A Firm-Level Perspective on Migration

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The literature and our contribution

- weak evidence of substitution between migrants and native workers;
- mostly sector level evidence, census and labour force data;
- our contribution: firm-level evidence on Italian manufacturing.

The Data

- *IX* wave CAPITALIA;
- *WHIP* database on Italian employees;

Migrants in Italian Manufacturing by Sector and Size

% of Migrant labour

	High Tech	Scale Intensive	Specialized	Traditional	Total
< 21	2.04	4.49	3.35	4.28	4.10
$\geq 21 \& < 50$	1.95	5.39	2.98	4.17	4.18
$\geq 50 \& < 250$	2.93	5.73	2.49	3.93	3.99
$\geq 250 \& < 500$	0.32	2.58	1.66	2.24	1.96
≥ 500	0.49	0.60	0.66	2.24	1.06
Total	1.95	4.92	2.61	3.97	

Migrants in Italian Manufacturing by International Status(%)

% of Migrant labour

	International	Exporter	Foreign Comp.	Domestic
High Tech	2.02	2.04	1.93	1.67
Scale Intensive	4.99	4.96	5.31	4.79
Specialized	2.53	2.52	2.47	3.09
Traditional	3.82	3.79	4.02	4.59
Total	3.67	3.65	3.69	4.34

Migrants in Italian Manufacturing by Location(%)

% of Migrant labour

	North-West	North-East	Centre	South	Total
High Tech	1.83	2.77	1.69	0.05	1.95
Scale Intensive	5.29	7.42	3.72	0.73	4.92
Specialized	2.60	3.53	1.33	0.32	2.61
Traditional	4.01	5.80	3.82	0.72	3.97
Total	3.87	5.50	3.27	0.66	3.83

The production function

$$lnY_f = \alpha_0 + \sum_i \alpha_i lnX_{fi} + \frac{1}{2} * \sum_i \alpha_{ii} lnX_{fi} lnX_{fi} + \sum_{i=} \sum_{j \neq i} \alpha_{ij} lnX_{fi} lnX_{fj} \quad (1)$$

$$S_{fL_D} = \alpha_{L_D} + \alpha_{L_D L_D} lnX_{fL_D} + \sum_{j \neq L_D} \alpha_{L_D j} lnX_{fj}$$

$$S_{fL_M} = \alpha_{L_M} + \alpha_{L_M L_M} lnX_{fL_M} + \sum_{j \neq L_M} \alpha_{L_M j} lnX_{fj}$$

$$S_{fL} = S_{fL_D} + S_{fL_M}$$

- Iterated SUR;
- controlling for sample selection (Inl=. when l=0);

Measures of complementarity/substitutability from the Production Function:

- Technical Elasticity of Substitution:

$$TES_{ij} = \frac{\alpha_j + \alpha_{jj} lnX_{fj} + \sum_{k \neq j} \alpha_k lnX_{fk}}{\alpha_i + \alpha_{ji} lnX_{fi} + \sum_{k \neq i} \alpha_k lnX_{fk}} \quad (2)$$

- Partial Price Elasticity - q-complements/substitutes:

$$\epsilon_{p_i x_j} = c_{ij} * S_j = \frac{\alpha_{ij} + S_i * S_j}{S_i} \quad (3)$$

The cost function

$$lnC_f = \beta_0 + \sum_i \beta_i lnP_{fi} + \frac{1}{2} * \sum_i \beta_{ii} lnP_{fi} lnP_{fi} + \\ + \sum_{i=} \sum_{j \neq i} \beta_{ij} lnP_{fi} lnP_{fj} + \gamma_k lnK + \sum_i \gamma_{ki} lnK lnP_{fi} + \\ + \gamma_y lnY + \sum_i \gamma_{yi} lnY lnP_{fi} \tag{4}$$

$$S_{fL_D} = \beta_{L_D} + \beta_{DD} lnP_{fL_D} + \sum_{j \neq L_D} \beta_{L_D j} lnP_{fj}$$

$$S_{fL_M} = \beta_{L_M} + \beta_{L_M L_M} lnP_{fL_M} + \sum_{j \neq L_M} \beta_{L_M j} lnP_{fj}$$

$$S_{fL} = S_{fL_D} + S_{fL_M}$$

Measures of complementarity/substitutability from the Cost Function:

- Partial Demand Elasticity - p-complements/substitutes:

$$\eta_{x_i p_j} = \sigma_{ij} * S_j = \frac{\beta_{ij} + S_i * S_j}{S_i} \tag{5}$$

- Morishima elasticity of Substitution MES-complements/substitutes:

$$MES_{ij} = \eta_{x_i p_j} - \eta_{x_j p_j} = \frac{\partial ln(X_i/X_j)}{\partial ln p_j} \tag{6}$$

Regularity Conditions I:

Share	Production Function Mean		Cost Function Mean	
S_L	0.184		0.157	
$\hat{S}_L$	0.185		0.158	0.75%
S_{L_D}	0.151		0.162	
$\hat{S}_{L_D}$	0.150	1.25%	0.144	0.47%
S_{L_M}	0.012		0.013	
$\hat{S}_{L_M}$	0.014	1.74%	0.014	16.22%
S_{IM}	0.472		0.546	
$\hat{S}_{IM}$	0.521	0.31%	0.545	0.00%
S_{IS}	0.246		0.297	
$\hat{S}_{IS}$	0.277	0.67%	0.296	0.00%
S_K	0.033			
$\hat{S}_K$	0.037	1.80%		
Observations:	3274		3199	

Regularity Conditions - II:

	Constant Returns to Scale Production Function				
	$\epsilon_{p_i x_j}$ based on:				
	mean ϵ_{ij} across i	**median ϵ_{ij} across i**	**estimated shares**	**calculated shares**	**Violations**
$\epsilon_{p_{L_D} x_{L_D}}$	-0.01	-0.43	-0.24	-0.32	12.10%
$\epsilon_{p_{L_M} x_{L_M}}$	-0.72	-0.90	-0.89	-0.89	0.06%
$\epsilon_{p_K x_K}$	-0.46	-0.77	-0.60	-0.59	2.72%
$\epsilon_{p_{IM} x_{IM}}$	-0.03	-0.11	-0.08	-0.09	10.90%
$\epsilon_{p_{IS} x_{IS}}$	0.12	-0.20	-0.12	-0.11	17.65%
	Constant Returns to Scale Cost Function				
	$\eta_{x_i p_j}$ based on:				
	mean η_{ij} across i	**median η_{ij} across i**	**estimated shares**	**calculated shares**	**Violations**
$\eta_{x_{L_D} p_{L_D}}$	-0.72	-0.75	-0.76	-0.75	0.00%
$\eta_{x_{L_M} p_{L_M}}$	-1.92	-1.23	-1.22	-1.24	0.00%
$\eta_{x_{IM} p_{IM}}$	-0.55	-0.55	-0.55	-0.55	0.00%
$\eta_{x_{IS} p_{IS}}$	-0.61	-0.61	-0.61	-0.61	0.00%

Output Elasticities

	All	High Tech&. Scale	Traditional	Specialized Suppliers	Exporters	Foreign Competitor	SMEs	North-West	Noth-East
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
K	0.037	0.043	0.038	0.031	0.033	0.024	0.036	0.039	0.032
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
L_D	0.15	0.161	0.131	0.189	0.146	0.15	0.153	0.175	0.145
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
L_M	0.014	0.015	0.017	0.007	0.008	0.009	0.016	0.007	0.017
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
IM	0.521	0.503	0.54	0.486	0.531	0.524	0.518	0.505	0.531
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
IS	0.277	0.277	0.274	0.287	0.281	0.294	0.277	0.274	0.275
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

Technical Elasticities of Substitution

	All	High Tech&. Scale	Traditional	Specialized Suppliers	Exporters	Foreign Competitor	SMEs	North-West	Noth-East
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
$TES_{L_D L_M}$	0.097***	0.094***	0.131***	0.039***	0.057***	0.059***	0.103***	0.039***	0.117***
	[0.008]	[0.015]	[0.014]	[0.013]	[0.009]	[0.013]	[0.009]	[0.011]	[0.014]
$TES_{L_D K}$	0.248***	0.268***	0.292***	0.166***	0.226***	0.158***	0.237***	0.222***	0.223***
	[0.011]	[0.022]	[0.018]	[0.018]	[0.013]	[0.017]	[0.011]	[0.015]	[0.017]
$TES_{L_D IM}$	3.474***	3.113***	4.139***	2.574***	3.628***	3.495***	3.381***	2.886***	3.665***
	[0.050]	[0.078]	[0.091]	[0.072]	[0.058]	[0.079]	[0.049]	[0.056]	[0.077]
$TES_{L_D IS}$	1.846***	1.718***	2.098***	1.518***	1.924***	1.962***	1.804***	1.568***	1.897***
	[0.032]	[0.053]	[0.057]	[0.048]	[0.037]	[0.052]	[0.032]	[0.039]	[0.048]
$TES_{K L_D}$	4.039***	3.729***	3.423***	6.008***	4.432***	6.310***	4.215***	4.503***	4.482***
	[0.187]	[0.306]	[0.212]	[0.646]	[0.251]	[0.679]	[0.203]	[0.305]	[0.342]
$TES_{IM L_D}$	0.288***	0.321***	0.242***	0.388***	0.276***	0.286***	0.296***	0.346***	0.273***
	[0.004]	[0.008]	[0.005]	[0.011]	[0.004]	[0.006]	[0.004]	[0.007]	[0.006]
$TES_{IS L_D}$	0.542***	0.582***	0.477***	0.659***	0.520***	0.510***	0.554***	0.638***	0.527***
	[0.009]	[0.018]	[0.013]	[0.021]	[0.010]	[0.014]	[0.010]	[0.016]	[0.013]
$TES_{L_M L_D}$	10.363***	10.598***	7.606***	25.835***	17.667***	17.075***	9.732***	25.444***	8.561***
	[0.910]	[1.670]	[0.839]	[8.983]	[2.868]	[3.668]	[0.860]	[7.014]	[0.999]
$TES_{L_M K}$	2.566***	2.842***	2.222***	4.300***	3.986***	2.706***	2.309***	5.651***	1.910***
	[0.238]	[0.451]	[0.263]	[1.542]	[0.653]	[0.611]	[0.218]	[1.562]	[0.253]
$TES_{L_M IM}$	36.005***	32.995***	31.485***	66.502***	64.089***	59.669***	32.903***	73.437***	31.374***
	[2.925]	[4.845]	[3.123]	[22.414]	[10.013]	[12.282]	[2.678]	[19.616]	[3.328]
$TES_{L_M IS}$	19.132***	18.208***	15.960***	39.223***	33.983***	33.495***	17.561***	39.887***	16.237***
	[1.567]	[2.694]	[1.591]	[13.308]	[5.318]	[6.932]	[1.443]	[10.685]	[1.752]
$TES_{K L_M}$	0.390***	0.352***	0.450***	0.233***	0.251***	0.370***	0.433***	0.177***	0.523***
	[0.036]	[0.056]	[0.053]	[0.083]	[0.041]	[0.083]	[0.041]	[0.049]	[0.069]
$TES_{IM L_M}$	0.028***	0.030***	0.032***	0.015***	0.016***	0.017***	0.030***	0.014***	0.032***
	[0.002]	[0.004]	[0.003]	[0.005]	[0.002]	[0.003]	[0.002]	[0.004]	[0.003]
$TES_{IS L_M}$	0.052***	0.055***	0.063***	0.025***	0.029***	0.030***	0.057***	0.025***	0.062***
	[0.004]	[0.008]	[0.006]	[0.009]	[0.005]	[0.006]	[0.005]	[0.007]	[0.007]

Price, Demand and MES Elasticities of Substitution

	All	High Tech&. Scale	Traditional	Specialized Suppliers	Exporters	Foreign Competitor	SMEs	North-West	Noth-East
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Partial Price Elasticities: Direct Estimates From the Production Function									
$\epsilon_{p_{L_D} x_{L_M}}$	0.049***	0.075***	0.058***	0.036**	0.040***	0.043***	0.055***	0.025**	0.055***
	[0.006]	[0.009]	[0.010]	[0.016]	[0.006]	[0.008]	[0.007]	[0.010]	[0.009]
$\epsilon_{p_{L_M} x_{L_D}}$	0.510***	0.793***	0.438***	0.923**	0.711***	0.728***	0.537***	0.631**	0.471***
	[0.061]	[0.099]	[0.074]	[0.404]	[0.106]	[0.145]	[0.067]	[0.249]	[0.077]
Partial Demand Elasticities: Direct Estimates From the Cost Function									
$\eta_{x_{L_D} p_{L_M}}$	-0.0351**	-0.0863***	0.0261	-0.0827**	-0.0449***	-0.0308	-0.0425***	-0.0422*	-0.0518**
	[0.0150]	[0.0273]	[0.0214]	[0.0367]	[0.0168]	[0.0210]	[0.0162]	[0.0243]	[0.0225]
$\eta_{x_{L_M} p_{L_D}}$	-0.360**	-0.417***	0.359	-1.430**	-0.516***	-0.3	-0.476***	-0.395*	-0.681**
	[0.153]	[0.132]	[0.294]	[0.635]	[0.193]	[0.205]	[0.181]	[0.227]	[0.296]
Morishima Elasticities of Substitution: Direct Estimates From the Cost Function									
$mes_{L_D L_M}$	1.184***	0.912***	1.797***	0.257	1.209***	1.284***	1.058***	1.123***	0.802***
	[0.151]	[0.141]	[0.283]	[0.635]	[0.189]	[0.199]	[0.179]	[0.225]	[0.293]
$mes_{L_M L_D}$	0.398**	0.487***	1.073***	-0.853	0.218	0.456**	0.26	0.293	0.0924
	[0.162]	[0.157]	[0.307]	[0.676]	[0.204]	[0.217]	[0.191]	[0.248]	[0.311]

Conclusion

- small contribution of migrants in manufacturing production;
- TES involving a migrant labour change in response to a drop in the availability of the remaining inputs are always larger than the ones involving native labour;
- complementarity (both *p*- and *q-complementarity*) between migrants and natives;
- native labour *q-complement* with respect to the remaining factors of production;
- migrant labour *q-complement* with respect to capital;
- natives and migrants, especially, are *p-substitute* with respect to materials.
- domestic and foreign labour are MES-substitutes.