Climbing the Rungs of the Quality Ladder: FDI and Domestic Exporters in Romania

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May 10, 2017

Upgrading of export quality and sophistication

- correlated with economic growth (Schott, 2004; Hausmann et al., 2007; Hidalgo and Hausmann, 2009)
- precondition for successful exporting and participation in GVCs (Brooks, 2006; Hallak and Sivadasan, 2013; Sutton, 2012; Iacovone and Javorcik, 2012)
- objective of industrial policies
  - *"Given the competitiveness squeeze that South African industry finds itself in, industrial upgrading is a logical progression in order to avoid cut-throat price competition as certain parts of manufacturing becoming increasingly commoditised, particularly due to a combination of global trade liberalisation and pressure from Chinese and Indian firms in particular."* South African National Industrial Policy Framework

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- **How can countries promote export upgrading?**

What drives export upgrading?

- trade liberalisation (Amiti and Khandelwal, 2013)
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- **presence of multinational enterprises (MNEs)?**

MNEs are special

- MNEs are active in R&D and skilled labor intensive sectors (Markusen 1995)
- MNEs are more productive than other firms (Helpman, Melitz and Yeaple 2004)
- MNEs have outsize role in global R&D performance
  - Foreign affiliates account for $>$50% of business R&D in Belgium and Czech Republic (OECD, 2017)

Research questions

- Do exporters in an emerging economy improve...
  - within-product quality of their exports
  - sophistication or diversification of product and destination mix
- ...as a result of MNE presence in...
  - downstream sectors?
  - upstream sectors?
  - the same sector?

How can MNE presence affect the quality of exports?

Downstream FDI

- Incentive to upgrade or develop new products to become a supplier
- Help from MNEs to suppliers
- Reputation facilitating access to new markets

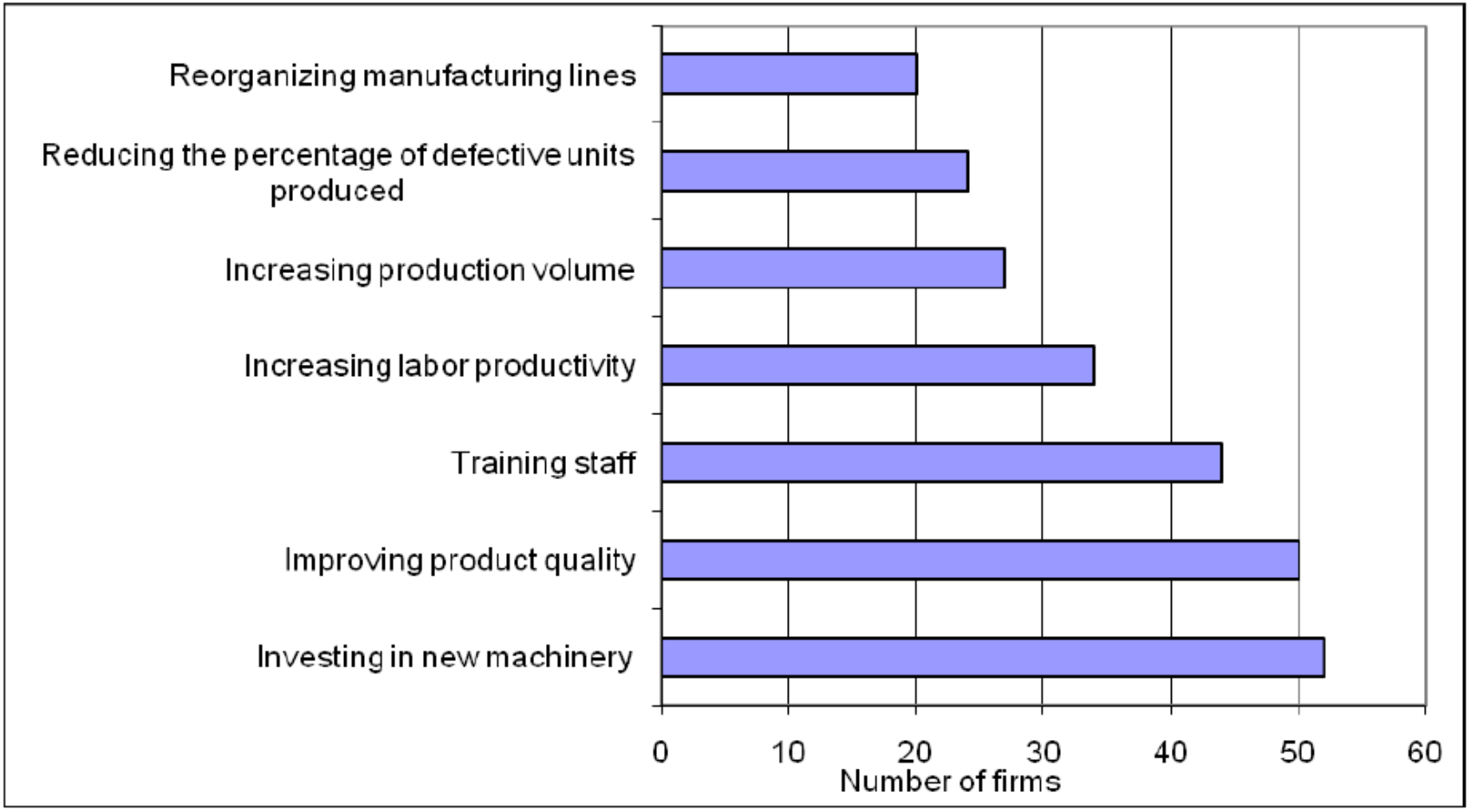
Upstream FDI

- Higher quality inputs lead to higher quality output (Kugler and Verhoogen, 2012)
- If there is fixed cost of importing, smaller firms may be unable to access imported inputs

Own-sector FDI

- Demonstration effects
- Worker flows (Poole, 2012)

Improvements undertaken by Czech firms in order to supply MNEs



Source: Javorcik (2008).

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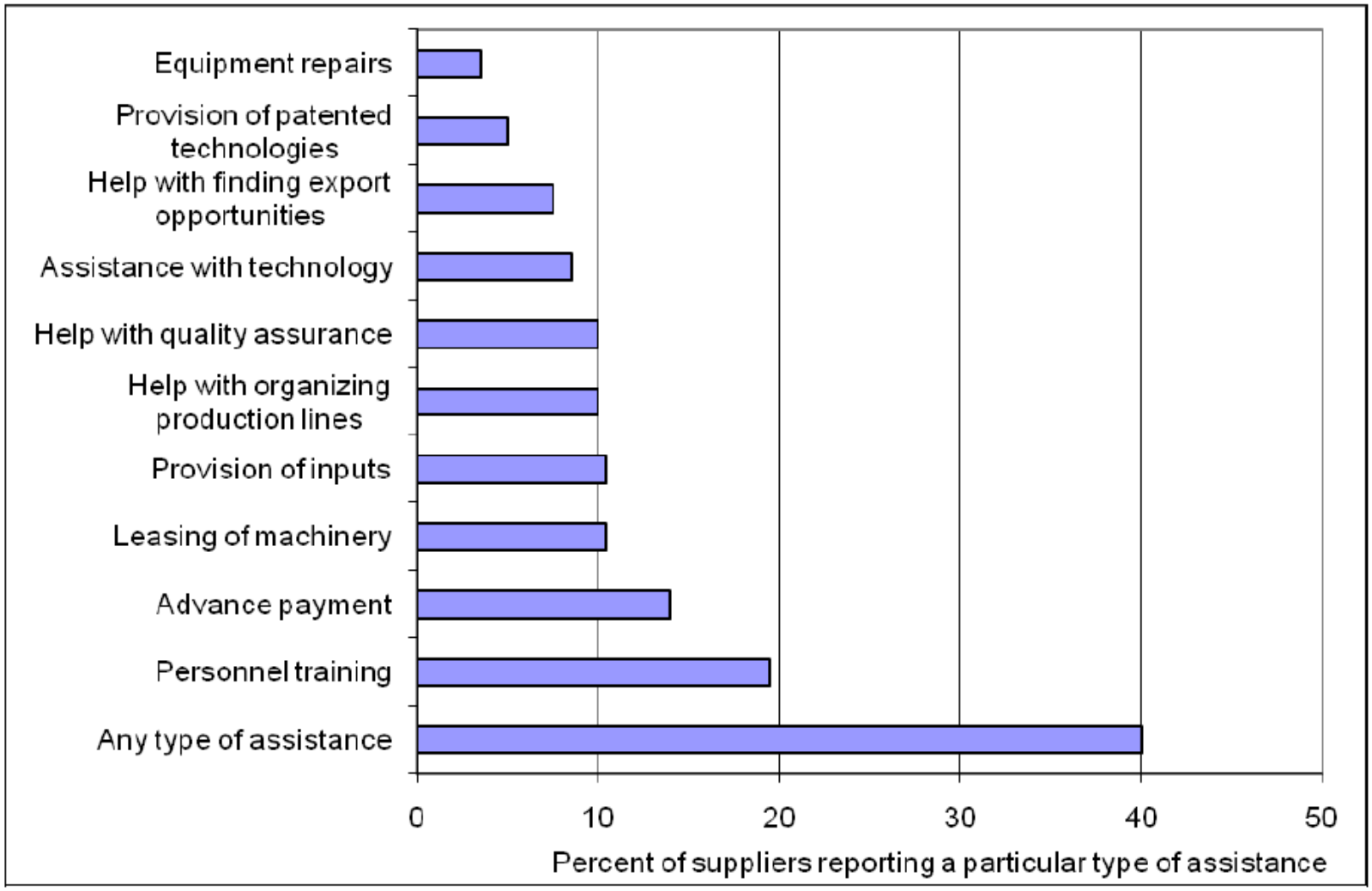
Assistance received by Czech firms from MNEs



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Results consistent with...

- Romanian exporters upgrading the within-product quality of export products thanks to
  - supplying downstream MNEs
  - access to inputs from upstream MNEs

Results consistent with...

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- no positive effect of MNE presence on sophistication of product or destination mix

Literature

- **Export upgrading** — Imbs and Wacziarg (2003), Schott (2004), Hausmann et al. (2007), Hidalgo and Hausmann (2009), Mattoo and Subramanian (2009), Goldberg et al. (2010)
- **Productivity spillovers from FDI** — Javorcik (2004), Blalock and Gertler (2008), Javorcik and Spatareanu (2008, 2011), Havranek and Irsova (2011)
- **Exporting and FDI** — Aitken et al. (1997), Greenaway et al. (2004), Kneller and Pisu (2007)
- **Export upgrading and FDI** — Chen and Swenson (2007), Swenson (2008), Harding and Javorcik (2012), Javorcik et al. (2016)

Talk outline

Romanian data

Firm panel, 2005-2010

- All firms with >20 employees, sample of smaller firms
- 15,000 domestic and 5,000 foreign manufacturing firms

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Input-output table

- 58 manufacturing industries

Examples of CN 8-digit products

- **0401 10 10** Milk and cream, not concentrated nor containing added sugar or other sweetening matter; of a fat content, by weight, not exceeding 1%; In immediate packings of a net content not exceeding two litres

- **0401 20 91** Milk and cream, not concentrated nor containing added sugar or other sweetening matter; of a fat content, by weight, exceeding 1% but not exceeding 3%; In immediate packings of a net content not exceeding two litres

Romania (2005-2010)

- Manufacturing — 30% of value added
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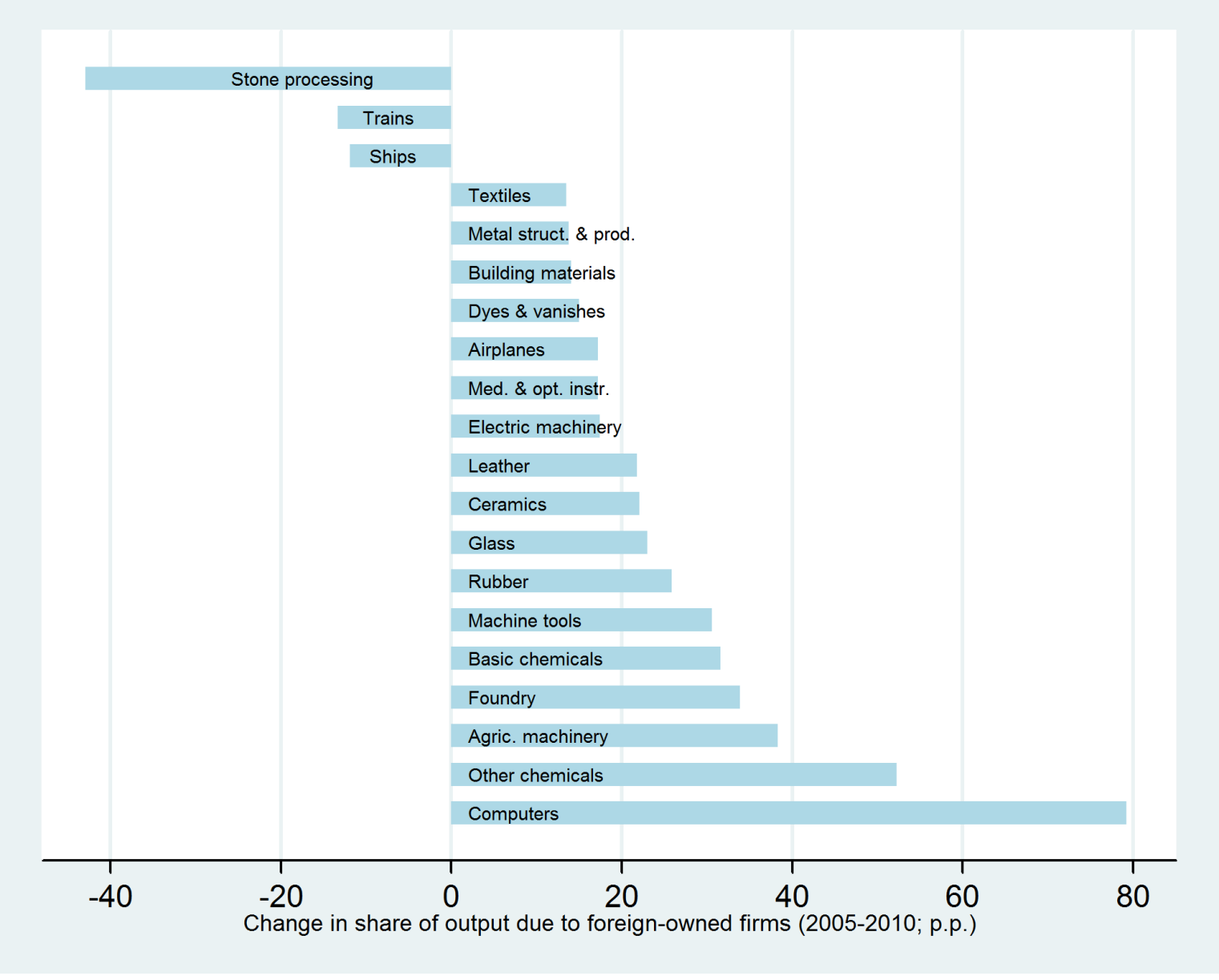
- Median unit values of domestic exporters relative to EU15 (%)
  - 2006 — 74%
  - 2011 — 87%

Industries with largest changes in foreign presence (2005-2010)



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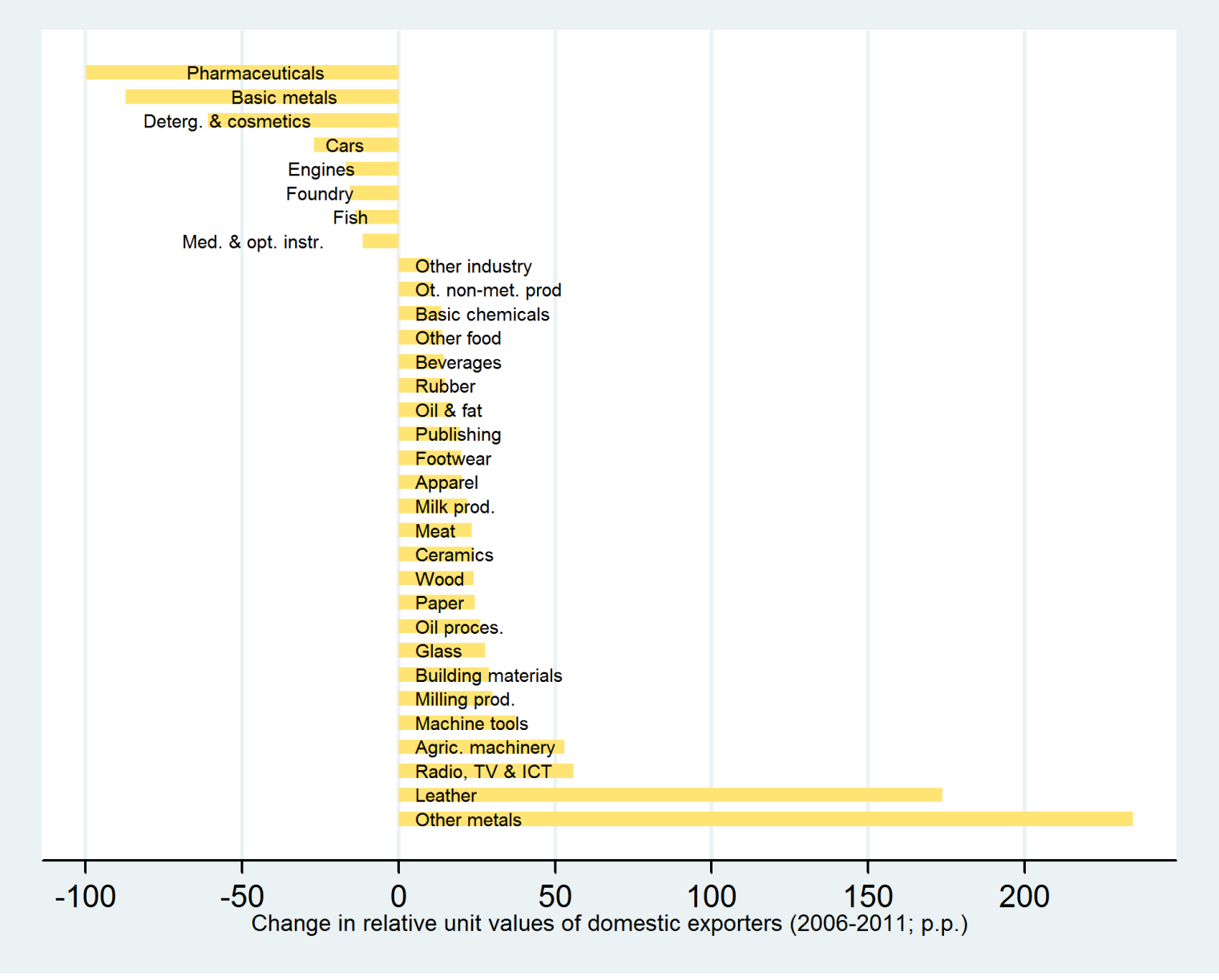

Romania - consultants' reports

"Biggest challenge in this sector is quality and skills to enable Romanian companies to join supply networks."

Romania - consultants' reports

- "In order to be accredited as official suppliers, firms need to satisfy quality requirements for all the firms plants throughout Europe."
- "Renault has '**local integration**' targets — 80% of inputs to be purchased from local country or region."

Romania - consultants' reports

"New technology and modern machinery available only from Western Europe or Japan."

Specification

$$\Delta Y_{i(p)(c)t} = \delta_1 \Delta OwnFDI_{s,t-1} + \delta_2 \Delta UpstreamFDI_{s,t-1} + \delta_3 \Delta DownstreamFDI_{s,t-1} + \pi_{rt} + \pi_{sr} + \eta_{ipt}$$

- Depending on outcome variable, observations defined by
  - firm-year-product-destination
  - firm-year-destination
  - firm-year-product
- Domestic manufacturing exporters
- Clustering by industry-year

Outcome variables

Within product quality

- **Log(unit values of exports)** - Schott (2004); Hummels and Klenow (2005); Hallak (2006, 2010)
- **Log(export quality)** - Khandelwal (2010); Amiti and Khandelwal (2013); Khandelwal et al. (2013)
- **Log(unit values of imports)** - Kugler and Verhoogen (2012); Manova and Zhang (2012)

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Product portfolio sophistication

- Product skill, R&D and advertising intensity (Ma et al., 2014)
- # of products

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Destination portfolio sophistication

- Mean log destination GDP p.c.
- Share of exports to rich destinations
- # of destinations

Estimating quality - Khandelwal et al. (2013)

- quality = ability to sell at high quantity for a given price
- estimated as residual (as in TFP estimation)

$$\log q_{ipct} + \sigma_s \log p_{ipct} = \alpha_p + \alpha_{ct} + \sigma_s \alpha_{ct} + e_{ipct}$$

- 2-digit-sector-specific σ_s from Broda and Weinstein (2006)
- Fan et al. (2015) find assumed and estimated σ lead to similar results

Measuring FDI presence

Own-industry foreign share

- $FDI_{st}^{own} = \frac{\sum_{j \in s} f_{jt} Y_{jt}}{\sum_{j \in s} Y_{jt}}$
- FDI_{st}^{own} = share of sectoral output due to foreign-owned firms

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Downstream-industry foreign share

- $FDI_{st}^{down} = \sum_{d} \alpha_{sd} FDI_{dt}^{own}$
- α_{sd} = share of intermediate inputs sales by sector s sold to sector d

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Upstream-industry foreign share

- $FDI_{st}^{up} = \sum_{u} \alpha_{us} FDI_{ut}^{own}$
- α_{us} = share of intermediate inputs sector s buys from sector u

Presence of MNEs and export unit values/quality

	(1) Levels	(2) First diff.	(3) Second diff.	(4) Third diff.	(5) Fourth diff.
			A. Unit values		
(Δ) Downstream FDI (s,t-1)	0.637***	0.797***	1.061***	0.856*	2.276***
	(0.196)	(0.269)	(0.331)	(0.435)	(0.396)
(Δ) Upstream FDI (s,t-1)	0.332***	0.272**	0.245	0.689***	0.283
	(0.092)	(0.123)	(0.167)	(0.234)	(0.187)
(Δ) Own FDI (s,t-1)	-0.243***	-0.178	-0.409***	-0.051	-0.364*
	(0.093)	(0.114)	(0.151)	(0.288)	(0.200)
R-squared	0.059	0.010	0.011	0.007	0.007
			B. Quality		
(Δ) Downstream FDI (s,t-1)	0.630**	0.704**	1.387***	1.100*	2.057***
	(0.256)	(0.346)	(0.483)	(0.626)	(0.622)
(Δ) Upstream FDI (s,t-1)	0.338***	0.511***	0.425**	0.605**	0.657***
	(0.119)	(0.144)	(0.192)	(0.282)	(0.239)
(Δ) Own FDI (s,t-1)	-0.215*	-0.229	-0.280	-0.083	-0.533*
	(0.129)	(0.175)	(0.280)	(0.505)	(0.272)
R-squared	0.008	0.003	0.005	0.004	0.002
N	146760	49598	28558	16766	9281

**** 99%, ** 95%, * 90%.*

Magnitudes

- The average increase in FDI^{down} in 2005-2010 of 6.2 percentage points implies **4-13%** increase in quality
- The average increase in FDI^{up} in 2005-2010 of 6.5 percentage points implies **2-4%** increase in quality

Strict exogeneity test

	(1)	(2)
	Unit values	Quality
Δ Downstream FDI (s,t-1)	0.369	0.596
	(0.377)	(0.407)
Δ Downstream FDI (s,t)	0.577	1.186**
	(0.489)	(0.552)
Δ Downstream FDI (s,t+1)	-0.241	0.001
	(0.322)	(0.369)
Δ Upstream FDI (s,t-1)	0.281**	0.594***
	(0.118)	(0.139)
Δ Upstream FDI (s,t)	-0.310*	-0.064
	(0.166)	(0.181)
Δ Upstream FDI (s,t+1)	0.014	-0.202
	(0.197)	(0.219)
Δ Own FDI (s,t-1)	-0.217	-0.546**
	(0.179)	(0.222)
Δ Own FDI (s,t)	-0.278	-0.485*
	(0.225)	(0.261)
Δ Own FDI (s,t+1)	0.087	-0.018
	(0.190)	(0.226)
R-squared	0.013	0.002
N	31108	29551

**** 99%, ** 95%, * 90%. Strict exogeneity test described by Wooldridge, 2010.*

Alternative explanations

	(1)	(2)	(3)	(4)
	Price control	Demand control	Import control	Cont. firms
		A. Unit values		
Δ Downstream FDI (s,t-1)	0.800***	0.865***	0.859***	1.006***
	(0.268)	(0.229)	(0.281)	(0.224)
Δ Upstream FDI (s,t-1)	0.272**	0.192*	0.186	0.286**
	(0.123)	(0.112)	(0.124)	(0.125)
Δ Own FDI (s,t-1)	-0.179	-0.162	-0.177	-0.351***
	(0.115)	(0.104)	(0.118)	(0.115)
Δ Log UV of EU exports (p,t)	-0.001			
	(0.003)			
Δ Log downstr. demand (s,t-1)		0.207***		
		(0.059)		
Δ Log industry imports (st)			0.072***	
			(0.024)	
R-squared	0.010	0.010	0.010	0.010
		B. Quality		
Δ Downstream FDI (s,t-1)	0.713**	0.771**	0.737**	0.761**
	(0.346)	(0.320)	(0.352)	(0.299)
Δ Upstream FDI (s,t-1)	0.510***	0.444***	0.461***	0.590***
	(0.143)	(0.141)	(0.155)	(0.154)
Δ Own FDI (s,t-1)	-0.232	-0.218	-0.228	-0.419**
	(0.176)	(0.166)	(0.180)	(0.190)
Δ Log UV of EU exports (p,t)	-0.002			
	(0.003)			
Δ Log downstr. demand (s,t-1)		0.168*		
		(0.087)		
Δ Log industry imports (st)			0.043	
			(0.031)	
R-squared	0.003	0.003	0.003	0.003
N	49597	49598	49598	34780

By stage of production

- MNE presence in sectors supplying inputs => impact on the quality of intermediate and final goods
- MNE presence in sectors buying inputs => impact on the quality of intermediates

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	Unit values		Quality	
	(1)	(2)	(3)	(4)
	Non-final	Final	Non-final	Final
Δ Downstream FDI (s,t-1)	1.452***	-0.148	0.987*	0.104
	(0.359)	(0.241)	(0.509)	(0.484)
Δ Upstream FDI (s,t-1)	0.463**	0.197	0.534**	0.614***
	(0.222)	(0.121)	(0.250)	(0.166)
Δ Own FDI (s,t-1)	-0.694***	0.293**	-0.489	0.049
	(0.243)	(0.126)	(0.297)	(0.169)
R-squared	0.009	0.016	0.004	0.003
N	20830	29381	19805	28479

**** 99%, ** 95%, * 90%.*

Presence of MNEs and import unit values

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	(1)	(2)	(3)
	Exporters	All firms	Imports & exports
Δ Downstream FDI (s,t-1)	0.354*	0.313*	0.294*
	(0.189)	(0.171)	(0.172)
Δ Upstream FDI (s,t-1)	0.317***	0.323***	0.256***
	(0.083)	(0.076)	(0.092)
Δ Own FDI (s,t-1)	-0.253**	-0.236**	-0.174*
	(0.122)	(0.111)	(0.091)
R-squared	0.004	0.004	0.002
N	125444	139565	5045

**** 99%, ** 95%, * 90%.*

Changes in product porfolio (firm-destination-year level, 1st diff.)

	(1) Skill	(2) R&D	(3) Advertising	(4) # products
Δ Downstream manuf. FDI (s,t-1)	-0.088***	0.000	-0.001	-0.014
	(0.027)	(0.002)	(0.001)	(0.195)
Δ Upstream manuf. FDI (s,t-1)	-0.014	0.000	0.001	0.249
	(0.018)	(0.001)	(0.001)	(0.180)
Δ Own FDI (s,t-1)	0.017	-0.003***	0.000	-0.194
	(0.020)	(0.001)	(0.001)	(0.141)
R-squared	0.002	0.000	0.001	0.010
N	22791	22791	22791	22791

**** 99%, ** 95%, * 90%.*

Changes in destination portfolio (firm-product-year level, 1st diff.)

	(1)	(2)	(3)
	Mean log GDP p.c.	Share of rich	# destinations
Δ Downstream manuf. FDI (s,t-1)	-0.171	-0.087	-0.123
	(0.266)	(0.121)	(0.156)
Δ Upstream manuf. FDI (s,t-1)	0.007	-0.010	0.062
	(0.157)	(0.068)	(0.107)
Δ Own FDI (s,t-1)	0.181	0.024	0.058
	(0.153)	(0.059)	(0.105)
R-squared	0.003	0.002	0.004
N	32035	32783	32783

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Conclusion

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  - MNEs strength in standards and procedures
- New policies for quality upgdading?
  - FDI promotion
  - facilitation of supplier-buyer relationship with MNEs

Amiti, Mary and Amit K. Khandelwal, "Import Competition and Quality Upgrading," *The Review of Economics and Statistics*, May 2013, *95* (2), 476–490.

Atkin, David, Amit K. Khandelwal, and Adam Osman, "Exporting and Firm Performance: Evidence from a Randomized Trial," *Quarterly Journal of Economics*, 2017.

Broda, Christian and David E. Weinstein, "Globalization and the Gains From Variety*," *The Quarterly Journal of Economics*, May 2006, *121* (2), 541.

Brooks, Eileen L., "Why Don't Firms Export More? Product Quality and Colombian Plants," *Journal of Development Economics*, 2006, *80*, 160–178.

Fan, Haichao, Yao Amber Li, and Stephen R. Yeaple, "Trade Liberalization, Quality, and Export Prices," *The Review of Economics and Statistics*, December 2015, *97* (5), 1033–1051.

Hallak, Juan Carlos, "Product Quality and the Direction of Trade," *Journal of International Economics*, January 2006, *68* (1), 238–265.

___ , "A Product-Quality View of the Linder Hypothesis," *The Review of Economics and Statistics*, 09 2010, *92* (3), 453–466.

___ **and Jagadeesh Sivadasan**, "Product and Process Productivity: Implications for Quality Choice and Conditional Exporter Premia," *Journal of International Economics*, 2013, *91* (1), 53–67.

Hausmann, Ricardo, Jason Hwang, and Dani Rodrik, "What You Export Matters," *Journal of Economic Growth*, 2007, *12* (1), 1–25.

Hidalgo, Cesar A. and Ricardo Hausmann, "The Building Blocks of Economic Complexity," *Proceedings of the National Academy of Sciences*, 2009, *106* (26), 10570–10575.

Hummels, David and Peter J. Klenow, "The Variety and Quality of a Nation's Exports," *American Economic Review*, June 2005, *95* (3), 704–723.

Iacovone, Leonardo and Beata Javorcik, "Getting Ready: Preparation for Exporting," Centre for Economic Policy Research Discussion Paper 8926, April 2012.

Khandelwal, Amit, "The Long and Short (of) Quality Ladders," *Review of Economic Studies*, October 2010, *77* (4), 1450–1476.

Khandelwal, Amit K., Peter K. Schott, and Shang-Jin Wei, "Trade Liberalization and Embedded Institutional Reform: Evidence from Chinese Exporters," *American Economic Review*, October 2013, *103* (6), 2169–95.

Kugler, Maurice and Eric Verhoogen, "Prices, Plant Size, and Product Quality," *The Review of Economic Studies*, 2012, *79* (1), 307–339.

Ma, Yue, Heiwai Tang, and Yifan Zhang, "Factor Intensity, product switching, and productivity: Evidence from Chinese exporters," *Journal of International Economics*, 2014, *92* (2), 349–362.

Manova, Kalina and Zhiwei Zhang, "Export Prices Across Firms and Destinations," *The Quarterly Journal of Economics*, February 2012, *127* (1), 379–436.

Schott, Peter K., "Across-product Versus Within-Product Specialization in International Trade," *The Quarterly Journal of Economics*, May 2004, *119* (2), 646–677.

Sutton, John, *Competing in Capabilities: The Globalization Process*, Oxford: Oxford University Press, 2012.

Verhoogen, Eric A., "Trade, Quality Upgrading, and Wage Inequality in the Mexican Manufacturing Sector," *The Quarterly Journal of Economics*, May 2008, *123* (2), 489–530.