

# TECHNOLOGY, MNEs ACTIVITY AND ITALIAN SKILL UPGRADING

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## LITERATURE

The increasing demand of skilled workers associated with an increase in relative wages may be explained by:

- Technological change
- Globalisation, in terms of trade, outsourcing and FDI

This paper focus on technological change and FDI.

- Technological change: there exists consensus on the role of technical progress in reducing the need for unskilled labor (Berman, Bound and Griliches 1994; Machin and Van Reenen 1998; Autor, Katz and Krueger 1998; Haskel and Heden 1999).
  - FDI: the correlation between FDI and skill upgrading is not so clear. The evidence is quite mixed (Feenstra and Hanson 1997; Figini and Gorg 1998; Blonighen and Slaughter 2001; Slaughter 2000; Head and Ries 2002).
  - Some recent empirical models focus on FDI flows and R&D spillovers. The FDI are used as weights of the stock of foreign R&D (Lichteberg and Van Pottelsberghe 2001; Braconier, Ekholm and Midelfart Knarvik 2001).
- ➔ The **novelty of this work** is to explore the relationship between skill upgrading and FDI using both data on foreign owned firms in Italy and Italian multinational companies investing abroad.

The idea is that both inward and outward FDI are a potential channel for increasing the skilled component of the workforce. But the most important hypothesis in this paper is that the effect on skill upgrading depends on the behaviour of the two kinds of firms in terms of technological effort undertaken.

Using both data on foreign owned firms and Italian parents aggregated at 3-digit level from 1994 to 1997 I take into account the technological effort undertaken by each group of firms and the interaction between these variables and the amount of inward and outward FDI.

## DATA AND MODEL

I use two different datasets:

- ISTAT (National Institute of Statistics) contains industry level data on manufacturing firms. I collect data on wages and employment for blue-collar and white-collar workers, total sales, value added and capital. The wages include wage and salary payment to employees as well as contribution to Government funds.
- “Centro Studi Luca D’Agliano – Reprint” database. It is the merging of Reprint and AIDA. It contains balance sheet data on Italian parents and foreign affiliates in Italy. I collect data on R&D, Patent, Total Intangible fixed assets and Total Tangible fixed assets. Aggregating these data at 3-digit industry level, the result is a panel of 95 sectors from 1994 to 1997.

I estimate a wage share equation derived from a translog cost function. I add to the basic model the explanatory variables related to FDI and technology.

$$SH_{it} = \beta_0 + \beta_1 \ln(w^s/w^{us})_{it} + \beta_2 \ln(Y)_{it} + \beta_3 \ln(K/Y)_{it} + \beta_4 (Tech_{inw})_{it} + \beta_5 (Tech_{inw} * FDI_{inw})_{it} + \beta_6 (FDI_{inw})_{it} + \beta_7 (Tech_{MNEs})_{it} + \beta_8 (Tech_{MNEs} * FDI_{out})_{it} + \beta_9 (FDI_{out})_{it} + \beta_{10} D_{it} + \varepsilon_{it} \quad (1)$$

$i$ = sector;  $t$ =time

$SH_{it}$ =skilled workers wage bill divided by total wage bill

$(w^s/w^{us})_{it}$ = average skilled wage on average unskilled wage;  $Y_{it}$ = value added;  $K_{it}$ =capital  
 $(Tech_{inw})_{it}$ = Research, development and advertising expenses + Industrial patents and intellectual property rights over total assets (tangible + intangible) of foreign owned firms  
 $(FDI_{inw})_{it}$ = employment of foreign owned firms over total employment in the sector  
 $(Tech_{MNEs})_{it}$ = Research, development and advertising expenses + Industrial patents and intellectual property rights over total assets (tangible + intangible) of Italian multinational companies

$(FDI_{out})_{it}$ = employment of Italian subsidiaries over total employment in the sector

$D_{it}$ = set of time dummy variable;  $\varepsilon_{it}$ =error term

I regress equation (1) also using as explanatory variable the total amount of intangible assets over total assets for each group of firms:  $Intangible_{inw}$  ;  $Intangible_{MNEs}$

### *Descriptive Statistics*

	Low-tech sectors		High-tech sectors	
	Mean (standard deviation)	Mean (Standard deviation)	Mean (Standard deviation)	Mean (Standard deviation)
$Tech_{inw}$	0.0106 (0.0315)	0.0100 (0.0401)	0.0098 (0.0153)	
$Tech_{MNEs}$	0.0116 (0.0200)	0.0080 (0.0150)	0.0130 (0.0222)	
$Intangible_{inw}$	0.1453 (0.0169)	0.1314 (0.1793)	0.1678 (0.1520)	
$Intangible_{MNEs}$	0.1091 (0.138)	0.1028 (0.1442)	0.1197 (0.1360)	
$Tech_{inw} * FDI_{inw}$	0.002 (0.0067)	0.0011 (0.0047)	0.0033 (0.0087)	
$Tech_{MNEs} * FDI_{out}$	0.0009 (0.0024)	0.0007 (0.0023)	0.0012 (0.0024)	
$Intangible_{inw} * FDI_{inw}$	0.0278 (0.050)	0.0151 (0.0255)	0.0465 (0.0684)	
$Intangible_{MNEs} * FDI_{out}$	0.0108 (0.0242)	0.0105 (0.0267)	0.0112 (0.020)	
$FDI_{inw}$	0.1672 (0.1756)	0.1113 (0.1273)	0.2511 (0.2031)	
$FDI_{out}$	0.1391 (0.3487)	0.0948 (0.2088)	0.2034 (0.4777)	

*Skill upgrading in Italian manufacturing sectors, 1994-1997*  
*Foreign Owned Firms and Italian Multinational Firms*  
*Dependent Variable: Wage Share*

Method Specifications	Fixed Effects (1)		Fixed Effects (2)	
Constant	0.5988***	(0.1564)	0.5998***	(0.1548)
ln(W <sup>s</sup> /W <sup>us</sup> )	0.0661***	(0.0128)	0.0659***	(0.0127)
lnY	-0.0183*	(0.011)	-0.0179*	(0.0109)
lnK/Y	-0.0131**	(0.0054)	-0.0126**	(0.0054)
Intangible <sub>inw</sub>	0.0712***	(0.0217)		
Intangible <sub>inw</sub> *FDI <sub>inw</sub>	-0.3289***	(0.111)		
Intangible <sub>MNEs</sub>	-0.0004	(0.0198)		
Intangible <sub>MNEs</sub> *FDI <sub>out</sub>	-0.0243	(0.1808)		
Tech <sub>inw</sub>			0.2295***	(0.0702)
Tech <sub>inw</sub> *FDI <sub>inw</sub>			-0.5957	(0.4157)
Tech <sub>MNEs</sub>			-0.1753	(0.1091)
Tech <sub>MNEs</sub> *FDI <sub>out</sub>			0.1941	(0.869)
FDI <sub>inw</sub>	0.0527**	(0.0267)	0.0128	(0.0236)
FDI <sub>out</sub>	-0.0463**	(0.0234)	-0.0507**	(0.0257)
Time dummies	Yes		Yes	
N.obs	312		312	
R <sup>2</sup>	0.24		0.24	

Standard errors in brackets. \*\*\*,\*\* and \* denote significance at 1%, 5% and 10% level.

Using the Intangible assets as explanatory variable we obtain the most interesting results.

- There is a positive correlation between the investment in Intangible assets by foreign owned firms in Italy and skill upgrading. This result is confirmed also using the technological effort.
- The interaction term of foreign owned firms is significant but negative. If we consider the magnitude of the coefficients:  $\partial SH / \partial \text{Intangible}_{inw} = 0.0712 - 0.3289 * \text{FDI}_{inw}$  we have a positive effect of the investment in intangible assets on skill upgrading only if the derivative is positive and that is true for  $\text{FDI}_{inw} < 0.2165$ . It seems like a sort of scale effect; if the employment in foreign owned firms is high, given the investment in intangible assets, there will be an increase in the demand for unskilled workers.
- The coefficient of  $\text{FDI}_{inw}$  is significant and positive, confirming the theory according to which the inward FDI increase the demand for skilled workers.
- Regarding the Italian parents we do not find a significant correlation between investment in intangible assets and skill upgrading
- We have a counterintuitive result for the outward FDI: an increase in employment in Italian subsidiaries increase the demand of unskilled workers in Italy. This result is confirmed also using the technological effort.

## LOW AND HIGH TECHNOLOGY SECTORS

I perform the same regressions taking into account low and high technology sectors following WIFO and OECD classification.

### *Skill upgrading in Italian manufacturing sectors, 1994-1997*

*Foreign Owned Firms and Italian Multinational Firms Dependent Variable: Wage Share*

Method Specifications	LOW SECTOR		HIGH SECTOR	
	Fixed Effects (1)	Fixed Effects (2)	Fixed Effects (3)	Fixed Effects (4)
Constant	0.3712 (0.2364)	0.5363** (0.2390)	0.5180** (0.1987)	0.5586*** (0.1961)
ln(W <sup>S</sup> /W <sup>US</sup> )	0.0352*** (0.0123)	0.0358*** (0.0125)	0.2298*** (0.0338)	0.2166*** (0.0332)
lnY	0.0059 (0.0164)	-0.0162 (0.0168)	-0.0115 (0.0137)	-0.0134 (0.0135)
lnK/Y	-0.0099 (0.0095)	-0.0091 (0.0097)	-0.0116* (0.0065)	-0.0141** (0.0065)
Intangible <sub>inw</sub>	0.0994*** (0.0312)		-0.0036 (0.0347)	
Intangible <sub>inw</sub> *FDI <sub>inw</sub>	-0.4132 (0.3146)		-0.1369 (0.1379)	
Intangible <sub>MNE</sub>	0.0514* (0.0300)		-0.0368 (0.0274)	
Intangible <sub>MNEs</sub> *FDI <sub>out</sub>	-0.7840** (0.3301)		0.3752 (0.2796)	
Tech <sub>inw</sub>		0.2843** (0.1156)		-0.5755 (0.4077)
Tech <sub>inw</sub> *FDI <sub>inw</sub>		-1.9655* (1.0533)		1.016 (0.7403)
Tech <sub>MNEs</sub>		0.2627 (0.2008)		-0.1621 (0.144)
Tech <sub>MNEs</sub> *FDI <sub>out</sub>		-0.3187 (1.2983)		0.2892 (1.2439)
FDI <sub>inw</sub>	0.071** (0.0345)	0.0541 (0.0342)	0.0267 (0.0365)	-0.0181 (0.0305)
FDI <sub>out</sub>	0.082 (0.0673)	-0.0375 (0.0582)	-0.0477* (0.0267)	-0.0465 (0.0293)
Time dummies	Yes	Yes	Yes	Yes
N_obs	175	175	137	137
R <sup>2</sup>	0.35	0.33	0.42	0.42

Standard errors in brackets. \*\*\*, \*\* and \* denote significance at 1%, 5% and 10% level.

We find the most interesting results for the low technology sectors.

- The investment in intangible assets and in technology by foreign owned firms have a positive relationship with skill upgrading.
- Interaction term between technology effort and inward FDI: we obtain a positive value of the derivative:  $\partial SH / \partial Tech_{inw} = 0.2843 - 1.9655 * FDI_{inw}$  only if  $FDI_{inw} < 0.1446$
- Regarding Italian multinationals, the results show a positive impact of investment in intangible assets and skill upgrading.

Interaction term: the derivative is positive only if  $FDI_{out} < 0.0656$ . That may suggest that the impact of Italian parents activity in terms of investment in technology or intangible assets has a weak or even negative impact on skill upgrading.

For high technology sectors we do not find significant results.

## CONCLUSION AND COMMENT

The analysis conducted seems to provide evidence of skill upgrading in Italy transmitted by technology effort undertaken by foreign owned firms. This result seems confirmed especially for low-tech sectors. However, given the Italian comparative advantages in unskilled intensive sectors, it seems that the higher the amount of labor force employed the higher the probability that the positive impact of technology effort is offset.

There is no evidence of skill upgrading transmitted by the activity of Italian multinationals.