit an entire industry, do different types of knowledge interact?

In this paper we take a micro-econometric approach to international technology diffusion, and analyze one particular mechanism, capital imports—the importance of which has been emphasized by Eaton and Kortum (2001) and Caselli and Wilson (2004)—in Hungarian firm level data. While our micro approach is also subject to some endogeneity concerns, we argue that the use *product-level data* on technology imported by each individual firm yields improvements both in measurement and in identification. In particular, we are able to compare the intertemporal behavior of firms essentially identical in observables, one of which does, and the other does not start to import foreign capital. By doing so, we solve the country and industry level omitted variable problems which Keller (2004) highlights as key concerns with identification. We can also address directly micro-level questions about within-industry technology diffusion and within-firm complementarities.

The starting point of our analysis is a unique dataset that contains detailed information on imported capital and intermediate goods for essentially all Hungarian manufacturing firms during 1992-2003. In particular, for every importer we observe, in each year, the identity of each imported good, the amount of money spent on the good, and the source country. Using these data we construct a firm-level analogue of Coe and Helpman (1995) technology-weighted capital as the sum of capital imported from each foreign country weighted by the country's R&D intensity. We also include domestically purchased capital weighted by Hungarian R&D intensity in this calculation. Our empirical approach then is to use technology-weighted capital as a factor in firm level production function regressions which are identified

[1] For example, Coe and Helpman (1995) find that countries importing from R&D abundant trade partners are more productive, while Keller (2002), Keller and Yeaple (2009), Acharya and Keller (2009) obtain similar findings at the industry level.

in standard ways. This approach allows us to distinguish the effect of (unweighted) capital from that of the technology imported by an individual firm.

Our central finding is that—robustly across specifications—technology-weighted capital is strongly positively associated with firm sales. For example, in our preferred specification which includes firm fixed effects and controls for foreign ownership and exporting status, the coefficient on imported technology is 0.086 (standard error 0.011). In this regression identification comes from within-firm variation: conditional on capital, labor, and calendar year effects, firms are producing more in those years in which their technology-weighted capital is higher than its average value during the lifetime of the firm. This result cannot be explained by business-cycle effects, industry-specific trade costs or industry-level profitability, three major omitted variable concerns emphasized by Keller (2004). The most plausible alternative story explaining our fact is that firms which start importing foreign capital also simultaneously *become* more productive for reasons unrelated to capital imports. This could happen for example if the firm hires a talented manager who both starts to import foreign capital and streamlines the production process in other ways. While our identification is not immune to such concerns, the fact that our coefficient is stable across specifications which include different sets of observable controls gives us hope that it likely remains robust to including unobservables as well.[2]

Interpreted as a causal effect, our point estimate implies that the role of imported capital for technology diffusion is large. For example, if in 2003 all firms in the Hungarian economy replaced their capital stock with German capital, our estimate predicts that manufacturing value added would grow by 6 percent. And a simple development accounting exercise implies that the actual imports of foreign capital during 1996-2003 increased aggregate TFP in the Hungarian economy by 2 percent. Our result also goes beyond studies based on aggregate data by showing that cross-border technology diffusion is—at least partly—local to the firm importing foreign technology: that firm benefits more than others in the same industry. This finding raises the follow-up research question—to which we currently have no answer—of why some firms do while others do not import foreign technology.

Our micro approach also allows us to explore within-firm complementarities between different stages of production. Our main result here us that the probability that a firm imports materials from a given country increases after the firm imports capital from that country. Two potential explanations for this finding are that (i) capital and intermediate goods produced in a particular country are complementary; (ii) firms experience a change

[2] In future work we intend to improve identification using a discontinuity design which exploits the lumpiness of capital imports.

in foreign affinity which affects both their capital and material purchases. The first interpretation is consistent with related results by Csillag and Koren (2011), who analyze the effect of machine imports on the wages of machine operators. They find that workers whose employer have recently purchased a machine they regularly use enjoy significant wage premia both relative to workers in the same occupation at other firms, as well as relative to workers at the same firm in unrelated occupations. Taken together, their results and ours suggest that complementarities exist at several different places along the production chain, a result consistent with the theoretical arguments of Hirschman (1958), Kremer (1993) and Jones (2009) that complementarities, which amplify differences in input quality, may help explain large cross-country income differences.

In related work (Halpern, Koren and Szeidl, 2011), we estimate the effect of imported *intermediate inputs* on firm productivity. We find that firms that import intermediates are more productive partly because of the higher quality of imported inputs, partly because of the complementarity between domestic and foreign inputs. The current paper focuses on capital goods, for which embodied technology may be even more important than for intermediates.

The rest of the paper is organized as follows. In section 2 we present the data and stylized facts. We derive the production function in Section 3. We describe our capital stock variable in Section 4. Estimation results are presented in Section 5. In Section 6 we provide evidence for complementarity between imported capital and imported material inputs. Section 7 concludes.

2 Data and stylized facts

Our data come from the Hungarian Customs Statistics and Earnings Statements, covering the years 1992–2003. The dataset includes the full universe of trading firms as well as all firms with more than 20 employees. We focus on the manufacturing sector, which has about 32,000 firms. We use measures of sales, employment, fixed assets, other cost measures and ownership structure (foreign, state, private).[3]

In the Customs Statistics (CS), we have, for each firm, the annual export and import flows within the 6-digit Harmonized System categories (5,200 product categories). Importantly, we can also identify the source country of imports, which helps us differentiate imports from high-R&D countries. We measure the total imports of capital goods and components (from the end use classification). We do not have information on purchases of capital from *domestic*

[3] A more detailed description of the database is in Békés, Harasztosi and Muraközy (2009).

sources, which we calculate as the difference between total fixed assets and imported capital stock for each firm.

We take imported machines to be representative of the machinery industry in their source country. Table 1 reports the R&D intensities of machinery industries for 32 foreign countries and their share in the machinery imports of the sampled Hungarian manufacturing firms. R&D intensity is defined as business R&D expenditure over value added.[4] The firms in the sample import 82% of their machinery from the reported 32 countries.[5] For the rest of the source countries in the sample we impose 0.4% R&D intensity (the minimum of the data points). Notice that the R&D intensity of machinery production in Hungary (1.2%) is considerably lower than in most of the reported countries.

Table 1: Share in capital imports and R&D intensity of countries (%)

		import share	R&D intensity			import share	R&D intensity
1.	Sweden	1.0	23.0	17.	Norway	0.1	8.8
2.	United States	3.8	18.2	18.	Australia	0.0	7.8
3.	France	3.4	17.8	19.	Italy	5.5	6.3
4.	Israel	0.1	17.3	20.	Ireland	0.3	5.9
5.	Estonia	0.2	15.0	21.	Czech Republic	0.9	5.4
6.	Finland	0.6	14.9	22.	Slovenia	0.2	5.0
7.	Japan	7.6	14.6	23.	Spain	1.4	4.7
8.	Netherlands	1.4	14.4	24.	Greece	0.0	3.9
9.	Germany	35.9	12.1	25.	Switzerland	1.1	3.8
10.	Austria	8.8	12.1	26.	Romania	0.3	3.4
11.	South Korea	1.8	11.5	27.	New Zealand	0.0	3.0
12.	Canada	0.3	10.5	28.	Poland	0.8	2.6
13.	United Kingdom	2.5	10.0	29.	Turkey	0.1	2.2
14.	Belgium	1.8	9.6	30.	Slovakia	0.6	2.2
15.	Iceland	0.0	9.4	31.	Portugal	0.5	2.1
16.	Denmark	0.3	9.1	32.	Mexico	0.8	0.4

Source: OECD, Eurostat and authors' calculation. R&D intensity is business R&D expenditure over value added in 1992-2003 and industries NACE 29-35. Countries sorted by R&D intensity.

Trade data confirms the view that machines that are imported from countries with high R&D intensity are in general of better quality. Prices of imported machinery, measured as value per unit quantity, correlate positively with the R&D intensity of the source country within 6-digit product categories. As Table 2 shows, if R&D intensity of the source country is one percentage point higher, the unit value of the imported machine is on average 3.5-5% higher.

Figure 1 shows two broad measures for the importance of imported capital in the Hungarian manufacturing sector. We find that roughly half of the firms has imported capital.

[4]Data is originally from the ANBERD database, reported by Eurostat and OECD.

[5]A further 14% is from China, Taiwan, Malaysia and Singapore, for which we do not have R&D data.

Table 2: Machinery prices and R&D intensity

Dependent variable: log value per quantity unit		
R&D intensity (32 countries)	0.0364***	
	(0.0012)	
R&D intensity (all countries)		0.0512***
		(0.0015)
6-digit product effects	yes	yes
Year effects	yes	yes
Adj.R^2	0.4645	0.4615
N	2,648,509	2,914,621

Notes: Log import value per unit quantity is regressed on the R&D intensity of source country's machinery sector by OLS with 6-digit product and year dummies. Sample is machinery imports of Hungarian manufacturing firms in years 1992-2003. Robust standard errors with product clusters in brackets.

The share of these firms has increased to close to 60% by 2003. Those firms that import capital has acquired 35-45% of their fixed assets from foreign sources. This share stayed stable since the mid-1990s.

Figure 1: Trends in capital imports

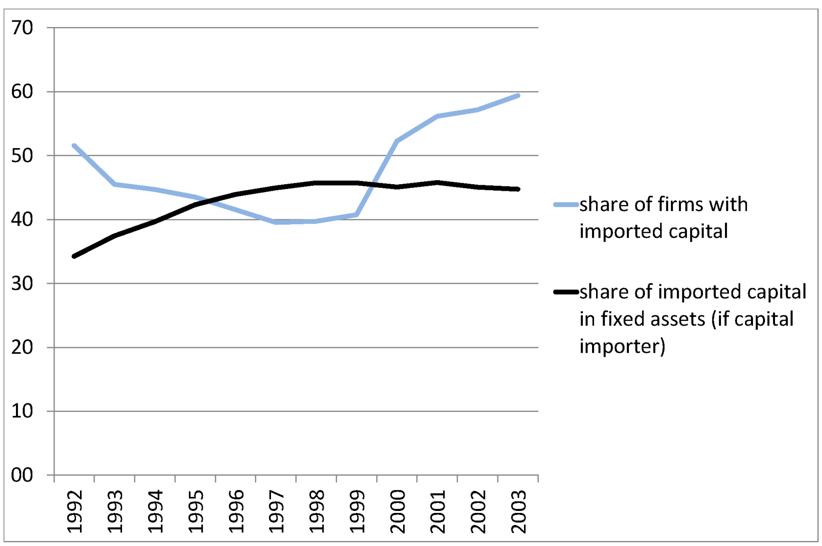


Table 3 compares the characteristics of firms that have imported capital stock to those that have not. The two sets of firms differ considerably in many ways. Firms with imported capital are bigger than non-importers.[6] They are on average more productive, and are more

[6]The same holds for intermediate importers, see Halpern, Koren and Szeidl, 2011.

likely to export. They are also more likely to import their material inputs and be foreign-owned.

Table 3: Firms with and without imported capital

Variable	**Non-importer**	**Importer**
Employment (persons)	15.00	94.00
Sales (HUF million)	25.84	421.16
Value added per worker	0.72	1.16
Capital per worker	0.79	3.05
Material per worker	2.28	3.54
Exporter dummy	0.16	0.58
Exports in total sales (%)	0.05	0.25
Material importer dummy	0.14	0.64
Foreign ownership dummy	0.07	0.31
Imported capital in total fixed assets (%)	0.00	0.44
Observations	91,553	81,967
	53%	47%

Notes: Statistics are averages across firms and years 1992-2003.

These differences also reflect selection: larger and better performing firms are more likely to buy (better quality) foreign machines than domestic ones. To control for such selection effects, we next look at firms, who became capital importers during the sample period. We compare the performance of these firms before and after becoming capital importers (and having more than 30% of their capital imported) by estimating with firm fixed effects. Results in Table 4 show that firms become bigger, more productive and more capital- and material-intensive after the capital import. There is also evidence that firms start to purchase their material inputs from foreign markets as their share of imported capital increases.

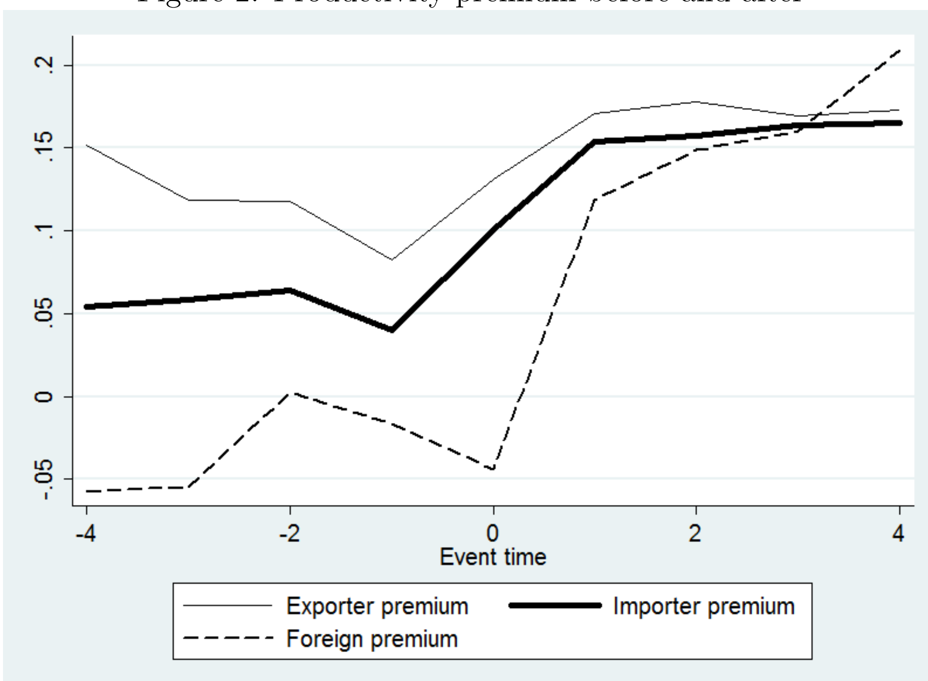
Table 4: Firms after capital imports

	Employment (log)	Value added per worker (log)	Capital per worker (log)	Material per worker (log)	Foreign	Exporter	Material importer
After capital imports	0.193***	0.117***	0.148***	0.088***	0.010**	0.033***	0.033***
	(0.016)	(0.016)	(0.022)	(0.018)	(0.004)	(0.007)	(0.008)
Over 30% imported cap.	0.068***	0.044**	0.239***	0.136***	-0.012**	-0.008	0.030***
	(0.024)	(0.022)	(0.033)	(0.027)	(0.006)	(0.010)	(0.010)
Employment (log)		-0.195***	-0.438***	-0.143***	-0.002	0.112***	0.100***
		(0.015)	(0.016)	(0.018)	(0.003)	(0.004)	(0.004)
Observations	34,734	31,759	34,115	34,401	34,734	34,734	34,734
Number of firms	4,994	4,922	4,994	4,994	4,994	4,994	4,994
Within R-squared	0.132	0.037	0.224	0.078	0.004	0.084	0.082

Notes: Firm fixed effects and common time dummies included. Sample includes firms that became capital importers between 1992 and 2003. Robust standard errors (in parentheses) are clustered by firm. *** p¡0.01, ** p¡0.05, * p¡0.1

We look at the relative importance of selection versus technology spillover by observing the productivity premium in the years before and after a firm becomes capital importer, and do the same for becoming exporter and foreign-owned. We measure productivity premium as the difference in the level of TFP relative to firms who never become capital importers, exporters or foreign-owned. Figure 2 shows that selection seems to be weaker and technology spillover somewhat stronger for capital imports than for becoming an exporter. The strongest spillover effect, with no selection, is however observed for becoming foreign-owned.

Figure 2: Productivity premium before and after



3 An empirical model of imported capital

In the next sections we look at the effect of imported capital on firm productivity. We study the production process in value added terms. We assume that value added output is determined by the production function

$$Y_{it} = \Omega_{it}\Lambda_{it}^{\alpha}K_{it}^{\alpha}L_{it}^{\beta}, \tag{1}$$

where K denotes capital inputs, Λ the R&D content of capital, L labor inputs, and Ω is Hicks neutral total factor productivity (TFP).

We assume that K is assembled from a combination of two varieties, a domestic and a foreign one, $K = K_H + K_F$. Capital goods carry different levels of R&D depending on their country of origin. The R&D content Λ is the ratio of the stock of R&D (R) and the capital stock and is given by

$$\Lambda_{it} = \frac{R_{it}}{K_{it}} = \frac{\lambda_0 K_{Hit} + \sum_c \lambda_c K_{cit}}{K_{it}},$$

where c denotes foreign source country with λ_c R&D content and λ_0 is the R&D content of domestically produced capital.

The R&D content can be further decomposed into (i) a difference between imported and non-imported R&D and (ii) cross-country variation in R&D,

$$\Lambda_{it} = \frac{\lambda_0 K_{Hit} + \bar{\lambda} K_{Fit}}{K_{Hit} + K_{Fit}} \cdot \frac{\lambda_0 K_{Hit} + \sum_c \lambda_c K_{ict}}{\lambda_0 K_{Hit} + \bar{\lambda} K_{Fit}}, \tag{2}$$

where $\bar{\lambda} > \lambda_0$ is the average R&D content of imported capital. The decomposition reflects that R&D content can be large (i) because the firm uses more imported capital, which contains on average more R&D than non-imported capital, and (ii) because imported capital is from R&D abundant countries.

The log of the production function (1) gives the estimable equation,

$$y_{it} = \alpha_1 \ln \Lambda_{it} + \alpha_2 k_{it} + \beta l_{it} + \omega_{it}, \tag{3}$$

where lower-case letters denote natural logarithms. We estimate (3) by OLS with industry-time dummies and by firm fixed effects. Firm fixed effects can control for cross-sectional variation in the unobserved productivity term, ω_{it}. Later on, we wish to fully specify the dynamic investment decision of the firm, and the biases arising from the endogeneity of this decision with respect to productivity.

We will modify (3) and replace λ_{it} with its decomposition in (2) to get separate estimates for the two effects. Also, we will decompose the capital variable as $k = \ln(1 + \frac{K_F}{K_H}) + k_H$ to test whether the source of capital matters after controlling for differences in R&D content.[7] Equality of coefficients on $\ln(1 + \frac{K_F}{K_H})$ and k_H shall confirm that, after controlling for R&D content, imported and non-imported capital has the same effect on productivity.

4 Measurement

We use the perpetual inventory method to calculate K_{Fit},

$$K_{Fit} = (1 - \delta) K_{Fi,t-1} + \sum_c M_{ict},$$

[7] Estimation sample size is somewhat smaller in this case, because we lose firms with zero domestic capital.

where δ is depreciation (which we set to 10 percent a year), and M_{ict} is the amount of imported capital purchased by firm i from source c in year t.

Since our CS sample starts in 1992, we cannot observe capital imports by firm before that date. We estimate the initial imported capital stock in 1991 based on total capital goods imports of Hungary in years 1980-1991, using the same perpetual inventory method.[8] The imported capital stock in 1991 is then allocated to firms, operating in 1992, proportional to their share in total capital imports in the CS sample. In addition, we start our estimation sample in 1996, by which time a large fraction of the early capital stock would have depreciated anyway.

The flow of imported R&D,

$$r_{Fit} = \sum_c \lambda_c M_{ict},$$

is the sum of capital imports weighted by the R&D intensities of the machinery industry in the source country (λ_c). We calculate the stock of imported R&D also by the perpetual inventory method,

$$R_{Fit} = (1-\delta)R_{Fi,t-1} + r_{Fit},$$

where we assume the same depreciation rate as for capital. The stock of non-imported capital is obtained from the difference between total fixed assets and the imported capital stock: $K_{Hit} = K_{it} - K_{Fit}$. Hence, the total stock of R&D (foreign and domestic) is

$$R_{it} = R_{Fit} + \lambda_0 K_{Hit},$$

where λ_0 is the R&D intensity of the Hungarian machinery industry.

5 Results

Table 5 presents the results of the OLS regressions. All specifications include industry-year dummies (not reported), with 4-digit NACE industry classification. The coefficients are therefore identified from firm level data within industry and year. Robust standard errors are clustered by firm. We restrict the sample period to years between 1996 and 2002.[9] Several findings emerge.

When the R&D content of capital is not controlled for (columns 1 and 2), the imported capital stock is estimated to affect total factor productivity significantly stronger than domestically purchased capital. When we control for the R&D content (columns 3 and 4), this

[8] Data is from the Trade, Production and Protection database of CEPII. We deflate trade flows (in current USD) with the US Producer Price Index of capital goods.

[9] We do not include year 2003 due to a change in the industry classification of many firms.

Table 5: Capital imports and productivity - OLS

Dependent variable: log value added	(1)	(2)	(3)	(4)	(5)	(6)
R&D content of capital			0.088***	0.194***		0.043***
			(0.007)	(0.013)		(0.007)
Import content					0.085***	
					(0.007)	
Cross-country variation					0.111***	
					(0.018)	
Capital stock	0.253***		0.242***		0.243***	0.229***
	(0.004)		(0.004)		(0.004)	(0.004)
Foreign-to-domestic		0.405***		0.232***		
		(0.010)		(0.013)		
Domestic		0.263***		0.257***		
		(0.004)		(0.004)		
Employment	0.761***	0.747***	0.762***	0.740***	0.761***	0.740***
	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.005)
Firm has foreign owner	0.236***	0.223***	0.183***	0.179***	0.184***	0.120***
	(0.014)	(0.017)	(0.015)	(0.017)	(0.015)	(0.015)
Firm imports materials						0.188***
						(0.012)
Firm is an exporter						0.159***
						(0.011)
Observations	98,321	84,210	98,321	84,210	98,321	98,321
R-squared	0.785	0.773	0.786	0.775	0.786	0.789

Notes: Standard errors (in parentheses) are clustered by firm. All specifications include industry-time dummies. *** p¡0.01, ** p¡0.05, * p¡0.1

difference vanishes. This suggests that our measure for R&D content captures most of the "quality" variation in capital items.

R&D content is strongly positively related to total factor productivity. Its estimated coefficient in column 3 can be read as follows. If all capital in the Hungarian manufacturing sector were sourced from abroad and, as a consequence, the average level of R&D content rose from 3.3% to 10.5%, productivity would be up roughly by 10%. The coefficient is somewhat smaller, though still strongly significant, if we control for the exporting and importing status of the firm (column 6).

In column 5 we report estimates for the decomposition of R&D content into import content and cross-country variation as in (2). It shows that imports from R&D abundant countries matter significantly more for productivity; they are associated with productivity gains that are roughly twice as high as those for imports from R&D scarce countries. This is consistent with country- and sector-level evidence from Coe and Helpman (1995) and Acharya and Keller (2009).

Table 6 reports firm fixed effects estimates with common year dummies (not reported). Here the coefficients are identified from time changes within firm. Robust standard errors are again clustered by firm. Fixed effects estimation controls for endogeneity of the right-hand side variables to the time-constant component of productivity.

Table 6: Capital imports and productivity - Fixed Effects

Dependent variable: log value added	(1)	(2)	(3)	(4)	(5)	(6)
R&D content of capital			0.100***	0.111***		0.086***
			(0.011)	(0.015)		(0.011)
Import content					0.108***	
					(0.011)	
Cross-country variation					-0.003	
					(0.027)	
Capital stock	0.172***		0.176***		0.176***	0.170***
	(0.005)		(0.005)		(0.005)	(0.005)
Foreign-to-domestic		0.249***		0.191***		
		(0.012)		(0.013)		
Domestic		0.182***		0.183***		
		(0.006)		(0.006)		
Employment	0.667***	0.651***	0.664***	0.648***	0.664***	0.648***
	(0.010)	(0.010)	(0.010)	(0.011)	(0.010)	(0.010)
Firm has foreign owner	0.027	0.025	0.022	0.021	0.022	0.014
	(0.021)	(0.025)	(0.021)	(0.025)	(0.021)	(0.021)
Firm imports materials						0.120***
						(0.010)
Firm is an exporter						0.123***
						(0.011)
Observations	99,816	85,475	99,816	85,475	99,816	99,816
Number of firms	24,316	22,409	24,316	22,409	24,316	24,316
Within R-squared	0.283	0.276	0.285	0.277	0.285	0.289

Notes: Standard errors (in parentheses) are clustered by firm. All specifications include firm fixed effects and common time dummies. *** p¡0.01, ** p¡0.05, * p¡0.1

The fixed effects estimates confirm most of the previous findings. Importantly, the estimated effect of the R&D content falls in the same range. A difference from the previous estimates is that the cross-country variation in R&D content does not seem to play a role (column 5). The relatively large standard error estimate however suggests a weak time series variation of this variable.

6 Imported capital and imported material

The effect of imported machinery on productivity might be amplified by complementarities between imported capital and imported material inputs. Estimation results in Section 2 (Table 4) suggest that firms start to import material inputs after importing machines. If imported material is technologically more advanced than domestic material, such complementarities may strengthen the technology transfer.

In this section we ask whether high-R&D capital imports make it more likely that the firm starts to import high-R&D material.[10] First, we look at whether capital imports from a given country increases the likelihood of material imports from the same country in the subsequent years. We take capital and material import data in firm - source country - year detail and consider firms who started to import capital from a given country during the sample period. We estimate with firm-country fixed effects and control for the size of the firm (employment), foreign ownership, exporter status and a common time trend (not reported).

Table 7: Importing materials by country

Dependent variable: Firm imports material dummy			
	(1)	(2)	(3)
After capital imports	0.051***	0.047***	0.037***
	(0.002)	(0.002)	(0.003)
After x Top 10 R&D		0.010***	
		(0.004)	
After x Top 20 R&D			0.022***
			(0.003)
Observations	363,371	363,371	363,371
Number of groups	39,424	39,424	39,424
Within R-squared	0.088	0.088	0.088

Notes: Firm-country fixed effects and common time dummies included. Additional regressors: employment (log), foreign dummy, exporter dummy. Sample includes firms that became capital importers between 1992-2003. Robust standard errors (in parentheses) are clustered by firm-country groups.
*** p¡0.01, ** p¡0.05, * p¡0.1

Results in Table 7 show that firms tend to start importing material from the source country of their capital. Capital import from a given country increases the likelihood of material imports from the same country by 5-6%. This effect is significantly stronger if capital was imported from one of the the most R&D abundant sources (first 10 or first 20 in Table 1).

Capital importers are not only more likely to buy materials from the same source country, but also from other countries. This finding especially holds for firms, who have imported capital from R&D abundant countries. Firm-level estimates in Table 8 show that after buying capital from top 20 R&D foreign sources a firm is more likely to import material from both top 20 and non-top 20 countries. However, this effect is clearly the strongest for material from top 20 countries, which are also capital sources of the firm.

[10] Material inputs are BEC categories 111 “Food, beverages, primary, mainly for industry”, 121 “Food, beverages, processed, mainly for industry” and 2 “Industrial supplies not elsewhere specified (both primary and processed)”.

Table 8: Importing materials

Dependent variable: Firm imports material dummy			material from top20	material from top20 & firm's capital source	material from non-top20
After capital imports	0.088***	0.035**	-0.001	-0.020***	0.019
	(0.006)	(0.015)	(0.013)	(0.007)	(0.014)
After top20 R&D capital imports		0.060***	0.096***	0.418***	0.037***
		(0.015)	(0.014)	(0.008)	(0.014)
Observations	44,076	44,076	44,076	44,076	44,076
Number of firms	5,448	5,448	5,448	5,448	5,448
Within R-squared	0.196	0.196	0.184	0.349	0.107

Notes: Firm fixed effects and common time dummies included. Additional regressors: employment (log), foreign dummy, exporter dummy. Sample includes firms that became capital importers between 1992-2003. Robust standard errors (in parentheses) are clustered by firm. *** p¡0.01, ** p¡0.05, * p¡0.1

7 Summary

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