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Offshoring to High and Low Income Countries and the Labor Demand. Evidence from Italian Firms

*Alessia Lo Turco and Daniela Maggioni**

Abstract

Making use of an original data set the effects of imports of intermediates from high and low income countries on the conditional labor demand of a panel of Italian manufacturing firms are investigated. A dynamic panel data model is estimated by means of system GMM allowing for the endogeneity of the right-hand side regressors, especially the offshoring measures. The results bear a negative offshoring effect which is attributable exclusively to imports of intermediates from low income trading partners and mainly concerns firms operating in traditional sectors. No statistically significant effect is estimated for imports from high income countries. These findings are robust to the different measures of offshoring and to the inclusion of further controls.

1. Introduction and Literature Review

The current economic downturn is giving new momentum to the policy debate on the future of manufacturing workers in advanced economies. Political worries have especially regarded the role of competition from low income countries which may turn into severe domestic job losses and the International Monetary Fund (IMF, 2007) showed a worrying picture: since the 1990s the labor share has declined mainly in Europe and Japan and especially in unskilled sectors. For an advanced economy the permanent shift of technology not only involves the relative position of skilled vs unskilled workers, but more generally concerns a permanent substitution of labor in favor of labor saving technologies and imported intermediates.

While there is more consensus on the role of technological advancements on the labor market (Machin and Van Reenen, 1998), the most debated issue in literature dealing with offshoring has been its potential effect on the skill composition of employment and on the wage differential between skilled and unskilled workers. In contrast, the overall employment effect of offshoring has received relatively less attention in the literature, even though manufacturing sectors in advanced economies have been experiencing sharp reductions in employment levels (Organisation for Economic

* Lo Turco: Department of Economics and Social Sciences, Università Politecnica delle Marche, Ancona, Italy. Tel: +39 071 2207250; E-mail: a.loturco@univpm.it. Maggioni: Università Politecnica delle Marche, Ancona, Italy. The data used in this work are from the ISTAT Annual Report, 2006. All elaborations have been conducted at the ISTAT "Laboratorio per l'Analisi dei Dati ELEmentari" under the respect of the law on the statistic secret and the personal data protection. The results and the opinions expressed in this article are exclusive responsibility of the authors and, by no means, represent official statistics. Financial support received from the Italian Ministry of Education, University and Research—Scientific Research Programs of National Relevance 2007 on "European Union policies, economic and trade integration processes and WTO negotiation" and on "Patterns and Effects of International Sourcing of Knowledge"—is gratefully acknowledged. We are particularly grateful to Dr Monducci, Dr Anitori and the ADELE staff for permitting the realization of this research. Also, we wish to thank Francesco Aiello, Giuliano Conti, Jack Lucchetti, and Alberto Russo for their useful comments and suggestions. Also we wish to thank participants in the CAED conference 2010 in London, the ETSG conference 2010 in Lausanne and the PUE&PIEC workshop in Macerata and for useful advice and discussions.

Co-operation and Development (OECD), 2007). For Italy, in particular, the recent closure of the FIAT plant located in Sicily on behalf of production in foreign labor cost locations represents the symbol of the tensions existing between deepening international integration and the preservation of employment levels in advanced countries.

With this research, we then intend to add to the existing evidence on the offshoring consequences on the labor market in several directions.

First, we mean to address the impact on the labor demand at firm level. Most of the existing evidence on the issue is rather based on sector-level analysis (Amiti and Wei, 2005, 2006; OECD, 2007; Hijzen and Swaim, 2007). For the Italian case, at the sector level Bertoli (2008) found a negative effect of offshoring on the conditional labor demand which turns non-significant on the unconditional labor demand, while Falzoni and Tajoli (2011) found no effect at all.[1] In this framework, a firm level perspective can shed more light on the issue: if the demand for labor ultimately comes from firms, it is fundamental to highlight how production techniques adjust to the increasing availability of cheap intermediates from low labor cost countries.

Second, our firm level offshoring measures are split according to the origin country of foreign inputs. This represents an important advantage of our contribution. Previous firm level studies of the offshoring effect on the labor demand do not take into account the existence of a heterogeneity of effects according to the partner country (Görg and Hanley, 2005; Moser et al., 2009), but this is potentially misleading because the reasons behind the foreign input flows may differ across partner countries and also the effects on the offshoring firm's performance could differ (Harrison and McMillan, 2007). Some sectoral studies deal with the foreign input origin combining national input–output (IO) tables with national trade data and show that the labor demand is negatively affected by imports from low labor cost countries. However this kind of measure could not be a good proxy: it assumes that the breakdown by origin country of imports of intermediate input j is the same across all of the input purchasing sectors (Falk and Wolfmayr, 2005; Geishecker, 2006; Cadarso et al., 2008). In this respect, our micro level data allow us to properly measure the geographical origin of inputs.

Third, we also investigate the existence of heterogeneous offshoring effects between traditional and non-traditional sectors. The general belief is that employment in advanced countries may be negatively affected by imports of intermediates from low labor cost countries. However, it could be the case that this process does not involve all the sectors equally. In particular, for firms performing more traditional activities, imports from low income countries might actually represent an opportunity to restructure their own production processes. On the contrary, these imports could not be suitable for firms performing more complex tasks.

Finally, the firm-level analysis allows us to appraise another dimension of heterogeneity: following the idea that offshoring may be a determinant for competitiveness, we re-estimate our model on exporting firms only, because of their higher exposure to competitive pressures.

Our results are confirmed by a set of robustness checks and show that while imports from high income partners do not affect employment at all, the negative effect from offshoring on employment is attributable exclusively to imports of intermediates from low income partners and mainly concerns firms in traditional sectors. This outcome is of particular interest for the target country of our analysis. These sectors have traditionally represented an important share of the Italian manufacturing output, employment, and exports, but recent technological advances and, as supported by our results, the international reorganization of production has led to their reduced domestic labor absorptive capacity. All this calls for the immediate attention of policy makers who should tailor some policies to ease the transition of labor from these sectors towards more knowledge intensive activities. The work is structured as follows. Section 2 presents the data and some evidence on offshoring and employment, section 3 discusses the empirical model, section 4 shows the main results and the robustness checks, and section 5 concludes.

2. The Data

The main data source for this work is a balanced panel of Italian surviving limited companies covering a 5-year period from 2000 to 2004.[2] The data set used in the analysis represents 40% of Italian manufacturing sectors and provides detailed information for 40,479 firms[3] on output and inputs, labor costs, tangible and intangible fixed assets, exports, control participation, and offshoring (imports of intermediates). The firm capital stock is proxied by the tangible fixed assets and deflated with the capital price index (always retrieved from the Italian National Accounts) while the firm unit wage and output have been deflated using the three-digit producer price index (Istat). The firm activity sector is at three-digit NACE and throughout the paper the definition of traditional sectors is established according to the Pavitt's taxonomy[4] (Pavitt, 1984).

Researchers at Istat have labeled as offshoring the firm import flows of non-energy material intermediates[5] from all sectors together with the imports of finished goods from the firm's sector since the firm could also decide to move the final production stage abroad. The latter phenomenon is not captured by the traditional sectoral indicators based on IO tables that only record intermediate flows (Feenstra and Hanson, 1996, 1999; OECD, 2007). Also, the offshoring indicators have been split according to the development stage of partner countries (developed and non-developed economies).[6] Turning to the firm-level evidence on offshoring practices in Italian manufacturing, according to Table 1 about 37% of the 40,479 firms show a non-zero value for offshoring. Over the sample period the net absolute increase in the number of offshorers is of about 600 units. The average percentage of offshorers importing from low income countries is about 55% in 2000 and becomes 64% in 2004. Across sectors, the percentage of offshorers to low income countries is quite high in the traditional sectors (e.g. sectors 17–20), nevertheless between 2000 and 2004 the share of importers of intermediates from the same origins grows especially in more advanced production (e.g. sectors 32–35). Offshorers to high income countries represent the bulk of the offshorers within each two digit sector, however, their share declines, especially for more traditional activities. A smaller fraction of offshorers within each sector imports intermediates both from high and low income countries and these firms modestly grew in number between 2000 and 2004. Summing up, the firms involvement with low income countries as a source for imports of intermediates is a growing phenomenon which goes hand in hand with a slightly reduced involvement with high-income exporters, even if heteterogenous evolutions can be detected across sectors.

To preliminary assess whether the splitting of the offshoring measure by origin gives some new insights, we aggregate our firm-level information on imports of intermediates at the sector level and we compare the total offshoring indicator over purchases from the national IO tables with the corresponding measure from the firm level dataset. The two indicators present a correlation of more than 0.71 and, as expected, it seems that the IO indicator is related more to the purchases from high income countries (correlation 0.75), than from non-developed economies (correlation 0.13). Now, we compare in Table 2 the two-digit NACE sector evolution of employment and offshoring

Table 1. Sample Composition and Offshoring Practices

	Number of:				*Offshorers to (%):*					
	Firms		*Offshorers*		*Low income countries*		*High income countries*		*Low and high income countries*	
NACE	*2000*	*2004*	*2000*	*2004*	*2000*	*2004*	*2000*	*2004*	*2000*	*2004*
15	2,595	2,596	831	870	39.95	48.51	88.93	88.28	28.88	36.78
17	2,545	2,583	1,353	1,355	69.55	78.15	81.15	76.97	50.70	55.13
18	1,699	1,629	727	791	78.95	87.61	70.56	61.19	49.52	48.80
19	1,666	1,688	810	833	83.83	87.88	61.11	56.42	44.94	44.30
20	1,291	1,247	586	592	69.11	68.75	76.79	76.35	45.90	45.10
21	845	861	354	360	53.11	60.28	93.22	90.83	46.33	51.11
22	2,226	2,211	366	361	23.77	33.24	93.44	91.41	17.21	24.65
24	1,366	1,371	902	908	53.66	62.78	93.79	92.51	47.45	55.29
25	2,404	2,383	1,064	1,088	46.15	54.78	87.97	85.39	34.12	40.17
26	2,334	2,324	524	573	59.35	63.18	78.24	77.49	37.60	40.66
27	940	907	431	450	58.93	69.33	85.15	83.56	44.08	52.89
28	7,351	7,531	1,517	1,627	44.17	53.10	83.92	81.68	28.08	34.79
29	5,967	5,822	2,689	2,778	54.93	64.00	85.98	82.54	40.91	46.54
30	151	144	67	72	56.72	56.94	100.00	93.06	56.72	50.00
31	1,854	1,854	714	798	56.02	66.04	86.83	83.58	42.86	49.62
32	494	515	251	287	54.18	70.03	94.02	88.85	48.21	58.89
33	1,092	1,096	601	630	48.92	60.00	95.01	89.52	43.93	49.52
34	471	471	243	258	53.50	68.99	88.07	87.98	41.56	56.98
35	416	405	160	164	50.63	62.80	87.50	87.20	38.13	50.00
36	2,772	2,841	1,024	1,100	54.59	63.36	83.01	77.00	37.60	40.36
Total	40,479	40,479	15,214	15,895	55.50	63.99	85.74	82.59	41.24	46.58

Source: Our elaborations on the firm-level database from ISTAT Annual Report, 2006.

Table 2. Sectoral Offshoring and Employment Evolution

	Sectoral Indicators			*Sectoral Offshoring from Firm-Level Data*			
	Offshoring from IO Tables		*Employment*	*To low income*		*To high income*	
NACE	*2000*	*Δ%2000/2004*	*Δ%2000/2004*	*2000*	*Δ%2000/2004*	*2000*	*Δ%2000/2004*
15[a]	0.096	1	5.6	0.02	47.37	0.14	0.72
17	0.227	2.6	–15.9	0.10	41.05	0.16	–5
18	0.186	1.7	–11	0.27	36.33	0.09	–5.56
19	0.214	–0.3	–12.6	0.22	26.15	0.06	3.17
20	0.153	0.7	0.1	0.13	7.2	0.20	–3.96
21	0.302	–4.2	–0.5	0.07	–4.48	0.26	–2.31
22	0.159	–1.3	–5.8	0.004	100	0.18	7.87
24	0.437	3.3	–3.1	0.04	–2.78	0.50	7.23
25	0.318	–1.6	–1.3	0.03	33.33	0.25	–21.26
26	0.113	–1.6	2.3	0.01	71.43	0.06	6.78
27	0.336	4.4	–2.8	0.15	11.26	0.20	–5.08
28	0.182	2.8	3.5	0.03	50	0.11	–5.26
29	0.158	0.2	–1.8	0.02	60.87	0.12	–3.48
30	0.651	–12.6	–11	0.03	42.86	0.23	58.26
31	0.234	–3.8	–12.6	0.04	80	0.17	–4.82
32	0.527	–6.9	–13.1	0.04	27.27	0.52	–25.1
33	0.339	2.5	–0.3	0.04	78.95	0.23	–2.6
34	0.28	–3.1	–6.2	0.02	54.17	0.24	–15.9
35	0.299	–2	4.6	0.08	–37.33	0.24	23.01
36	0.217	0	3.7	0.03	34.48	0.07	–15.15

Source: National IO Tables, National Accounts and Firm Economic Accounts (Istat).
Notes: The growth rates concern the 5-year period 2000 or 2004. [a] This is the sum of NACE 15 and 16 (sub-section DA), because in the Firm Economic Accounts (Istat) NACE sector 15 is missing.

from IO tables and National Accounts (columns (2)–(4)) to the evolution of the offshoring to low and high income countries obtained through the aggregation of our firm level imports (columns (5)–(8)).

Comparing the sector level indicators from aggregated national sources in the first half of the table, there is no clear time evolution for offshoring in all sectors and no particular relationship can be observed between the two variables. As mentioned above, these unenlightening findings may be due to the fact that the imported input origins are not recorded in the IO tables. So, the sectoral offshoring measures to high and low income countries reconstructed from our firm-level sample in the last four columns of Table 2 show that, almost in every sector the amount of foreign materials from advanced countries is higher than total inputs from low-wage ones, but the role of sourcing from less developed countries has increased dramatically in our sample period. In contrast the offshoring share to industrial economies turns out to be quite constant across the sample time with some exceptions. It is worth noticing that once the offshoring measure is split by origin, for most of the sectors, an increase in offshoring to low income countries goes with a reduction in employment while it is much less so for the relation between offshoring to high income countries and sectoral employment.[7]

3. Modeling the Effects of Offshoring

Transposing the usual skilled/unskilled labor analytical framework to the capital/labor dichotomy, offshoring is modeled as to affect the relative demand for labor exactly in the same way labor saving technological change does (Feenstra and Hanson, 1996, 1999; Feenstra, 2004).

Then substituting offshoring for the log of technical progress in a standard log-linear model for the conditional labor demand we get the empirical model to estimate

$$
\begin{aligned}
l_{ijt} = {} & \alpha_0 + \beta_0 l_{ijt-1} + \alpha_1 w_{ijt} + \gamma_1 w_{ijt-1} + \alpha_2 k_{ijt} + \gamma_2 k_{ijt-1} + \alpha_3 y_{ijt} \\
& + \gamma_3 y_{ijt-1} + \delta_1 Off_{Low\,ijt} + \delta_2 Off_{High\,ijt} + \eta_i + \phi_j + \tau_t + \varepsilon_{ijt}
\end{aligned} \tag{1}
$$

where l is the log of the number of workers of the firm i operating in industry j, w measures the log of the average wage paid by the firm, k represents its capital stock which enters the specification as a fixed factor, y measures the log of the firm's real output, ϕ_j is a sector time-invariant unobservable captured by the three-digit sector dummy, τ_t represents a common time effect, η_i is the firm's unobserved heterogeneity, and ε_{ijt} is an idiosyncratic disturbance term. OFF_{Low} and OFF_{High} are the share of imported inputs from low and high labor cost countries over total sales (as in Falk and Wolfmayr, 2005; Cadarso et al., 2008). With respect to the traditional measure on total intermediate purchases (Feenstra and Hanson, 1996), offshoring over total sales better captures the ease of substitution between those activities previously performed within the firm and then outsourced abroad. For the sake of brevity, we only present the set of results based on this indicator. However, the results obtained using the measure on total purchases are readily available from the authors upon request. Descriptive statistics for the variables included in the empirical model are displayed in Table 3.

As shown in the equation, a ARDL(1,1) specification emerged as more suitable than the static one from a preliminary investigation of the data. This evidence is consistent with the presence of rigidities in the Italian labor market.

According to the theoretical predictions and previous studies, we expect that offshoring has a negative impact on the firm level conditional demand for labor.

For each specification we will then estimate model 1 and, from the estimated short-run coefficient on the generic regressor x, we will also retrieve the long run one from the long run solution:

$$
l = \frac{\alpha + \gamma}{1 - \beta_0} x. \tag{2}
$$

Descriptive statistics for the main variables used in the empirical model are shown in Table 3.

Thanks to the availability of a 5-year panel and because of the high persistence of firm employment we estimate our dynamic model by means of GMM-SYS (Arellano and Bond, 1991; Blundell and Bond; 1998),[8] thus dealing also with the endogeneity of our regressors and allowing for a causal interpretation of our results. Finally, allowing for the correlation between the unobserved firm heterogeneity and our right-hand side variables, the estimator accommodates the unobserved firm location which, because of the short time span of our panel, can be assumed as a firm-specific time invariant unobservable.

Table 3. Descriptive Statistics

Variable		*Mean*	*Std. dev.*	*Observations*
l	overall	2.89	1.06	N = 202,395
y	overall	14.64	1.38	N = 202,395
k	overall	12.55	1.82	N = 202,254
w	overall	10.06	0.37	N = 202,387
OFF_{Low}	overall	0.01	0.07	N = 202,395
OFF_{high}	overall	0.03	0.10	N = 202,395

Note: The table shows real variables in logarithms, with the exception of the offshoring intensity.

4. Results

Tables 4–6 display the one-step GMM coefficient estimates of the empirical model with heteroskedasticity-robust standard errors for the two subsamples of traditional and non-traditional sectors.[9] In the first column we include the offshoring measure at time t, in the second one its value both at time t and at $t - 1$.[10] While the upper panel presents the direct results from the estimates of model 1, the lower panel displays the long-run coefficients[11] from equation (2) and the final rows of each table report the tests for first-order *AR1*, and second-order *AR2*, serial correlation in the differenced residuals and the Hansen test of over-identifying restrictions. In all of the specifications we reject the null of no first order serial correlation and we fail to reject the null of no second order serial correlation. Also, the Hansen test supports, in general, the validity of our instruments.[12]

Now, from Table 4 the long-run elasticity of the wage turns non-significant and the output elasticity turns higher for traditional sectors in the long run, thus confirming a deeper labor intensity of these activities. The capital stock is not significant either in the short or the long run. This finding may be due to the short time span of our analysis, additionally it may reflect the traditional difficulties in measuring capital stock by means of book value of tangible assets. The latter, however, is the usual measure adopted in empirical works especially when a short time span is at hand—as in our case—and the investment activity of the firm may not be properly observed thus making the perpetual inventory method unreliable. The short-run wage elasticity of labor demand is in line with the reference confidence interval [0.15; 0.75] defined by Hamermesh (1993, p. 92) and it is, however, similar to values found by previous studies on firm or plant data. Considering sectoral heterogeneity is particularly important in our analysis since, as we can observe from the table, offshoring to low income countries only proves detrimental for the first group of sectors regardless of the measure adopted. For the second group, the coefficient is also negative, but never statistically significant. To quantify the effect, an increase of one percentage point in offshoring reduces employment by 2.175% according to the long-run coefficient estimates from columns (2). Since offshoring to low income countries in traditional-sector firms has increased on average by about 0.5 points when measured over total sales, the estimated coefficient implies a reduction of 1.1% in employment on average over our sample period.[13] Comparing these percentages with the weighted average of the employment growth rate in traditional sectors in the sample period, offshoring explains about the 23–37% of the overall employment reduction.

Table 4. Labor Demand

	Traditional sectors						Non-traditional sectors					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
l_{t-1}	0.687***	0.694***	0.678***	0.686***	0.700***	0.713***	0.701***	0.709***	0.734***	0.745***	0.718***	0.751***
	[0.0430]	[0.0463]	[0.0376]	[0.0430]	[0.0424]	[0.0469]	[0.0515]	[0.0503]	[0.0391]	[0.038]	[0.0502]	[0.049]
k_t	–0.082	–0.078	–0.0484	–0.0768	–0.0105	0.025	–0.043	–0.027	0.00328	0.008	–0.0151	–0.016
	[0.0506]	[0.0532]	[0.0410]	[0.0503]	[0.0494]	[0.0567]	[0.0790]	[0.0751]	[0.0603]	[0.059]	[0.0595]	[0.063]
k_{t-1}	0.088*	0.082	0.0564	0.0795*	0.0136	–0.0202	0.054	0.0382	0.0108	0.004	0.0289	0.023
	[0.0472]	[0.0503]	[0.0376]	[0.0464]	[0.0470]	[0.0544]	[0.0666]	[0.0637]	[0.0507]	[0.051]	[0.0542]	[0.058]
y_t	1.126***	1.156***	1.041***	1.077***	1.173***	1.188***	0.742***	0.730***	0.543***	0.539***	0.627***	0.523***
	[0.106]	[0.116]	[0.0865]	[0.0984]	[0.112]	[0.121]	[0.178]	[0.163]	[0.123]	[0.114]	[0.162]	[0.147]
y_{t-1}	–0.758***	–0.784***	–0.686***	–0.717***	–0.811***	–0.829***	–0.497***	–0.494***	–0.329***	–0.326***	–0.391***	–0.326***
	[0.093]	[0.103]	[0.0793]	[0.0905]	[0.0908]	[0.101]	[0.157]	[0.145]	[0.108]	[0.103]	[0.125]	[0.111]
w_t	–0.733**	–0.851**	–0.606**	–0.708**	–0.921***	–1.060***	–0.753*	–0.642*	–0.542*	–0.641*	–0.629*	–0.455
	[0.314]	[0.354]	[0.269]	[0.300]	[0.289]	[0.354]	[0.387]	[0.361]	[0.303]	[0.342]	[0.351]	[0.354]
w_{t-1}	0.564***	0.608***	0.514***	0.554***	0.645***	0.710***	0.522**	0.451*	0.351*	0.419*	0.384	0.201
	[0.146]	[0.161]	[0.124]	[0.142]	[0.136]	[0.158]	[0.255]	[0.237]	[0.208]	[0.244]	[0.273]	[0.260]
$OFF_{Low\ t}$	–0.585***	–1.097**	–0.652***	–1.345*	–0.683***	–1.599**	–0.127	–0.661	–0.0674	–0.693	–0.172	–0.705
	[0.105]	[0.555]	[0.105]	[0.807]	[0.109]	[0.756]	[0.349]	[1.944]	[0.323]	[1.328]	[0.297]	[0.956]
$OFF_{Low\ t-1}$		0.43		0.479		0.72		0.527		0.608		0.527
		[0.464]		[0.565]		[0.610]		[1.646]		[1.262]		[0.851]
$OFF_{High\ t}$	0.16	0.026	0.172	1.336	0.048	–0.328	0.716	–0.168	0.702	–0.444	0.559	–0.299
	[0.145]	[0.860]	[0.142]	[0.968]	[0.136]	[0.836]	[0.636]	[0.830]	[0.731]	[0.801]	[0.506]	[0.739]
$OFF_{Hight\ t-1}$		0.1		–0.736		0.191		0.695		0.738*		0.568
		[0.545]		[0.630]		[0.542]		[0.481]		[0.406]		[0.462]
Exp_t			0.0565	0.568					–0.168	0.181		
			[0.0602]	[0.738]					[0.121]	[0.384]		
Exp_{t-1}				–0.376						–0.239		
				[0.515]						[0.285]		
$Imm.Assets_t$					–0.0155***	–0.0341*					–0.00389	0.023**
					[0.00578]	[0.0195]					[0.00730]	[0.011]

Table 4. Continued

	Traditional sectors						Non-traditional sectors					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Imm.Assets$_{t-1}$						0.0201						–0.022*
						[0.0157]						[0.009]
Observations	62015	62015	61222	61023	54060	52634	94876	94876	94615	94516	83955	81767
Firms	16045	16045	15940	15899	14923	14696	24306	24306	24282	24266	22873	22524
Long run coefficients												
K	0.019	0.016	0.0248	0.00856	0.0102	0.0169	0.035	0.037	0.0528	0.045	0.0488	0.03
	[0.0327]	[0.0347]	[0.0293]	[0.0327]	[0.0331]	[0.0400]	[0.0625]	[0.0583]	[0.0546]	[0.052]	[0.0403]	[0.041]
Y	1.179***	1.215***	1.103***	1.147***	1.207***	1.249***	0.820***	0.809***	0.806***	0.837***	0.834***	0.787***
	[0.189]	[0.212]	[0.142]	[0.169]	[0.192]	[0.204]	[0.109]	[0.104]	[0.0907]	[0.095]	[0.0978]	[0.106]
W	–0.541	–0.793	–0.287	–0.491	–0.921	–1.217	–0.772	–0.656	–0.72	–0.87	–0.865*	–1.020*
	[0.620]	[0.750]	[0.500]	[0.584]	[0.636]	[0.865]	[0.767]	[0.707]	[0.658]	[0.667]	[0.510]	[0.585]
OFF_{Low}	–1.872***	–2.175***	–2.023***	–2.760***	–2.281***	–3.056***	–0.423	–0.462	–0.254	–0.335	–0.61	–0.715
	[0.446]	[0.620]	[0.419]	[1.066]	[0.498]	[0.840]	[1.164]	[1.040]	[1.219]	[1.114]	[1.042]	[1.072]
OFF_{High}	0.511	0.241	0.533	1.914	0.16	–0.478	2.394	1.812	2.641	1.15	1.978	1.078
	[0.457]	[1.087]	[0.434]	[1.321]	[0.454]	[1.137]	[2.023]	[2.024]	[2.653]	[2.260]	[1.655]	[1.685]
E			0.0175	0.611					–0.631	–0.225		
			[0.167]	[0.767]					[0.452]	[0.595]		
IMM.ASS.					–0.0518*	–0.0488**					–0.0138	0.006
					[0.0216]	[0.0247]					[0.0247]	[0.024]
AR1	0	0	0	0	0	0	0	0	0	0	0	0
AR2	0.387	0.357	0.48	0.44	0.86	0.8	0.328	0.592	0.32	0.682	0.62	0.479
Hansen	0.224	0.247	0.15	0.43	0.1	0.22	0.951	0.991	0.46	0.337	0.6	0.923

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Robust S.E. in brackets. All regressions include a full set of three-digit sector, time dummies and a group dummy. The 2nd and 3rd (3rd and 4th) lags of the variables and the 1st (2nd) lag of their first differences have been used as instruments in columns (1) to (6) (columns (7) to (12)) respectively for the equation in differences and for the one in levels. AR1 and AR2 show the *p*-value for the tests of the null hypothesis of no first and second order serial correlation in the differences of residuals. Hansen shows the *p*-value of the test of the validity of the over-identifying restrictions.

Table 5. Labor Demand—Further Checks

	Sector classification according to skill intensity											
	High skill		Low skill		Traditional sectors				Non-traditional sectors			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
l_{t-1}	0.782***	0.846***	0.727***	0.728***	0.532***	0.689***	0.687***	0.695***	0.795***	0.808***	0.733***	0.739***
	[0.066]	[0.073]	[0.032]	[0.033]	[0.042]	[0.055]	[0.044]	[0.047]	[0.034]	[0.039]	[0.063]	[0.064]
k_t	0.065	0.079	–0.071*	–0.074*	0.009	–0.105*	–0.075	–0.07	–0.017	0	–0.012	0.009
	[0.071]	[0.065]	[0.038]	[0.040]	[0.046]	[0.056]	[0.050]	[0.052]	[0.051]	[0.054]	[0.092]	[0.090]
k_{t-1}	–0.054	–0.072	0.063*	0.065*	–0.004	0.104**	0.080*	0.074	0.027	0.014	0.022	0.004
	[0.057]	[0.056]	[0.033]	[0.035]	[0.043]	[0.052]	[0.046]	[0.049]	[0.043]	[0.046]	[0.079]	[0.077]
y_t	0.337**	0.429***	0.753***	0.755***	0.912***	1.421***	1.119***	1.152***	0.321***	0.340***	0.729***	0.735***
	[0.159]	[0.143]	[0.112]	[0.112]	[0.096]	[0.139]	[0.106]	[0.116]	[0.077]	[0.105]	[0.209]	[0.199]
y_{t-1}	–0.152	–0.278*	–0.514***	–0.515***	–0.480***	–0.971***	–0.752***	–0.779***	–0.176**	–0.202**	–0.498***	–0.515***
	[0.160]	[0.162]	[0.104]	[0.105]	[0.071]	[0.123]	[0.092]	[0.103]	[0.069]	[0.087]	[0.188]	[0.178]
w_t	–0.512	–0.690*	–0.421**	–0.410**	0.114	–1.087***	–0.749**	–0.889**	–0.460**	–0.541**	–1.029**	–0.875*
	[0.503]	[0.353]	[0.196]	[0.203]	[0.332]	[0.378]	[0.320]	[0.363]	[0.230]	[0.254]	[0.496]	[0.508]
w_{t-1}	0.184	0.306	0.151	0.141	0.119	0.700***	0.567***	0.622***	0.286*	0.416**	0.735**	0.675*
	[0.275]	[0.216]	[0.183]	[0.187]	[0.150]	[0.179]	[0.149]	[0.166]	[0.162]	[0.180]	[0.347]	[0.347]
$OFF_{Low\ t}$	–0.311	–2.484	–0.274***	0.05	–0.455***	–1.127*	–0.576***	–1.161**	–0.315	–0.648	–0.262	–1.234
	[0.312]	[1.736]	[0.093]	[0.614]	[0.096]	[0.585]	[0.104]	[0.558]	[0.232]	[1.070]	[0.407]	[2.394]
$OFF_{High\ t}$	0.157	–0.152	0.635**	0.464	0.165	–0.2	0.15	–0.185	0.334	0.112	0.573	–0.674
	[0.229]	[0.784]	[0.308]	[1.384]	[0.223]	[1.014]	[0.143]	[0.863]	[0.341]	[0.625]	[0.656]	[0.977]
$OFF_{Low\ t-1}$		2.33		–0.289		0.525		0.487		0.326		0.975
		[1.840]		[0.560]		[0.484]		[0.467]		[1.014]		[2.425]
$OFF_{High\ t-1}$		0.223		0.102		0.343		0.191		0.254		1.009
		[0.631]		[0.775]		[0.651]		[0.541]		[0.426]		[0.627]
$Tot.Int._t$					–1.266***	0.036			0.679***	0.58		
					[0.263]	[0.398]			[0.202]	[0.355]		
$Tot.Int._{t-1}$						–0.715***				0.11		
						[0.168]				[0.324]		
Imp^{Low}_{sect}							–0.113	–0.071			–0.108	–0.069
							[0.152]	[0.164]			[0.244]	[0.222]

Table 5. Continued

	Sector classification according to skill intensity											
	High skill		*Low skill*		*Traditional sectors*				*Non-traditional sectors*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Imp_{sect}^{High}							0.240**	0.194			0.023	−0.004
							[0.120]	[0.134]			[0.078]	[0.077]
Observations	56,071	56,071	100,261	100,261	61,805	61,568	61,906	61,906	94,709	94,501	79,255	79,255
Number of id	14,780	14,780	25,903	25,903	16,040	16,031	16,045	16,045	24,306	24,299	20,535	20,535
	Long run coefficients											
K	0.054	0.046	−0.03	−0.032	0.009	−0.004	0.018	0.014	0.048	0.075	0.039	0.048
	[0.084]	[0.096]	[0.050]	[0.050]	[0.024]	[0.036]	[0.033]	[0.035]	[0.058]	[0.062]	[0.079]	[0.076]
Y	0.850***	0.983***	0.876***	0.881***	0.922***	1.446***	1.173***	1.221***	0.710***	0.717***	0.863***	0.843***
	[0.242]	[0.284]	[0.071]	[0.075]	[0.118]	[0.271]	[0.192]	[0.220]	[0.095]	[0.117]	[0.151]	[0.151]
W	−1.506	−2.5	−0.986*	−0.991*	0.499	−1.243	−0.58	−0.875	−0.85	−0.649	−1.099	−0.763
	[1.631]	[2.094]	[0.545]	[0.542]	[0.390]	[0.832]	[0.634]	[0.781]	[0.662]	[0.679]	[1.003]	[0.959]
OFF_{Low}	−1.431	−1	−1.005***	−0.877**	−0.974***	−1.934***	−1.836***	−2.208***	−1.537	−1.674	−0.979	−0.993
	[1.365]	[2.557]	[0.337]	[0.374]	[0.231]	[0.645]	[0.444]	[0.639]	[1.182]	[1.222]	[1.488]	[1.313]
OFF_{High}	0.724	0.461	2.327**	2.08	0.353	0.461	0.48	0.018	1.633	1.899	2.145	1.283
	[1.059]	[1.870]	[1.113]	[2.354]	[0.472]	[1.230]	[0.450]	[1.117]	[1.636]	[1.938]	[2.376]	[2.624]
Tot.Int.					−2.707***	−2.183**			3.314***	3.587**		
					[0.589]	[0.909]			[1.283]	[1.512]		
AR1	0	0	0	0	0	0	0	0	0	0	0	0
AR2	0.237	0.941	0.0503	0.0462	0.691	0.581	0.357	0.347	0.211	0.124	0.288	0.56
Hansen	0.476	0.266	0.662	0.485	0.001	0.308	0.2	0.262	0.163	0.177	0.925	0.988

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Robust S.E. in brackets. All regressions include a full set of three-digit sector, time dummies and a group dummy. The 2nd and 3rd (3rd and 4th) lags of the variables and the 1st (2nd) lag of their first differences have been used as instruments in columns (5)–(8) (columns (1)–(4) and (9)–(12)) respectively for the equation in differences and for the one in levels. AR1 and AR2 show the *p*-value for the tests of the null hypothesis of no first and second order serial correlation in the differences of residuals. Hansen shows the *p*-value of the test of the validity of the over-identifying restrictions.

Table 6. Labor Demand By International Involvement

	Traditional sectors						Non-traditional sectors					
	Exclusion of OFF_{Low} switchers		*Exporters*		*Always exporters*		*Exclusion of OFF_{Low} switchers*		*Exporters*		*Always exporters*	
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*
l_{t-1}	0.632***	0.634***	0.716***	0.738***	0.763***	0.762***	0.724***	0.725***	0.705***	0.725***	0.763***	0.786***
	[0.0556]	[0.0582]	[0.0462]	[0.0536]	[0.0510]	[0.0537]	[0.0489]	[0.0515]	[0.0533]	[0.0526]	[0.0584]	[0.0710]
k_t	−0.159**	−0.159**	−0.0247	−0.0148	−0.019	−0.026	−0.0168	−0.02	−0.116	−0.0893	−0.053	−0.004
	[0.0789]	[0.0787]	[0.0535]	[0.0611]	[0.0550]	[0.0572]	[0.0839]	[0.0879]	[0.0785]	[0.0764]	[0.0679]	[0.0846]
k_{t-1}	0.154**	0.154**	0.0286	0.0166	0.035	0.042	0.0309	0.0329	0.124*	0.0961	0.062	0.015
	[0.0721]	[0.0721]	[0.0512]	[0.0590]	[0.0510]	[0.0538]	[0.0700]	[0.0737]	[0.0697]	[0.0685]	[0.0615]	[0.0771]
y_t	1.234***	1.235***	1.011***	1.080***	0.828***	0.808***	0.676***	0.692***	0.602***	0.608***	0.363***	0.367***
	[0.141]	[0.145]	[0.115]	[0.144]	[0.101]	[0.162]	[0.208]	[0.216]	[0.130]	[0.120]	[0.108]	[0.107]
y_{t-1}	−0.791***	−0.791***	−0.685***	−0.745***	−0.535***	−0.506***	−0.465**	−0.476**	−0.348***	−0.371***	−0.16	−0.18
	[0.115]	[0.119]	[0.105]	[0.132]	[0.0936]	[0.161]	[0.189]	[0.195]	[0.113]	[0.114]	[0.108]	[0.127]
w_t	−0.423	−0.437	−0.828**	−1.154**	−0.947***	−0.942**	−0.689*	−0.741	−0.780**	−0.731**	−0.809**	−0.796**
	[0.373]	[0.418]	[0.352]	[0.428]	[0.367]	[0.441]	[0.417]	[0.452]	[0.349]	[0.322]	[0.325]	[0.344]
w_{t-1}	0.439**	0.446**	0.608***	0.747***	0.652***	0.654***	0.506*	0.540*	0.464**	0.438**	0.492**	0.525**
	[0.173]	[0.190]	[0.168]	[0.201]	[0.170]	[0.192]	[0.262]	[0.288]	[0.220]	[0.204]	[0.218]	[0.216]
$OFF_{Low\ t}$	−0.886***	−0.913	−0.446***	−1.361**	−0.336***	−0.638	−0.344	−0.711	−0.204	−1.131	−0.456*	−1.205
	[0.151]	[0.574]	[0.0908]	[0.548]	[0.0832]	[0.405]	[0.432]	[1.894]	[0.279]	[1.656]	[0.236]	[1.877]
$OFF_{Low\ t-1}$		0.0204		0.734		0.23		0.444		0.969		0.758
		[0.482]		[0.456]		[0.363]		[1.977]		[1.673]		[2.046]
$OFF_{High\ t}$	0.153	0.055	0.0733	−0.875	−0.141	−0.752	0.49	0.689	0.489	−0.011	−0.062	−0.934*
	[0.244]	[1.134]	[0.120]	[0.827]	[0.169]	[0.940]	[0.757]	[1.074]	[0.439]	[0.620]	[0.270]	[0.539]
$OFF_{High\ t-1}$		0.0597		0.55		0.358		−0.167		0.428		0.665*
		[0.744]		[0.559]		[0.566]		[0.722]		[0.363]		[0.375]
Observations	45,929	45,929	48,851	48,851	36,458	36,458	72,030	72,030	67,973	67,973	46,869	46,869
Firms	11,877	11,877	12,636	12,636	9,421	9,421	18,435	18,435	17,451	17,451	12,051	12,051

Table 6. Continued

	Traditional sectors						*Non-traditional sectors*					
	Exclusion of OFF_{Low} switchers		*Exporters*		*Always exporters*		*Exclusion of OFF_{Low} switchers*		*Exporters*		*Always exporters*	
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*
	Long run coefficients											
K	–0.0141	–0.0145	0.0136	0.0069	0.066	0.066	0.0512	0.0472	0.0261	0.025	0.038	0.049
	[0.0402]	[0.0411]	[0.0327]	[0.0380]	[0.0433]	[0.047]	[0.0715]	[0.0728]	[0.0547]	[0.0521]	[0.0610]	[0.0685]
Y	1.204***	1.210***	1.148***	1.275***	1.236***	1.266***	0.775***	0.784***	0.862***	0.865***	0.855***	0.871***
	[0.210]	[0.220]	[0.201]	[0.274]	[0.280]	[0.295]	[0.119]	[0.125]	[0.107]	[0.103]	[0.134]	[0.139]
W	0.0439	0.0238	–0.775	–1.552	–1.247	–1.21	–0.665	–0.729	–1.07	–1.069	–1.336	–1.265
	[0.575]	[0.658]	[0.770]	[1.148]	[1.059]	[1.283]	[0.840]	[0.872]	[0.773]	[0.737]	[1.014]	[1.041]
OFF_{Low}	–2.409***	–2.437***	–1.580***	–2.389***	–1.419***	–1.712***	–1.247	–0.959	–0.692	–0.59	–1.924*	–2.089*
	[0.558]	[0.660]	[0.445]	[0.807]	[0.525]	[0.652]	[1.609]	[1.663]	[0.936]	[1.032]	[1.023]	[1.235]
OFF_{High}	0.415	0.313	0.258	–1.238	–0.596	–1.652	1.777	1.896	1.654	1.52	–0.262	–1.256
	[0.652]	[1.150]	[0.415]	[1.249]	[0.777]	[1.767]	[2.658]	[2.712]	[1.423]	[1.608]	[1.158]	[1.563]
AR1	0	0	0	0	0	0	0	0	0	0	0	0
AR2	0.49	0.5	0.46	0.93	0.258	0.397	0.68	0.69	0.22	0.65	0.15	0.474
HANSEN	0.67	0.46	0.08	0.4	0.499	0.563	0.94	0.88	0.86	0.72	0.208	0.199

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Robust S.E. in brackets. All regressions include a full set of three-digit sector, time dummies and a group dummy. The 2nd and 3rd (3rd and 4th) lags of the variables and the 1st (2nd) lag of their first differences have been used as instruments in columns (1) to (6) (columns (7) to (12)) respectively for the equation in differences and for the one in levels. AR1 and AR2 show the *p*-value for the tests of the null hypothesis of no first and second order serial correlation in the differences of residuals. Hansen shows the *p*-value of the test of the validity of the over-identifying restrictions.

In columns (3)–(6) and (10)–(12) the export intensity and the log of the stock of immaterial assets at time *t* and both at *t* and $t - 1$ are included as a robustness check. The export intensity is aimed at controlling for another very important firm international activity. A deeper involvement in export markets might force the firm to reduce the labor intensity of production owing to higher competitive requirements. Also, in the absence of a direct measure of technical progress at the firm-level, the stock of immaterial assets is meant to proxy for the complexity and the technological level of the activities performed within the firms. As a matter of fact, taking as reference Pavitt's taxonomy of sectors, we observe in our sample that the largest stock of these activities is recorded for firms in high tech sectors while the lowest stock is for firms in traditional sectors. The results mimic the previous ones and while no direct channel seems to exist between the firm employment and the export intensity, the stock of immaterial assets seems to substitute for employment in traditional production processes. Again, only the coefficient on offshoring to low income countries is negative and significant in the traditional sectors.

Further Robustness Checks

Table 5 shows further robustness checks. First, we have reclassified sectors according to their share of non-production workers in total employment being above or below the median of three-digit NACE sectors to investigate whether our findings are driven by the skill composition in traditional and non-traditional sectors. This basically corresponds to the aggregation of most of the scale sectors with the traditional ones according to Pavitt's classification, owing to their similar share of manual workers in total employment (about 70% in both groups). Columns (3) and (4) show a negative effect for low skill intensive sectors only, but the long run elasticity is much smaller than for traditional sectors. In our opinion, this hints at the fact that in our baseline model we are not just capturing a reduction for the relative demand of the low skilled workers, but also some structural features that make domestic (either white or blue collar) labor more substitutable by foreign inputs in traditional sectors than in the scale ones. Second, we have included the share of total purchases over total sales, *Tot.Int.*, to account for employment reduction effects driven from the general firm vertical disintegration process that might be otherwise captured by our offshoring measures. Finally, we add the three-digit sector level import penetration from high and low labor cost countries, Imp_{sect}^{High} and Imp_{sect}^{Low} respectively, to account for sectoral time varying heterogeneity related to increasing foreign competition that might not properly be captured by sector dummies. Our baseline results on the traditional sectors are confirmed both in their sign and significance.[14] Total outsourcing contributes negatively in traditional activities and positively in non-traditional ones.[15]

Sub-sample Estimates

Now, we try to dissect how the working of offshoring practices may be related to the degree of the firm international involvement. First, we investigate in what measure the offshoring negative effect on the labor demand is related to the deepening of offshoring practices of *Always Offshorers*[16] than to *Switchers*. Temporary importers may not be willing to restructure their productive processes substituting foreign inputs for labor following an occasional episode. In contrast, when new importers turn to more stable relationships with foreign suppliers, they may take some time to switch to less labor intensive techniques. Persistent importers, instead, have already undergone this change and may take advantage of a well established international supply network. For these reasons they might exploit this labor saving strategy more easily.

Second, although no direct significant effect of the export intensity on the labor demand has been found, we follow the idea that the rise in imported input intensity may be related to the firm's cost saving strategy to gain and preserve competitiveness in international markets and we re-estimate the empirical model on exporters.

Table 6 presents the results respectively for the subsample of *Always* and *Never Offshorers* to low income countries, for the subsample of *Exporters*, i.e. of all the firms exporting at least one year, and for the subsample of *Always Exporters* only, thus including only firms exporting each year of our 5-year sample period. When *Switchers* into and from offshoring to low income countries are excluded from the sample, the size of the offshoring coefficients in traditional sectors is slightly higher (column (2)) than in the baseline case (Table 4, column (2)). This evidence may suggest that the ease of substitution between labor and imported inputs from low-labor cost countries is more intense for "experienced" offshorers than for switchers. An increase by 1 percentage point in offshoring in this case implies a reduction of 2.4% of the conditional labor demand. The labor demand seems to be more sensitive to offshoring in this group of firms. Again no effect is detected for non-traditional sectors.

Turning to the results on the two groups of exporters, the two sets of results are slightly different: on one hand, the documented negative effect of offshoring to low income countries on the conditional labor demand in traditional sectors is confirmed for *Exporters*, even if the size of the long-run coefficient estimate is a bit larger in this case (column (4)) than in the baseline regression (column (2) of Table 4); on the other hand, for *Always Exporters*, the size of the effect is smaller than the previous one for firms in traditional sectors and the coefficient on offshoring to low income countries turns out to be negative and slightly significant for firms in non-traditional sectors too. A tentative explanation for these findings could be related to the different role of imported intermediates in improving the firm's ability to enter and stay in foreign markets. In traditional sectors we find a larger effect for *Exporters* than for *Always Exporters* (compare columns (4) and (6) in the table). This evidence is driven by the presence of switchers in and out of export in the first sample: the penetration of foreign markets is harsher for switchers than for always exporters, owing to the presence of sunk costs, therefore labor cost saving strategies may turn out to be relevant. Where sunk costs are sector specific, the different outcome in terms of coefficient significance for firms performing more advanced activities might suggest that the cost saving strategy is less effective to enter foreign markets for firms in these sectors. However, the positive coefficient for *Always Exporters* may imply that labor saving through imports from cheap labor countries may prove useful to preserve competitiveness. Focusing on *Always Exporters*, the estimates of the long-run coefficients of columns (6) and (12) and considering that the average of offshoring increase is 0.8 and 0.4 points in the two cases, the implied reduction in employment is 1.4% in traditional sectors and 0.8% in the non-traditional ones.

Summing up the previous evidence, the main result is that only offshoring to low income countries displays a significant and negative effect on the conditional labor demand of firms in traditional sectors and of firms which are persistent exporters in non-traditional sectors. In firms performing more traditional activities, the size of the effect is lower when persistent exporters are considered in the sample than when new exporters are also included. Finally, the labor demand semi-elasticity with respect to offshoring is higher for "experienced" offshorers. In general, the evidence of manufacturing firms reducing the labor intensity of production in favor of the use of intermediate inputs from low labor cost countries emerges from our data.

To conclude our analysis it would be worth taking the scale effect from offshoring into account. Usually, empirical papers estimating the unconditional labor demand simply remove output from the model and/or substitute it with the output price (OECD, 2007; Hijzen and Swaim, 2007). In our case we do not have information on the output price at the firm level so we tried to remove or substitute output with the sector-level price. Unfortunately, this resulted in a serious mis-specification of our empirical model with the consequent poor performance of our preferred estimator. It is worth mentioning that studies estimating the offshoring effect on the unconditional labor demand are usually carried on at the sector level by means of OLS. So we did not proceed further on this direction and we stick to the conditional labor demand specification focusing our main interest on the effect of offshoring practices on the choice of production techniques. This line of research however should be further investigated.

5. Conclusion

This paper has analyzed the effect of offshoring on the manufacturing conditional labor demand at the firm level by means of System GMM. The availability of firm level indicators of offshoring split by origin of the intermediate inputs has allowed us to shed new light on the issue and reconcile the ambiguous sector level evidence on the Italian case. In line with previous evidence on the topic, our results bear a negative effect of offshoring to low income countries on the conditional labor demand of Italian manufacturing firms. This outcome, however, is mainly attributable to those firms involved in traditional activities. Only when the sub-sample of exporting firms is considered, does offshoring to low income countries negatively affect the labor demand in non-traditional sectors too, even if the economic magnitude of the effect is smaller than the one recorded for exporters of more traditional goods and its significance is low.

Our work, then, clarifies how production techniques in an advanced country's manufacturing adjusts to the availability of cheaper inputs from abroad and what is the outcome in terms of units of labor necessary for each produced unit. Our study also highlights that measures of international fragmentation of production should definitely take into account the heterogeneity of trading partners in order to dissect the different mechanisms underlying such a complex phenomenon. Turning to the implication of our study for society, we show that, besides rapid low skilled labor saving technological change, the new international division of labor is putting the advanced economies' labor markets under stress. Even if offshoring represents a renewed opportunity for competitiveness for many firms in advanced countries, it may pose a heavy burden on traditional manufacturing sector workers owing to two features: on the one hand, firms in these sectors are the ones facing fiercer competition from low labor cost countries and are compelled to reduce labor costs to preserve their competitiveness; on the other hand, the employment composition in these sectors is more skewed towards activities that are more easily substituted with intermediate imports from cheap labor locations. In both cases it is evident that a structural change is at work and, then, policy makers should foster innovation, R&D, and human capital investment to ease the transition towards intangible production and more advanced tasks which are less substitutable by imported materials.

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Notes

1. Costa and Ferri (2007) presented a firm-level study and found that offshoring of downstream firm clusters lowers employment of the subcontracting firm clusters.

2. The data set has been used by the National Statistical Institute (Istat) for an analysis on offshoring practices by Italian firms for the Istat Annual Report in 2006 and it comes from the merging of customs and balance sheet data.
3. Details on the representativeness and on the cleaning procedure are available from the authors upon request.
4. The only manufacturing sectors excluded from the analysis are Tobacco and Coke and Refinery Products. The following sectors are classified as traditional: all the three digit activities in the NACE two digit sectors 15–20, and the activities 212, 245, 246, 251, 286, 287, 361, 362, 364, 365, 366. The remaining ones, including High Tech, Scale and Specialized supplier sectors, are classified as non-traditional (Pavitt, 1984).
5. Although the use of such on indicator is standard in the offshoring literature it is worth noticing that some of the non-energy imports included in its definition may be commodities and, if the weight of such products is not negligible, this may turn into a severe mismeasurement of offshoring. Thus, making use of the IO tables for our sample period, we checked the weight of primary and mining intermediate goods in total intermediate inputs for the manufacturing sectors included in our analysis and it turned out that these goods on average account for about 3% of total intermediates. This share is rather stable across years and is halved if sector 15, i.e. Food and Beverages, is removed from the average. From this evidence we are confident that our offshoring proxies are not severely affected by this and we proceed further.
6. The classification between high and low income countries has been performed by the Italian National Statistical Office.
7. The correlation between employment growth and the growth of offshoring is about –0.20 when the latter is to low income countries and about –0.02 when it is to high income countries.
8. The validity of our estimates is confirmed by the fact that the GMM coefficients of the autoregressive term lie above the downward biased FE ones and below the upward biased OLS ones (Bond, 2002). These results are available from the authors upon request.
9. Results for the measure on total purchases and on the whole sample are not shown here for the sake of brevity, but are available from the authors upon request.
10. Results do not change if offshoring measures are included exclusively in their value at $t-1$. These results are available upon request.
11. Estimates of the long-run coefficients and their standard errors are obtained by means of the STATA command *nlcom* as a nonlinear combination of the short-run parameters.
12. The Hansen test of over-identifying restrictions does not fail to strongly reject the validity of lagged levels dated $t-2$ for the sub-sample of non-traditional sectors. This is consistent with the presence of measurement errors as also shown in Bond (2002) and in these cases, instruments dated $t-3$ and $t-4$ are not rejected and we will use these instruments, while we will stick to instruments dated $t-2$ and $t-3$ for the sub-sample of traditional sectors. However, the detailed description of the instruments adopted is displayed below each of the tables containing the results. Finally, we have collapsed the instruments, as in Beck and Levine (2004), because this allows us to improve the validity of instruments and preserves the information contained in original variables (Roodman, 2009).
13. To obtain this percentage we calculated $2.175 \times 0.005 \times 100 = 1.0875$.
14. We also ran further robustness checks concerning the inclusion of the sectoral Information and Computer Technology (ICT) capital intensity, the sectoral material offshoring measure from national IO tables, the overall sector offshoring by dowstream manufacturing sectors, and the sectoral skill share in the baseline specifications: the previous findings are unaffected, while sector level variables are never significant. For these reasons we do not show these estimates here; however, they are available upon request.
15. The positive effect in this group of sectors would call for more detailed investigation, however this does not represent the focus of our work so we leave it for further research.
16. Firms displaying a positive value of imports from low income countries in each year of our sample period.