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"Exporters, Importers and Two-way Traders: the Links between Internationalization, Skills and Wages"

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Exporters, Importers and Two-way traders: The links between internationalization, skills and wages *

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PRELIMINARY

Abstract

How do trade activities affect firms' employment and wages structures? Using firm level data on Italian manufacturing firms, this paper adds to the existing literature, by assessing how the *degree* of involvement in international trade impacts on workforce composition, earning levels and wage inequality. We differentiate firms involved in both trading activities - namely two-way traders - from firms that only export, and from those that only import. We show that two-way traders have a higher propensity to employ non-production workers, exhibit significant wage gaps, but also pay higher wages for both production and non production workers, relative to non internationalized firms and to firms which are involved only in either export or import. The paper also looks at how the wages and the skill structure of the trading firms change with the country of destination and origin and with the firms' sectoral and geographical diversification.

JEL codes: F10, F16, J21

Keywords: heterogeneous firms; exports; imports; wage inequality; skills

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1 Introduction

The standard prediction from Heckscher-Ohlin theory is that the distributional impact of trade operates through changes in the relative prices of tradable goods inducing the expansion of some industries and the contraction of others. Countries having a more skilled labour force should specialize in industries that use such factors more intensively. As a result of an expansion of trade, the relative price of goods that use less skilled labour more intensively should fall (and those of skill intensive goods increase) which in turn should reduce the aggregate relative demand and, ceteris paribus, the relative wages of the factors used in producing these goods domestically. Hence the traditional view implies that international trade should have the effect of moving workers from contracting industries towards expanding ones, changing the aggregate ratio between skilled and unskilled workers and their relative wages.

In contrast with the standard trade theory, much of the empirical literature has highlighted that the largest proportion of the observed changes in the relative employment of non production workers is due to *within* industry movements (Berman et al. (1994), Bernard and Jensen (1997), Heitger and Stehn (2003)). Among others, Berman et al. (1998) find that both the rise in the demand for skilled workers and the increase in wage inequality in the US economy can be attributed to the within industry skill upgrading rather than to a reallocation of employment between industries.

This has induced most scholars to consider that the main driver to employment shifts and wage inequality is not international trade, and spurred them to look for other explanations, the most acknowledged of which is the skill biased technical change view. According to this view, rapid technological change, especially when associated with the widespread introduction of computers, modifies the workforce composition, increasing the employment share of skilled workers and reducing the demand for unskilled workers and thereby their wages. Following this line of reasoning the skill biased technical change causes a skill upgrading *within* each sector (Katz and Murphy (1992); Bound and Johnson (1992)).

However, at least some of the observed within sector changes in labour composition and relative wages can also be attributed to international trade once intra-industry heterogeneity is allowed for, and the possibility that firms active in a given sector differ in terms of their international involvement is acknowledged. Recent trade models have put these issues at center stage (Melitz (2003), Helpman et al. (2004), Yeaple (2005)). Melitz (2003) assumes that firms vary in terms of innate productivity, assigned according to a random draw, and relates firms' decision to export to their productivity level. Due to self-selection, only the most productive firms enter the foreign market while less productive firms will restrict their activity to their home market. Given differences in productivity levels, the relative magnitude of fixed and variable costs determines the export status of firms. Hence, this model allows for the co-existence in the same sector of both exporters and non exporters. Yeaple (2005) jointly considers workers heterogeneity, differences in technology, and trade costs, and derives important conclusions in terms of the effect of trade on skill premia. In particular, this model assumes that firms are identical when born while workers differ in terms of their skills. In general equilibrium, some firms choose new technologies that allow them to lower their unit cost. In presence of fixed costs to enter the foreign markets, only the firms adopting the new technologies will export, since they are able to sell a larger quantity profitably. Therefore exporting firms are larger and more technologically advanced with respect non internationalized firms. Moreover, since

the adoption of the new technologies requires employing workers with a relatively high skill level, the exporting firms have a more skilled workforce and pay higher wages (both to blue and white collars). A reduction in trade costs increases the share of exporting firms and, hence, it raises the aggregate relative demand. As a consequence, the aggregate wage gap and the wage premia that exporters pay to their blue and white collar workers increases.

Empirical literature, increasingly based on firm level data, has recognized that differences of international involvement within industries may be associated with diversities in labour composition and in relative wages. Indeed, these contributions have reached different conclusions from those obtained using industry level data, suggesting that trade may have a key role in explaining the increase in the demand for skilled workers and the rise of wage inequality.

Bernard and Jensen (1997) show that in US the increase of the relative demand for skilled workers and of the skill premium were mainly driven by between firm shifts, often within the same industry, toward exporting firms. They also highlight that these between firms movements are related to increases in international demand and not to technological upgrading. In a similar vein, Manasse and Stanca (2003)[1] focus on Italian manufacturing firms and decompose the within industry effect into a between and a within plant component, finding that exports has induced a between firms reallocation but in the opposite way, shifting away employment from skill-intensive firms. This result is consistent with the peculiarity of the Italian trade specialization model which, compared to other industrialized countries, is more oriented towards unskilled intensive traditional goods. Biscourp and Kramarz (2007), using firm level data for France, decompose the aggregate changes of the skill labor force composition into a between-firm and a within-firm component as well. However, they also account for a further heterogeneity in internationalization strategies, by distinguishing exporting firms from those active in import activities.

Other studies have more broadly examined the relationship between export activity and firm performances. These studies have overwhelmingly found that exporters are larger, more productive, more capital intensive than firms producing solely for the domestic market. By looking at the workforce composition and at the employments' earnings, most of these contributions have reached the conclusion that exporting firms pay higher wages and have more skilled workers than their domestic counterparts [2].

Consistent with the increasing attention given by theoretical and empirical literature to the links between intra-industry heterogeneity and distributional patterns, we use firm level data on Italian firms to highlight that firms involved in international trade exhibit peculiar characteristics in terms of workforce composition and wage inequality. The available information on import and export enable us to differentiate firms involved in both trading activities - which we identify with the term "two-way traders" - from firms that only export, and from those that only import. This distinction has two important implications. On the one hand, it helps overcome a frequent limitation in international trade literature, which has been mainly focused on exports while imports have largely been left out of empirical studies. On the other hand, by considering firms that are involved in

[1] While Bernard and Jensen (1997) focus on the between-within decomposition considering separately the relative wage bill and the ratio of non production workers to total employment, Manasse and Stanca (2003) introduce an innovativeness by decomposing the overall change in the non-manual share of the wage bill into the respective contributions of the employment share and the wage premium.

[2] See Schank et al. (2006) for a synopsis of studies on wage differentials associated to exporting activities.

both imports and exports, it addresses the issues of whether the *degree* of involvement in international trade is associated with employment structure and wages. While a large number of studies which we have briefly reviewed above have highlighted that exporters are normally more skilled and contribute to sectoral wage inequalities, a few works analyse the characteristics of importers focusing mainly on their productivity premia (Tucci (2005), Bernard et al. (2007), Halpern et al. (2005)). Even fewer analyses consider both import and export activities and show how these tend to be concentrated in the hands of a minority of firms which trade a large number of products to a large number of countries (Bernard et al. (2005), Muuls and Pisu (2007)). However, to the best of our knowledge, there is no evidence at all concerning both the employment and the wage structure of firms which are simultaneously involved in import and in export activities [3]. This is quite surprising given the increasing importance of international fragmentation of production, implying that more and more firms are active in both imports and exports of intermediate and final goods. As particularly emphasised by Feenstra and Hanson (2004) trade of this type affects labour demand of firms producing the inputs in competition with imports, but also impacts on labour demand of firms using the imported inputs. This suggests that firms engaged in what is often defined as "global production sharing", which involves both import and export of goods corresponding to different stages of the overall vertical production process, may be particularly exposed to changes in employment composition and in relative wages of workers.

This paper also sheds some light on two other interesting issues previously unexplored. Firstly, we assess whether the wages and the skill structure of trading firms change with the country of destination and origin. This empirical exercise is helpful in examining whether different competencies are required for firms exporting (or importing) to different markets. The idea is that the workforce composition and/or the earnings may vary depending on the geographical, cultural or developmental "distance" of the markets of destination or origin. Secondly, we consider how the labour characteristics of trading firms are correlated with their sectoral and geographic diversification, as proxied by the number of products firms trade and by the number of countries with which they trade, respectively. This is in line with recent research carried out by Bernard et al. (2007), which highlights the relevance of the two extensive margins - i.e. the number of destinations served by a firm and the number of products exported by a firm - in understanding trading firms' heterogeneity and aggregate patterns of international trade.

The rest of this paper has the following structure. Section 2 describes the data-sources we use and how trade activities, workforce composition and wages can be measured using them. Section 3 provides an overview of how differences in Italian firms' involvement in international trade are associated with diversities in skill composition, wage levels and inequality. Section 4 will introduce some econometric exercises which exploit the whole time span of data available and check the robustness of the unconditional picture offered in Section 3, once observed and unobserved sources of heterogeneity are controlled for. Section 5 illustrates how the whole picture is affected by differences across firms according to the market of origin or destination of their import and export activities; and according to the degree of sectoral and geographic diversification of their international trade. Section 6 will summarise the results and conclude.

[3] Bernard et al. (2007) look at the employment and the skill composition of the two-way traders, but not wages; while Muuls and Pisu (2007) consider only the employment level.

2 Data description

This paper relies upon a data panel which combines two different datasets developed by Italy's Bureau of Statistics (ISTAT), namely MICRO 1 and COE [4]. MICRO 1 contains longitudinal data on a panel of 38.771 firms representing the entire universe of Italian manufacturing companies with 20 employees or more over the 1989-97 period. The entry and exit of firms in and out of the Italian manufacturing industry over the observation period, as well as the existence of missing values, makes of MICRO 1 an unbalanced panel data-set, containing information for an average of around 20.000 firms per year. Firms are classified according to their principal activity, as identified by ISTAT's standard codes for sectoral classification of business (Ateco), which correspond, to a large extent, to Eurostat's NACE 1.1 taxonomy. The database contains information on a number of variables appearing in a firm's balance sheet. For the purpose of this work we utilize the following pieces of information: number of employees, type of occupation of employees, labor costs, wages, industry and geographical location (Italian regions). All the nominal variables are measured in millions of 1995 Italian liras and they are deflated using various 2 digit industry-level price indices provided by ISTAT [5].

As regards the workforce composition separate pieces of information are available for production workers (including blue collars, assistants, trainees and home-based workers)[6] and non-production workers (comprising managers and clerks)[7]. For the purpose of this paper we consider production and non-production workers as a proxy of the distinction between unskilled and skilled workers, respectively [8]. For each of these two groups we have access to labor cost data, distinguishing between the wage paid to the worker (salary and severance-pay) and the total cost paid by the firm (salary, corporate income taxation and severance-pay). In line with previous empirical analyses (Bernard and Jensen (1997) and Biscourp and Kramarz (2007)), we construct a measure of firms' skill composition, given by the percentage of non production workers over the total number of employees, and a measure of wage gap, computed as the ratio between the average wage of non production workers to the average wage of production workers.

The MICRO1 database has been merged with ISTAT's external trade register (COE)[9], which provides firm-level information on exports and imports over the 1993-1997 period. For each of the about 17,000 firms surveyed on average in the observation period, COE supplies data on firms' trade status and their volume of trade. Moreover, data are available on the destination of exports, the origin of imports [10], the number of sectors in which a firm exports (in a four digit sectoral classification system) and the number of countries served (NSE and NCE, respectively), the number of sectors in which a firm imports and

[4] The databases have been made available under the mandatory condition of censorship of any individual information.

[5] Wages are deflated by the consumer price index. Labor cost are deflated using value added index.

[6] Respectively, *operai*, *commessi*, *apprendisti* and *lavoratori a domicilio*.

[7] Respectively, *dirigenti* and *impiegati*.

[8] See Berman et al. (1994) for a discussion on this categorization.

[9] Detailed information on the implementation of the COE database on foreign trade statistics are available at www.coeweb.istat.it

[10] We consider six geo-economic zones: 1) CEE and EFTA; 2) Usa, Canada and other advanced economies; 3) OPEC; 4) NIEs ;5) CEECs and 6) Other countries. ISTAT provides an online detailed description of the geo-economic classification at www.coeweb.istat.it/english/default.htm.

Table 1: Number of firms

Years	Micro 1	Merged Database
1989	19922	
1990	21208	
1991	19740	
1992	21301	
1993	22076	14579
1994	21720	14036
1995	20004	12320
1996	17231	10512
1997	15532	9215
Mean	19859	12132

the number of countries a firm imports from (NSI and NCI, respectively)[11].

The merging of balance sheet data with trade statistics implies a reduction in the size of our sample, which leaves us with an unbalanced database for an average of about 12.100 firms, covering the period between 1993 and 1997. Table 1 presents the number of firms active within the manufacturing sector, for the original MICRO1 database and for the database obtained after the merge with the foreign survey (merged database). The size of the sample stemming from the merge with COE trading data corresponds to approximately 60% of the sample obtained from MICRO 1 alone. In order to check the consistency of the panel obtained through the merge of the two datasets, we compare the sectoral and the size distribution of the new sample of firms with the one characterizing the entire population of firms in MICRO 1 database. The test we compute confirms that our merged database is not statistically different from the entire population of firms, with respect to both their sectoral and their size distribution (see Appendix 1 for details).

Table 2 presents summary statistics, from 1993 to 1997, on all manufacturing firms, together with average values for a number of sub-samples of firms grouped according to geographical location, size, sector and foreign ownership structure [12]. In 1993-97 we observe positive growth rates for both employment and wages. The largest increases are detected for the number of employees and for non production workers wages, which rose by 14.3 and 9.6 percentage points respectively, over the examined periods. A higher stability is instead observed for average wages, production wages and wage gaps.

The majority of firms (75%) are from the North of Italy, 62% are firms with less than 50 employees (*small firms*), 56% belong to the so-called traditional sectors (*supplier dominated*), while only 2% are foreign owned firms. While the latter figure reflects the very strict definition of foreign owned firms, as allowed by the available data (see footnote 12), this subsample will enable us to partially capture the specificity of multinationals in terms of employment and wage structure.

[11] The number of sectors are counted according to the 4-digit NACE classification system.

[12] A firm is defined as foreign owned when the majority of its capital assets is controlled by foreign shareholders. This is a very restrictive definition which has implications on the size of this subsample of firms.

Table 2: Descriptive statistics, all firms

	N. Empl	% of NPW	Wage	Wage NPW	Wage PW	Wage Gap	% of firms
Average Value	103	22.47	33.75	46.83	31.66	1.486	
1993	99	22.04	32.78	44.96	30.89	1.464	
1994	96	21.97	32.99	45.01	31.24	1.445	
1995	102	22.24	33.44	45.87	31.40	1.470	
1996	109	22.96	36.01	50.28	33.61	1.543	
1997	115	23.68	34.31	49.75	31.63	1.536	
Growth rate 93-97	14.3%	6.9%	4.5%	9.6%	2.3%	4.7%	
North	109	24.08	34.94	48.14	32.502	1.500	75%
Center	91	18.93	31.27	42.99	30.157	1.422	15%
South	74	15.42	28.37	41.85	27.420	1.470	10%
Small (<50)	31	19.47	31.05	43.45	30.40	1.406	62.6%
Medium (51-250)	99	26.16	37.10	50.46	33.19	1.589	31.8%
Large (251-500)	347	33.10	43.33	58.25	36.24	1.682	3.5%
Very large (>500)	1944	38.36	47.65	63.11	38.36	1.711	2.1%
Supplier dominated	65	17.63	30.49	43.73	29.36	1.474	56.2%
Scale intensive	170	24.13	37.30	50.96	34.51	1.507	24.2%
Specialised suppliers	94	30.98	38.08	49.32	35.08	1.463	15.4%
Science based	262	46.14	41.02	51.36	33.37	1.592	4.3%
Non Foreign Owned	92	22.07	33.46	46.49	31.52	1.480	97.8%
Foreign Owned	613	40.43	46.72	60.81	37.71	1.720	2.2%

Note: Monetary values are expressed in millions of 1995 Italian liras

A remarkable heterogeneity is detected across sub-samples, in terms of both wages and employment structure. The classification based on geographical distribution reveals that firms localised in the North are bigger, use more skilled labour, pay higher wages to non production and production workers and exhibit a higher wage gap than those localised in the Center and in the South. Higher average values for employment and wages are observable also for very large firms. For these firms the share of non production workers is twice as high as in the case of small firms, 50% and 15% higher compared to firms belonging to the category of medium and large size firms, respectively. The same ranking between the four size categories holds when looking at wage levels: highest salaries are detected for very large firms, followed by large, medium and small firms. Moreover, the greater the firm size the higher the average wage gap. Similarly, foreign owned firms employ a substantially higher number of employees (613 on average) and they have a higher percentage of white collars (40%) with respect to non foreign owned firms. Moreover, the pay on average higher salaries for both white and blue collars, and display an higher wage gap.

Science based sectors are characterized by the largest firm size. They also exhibit the highest percentage of white collars (46%) and the highest average wages and non production workers wages (41 and 51 millions Italian liras, respectively), and the highest average wage gap. By contrast, firms belonging to the suppliers dominated sectors are

Table 3: Differences between non-traders and other trading categories (average values 1993-1997)

	Niether Exp. nor Imp.	Only Exp	Only Imp	Two way Traders
Absolute value				
Num. Employees	40	78	59	132
% Non Prod Work	12.22	20.04	20.56	26.63
Wage	28.42	31.61	34.15	35.88
Wage Non Prod Work	42.56	43.61	46.50	48.34
Wage Prod Work	28.54	30.74	32.88	32.79
Wage Gap	1.391	1.433	1.464	1.518
*Relative value**				
Num. Employees	100	196.4	149.1	332.0
% Non Prod Work	100	164.1	168.3	218.0
Wage	100	111.2	120.2	126.3
Wage Non Prod Work	100	102.5	109.3	113.6
Wage Prod Work	100	107.7	115.2	114.9
Wage Gap	100	103.0	105.2	109.1
% of firms	24.19	5.48	5.08	65.24

* 100 = Neither Exporters nor Importers

those with the lowest number of employees and percentage of white collars, and those paying the lowest wage premium, to both white and blue collars.

3 Traders and non traders: some empirical facts

How do firms differ in terms of employment composition and wages according to their involvement in international trade? In this section we highlight some important empirical facts whose robustness we shall test econometrically in section4 .

In Table 3 and Table 4 we look at the employment and wage indicators, differentiating firms according to their participation into international markets. In Table 3 we introduce a basic distinction between firms serving the national market only, which we identify as "non traders", and internationalized firms, and we further group the latter into three classes: only importers, only exporters, and firms involved in both import and export activities, which we name "two way traders". As anticipated in Section 1, this is per se a partial novelty in the empirical literature, as most international trade contributions normally concentrate on exports. By contrast, we argue that on the one hand, imports may have different implications in terms of skill requirements and knowledge accumulation, as compared to exports. Moreover, two-way traders are even more exposed to international competition than both only-importers and only-exporters, and this makes this category of firms particularly interesting when considering employment composition and distributional patterns.

Table 3 shows that, while about 75% of firms are involved in international trade, two way traders are by far the largest share of internationalized firms, with an average participation rate of 65%.

Four important facts immediately emerge from the data. First, two-way traders are much larger than firms active only in the domestic market: the former are more than three times as big as the latter in terms of number of employees. Second, two way traders employ more than twice as many white collars as compared to non traders. Third, they pay much higher wages to both production and non production workers, relative to non internationalized firms. Fourth, the wage gap between white and blue collars is about 10% greater in the case of two-way traders relative to non internationalized firms.

This set of empirical facts is consistent with the idea put forth in recent trade literature: dealing with foreign markets is associated with differential sunk costs in terms of headquarter services and superior technology, which can only be afforded by larger firms with more skilled workers. A larger proportion of non production workers is needed to tackle these activities, raising the relative demand for such workers and creating more wage inequality; but higher quality production workers are also needed to handle new technology, implying higher salaries for blue collars too (Yeaple (2005)). This is only part of the story: some ex-post effect might be associated to international involvement, including access to foreign sources of knowledge, leading to a further accumulation of skills. This is consistent with a view of internationalization as a channel for learning and technology sourcing. While this view is increasingly being shared in the literature on international production (Narula and Zanfei (2005), Griffith et al. (2006)), there is still limited evidence of the fact that such ex-post effects can be associated to trade (Wagner (2005)). Besides, whether ex-post effects on productivity will eventually translate into increasing wages and disparities in workers' earnings can be debated. Suffice here to observe that our descriptive statistics are consistent with both (ex ante and ex post) mechanisms leading to intra-industry differences in employment composition and wages.

It is important to stress that we find *both* higher wage levels and inequality. In other words, in spite of higher disparities, working in Italy's internationalized firms is more rewarding for both skilled and unskilled workers in terms of absolute wage levels. In fact, while wage gaps between production and non production workers are larger in internationalized firms, both categories of workers obtain higher wages when they are employed by these companies and they are worse off when they are employed by firms active in the domestic market only.

A fifth important empirical fact emerging from the evidence is that firms partially involved in international trade, either with import or with export activities, rank between non internationalized firms and two way traders in terms of size, share of non production workers, wage levels, and wage gap. This could reflect the fact that both self selection mechanisms and post-entry effects are lower for firms active in import or export market only, relative to firms involved in two-way trade. We suggest that this fact further reinforces the idea that firm's heterogeneity can be better captured by analyzing trade flows in greater details.

As a sixth empirical fact, one can observe that some differences between importers and exporters do seem to exist. On the one hand, a lower size threshold seems to be required in order to engage into import rather than export activities. Only exporters are more than 30% larger than only importers. On the other hand, only importers exhibit a higher share of non production workers and pay on average higher wages than only exporters, both

Table 4: Descriptive statistics: Two way Traders vs Neither Exporters nor Importers

	N. Empl		% of NPW		Wage		Wage NPW		Wage PW		Wage Gap		% of firms*	
	T**	NT**	T	NT	T	NT	T	NT	T	NT	T	NT	T	NT
Average Value	132	40	26.6	12.2	35.9	28.4	48.3	42.6	32.8	28.5	1.52	1.39		
1993	131	38	26.5	11.6	35.3	26.7	47.1	38.8	32.3	27.0	1.50	1.37	62	24
1994	124	37	26.4	11.0	35.5	26.6	47.0	39.1	32.8	27.1	1.47	1.36	63	23
1995	128	42	26.1	13.3	35.5	28.6	47.4	41.5	32.6	28.6	1.50	1.4	70	30
1996	138	39	27.0	11.1	37.2	32.8	51.0	48.2	33.8	33.0	1.57	1.450	68	20
1997	146	44	27.5	14.2	36.3	29.3	50.4	49.1	32.6	28.8	1.58	1.41	64	24
Growth rate 93-97 (%)	10.6	12.8	3.8	18.2	2.8	8.9	6.5	20.8	0.8	6.1	4.9	2.8		
North	136	37	27.6	12.4	36.6	29.2	49.3	43.5	33.3	29.5	1.53	1.38	72	19
Center	114	40	22.7	12.4	32.7	28.8	43.2	43.1	30.9	28.8	1.44	1.40	55	33
South	115	49	20.4	11.6	31.3	26.0	44.4	39.4	29.2	25.7	1.53	1.43	32	52
Small (<50)	30	28	24.5	11.5	33.0	27.7	44.3	41.8	31.6	28.2	1.43	1.36	54	33
Medium (51-250)	94	82	27.7	15.8	37.7	32.0	51.0	45.6	33.5	30.2	1.60	1.53	83	10
Large (251-500)	352	344	33.4	28.8	43.4	41.9	58.4	53.9	36.2	35.5	1.68	1.69	93	3
Very large (>500)	1765	1300	38.9	25.6	47.9	45.1	63.5	58.0	38.4	40.4	1.72	1.44	94	3
Supplier dominated	84	35	21.6	10.0	32.4	26.7	44.9	41.2	30.4	27.1	1.51	1.39	59	30
Scale intensive	212	52	26.8	15.6	38.7	32.8	52.4	46.3	35.1	32.5	1.54	1.39	70	17
Specialised suppliers	107	49	34.1	17.6	39.5	32.1	50.8	43.1	35.7	32.3	1.49	1.37	77	16
Science based	302	41	50.9	26.2	43.8	30.7	53.4	43.0	34.8	27.9	1.62	1.43	75	16
Non Foreign Owned	116	40	26.2	12.2	35.5	28.4	47.9	42.5	32.6	28.5	1.51	1.39	65	25
Foreign Owned	634	135	40.7	30.3	46.9	39.6	61.0	52.8	37.8	31.8	1.72	1.66	94	2

Note: Monetary values are expressed in millions of 1995 Italian liras.
* The percentage of firms is computed with respect to the total number of firms within each sub-sample (including firms with only import and only export);
** T stand for Two-way Traders, NT for Non-Traders.

for white and blue collars. Both of these pieces of empirical evidence are less outstanding from descriptive statistics, and will thus need to be tested more carefully with econometric techniques. It is worth anticipating that these differences might reflect both the sectoral and geographic composition of import and export markets; and structural characteristics of the two categories of firms.

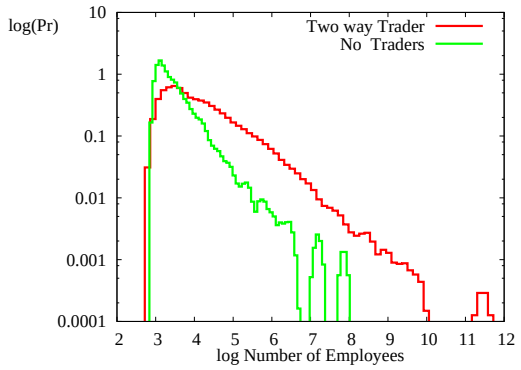
In Table 4 we further examine the differences between two-way traders and non-traders, classifying firms according to their characteristics (as in Table 2). Looking at the 1993-1997 growth rate we observe that, with the only exception of wage gaps, the increase in terms of share of white collars and in wages has been larger for non traders than for firms involved in international trade. Moreover, figures suggest that the basic differences between two-way traders and non traders hold across all the groups considered. Firms involved in both import and export are bigger, use more skill labour, pay higher salaries and display an higher wage gap compared to non traders, regardless of the geographical location, size, sector and ownership structure.

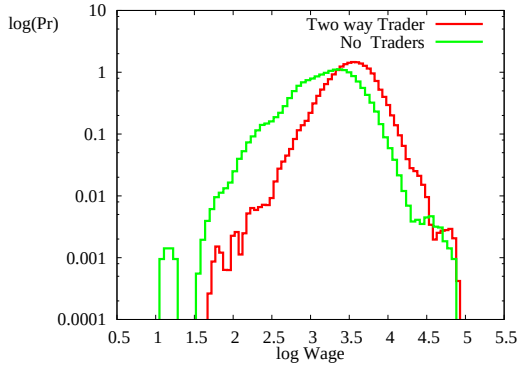
However, while the above facts are largely confirmed, the *intensity* of these phenomena significantly differs across the examined firm categories. This can be observed if one computed the ratio between two-way traders' values and non-traders' ones. Considering the classification based on size, we observe that the "distance" between firms involved in international trade and those serving only the domestic market is higher for small firms than for medium, large and very large firms. One explanation of this could be the fact that, in order to enter the foreign markets, small firms need to sustain higher efforts than their larger size counterpart. As a consequence, self-selection mechanisms could be lower for larger firms relative to small firms.

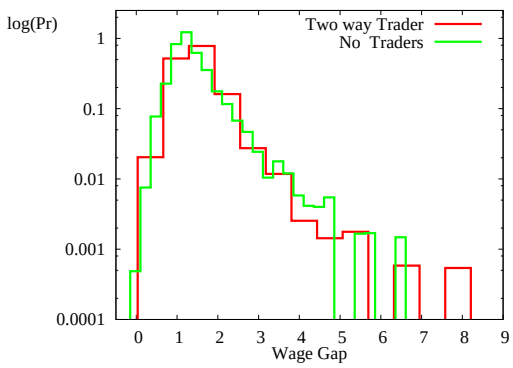
In a similar way, the difference between internationalized and non internationalized firms appears to be larger in the case of supplier dominated sectors as compared to other industries. The former sectors, in which Italy exhibits a remarkable specialization, are in fact those with the highest ratio between two way traders and non traders as far as the proportion of white collar and the overall wage are concerned. This result seems to suggest that firms active in these industries are the least endowed with skilled work-force when competing in domestic markets, but need to at least partially compensate this weakness in terms of qualified human capital to face international competition. This is consistent with the idea that industrialized countries can stand competition with less developed countries in traditional sectors more in terms of higher quality of production than in terms of labour cost and price reduction. These results persist when data are further disaggregated at 2-digit level. Table 2A, reported in Appendix 2, shows the average percentage of non production workers belonging to the different manufacturing sectors for all the firms' categories considered, together with the ratio between the two way traders' percentage value and the non traders' one. According to the last column of Table 2A, the highest ratio is detected for apparel, leather and textiles.

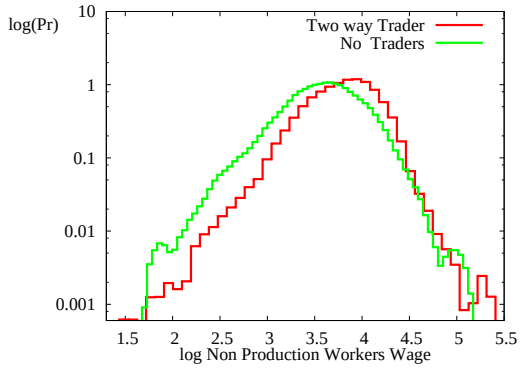
When looking at the geographic distribution of firms, higher differences between two way traders and non traders can be observed in the case of Northern regions. This might appear to be somewhat surprising as these are the regions wherein barriers to trade are lowest, hence firms could be expected to need a lower commitment to venture into foreign markets. The lower ratio for the Southern firms could at least partially be explained by the fact that the latter work mainly as subcontractors (Basile (2001)) and, consequently, lower competencies (in terms of employment and wage) are required in order to enter the foreign markets.

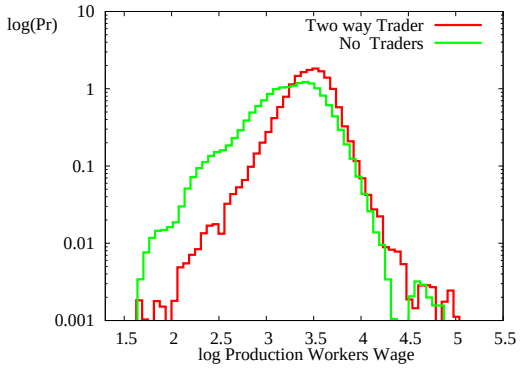
Figure 1: Kernel Density Estimates of Wage and Employment: Two-way Traders and Non Traders











Data in Table 3 also reveal a high heterogeneity across two-way traders belonging to the various sub-sample. Some differences emerge from the participation rate reported in the last column of Table 4. In the Northern regions 72% of companies are two way traders while firms localised in the Center exhibit a lower trade participation (55%) and in the South more than half of firms (52%) serve exclusively the domestic market. Similarly, the relative presence of two-way traders enlarges among very large, large and medium firms (94%, 93% and 83% respectively), rather than among small firms (54%). As regards the sectoral classification, the highest participation rate is among the science based and specialized suppliers groups. The percentage of two-way traders is much higher within the group of foreign owned group (which are by definition multinationals) than in the case of non foreign owned (94% vs. 64%).

There is also much variation among two-way traders with respect to workforce composition and wages. Two-way traders localised in the northern regions outperform, in terms of both employment and workers' salaries, those located in the Center and the South. The same holds for two-way traders belonging to the very large, to the science based sector and to the foreign owned group of firms. Hence, these empirical findings confirm a high degree of heterogeneity in terms of employment structure and wages not only among firms with a different degree of international involvement but also between internationalized firms with different characteristics in terms of geographic location, sector, size, etc.

Finally, kernel densities reported in Figure 1[13] illustrate that the empirical differences between two-way traders and non traders we have discussed above, hold not only when considering average values within industries, but also when considering the whole frequency distribution of the examined variables. In fact, two-way traders appear to dominate non internationalized firms for almost all values of the frequency distribution of firm size, skilled worker share, wage levels and wage gaps. Moreover, the intra and inter groups heterogeneity detected in Table 4 do not appear to be reduced when a sectoral disaggregation at 2-digit level is considered. In Appendix 2, kernel densities are supplied for two 2-digit sectors (wearing and apparel vs. paper and allied products), showing that remarkable diversities exist between the two industries not only in average values but also when considering the whole frequency distribution of the examined variables for two-way traders as opposed to non internationalized firms [14].

4 Testing the links between trade and wages

So far, we have delivered an unconditional picture of the relationship between the firms' internationalization status and their employment and wage structure for Italian manufacturing, largely based on average values for the examined period. In this section we will check the robustness of the previous findings by: 1) simultaneously controlling for the import and export status; 2) considering all the time span available (1993-1997); 3) controlling parametrically for additional (observed and unobserved) determinants of the

[13] The kernel density shown in this work were performed using *gbutils*, a package of programs for parametric and non-parametric analysis of panel data, distributed under the General Public License and freely available at *http://www.cafed.eu/gbutils*. If not else specified, density estimation is performed using Epanenchnikov kernel and setting the bandwidth following the "rules" suggested in Section 3.4 of Silverman (1981).

[14] Detailed tables are available from the authors upon request, highlighting these inter-sectoral differences for all the key variables illustrated above, namely size, work-force composition, wage levels and wage gaps.

employment and wage structure at the firm level.

As recalled earlier, the empirical literature has analyzed the links between trade, employment and wages almost exclusively by focusing on the role of exports. In these contributions, export premia are traditionally expressed as the coefficient associated with an exporter status dummy obtained by regressing the relevant dependent variable on an exporter status dummy and a set of control variables (typically industry, region and firm size; see for example the seminal paper Bernard and Jensen (1999)). Clearly no causal interpretation should be attached to such premia. The same holds with respect to the below β coefficients representing two way trader, only importer and only exporter percentage premia [15] with respect to the baseline category of non internationalized firms. We shall estimate the following equation

$$y_{it} = \alpha_A + \beta_A twowaytraders_{it} + \gamma_A onlyimporter_{it} + \phi_A onlyexporter_{it} + \theta_A controls_{it} + \upsilon_{it} \quad (1)$$

Dependent variables are expressed alternatively as [16]: the number of employees, the percentage of non-production workers, the average wage of all workers, the average wage of non production workers, the average wage of production workers and the wage gap. As controls we will employ the logarithm of the number of employees [17] , calendar year dummies, sectoral dummies and regional dummies.

In the subsequent stage of our regression analysis we will further check if, once time invariant observed and unobserved heterogeneity at the firm level is taken into account, such differences between firms involved in international trade and the other firms persist. This is done by employing a standard unobserved effects linear panel data model (fixed effects, FE). Premia are traditionally estimated with simple OLS regressions because FE washes out time constant heterogeneity and the researcher usually wants to give a picture of firm heterogeneity associated with international trade involvement, being it fixed in time or not. From a different perspective, FE can be useful to give a "more causal" interpretation of the estimated coefficients, since it basically estimates a correlation between a change in the trade status and a change of the dependent variables under analysis. Nevertheless, we should be careful when giving such a causal interpretation of the coefficients estimated with the FE regression. For example, it might well be that a shock at a firm level contemporaneously determines a switching into exporting (or importing) and a variation in the dependent variable under analysis. Keeping this caveat into account, the following is the linear unobserved effects model that we estimate by using the within transformation [18]

$$y_{it} = \alpha_B + \beta_B twowaytraders_{it} + \gamma_B onlyimporter_{it} + \phi_B onlyexporter_{it} + \theta_B controls_{it} + \upsilon_{it} \quad (2)$$

As controls we will employ the logarithm of the number of employees and calendar year dummies, given that sectoral and regional dummies are embedded in the firm specific

[15] The exact percentage differential is given by $(e_A^{\beta} - 1) \cdot 100$. The coefficients for the regression with percentage of non production workers as dependent variable are already in percentage values. See also footnote 16.

[16] For all these variables, except the share of non production workers, we use log values. When the percentage of non production workers is the dependent variable, we use absolute values.

[17] We omit this control variable when using as dependent variable the logarithm of the number of employees.

[18] Using first differencing instead of demeaning does not change the main results.

Table 5: Parametric Analysis: Number of Employees, Percentage of Non Production Workers, Wage (1993-1997)

	Num. of Employees		% Non Prod. Workers		Wage	
	model a	model b	model a	model b	model a	model b
Two way traders	0.633	0.035	10.009	0.253	0.119	0.039
	[0.000]	[0.000]	[0.000]	[0.358]	[0.000]	[0.000]
Only Imp	0.177	0.022	5.408	0.156	0.105	0.016
	[0.000]	[0.000]	[0.000]	[0.435]	[0.000]	[0.007]
Only Exp	0.155	0.019	5.901	0.227	0.050	0.029
	[0.000]	[0.063]	[0.000]	[0.439]	[0.000]	[0.005]
Observations	60662	60662	60662	60662	60660	60660
R-squared	0.15	0.95	0.33	0.95	0.42	0.86

Note: Model a: Pooled OLS. Model b: FE. Sectoral, regional, year dummies and size (log of number of employees) are included as controls.

intercepts[19]. As the first column of Table 5 shows, we estimate very significant premia in terms of the number of employees for all the categories of internationalized firms. However, what strikes is the magnitude of the premium of two-way traders, about 65%, with respect to those for the other two categories of firms involved only partially in international trade, respectively 16% and 17% for only importers and only exporters. Therefore, even controlling for the usual sources of heterogeneity, it is confirmed that being involved both in importing and exporting is associated with the highest premium in term of firm size.

This ordering conforms with what found by Bernard et al. (2007) for the US and by Muuls and Pisu (2007) for Belgium. Once we apply the fixed effect model all the coefficients remain statistically significant at 10% significance level; however the gap between two way traders, whose estimated advantage with respect non internationalized firms roughly halves, and one way traders shrinks. Assuming that selection into the three trading categories is due only to firm specific fixed effects, this fact would signal that firm size is probably a more stringent precondition for being two-way trader than for being one way trader; and that differences among the three firms' categories we consider are much lower in terms of post-entry effects.

Let us now turn to the investigation of firms skill structure that is proxied by the percentage of non-production workers over total employment. The third column of Table 5 displays the estimated premia. They are all statistically significant. Once again, two way traders exhibit a higher premium, that is about 10%, with respect the one way traders categories, that are about half of the former. This ordering of trading categories conforms with what found by Bernard et al. (2007) for US. However, once we apply the fixed effects model all the coefficients turn out to be insignificantly different from zero.

[19] As robustness check, we estimate equation 1 and equation 2 including as additional controls the skill intensity variable, proxied by the percentage of white collars, and the foreign ownership dummy. Moreover, we repeat all the econometric exercises using a balanced panel. Similar results are found for all the specifications and with different numbers of observations.

Table 6: Parametric Analysis: Wage Non Production Workers, Wage Production Workers, Wage Gap (1993-1997)

	Wage Non Prod. Workers		Wage Prod. Workers		Wage Gap	
	model a	model b	model a	model b	model a	model b
Two way traders	0.078	0.046	0.069	0.034	0.039	0.004
	[0.000]	[0.005]	[0.000]	[0.001]	[0.000]	[0.836]
Only Imp	0.073	0.018	0.080	0.013	0.016	0.006
	[0.000]	[0.110]	[0.000]	[0.077]	[0.098]	[0.645]
Only Exp	0.026	0.035	0.028	0.026	0.027	0.005
	[0.010]	[0.063]	[0.000]	[0.028]	[0.004]	[0.779]
Observations	56225	56225	60014	60014	55620	55620
R-squared	0.20	0.71	0.29	0.76	0.06	0.60

Note: Model a: Pooled OLS. Model b: FE. Sectoral, regional, year dummies and size (log of number of employees) are included as controls.

Assuming that selection into the three trading categories is due only to firm specific fixed effects, this last result could indicate that being more skill intensive than the average is possibly only a precondition for being internationalized not a consequence of international activities. This last finding on exporters conforms with the results of another study on Italian manufacturing that compare export starters to never exporters (Serti and Tomasi (2007)) and with the results of Maurin et al. (2002) for France: both papers find no clear evidence for a causal effect of exporting on the distribution of workers across production and non production activities, even if both papers find that exporting positively correlates with the share of non production workers on total employment.

The last two columns of Table 5 report the estimation results for the average wage variable. We detect very similar premia for two way traders and only importers, around 10%, and a lower differential for only exporters, about 5%. Introducing firm specific fixed effects, the coefficients remain statistically significant but decrease in size. However, in this case, the estimated percentage advantage of only exporters decreases to a lesser extent with respect to the other two categories (and especially with respect to only importers), and the estimated coefficient of only exporters becomes very similar to that of two way traders. These changes in the estimated coefficients determined by the inclusion of firm specific fixed effects might indicate that two way traders and only importers have much greater ex-ante advantages relative to only exporters and that instead possible ex-post effects are similar between the three groups of traders.

The results on average wages could be determined by the fact that internationalized firms have a higher share of non production workers with respect to "domestic" firms and those non production workers are on average better paid relative to the other workers. Hence, we will separately consider the average wage of non-production workers and the average wage of production workers as additional independent variables.

The first four columns of Table 6 show the results for the average wage of the two categories of workers. Consistent with the predictions by Yeaple (2005) and with the empirical findings of Bernard and Jensen (1999), we find that only exporters exhibit a wage

premium, for both production and non-production workers, relative to non internationalized firms. This wage premium amounts to 3% in our data. Here we additionally show that wage premia for exporters are robust to taking into account also importing activities, and that premia also exist for importers. Moreover, wage premia are even higher in the case of two way traders and only importers, and they are roughly the same, about 7%.

However, as already noted in the case of average wages, once we include firm specific fixed effects we observe a substantial reduction in the coefficients for only importers, which also become non significant in the case of non production workers wages. These changes in the estimated coefficients determined by the inclusion of firm specific fixed effects reinforce the above hypothesis that two way traders and only importers have ex-ante advantages relatively higher than only exporters in terms of wages.

The last two columns of Table 6 display the estimation results using the wage gap as dependent variable. Regressions yield very similar patterns for the three categories of firms. In the baseline specification without fixed effects we find that firms involved in international trade are characterized by higher levels of wage inequality between production and non production workers, of about 2-3%, with respect to the other firms. However, once we wash out firm specific fixed effects, all the relevant coefficients turn out to be statistically insignificant. Probably hiring more and better paid non production workers is only a pre-requisite for entering international markets, not a consequence of it. In other words: firms seem to need higher skilled worker shares to internationalise, and this generates inequality. However, once they engage into international activities, their wage gaps tend to persist unaltered.

5 Market heterogeneity and diversification as sources of inequality?

The results of the previous sections show that a substantial fraction of the observed intra industry heterogeneity is related to the international activities of the firms. Two-way traders, only importers and only exporters are bigger, more skilled intensive and they pay higher wages with respect to non traders. Moreover, we observe firm's heterogeneity also within the category of internationalized firms. The degree of involvement in international trade and some characteristics of firms, such as region and sector in which they are active, impact on employment structure and wages. In particular we observed that the two-way traders are the most interesting and by far the most numerically important grouping of internationalized firms.

In this section we will further investigate the heterogeneity within the two-way traders category, concentrating on two sets of characteristics. We shall first focus on the variety of countries of origin and destination of imports and exports (Section 5.1). We shall then assess the role of the degree of sectoral and geographic diversification of internationalized firms (Section 5.2). To do that, we consider the workforce composition and wage structure of the two-way traders, relating them with country of destination and origin, and with the number of products and the number of countries with which they trade.

Table 7: Countries of destination and origin: two-way traders

	Number of Employees Two way Traders		% Non Prod. Workers Two way Traders		Wage Two way Traders	
	exp to	imp from	exp to	imp from	exp to	imp from
EEC and Efta	100	100	100	100	100	100
Usa and Canada	118.1	160.4	104.7	115.8	101.5	106.6
CEECs	145.8	219.0	108.5	107.2	103.5	104.9
Nic	134.8	211.9	108.1	120.7	102.6	106.1
Opec	159.7	425.4	111.9	119.5	104.9	108.1
Other	131.5	204.6	110.1	113.3	103.7	103.8
EEC and Efta*	132	133	27	27	35.9	36.0

	Wage Non Prod. Workers Two way Traders		Wage Prod. Workers Two way Traders		Wage Gap Two way Traders	
	exp to	imp from	exp to	imp from	exp to	imp from
EEC and Efta	100	100	100	100	100	100
Usa and Canada	100.8	104.9	100.6	103.3	100.5	102.5
CEECs	102.8	104.0	101.8	102.7	102.0	102.5
Nic	101.7	103.4	101.1	102.4	101.1	101.9
Opec	103.4	105.3	102.5	104.1	101.6	101.9
Other	102.4	102.3	102.0	100.9	101.0	102.6
EEC and Efta*	48.4	48.6	32.8	32.9	1.519	1.523

Note:100 = EEC and Efta
*Absolute values

5.1 Market heterogeneity

Table 7 distinguishes between firms that trade with less developed countries from firms involved in import and export from and to more advanced countries (EEC, Efta, Usa and Canada), which tend to be less "distant" in geographic terms and, even more so, in terms of cultural and institutional proximity.

One important outcome from this table is that firms *exporting* towards advanced countries tend to be comparatively smaller, to pay lower (aggregate, production and non production) wages and to be less intensive in the use of non production workers. This evidence could be explained by the fact that, once the extra costs of engaging in foreign markets is faced, entering more "distant" markets entails higher fixed cost that only the most successful firms can afford. The last piece of evidence could be interpreted through the lens of H-O theory and of the peculiar Italian specialization pattern: Italian firms tend to export relatively low skill intensive goods to developed countries and relatively more skill intensive items to countries that are comparatively less endowed with this factor of production. This ordering holds also with respect the wage gap: exporting to less developed countries maps into higher inequality.

A further fact emerging from the data is that some of these intra-industry differences are even more striking when considering *import* activities of firms. Firms that import from non developed and/or non European countries are even bigger, pay even higher (aggregate, production and non production) wages and tend to be even more skill intensive

as compared to firms exporting towards those geographic areas. Importers from these countries are "better" firms possibly because they have to incur higher fixed costs to obtain information import markets which are more distant (in technological, geographical and cultural terms). Moreover, importers from USA and Canada exhibit a higher skill intensity than firms exporting towards those countries. This might have to do with the specialization profile of this country. Italian firms export more traditional goods towards North America, while they import more high tech goods from that area, and this might imply that lower skill intensity is needed to tackle exports to, than imports from, those countries. By contrast, firms that import from less developed countries may have concentrated their activities at home in more skill intensive production tasks, outsourcing from the South of the world unskilled intensive stages of production. This ordering is maintained also with respect to wage gaps: importing from less developed and/or non European countries reflects into higher inequality.

5.2 Sectoral and Country diversification

We have just noted that countries of origin and destination matter in terms of employment and wage structures of firms engaged in international trade. How about the degree of geographical and sectoral diversification of these firms' international activities? We shall here present an exploratory analysis of the role played by these characteristics in the case of two-way traders. We shall do it by using, on the export side, information on the number of sectors in which a firm exports (NSE) and the number of countries served by the firm (NCE). On the import side, we use the available information on the number of sectors in which imports are concentrated (NSI) and the number of countries a firm imports from (NCI). We divide the four variables into seven categories. The first category includes firms which export to (import from) one to 5 countries (or they export/import in 1 to 5 sectors); the second category from 6 to 10; the third from 11 to 15; the fourth from 16 to 20; the fifth from 21 to 25; the sixth from 26 to 30 and the seventh more than 30.

To examine how two-way traders' country and sector diversification relate to employment and wage structure we perform a set of multivariate kernel regressions. In Figure 2- 7 we show the results only for wage gaps, but similar conclusions can be drawn for the other variables. As in a standard parametric regression, the aim of this technique is to estimate the conditional expectation of a dependent variable, y, given other explanatory variables, x and z. However in this case we do not assume that the relationship between the dependent and the independent variables is linear. We instead estimate non parametrically by multivariate kernel methods the conditional expectation of y given the observed combinations of the explanatory variables x and z, i.e. $E(y|x;z)$. This is a non-parametric method which does not impose any a priori structure on the data themselves (Pagan and Ullah (1999)) and uses as input the observed level of the dependent and explanatory variables $(x_i; y_i; z_i)$ of the N firms under analysis. Using the kernel estimation technique, smooth surfaces have been obtained from the discrete set of observations (the observed triples $(x_i; y_i; z_i)$. The use of logarithmic scales allows us to represent firms with very different combinations of x and z on the same plot so that the identification of possible patterns becomes possible.

The main message of this analysis is that the more diversified a firm is, both in terms of sectors in which trades and in terms of countries with which it is connected, the higher its wage gap is (the same regularity applies for size, wages and skill intensity). This

Figure 2: NSI, NSE: Kernel estimate of the conditional expectation of wage gap for two-way traders (1993)

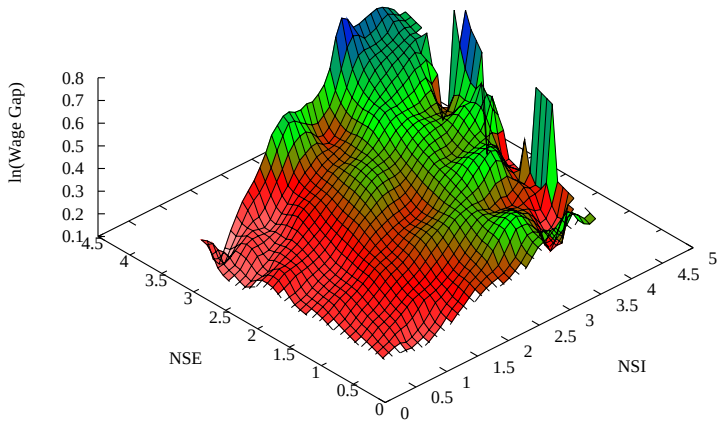


Figure 3: NCE, NSE: Kernel estimate of the conditional expectation of wage gap for two-way traders (1993)

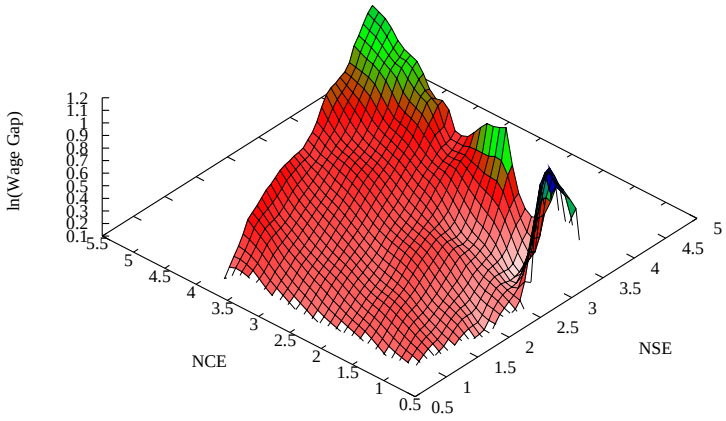


Figure 4: NCI, NSI: Kernel estimate of the conditional expectation of wage gap for two-way traders (1993)

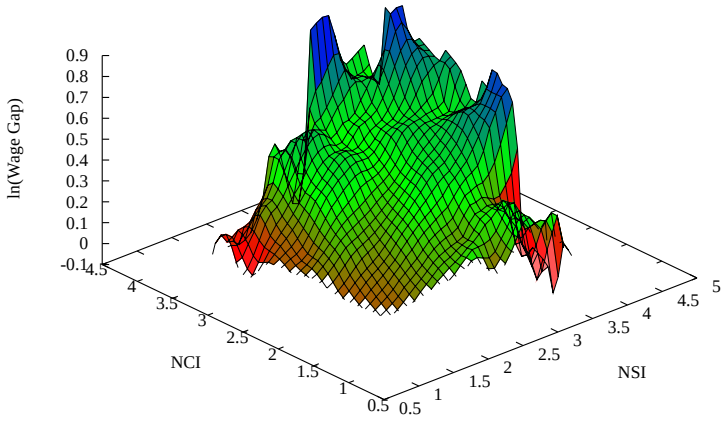


Figure 5: NCI, NCE: Kernel estimate of the conditional expectation of wage gap for two-way traders (1993)

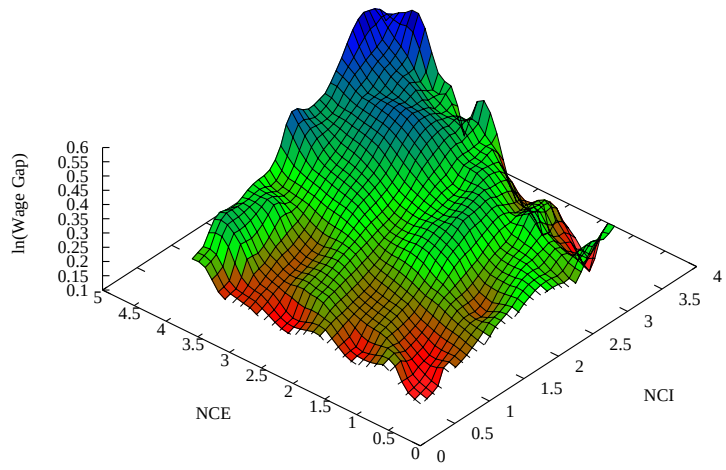


Figure 6: NCE, NSE: Kernel estimate of the conditional expectation of wage gap for only exporter (1993)

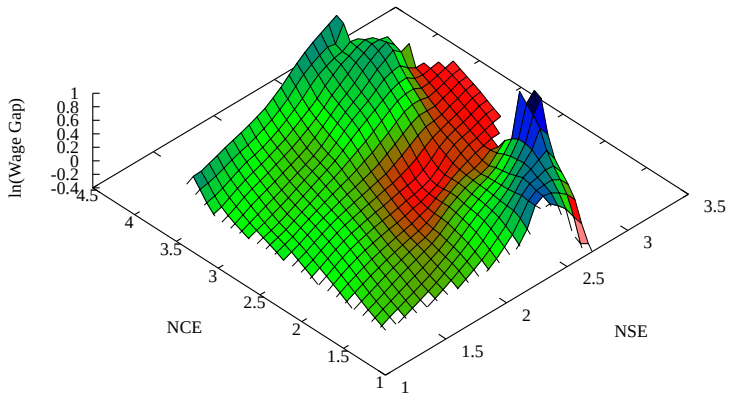
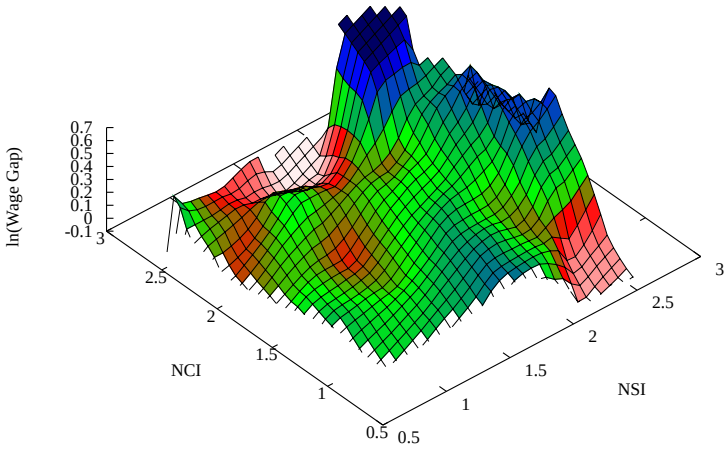


Figure 7: NCI, NSI: Kernel estimate of the conditional expectation of wage gap for only importers (1993)



fact holds quite robustly for all the combinations between the various possible couples of explanatory variables (NCE, NSE, NCI, NSI) and each dependent variable. In the following we show some of the estimated multivariate kernel regressions among the various feasible combinations of dependent variables.

For example, the kernel estimate of the conditional expectation of the wage gap given the number of sectors to which firms exports (NSE) and the number of sectors from which firms import (NSI) is reported in Figure 2. To a given combination of NSE and NSI on the horizontal plane corresponds a relative level of the estimated conditional expectation of the wage gap, i.e. a vertical height of the surface. If we move toward "North-East" combinations of NSE and NSI the vertical height of the surface increases. This means that the size of the firms is an increasing function of the number of sectors in which they import and export. The interpretation of the remaining surfaces we show in the paper is analogous.

To summirise, the descriptive evidence presented in the last two subsections suggests that both the characteristics of export and import markets and the diversification strategies of firms, in terms of the number of the markets and sectors, must be taken into account if one wants to understand the determinants of the wage and employment structure of internationalized firms.

6 Conclusion

Our analysis yields a set of interesting results. Fist, we find that two-way traders have a higher propensity to employ non-production workers, exhibit significant wage gaps, but also pay higher wages for both production and non production workers, relative to non internationalized firms and to firms which are involved only in either export or import. This seems to suggest that, while involvement in international trade is associated with increases in distributional disparities, workers are most likely to be better off when they are employed in these firms than in non (or less) internationalized firms, as they are likely to earn higher wages in absolute terms.

Second, some between firm heterogeneity is observable even within the two-way traders category. Interestingly, we observe that firms exporting to the more advanced countries (EU and USA) are comparatively smaller, employ less white collars, pay lower wages than firms exporting to other less developed countries. This could suggest that entering "distant" markets entails higher sunk costs than relatively "closer" countries. A similar picture is observable from the import side, with the only exception of the USA. While exporters to USA have similar characteristics as the one trading with EU, the overseas importers from that country employ a higher percentage of non production workers and pay higher wages with respect to importers from the European countries. This might reflect the specific pattern of trade relationships between Italy and the USA. Finally, we observe that more diversified firms, in terms of both sectoral and geographic dispersion of trade, exhibit greater wage gaps but also pay higher wages to all categories of workers, relative to firms that trade with a lower number of countries and in a lower number of sectors.

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Appendix 1: Checking the consistency of the merged database

In order to assess the consistency of our panel constructed through the linkages of the two distinct datasets, we compare the sectoral and size distribution of our new sample of firms with the one characterising the entire population of firms in the MICRO 1 dataset. We compute a chi-square test for independence which evaluates whether the distribution of the obtained sample (across sectors and size classes) is statistically different from the one observed in the initial population. The test is carried on considering the year-by-year distribution and the frequencies of the pooled period, from 1993 to 1997. A large value of the test statistic for the chi-squared test, indicates that the frequencies observed in the sample is very different from the one observed in the population. In this case, the null hypothesis of equality of the distributions will likely be rejected.

Tables 1A and **??** report the share of each manufacturing sectors in terms of number of firms for the new database and the entire population contained in MICRO 1. The chi-square test is defined for the following hypotheses:

H_0 Sectoral distribution of the sample (balanced panel) does not significantly differ from the one characterising the entire population

H_1 Distributions differ.

According to the values reported in Table we accept the null hypothesis, that is the distribution of the number of firms in each sector in the sample does not differ from that of the entire population. Similar results, reported in Table 1B , have been obtained comparing the size distribution. The small values for the chi-square confirm that there is an high correspondence between the frequencies of the merged database and the one of the entire population of firms.

Table 1A: Chi-Square Test for the sectoral distribution

Sector	Merged Data	Micro 1	Merged Data	Micro 1	Merged Data	Micro 1
	1993	1993	1994	1994	1995	1995
Food, Beverages	6.55	6.97	6.66	6.96	6.44	7
Tobacco	0.04	0.07	0.03	0.06	0.06	0.08
Textiles	9.4	9.18	9.64	9.3	8.98	8.79
Wearing, Apparel	8.73	7.77	8.88	7.85	7.92	6.97
Leather	5.84	5.38	5.84	5.37	5.69	5.36
Wood Manuf.	2.46	2.57	2.49	2.58	2.63	2.64
Paper	2.09	2.18	2.22	2.29	2.48	2.49
Printing, Publishing	2.94	3.55	3.01	3.63	2.86	3.52
Cook	0.44	0.42	0.41	0.39	0.41	0.38
Chemicals Product	3.55	3.65	3.68	3.76	3.74	3.83
Rubber, Plastics	5.12	5.03	5.25	5.15	5.24	5.18
Non-Metallic Min	6.69	6.65	6.39	6.44	6.15	6.32
Basic Metals	2.77	2.89	2.7	2.88	2.89	3.03
Metal Product	11.69	12.12	11.61	12.21	12.3	12.79
Industrial Mach.	13.07	12.57	13	12.47	13.39	12.67
Office Machinery	0.23	0.23	0.27	0.27	0.25	0.25
Electrical Mach.	4.37	4.28	4.34	4.29	4.41	4.32
Radio, TV	1.16	1.16	1.15	1.2	1.38	1.31
Medical	2.24	2.1	2.22	2.04	2.46	2.17
Motor Vehicles	1.92	2.05	1.81	1.98	1.87	2.06
Other Transport	1.16	1.29	1.09	1.22	1.18	1.27
Forniture Manuf.	7.46	7.82	7.19	7.56	7.13	7.53
Recycling	0.08	0.09	0.11	0.11	0.11	0.11
Chi-square	0.00		0.00		0.00	
D.o.F	22.00		22.00		22.00	
Chi- Square(22, 0.05)	33.92		33.92		33.92	
p-values	1.000		1.000		1.000	
	1996	1996	1997	1997	93-97	93-97
Food, Beverages	6.47	6.99	6.25	6.79	6.5	6.91
Tobacco	0.04	0.06	0.04	0.08	0.04	0.08
Textiles	9.02	8.94	8.08	7.95	9.11	9.13
Wearing, Apparel	7.38	6.6	6.74	5.94	8.06	7.34
Leather	6.41	5.75	4.38	3.93	5.69	5.3
Wood Manuf.	2.77	2.79	2.73	2.66	2.59	2.64
Paper	2.41	2.46	2.42	2.56	2.3	2.33
Printing, Publishing	2.77	3.38	2.82	3.44	2.89	3.5
Cook	0.41	0.4	0.46	0.43	0.42	0.42
Chemicals Product	3.75	3.98	3.76	4.11	3.69	3.84
Rubber, Plastics	5.63	5.43	6.15	5.94	5.42	5.13
Non-Metallic Min	6.08	6.33	6.18	6.2	6.33	6.65
Basic Metals	2.92	3.03	2.93	3.1	2.83	3.03
Metal Product	12.29	12.8	13.02	13.39	12.1	12.2
Industrial Mach.	12.98	12.36	14.14	13.65	13.27	12.74
Office Machinery	0.22	0.24	0.27	0.28	0.25	0.23
Electrical Mach.	4.41	4.25	4.85	4.63	4.45	4.26
Radio, TV	1.44	1.4	1.43	1.4	1.29	1.18
Medical	2.58	2.29	2.57	2.26	2.39	2.07
Motor Vehicles	2.04	2.17	2.1	2.24	1.93	2.12
Other Transport	1.04	1.18	0.98	1.15	1.1	1.26
Forniture Manuf.	6.9	7.13	7.57	7.78	7.25	7.59
Recycling	0.07	0.06	0.11	0.1	0.1	0.07
Chi-square	0.00		0.00		0.00	
D.o.F	22.00		22.00		22.00	
Chi- Square(22, 0.05)	33.92		33.92		33.92	
p-values	1.000		1.000		1.000	

Table 1B: Chi-Square Test for the size distribution

Sector	Merged Data	Micro 1	Merged Data	Micro 1	Merged Data	Micro 1
	1993	1993	1994	1994	1995	1995
Size 1	62.89	62.87	64.2	64.32	62.61	63.76
Size 2	31.63	31.33	30.66	30.2	31.72	30.43
Size 3	3.44	3.37	3.26	3.19	3.56	3.37
Size 4	2.04	2.43	1.89	2.29	2.1	2.44
Chi-square		0.08		0.13		0.11
D.o.F		3.00		3.00		3.00
Chi- Square(3, 0.05)		7.81		7.81		7.81
p-values		0.99		0.99		0.99
	1996	1996	1997	1997	93-97	93-97
Size 1	61.55	62.42	60.71	61.8	62.57	61.81
Size 2	32.6	31.68	33.28	32.1	31.84	32.13
Size 3	3.7	3.41	3.75	3.51	3.52	3.53
Size 4	2.15	2.49	2.26	2.6	2.07	2.54
Chi-square		0.11		0.12		0.10
D.o.F		3.00		3.00		3.00
Chi- Square(3, 0.05)		7.81		7.81		7.81
p-values		0.99		0.99		0.99

Appendix 2: Sectoral Analysis

Table 2A: Sectoral Analysis: Percentage of Non Production Workers (average value 1993-1997)

	Only Exp.	Only Imp.	Niether Exp. nor Imp.	Two way Traders	Two way Traders / Neither Exp. nor Imp.	Ranking
2-digit sector						
Food Bev.	20.7	21.3	16.1	27.6	1.72	12
Tobacco	14.8	15.3	10.3	16.3	1.59	16
Textiles	16.0	13.1	8.1	22.1	2.74	3
Apparel	9.9	8.0	2.0	21.9	10.95	1
Leather	9.0	6.6	2.8	14.0	4.96	2
Wood Manuf.	18.0	13.0	11.6	16.7	1.44	19
Paper	15.7	15.6	16.2	20.4	1.27	21
Print Publ.	27.4	46.7	26.3	38.2	1.46	18
Refined Petroleum	57.9	41.5	29.0	55.0	1.89	7
Chemi. Prod.	41.4	31.6	30.5	47.4	1.55	17
Rubber Plastics	19.2	14.1	12.1	22.8	1.89	8
NonMetallic Min	16.0	20.0	18.5	22.2	1.20	22
Basic Metals	18.2	15.4	13.1	22.3	1.71	15
Metal Prod.	17.9	17.7	12.8	21.9	1.71	14
Industrial Mach	27.9	26.2	17.6	33.2	1.89	9
Office Mach	46.8	95.3	50.1	65.7	1.31	20
Electrical Mach	27.0	22.3	17.0	30.8	1.81	11
Radio, Tv	34.8	30.8	20.2	40.3	1.99	5
Medical Prec.	31.2	44.5	23.8	40.8	1.71	13
Motor Vehicles	17.9	15.1	12.1	23.5	1.95	6
Other Trasp.Equ	23.8	14.1	10.7	25.6	2.39	4
Manuf.	19.9	13.6	11.4	21.1	1.86	10
Recycling	37.0	27.4	33.0	35.0	1.06	23
Totala Manuf.	20.0	20.6	12.2	26.6	2.18	
Pavitt's taxonomy						
Supplier dominated	16.8	17.9	10.0	21.6	2.15	1
Scale intensive	20.5	20.8	15.6	26.8	1.72	4
Specialised suppliers	28.7	25.0	17.6	34.1	1.93	3
Science based	41.3	43.0	26.2	50.9	1.95	2

Figure 2A: Empirical Densities for Sector 18 (Wearing and Apparel)

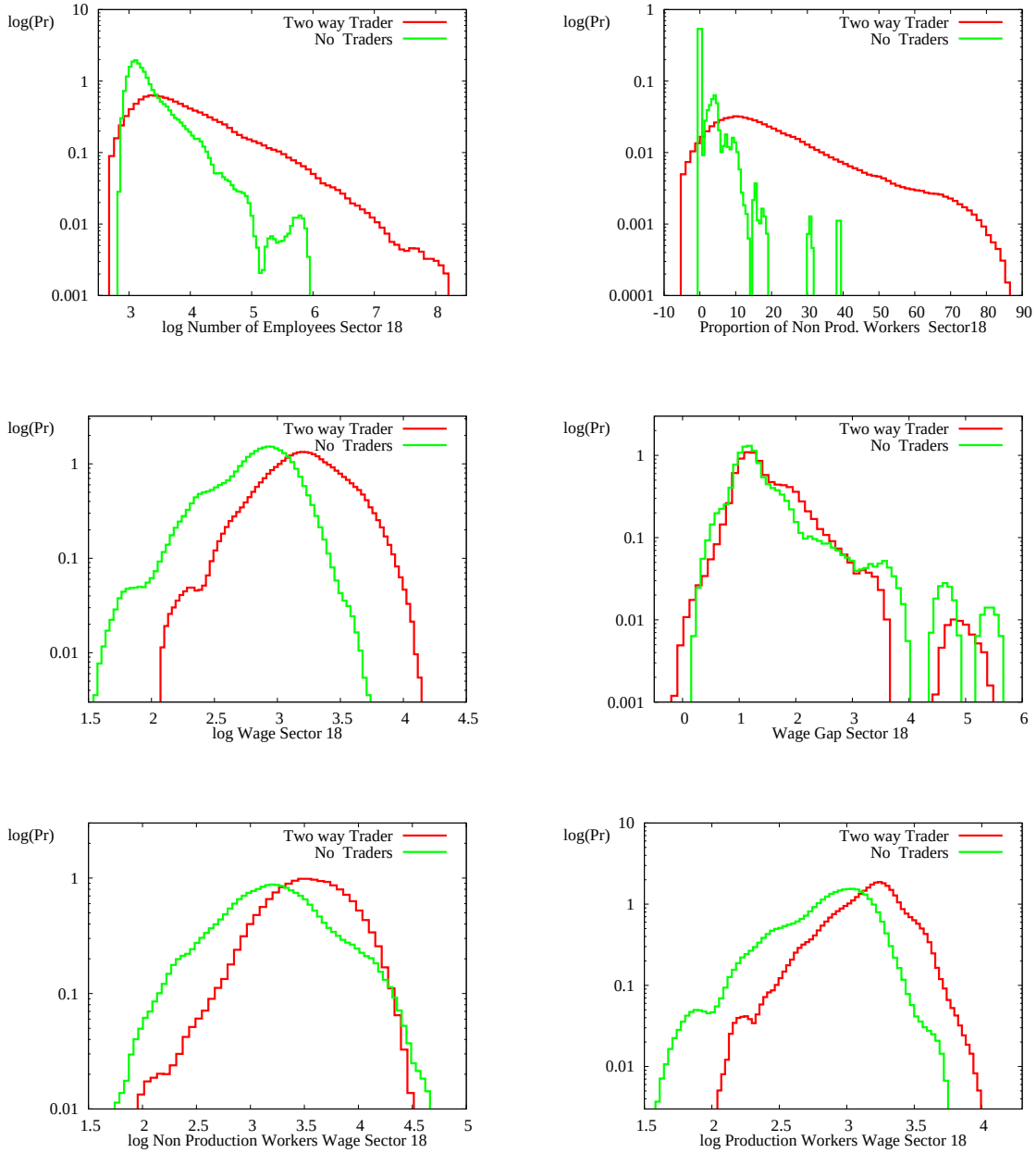
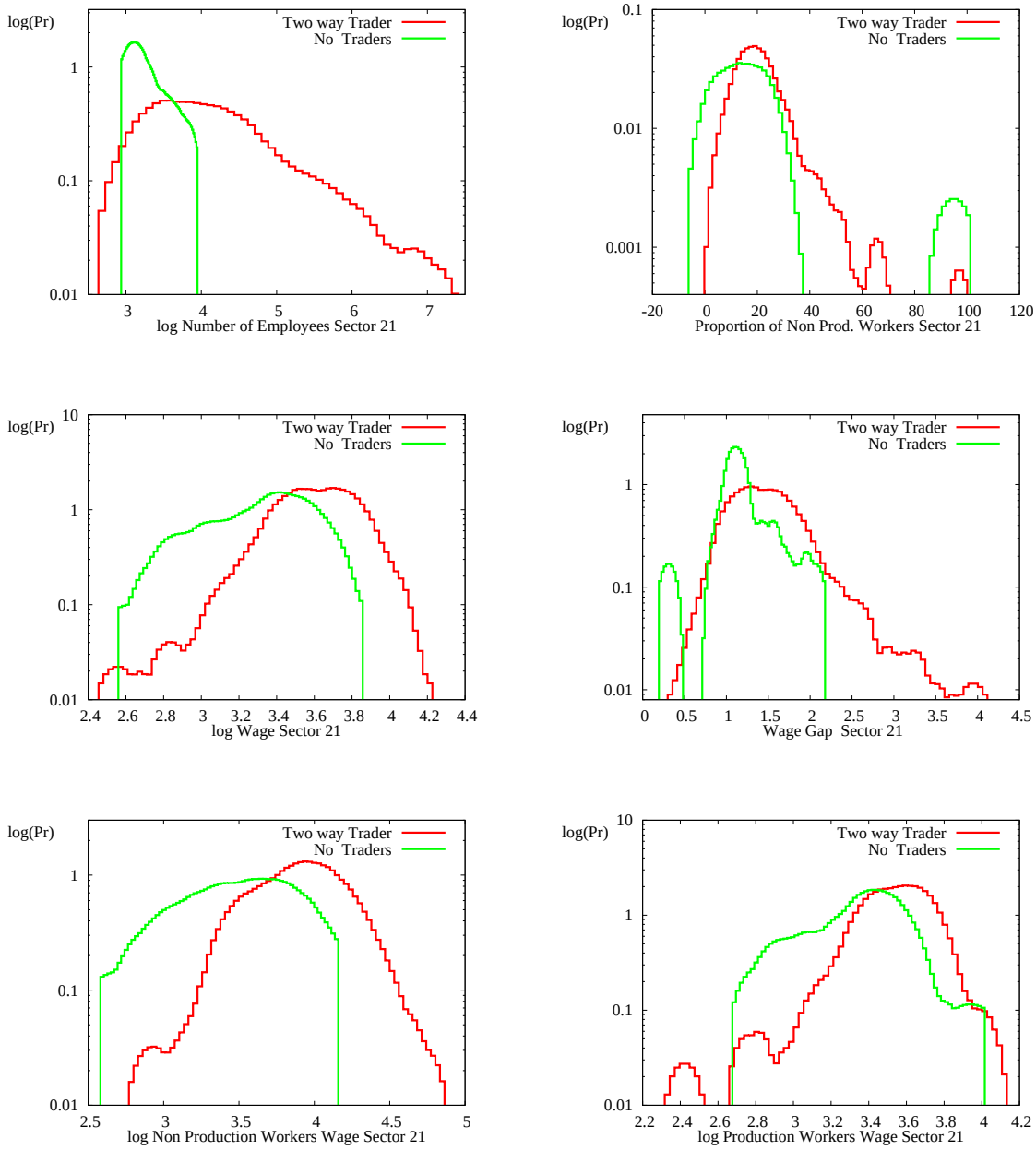


Figure 2B: Empirical Densities for Sector 21 (Paper, Allied Products)



Appendix 3: Sectoral and Country diversification

Table 3A: NSE, NCE and Wage Gap, 1993

		NCE						
		1	2	3	4	5	6	7
	1	1.42	1.44	1.47	1.42	1.53	1.50	1.58
	2	1.38	1.50	1.46	1.46	1.51	1.51	1.54
	3	1.42	1.51	1.43	1.51	1.56	1.59	1.61
NSE	4	1.67	1.35	1.57	1.64	1.43	1.56	1.52
	5	1.11	1.33	1.65	1.49	1.50	1.52	1.61
	6		2.13	1.69	1.32	1.62	1.41	1.58
	7	1.61	2.08	2.53	1.51	1.92	1.49	1.73

Table 3B: NSI, NCI and Wage Gap, 1993

		NCI						
		1	2	3	4	5	6	7
	1	1.42	1.47	1.46	1.48	1.23	1.50	
	2	1.51	1.51	1.63	1.56	1.83	1.62	
	3	1.61	1.56	1.51	1.48	1.46	1.65	1.48
NSI	4	1.50	1.63	1.67	1.57	1.70	1.51	1.27
	5	1.61	1.60	1.65	1.60	1.62	1.22	2.14
	6	0.82	1.81	1.59	1.65	1.39	1.36	
	7	1.26	1.90	1.67	1.51	1.63	1.61	1.77

Table 3C: NSE, NCE and Wage, 1993

		NCE						
		1	2	3	4	5	6	7
	1	32.5	32.7	33.0	31.9	34.6	35.1	38.8
	2	35.8	37.0	36.8	35.7	36.6	37.8	39.8
	3	33.3	40.6	39.2	38.8	37.7	39.3	41.1
NSE	4	42.4	40.5	41.0	41.8	40.6	41.9	42.9
	5	38.1	40.9	45.9	49.3	41.4	40.9	45.2
	6		36.7	44.5	38.1	34.8	33.7	44.6
	7	35.5	35.7	27.4	34.9	38.8	34.7	46.0

Table 3D: NSI, NCI and Wage, 1993

		NCI						
		1	2	3	4	5	6	7
hline								
	1	32.3	34.9	35.9	36.7	30.9	35.9	
	2	36.3	37.9	39.1	39.9	41.4	39.6	
	3	38.5	41.2	42.2	41.1	38.5	36.4	37.8
NSI	4	40.6	43.7	45.3	48.6	45.6	51.2	46.4
	5	37.1	42.9	45.7	48.4	45.3	50.4	39.3
	6	35.8	43.0	49.5	47.0	49.6	40.7	
	7	40.8	47.5	49.9	53.5	50.7	47.3	52.2

Table 3E: NSE, NCE and Wage Production Workers, 1993

		NCE						
		1	2	3	4	5	6	7
	1	30.9	30.8	30.9	30.3	31.7	32.3	33.8
	2	33.0	33.0	33.2	32.5	32.9	33.6	35.1
	3	31.0	35.3	35.2	33.6	32.5	33.3	34.6
NSE	4	33.4	36.5	33.9	33.2	36.1	35.1	36.5
	5	38.2	37.9	36.1	37.1	36.4	34.7	36.5
	6		24.6	37.6	32.9	30.2	31.4	36.3
	7	29.3	27.1	17.3	30.3	29.8	29.9	36.0

Table 3F: NSI, NCI and Wage Production Workers, 1993

		NCI						
		1	2	3	4	5	6	7
	1	30.8	31.9	32.9	33.6	30.8	35.4	
	2	32.6	33.7	33.4	34.0	33.1	36.7	
	3	33.5	35.3	36.1	36.1	32.6	32.2	33.9
NSI	4	35.8	35.8	36.5	38.8	36.4	43.8	40.9
	5	33.0	35.7	36.6	39.1	37.4	48.0	27.3
	6	40.7	35.2	39.6	37.4	43.7	36.0	
	7	39.8	34.9	38.7	42.0	39.1	36.7	38.3

Table 3G: NSE, NCE and Wage Non Production Workers, 1993

		NCE						
		1	2	3	4	5	6	7
	1	43.7	43.9	44.6	42.4	47.6	47.8	52.9
	2	45.1	48.5	47.5	46.4	48.5	50.0	52.8
	3	42.8	52.2	49.1	48.7	49.5	52.2	54.0
NSE	4	52.7	48.9	52.7	53.8	50.8	53.9	54.7
	5	42.3	50.5	58.0	58.0	51.8	51.1	57.9
	6		49.7	62.8	42.0	47.9	44.5	56.0
	7	47.1	56.3	43.8	45.1	60.5	44.5	60.6

Table 3H: NSI, NCI and Wage Non Production Workers, 1993

		NCI						
		1	2	3	4	5	6	7
	1	43.4	46.2	46.8	47.5	37.8	52.9	
	2	48.3	49.7	52.9	51.6	59.2	54.2	
	3	52.9	54.1	53.1	52.0	48.5	50.8	50.1
NSI	4	53.5	57.7	59.7	60.3	60.8	65.7	50.6
	5	54.8	55.1	59.4	61.4	55.0	57.0	58.1
	6	33.5	62.2	61.3	61.3	60.7	49.3	
	7	49.6	65.4	64.1	63.2	62.9	58.7	67.0

Table 3I: NSE, NCE and Percentage of Non Production Workers, 1993

		NCE						
		1	2	3	4	5	6	7
	1	21.1	22.7	23.2	22.1	24.6	24.5	27.4
	2	29.8	30.5	30.9	29.2	28.7	29.6	31.1
	3	26.1	36.0	35.3	37.9	34.6	35.0	36.7
NSE	4	39.2	39.4	36.9	42.4	34.5	39.4	39.8
	5	20.7	30.4	45.9	45.8	42.0	41.9	41.6
	6		46.4	34.0	71.3	30.5	24.1	45.2
	7	37.9	29.6	37.9	30.8	22.9	33.0	41.5

Table 3J: NSI, NCI and Percentage of Non Production Workers, 1993

		NCI						
		1	2	3	4	5	6	7
	1	21.5	27.0	29.0	31.2	19.4	11.0	
	2	28.2 q	30.9	33.5	36.8	34.8	22.8	
	3	28.6	34.7	35.8	36.4	35.6	34.6	24.9
NSI	4	29.1	36.4	38.2	44.9	39.1	34.2	52.7
	5	17.0	37.1	41.2	43.8	46.4	40.4	39.4
	6	38.1	33.2	48.1	41.9	34.1	27.6	
	7	20.9	39.8	46.9	48.9	43.9	46.9	48.6