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Employment, skill structure and international trade: Firm-level evidence for France ☆

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Abstract

We use the French Customs files, an exhaustive account of the international trade transactions carried out by firms across the period 1986–1992, to analyze the link between imports, exports, employment, and skill structure of French manufacturing firms. Our data allow us to distinguish between imports of finished goods and imports of intermediate inputs. Our results show that there is a strong correlation between increasing imports, in particular imports of finished goods, and job destruction, most notably destruction of production jobs. Interestingly, the strength of the relation between job destruction and imports is stronger for larger firms. For example, within production jobs, the association between increasing imports of finished goods and destruction of unskilled jobs is only found in large firms. These findings are robust to the introduction of firm-level measures of innovation.

Keywords: International trade; Labor demand; Skills; Exports; Imports

JEL classification: F16; J21; J23

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1. Introduction

Krugman hypothesized that wage inequality in the United States and unemployment in Western Europe were "the two sides of the same coin". There is a very large literature that examines the American side of the coin (Bound and Johnson, 1992; Berman, Bound and Griliches, 1994; Revenga, 1992; Katz and Murphy, 1992). Its conclusion is that the demand for unskilled labor decreased in virtually every industry, interpreting these within-industry evolutions as evidence of skilled-biased technical change. Bernard and Jensen (1997) (BJ, hereafter) using firm-level measures of wages, skills, employment as well as exports, and in contrast to most previous analysts, find that changes in product demand were key in understanding these phenomena. Their analysis confirmed that exporting plants played a key role during this period of rapid change. This paper examines the other side of the coin by investigating the relation between trade and employment in France, taking stock of the decrease in wage inequality in this country up to 1984 and its stability afterwards (see Buchinsky et al., 2003 for a description of these trends from 1967 to 1999).[2] We also use firm-level micro-data sources for this purpose. Our analysis distinguishes itself from that of Bernard and Jensen not only because its period is slightly more recent (1986 to 1992) or because we study France. The main difference is our use of French Customs data in which all flows of goods — imports and exports — are recorded. This administrative database also contains the origin or the destination as well as the product that is imported or exported. Of course, a thorough examination of the relationship between trade, most particularly imports, and employment is of potential academic interest given this debate. But, our results should also allow us to understand if the fears regularly expressed about globalization by the popular press, the unions, or some politicians, and not only in Europe, have any empirical support.

1.1. The road map

Following BJ, in order to examine the role of imports and exports on employment, we adopt a very descriptive perspective. Our empirical analysis comprises three stages. First, we study the relation between trade and the creation and destruction of manufacturing jobs using a quasi-exhaustive panel of firms. In particular, this file includes very small firms. Then, we examine the relation between trade and skill structure using measures of the share of production jobs in total employment of manufacturing firms and of the fraction of unskilled workers within these production jobs. Unfortunately, the size of the sample is reduced because the Survey on Skill Structure includes only establishments with at least 20 employees. Following the literature we apportion the job-skill composition changes to between-industry effects, within-industry but between firm effects, and within firms effects. Finally, we examine the robustness of our results to the introduction of firm-level measures of innovation, to control for changes in technology.

At each stage, we relate changes in employment or skill structure, both measured at the firm-level between 1986 and 1992, to changes of trade activity, also measured at the firm-level and over the same period. When we use our exhaustive manufacturing dataset, we also compare the contributions of firms that are present at both ends of our sample period with those that die and are born during the period.

Again at each stage, because our data allow us to identify the categories of imported goods (using a 3-digit classification), we distinguish between two types of imported goods (following Feenstra and Hanson, 1995, 1996). When the classification of the imported good exactly coincides with that of the importing firm, we label the imported good "finished" (hereafter, FG).

[2] See also Card, Kramarz, and Lemieux (1999) for an (negative) evaluation of Krugman's story.

Otherwise, we label the imported good "intermediate input" (hereafter, II). This concept of finished good tries to capture outsourcing strategies in which the production process is segmented and incorporates finished inputs from abroad (Venables, 1999).

Our results show that there is a strong correlation between increasing imports, in particular imports of finished goods, and job destruction, most notably destruction of production jobs. Interestingly, the strength of the relation between job destruction and imports is stronger in larger firms. For example, within production jobs, the association between imports of finished goods and destruction of unskilled jobs is found only in large firms. These findings are robust to the introduction of firm-level measures of innovation.

The next section presents a brief discussion of our economic motivation; Section 3 presents the data sources. Section 4 shows our results on employment, and Section 5 contains results on the skill structure. A conclusion summarizes the various results.

2. Economic motivation

We define a firm as active on international markets if it either imports any type of input or if it exports any part of its production. To be sure, there are other ways for firms to be internationalized, such as Foreign Direct Investment (FDI), but our data do not identify ownership.

To understand potential motivations for firms to turn to international markets, most particularly at the end of the eighties, our period of investigation, we start by describing changes that took place in France in the preceding period. In 1981, François Mitterrand was elected French President. In the ensuing years, the minimum wage was significantly increased, the working week was reduced to 39 h, and unions were given more power through the Auroux laws (for the largest establishments). These changes hit most particularly manufacturing firms and are likely to have created strong incentives to switch sourcing abroad.

If labor costs less abroad, imports offer a cost reduction for any firm that takes advantage of them. However, if a firm must pay a fixed cost to import, only a fraction of firms might find it worth paying, presumably the largest firms. In the French case, large manufacturing firms faced the largest cost increases due to stronger unions and increased wages as described above (see also Kramarz, 2005 for direct evidence). Hence, they were most at risk of losing market shares if they did not alter their sourcing strategy. Indeed, our numbers show that the bulk of the increase in imports over the period comes from the largest firms.

To see the effect on a firm's employment, a distinction is whether the switch to an import involves a good that the firm had already used as an intermediate purchase from a French supplier, or replaces production within the firm. The two types of imports might have very different effects on employment and skills. Switching from local to foreign suppliers of intermediates, by lowering the cost of a factor complementary to labor, might increase employment. But, replacing internal production with imports might be expected to have the opposite effect.

Of course, this argument applies to employment of production workers. Within production workers, those at greatest risk of losing employment when a cost reduction strategy is used are the low-skill workers. This effect is most likely when minimum costs (i.e. the labor costs at the minimum wage, including payroll taxes) are very high (see Kramarz and Philippon, 2001 for an analysis of this question).[3] At the same time, increasing importing may require a reorganization of the firm and increasing demand for engineering and managerial labor.

[3] But, firms' decisions to shed workers must take into account potential separation costs, which are also very high in the French context (see Abowd and Kramarz, 2003 for an evaluation of their magnitude at the end of the sample period).

The channels through which exports affects a firm's employment are potentially different from those for imports. Of course, exports may well complement import activities. The general view though, well captured in Bernard and Jensen (1999), is that "good firms become exporters" (page 1). Employment growth seems to be associated with export growth.[4]

3. Data

3.1. Data construction

Up to 1992, all movements of traded goods entering or leaving France were declared to French customs either by their owner or by the authorized customs commissioners.[5] These declarations constitute the basis of all French trade statistics. From these declarations, we build a Customs data set that contains, for all importing or exporting firms identified by their so-called SIREN number, the amount of their total transactions in each year between 1986 and 1992 for each type of good — finished (FG) or intermediate (II) — for 3 aggregate origins for imports and one destination for exports.[6] Transactions are recorded in French Francs and measure the amount paid or received by the firm (i.e. including discounts, rebates, etc.).

Since the Customs file contains information only on the trade of goods — nothing on services— we will focus on firms in manufacturing (excluding construction).

The resulting file is first matched with the BAL-SUSE ("Base d'Analyse Longitudinale — Système Statistique Unifié d'Entreprises") database, which provides firm-level information based on the mandatory reports of French firms to the fiscal administration. From this source, we use balance sheet information (total sales, total labor costs, total wage-bill, sales, value-added, total purchases, total assets, total employment). This first analysis file contains 330,945 firms belonging to manufacturing industries over the period 1986–1992. Among them, 96,239 firms are present in the file only at the beginning of the period. We call them "dying firms". Conversely, 84,784 firms are present only at the end of the period. We call them "new firms". The 149,922 remaining firms are called "continuing firms". They represent 75% of total employment in 1986, and over 80% in 1992.

This dataset does not provide information on the composition of firm employment by skill. To measure skills, we use the Employment Structure Survey (ESE, "Enquête sur la Structure des Emplois"). All establishments with more than 10 employees until 1988, 20 employees thereafter, are requested to provide information on their skill structure of employment by sex. Using information on skills within the firm therefore implies a strong reduction in the size of our sample, as well as a bias towards large firms. Restricting the sample to manufacturing firms and merging with the BAL-SUSE dataset leaves us with 39,459 firms. Among them, 17,190 are present in the ESE at both dates and have valid variables. Because of this reduction in sample size when including skill measures, we analyze employment using the matched Customs and BAL-SUSE file, whereas its composition by skill group is analyzed using the smaller ESE sample.

[4] Maurin, Thesmar, and Thoenig (2002) study another channel through which exports may affect employment composition. The authors show that export activity demands more skilled sales persons, lawyers, marketing personnel, etc.

[5] A Data Appendix describes data construction in much more detail.

[6] We aggregated imports into 3 categories: European Community (plus Switzerland), Other OECD countries and low-wage countries. To deflate these measures of firm-level trade, we use 3-digit import and export prices computed for three geographic zones (EC, OECD outside EC, outside OECD) taken from the French National Accounts.

In this article, to maximize comparability with other analyses (BJ, or Berman et al., 1994 for instance), we retain two measures of the firm's skill structure: the proportion of production workers in total employment, and the ratio of unskilled production workers to the total production workers.

The previous literature raised the issue of the extent to which technical change versus international trade is responsible for changes in employment structure. As a final step, we merge these two datasets with the 1991 Innovation survey. This survey covers manufacturing firms with 20 employees or more. Firms are asked to report their product innovations, process innovations, commercial innovations and organizational innovations for the period 1986–1990. Merging the Innovation Survey with the ESE file reduces the sample size from around 17,000 to around 13,000 continuing firms.

3.2. Internationally active firms

Table 1 presents the structure of firms that are active on the international markets contrasting firms that only export, only import, and those that do both at the beginning of the sample period (hence excluding firms born over the period). In addition, we contrast imports of intermediates with imports of finished goods. Finally, because we know the origin of the imports, we contrast three zones, described in the data section, namely European Community (EC), OECD outside the EC, and "low-wage countries" a very heterogeneous group, by all means. Table 1 shows for the different internationalization categories the fraction involved, un-weighted in the first column and weighted by sales in the second. Results are indeed striking. A small proportion of firms are active in foreign markets. But those most active (exporting and importing) represent the bulk of French sales. In addition, distance matters: fewer firms import from far-away countries than from the EC (un-weighted as well as weighted). Finally, more firms import II than FG.

Most firms essentially import or export very little. Table 2 presents fractiles (median, third quartile, ninth decile) of the distribution of exports as a fraction of sales (for those active), and fractiles (median, third quartile, ninth decile) of the distribution of imports as a fraction of total purchases (once again for those active). Even the importer or exporter at the third quartile imports

Table 1
Importing and exporting firms

Proportion of firms involved in:	Non-weighted (%)	Weighted by sales (%)
Neither exports nor imports	75	11
Imports only	6	5
Exports only	5	2
Exports and imports	14	82
Imports of FG, all origins	11	75
Imports of FG, EU	11	74
Imports of FG, OECD outside EU	2	45
Imports of FG, Low wage countries	3	45
Imports of II, all origins	18	85
Imports of II, EU	17	85
Imports of II, OECD outside EU	4	62
Imports of II, Low wage countries	3	54

Source: Customs Files and BAL, 1986–1987.
Number of firms : 246,161 in manufacturing industries.
FG = Final Goods (same 3 digit imported product as importing firm industry).
II = Intermediary Inputs (all other imports).

Table 2
The distribution of import and export intensity

Firms involved in:	Number of firms	Distribution of exports/sales or imports/sales		
		Median (%)	Third quartile (%)	Ninth decile (%)
Exports	46,005	3	11	31
Imports	49,267	3	10	26
Imports of FG, all origins	28,299	2	7	21
Imports of FG, EU	26,558	1	6	17
Imports of FG, OECD outside EU	5,366	0	2	6
Imports of FG, Low wage countries	6,228	1	4	13
Imports of II, all origins	43,238	2	6	15
Imports of II, EU	41,467	1	5	13
Imports of II, OECD outside EU	9,732	0	1	4
Imports of II, Low wage countries	8,012	0	2	7

Source: Customs Files, 1986–1987.
Number of firms: 246,161 in manufacturing industries.
FG = Final Goods (same 3 digit imported product as importing firm industry).
II = Intermediary Inputs (all other imports).

or exports around 10% of its purchases or sales (see also Table A.1 for the relation between various importing regimes and the size of the firm).

4. Employment and trade

Table 3 is central to our analysis of the relationship between employment and trade. It presents a decomposition of employment changes between the different categories of firms, in particular it differentiates between internationally active firms and firms that are not.

The first line of the Table presents statistics for our 330,945 firms. In particular, total employment among these firms decreased by 7.2%, representing 332,000 jobs, between 1986 and 1992 (fourth column, first line). The next lines give a decomposition of these numbers for our various categories of firms. The first column of the Table presents rates of growth of employment, the second column shows the fraction of employment that each category represents, the next column is equal to the product of the first two columns and essentially gives the fraction that this category represents in the overall change, the fourth column shows the number of jobs corresponding to these changes, the fifth column gives the number of firms in each category, and, finally, the last two columns show the imports (for the first panel) and exports (for the second panel) at the beginning and at the end of the analysis period again for each category. We compute the rate of growth as follows (in the spirit of Davis and Haltiwanger, 1999). First, we define employment of firm i at the beginning and at the end of our sample period as :

$$L_i^B = \frac{L_i^{86} + L_i^{87}}{2}, L_i^E = \frac{L_i^{91} + L_i^{92}}{2}$$

Then we define the average employment over the period as $\overline{L}_i = \frac{L_i^B + L_i^E}{2}$ and use it to compute employment growth in the firm over the period :

$$\Delta L_i = \frac{L_i^E - L_i^B}{\overline{L}_i}$$

Table 3
Employment growth and the import–export status

	Rate of growth of employment	Average share in total employment	Contribution to total employment change	Contribution to total employment change	Number of firms	Value in billion FF (1986–1987)	Value in billion FF (1991–1992)
All	−0.072	1.000	−0.072	−332,380	330,945	372	502
Continuing firms							
Never imports	0.083	0.090	0.008	34,990	106,909	0	0
Starts importing	0.069	0.049	0.003	15,690	8653	0	7
Stops importing	−0.093	0.021	−0.002	−8903	7145	1	0
Continuously imports, increasing ratio of imports to sales	−0.042	0.350	−0.015	−68,899	13,928	129	248
Continuously imports, constant or decreasing ratio of imports to sales	−0.016	0.269	−0.004	−19,612	13,287	166	166
Dying firms							
Does not import	−2.000	0.032	−0.064	−295,171	81,332	0	0
Imports	−2.000	0.094	−0.189	−876,709	14,907	76	0
New-born firms							
Does not import	2.000	0.028	0.056	262,168	71,283	0	0
Imports	2.000	0.067	0.134	624,071	13,501	0	81
All	−0.072	1.000	−0.072	−332,380	330,945	555	795
Continuing firms							
Never exports	0.089	0.108	0.010	44,595	110,054	0	0
Starts exporting	0.081	0.049	0.004	18,391	7426	0	15
Stops exporting	−0.117	0.028	−0.003	−149,79	7319	6	0
Continuously exports, increasing ratio of exports to sales	−0.026	0.333	−0.009	−40,144	13,221	236	422
Continuously exports, constant or decreasing ratio of exports to sales	−0.045	0.261	−0.012	−54,597	11,902	212	206
Dying firms							
Does not export	−2.000	0.035	−0.070	−325,376	82,676	0	0
Exports	−2.000	0.091	−0.182	−846,504	13,563	101	0
New-born firms							
Does not export	2.000	0.032	0.065	300,827	73,578	0	0
Exports	2.000	0.063	0.126	585,412	11,206	0	152

Source: Customs Files and BAL, 1986–1987 and 1991–1992. Total number of firms: 330,945 in manufacturing industries.

Then, these numbers are averaged across the economy using the following formula $\sum_i \frac{\bar{L}_i}{\sum_j \bar{L}_j} \Delta L_i$ or across various categories of internationalization that are mutually exclusive, say $I = \cup_{k=1}^{K} I_k$ in order to compute the following decomposition of total employment growth:

$$\sum_{k=1}^{K} \frac{\sum_{i \in I_k} \bar{L}_i}{\sum_i \bar{L}_i} \sum_{i \in I_k} \frac{\bar{L}_i}{\sum_{j \in I_k} \bar{L}_j} \Delta L_i$$

The Table comprises two panels, one for imports and the second for exports. Each row within each panel is mutually exclusive (the format resembles Table 3 in BJ). Continuing firms are differentiated from firms that died or were born over the period. And within each of these categories, the Table contrasts the different importing (resp. exporting) regimes (the I_k in the above definition): never imports, starts importing, stops importing, continuously importing (increasing imports w.r.t. sales), and continuously importing (constant or decreasing imports w.r.t. sales) (resp. exporting).

Hence, France lost 332,000 manufacturing jobs between 1986 and 1992. 1.172 million jobs were lost at dying firms, partially offset by 886,000 created at new firms. Finally, 47,000 jobs were lost at continuing firms. During this period imports of goods among these firms rose from 372 to 502 billion French Francs (FF, hereafter).[7]

How does this increase in imports correlate with declines in employment across firms?

Categorizing entering and exiting firms by import status, dying and new-born firms that import contributed more to employment turnover than those that did not. Job losses at dying firms that imported were proportionately greater than job creation at new firms that also imported. However, the fraction of firms that import among new firms is larger than the fraction of importing firms in dying firms.[8]

Among continuing firms, those that started to import created 16,000 jobs, but among continuous importers those that increased their ratio of imports to sales lost 69,000 jobs. In contrast, continuous importers that reduced their ratio of imports to sales lost only 19,000 jobs while those that ceased importing lost 9000.

In the meantime, the bulk of this increase in imports, from 295 to 414 billions FF, comes from continuing firms whereas changes in imports for dying firms and new-born firms almost exactly offset each other. Within continuing firms, the decrease in imports from firms with a decreasing ratio of imports to sales is tiny but imports from firms with an increasing ratio of imports to sales essentially double. Hence, among continuing firms, increased imports are associated with decreased employment.

Some of these results also hold for exports. However, expanding imports appear to be associated with more employment losses than expanding exports. For instance, among continuing firms, increasing the share of exports in sales is associated with 40,000 job losses while decreasing this share is associated with 55,000 destructions. More employment is created in new firms that import than in new firms that export (approximately 40,000 more). But, more employment is destroyed in dying firms that imported than in dying firms that exported (approximately 30,000 more).

[7] All values are deflated, see data Appendix.

[8] Job creation for a new firm is equal to $2=(L_t-0)/(L_t+0)/2$ from the formula for employment growth. Similarly, job destruction for a dying firm is equal to -2.

Table 4
Employment growth and import status (by size of the firm)

		Rate of growth of employment	Average share in total employment	Contribution to total employment change	Contribution to total employment change	Number of firms	Value in billion FF (1986–1987)	Value in billion FF (1991–1992)
Less than 20 employees	All	0.03	1.00	0.03	22,355	300,288	26	36
	Continuing firms							
	Never imports	0.10	0.36	0.03	27,173	103,311	0	0
	Starts importing	0.29	0.06	0.02	12,709	6440	0	1
	Stops importing	−0.09	0.04	0.00	−3062	5659	1	0
	Continuously imports, increasing ratio of imports to sales	0.10	0.06	0.01	4921	5362	4	10
	Continuously imports, constant or decreasing ratio of imports to sales	0.08	0.06	0.01	4192	5778	8	7
	Dying firms							
	Does not import	−2.00	0.14	−0.28	−220,129	80,291	0	0
	Imports	−2.00	0.08	−0.16	−124,851	11,609	13	0
	New-born firms							
	Does not import	2.00	0.13	0.26	209,348	70,708	0	0
	Imports	2.00	0.07	0.14	112,055	11,130	0	18
20 to 199 employees	All	−0.03	1.00	−0.03	−46,069	27,672	81	110
	Continuing firms							
	Never imports	0.07	0.09	0.01	8395	3570	0	0
	Starts importing	0.23	0.06	0.01	20,344	2151	0	2
	Stops importing	−0.09	0.04	0.00	−5053	1472	0	0
	Continuously imports, increasing ratio of imports to sales	0.05	0.31	0.02	24,478	7227	22	51
	Continuously imports,	0.06	0.27	0.02	22,375	6496	36	32

Table 4 (*continued*)

		Rate of growth of employment	Average share in total employment	Contribution to total employment change	Contribution to total employment change	Number of firms	Value in billion FF (1986–1987)	Value in billion FF (1991–1992)
	constant or decreasing ratio of imports to sales							
	Dying firms							
	Does not import	−2.00	0.03	−0.05	−73,755	1039	0	0
	Imports	−2.00	0.11	−0.21	−307,884	2989	22	0
	New-born firms							
	Does not import	2.00	0.01	0.03	40,849	568	0	0
	Imports	2.00	0.08	0.16	224,182	2160	0	26
200 employees and above	All	−0.13	1.00	−0.13	−308,665	2985	266	356
	Continuing firms							
	Never imports	−0.07	0.00	0.00	−578	28	0	0
	Starts importing	−0.19	0.04	−0.01	−17,363	62	0	4
	Stops importing	−0.19	0.00	0.00	−788	14	0	0
	Continuously imports, increasing ratio of imports to sales	−0.09	0.47	−0.04	−98,298	1339	103	187
	Continuously imports, constant or decreasing ratio of imports to sales	−0.06	0.33	−0.02	−46,178	1013	121	127
	Dying firms							
	Does not import	−2.00	0.00	0.00	−1291	2	0	0
	Imports	−2.00	0.09	−0.18	−443,974	309	42	0
	New-born firms							
	Does not import	2.00	0.00	0.00	11,971	7	0	0
	Imports	2.00	0.06	0.12	287,834	211	0	38

Source: Customs Files and BAL, 1986–1987 and 1991–1992. Total number of firms: 330,945 in manufacturing industries.

Table 5
Employment growth and export status (by size of the firm)

		Rate of growth of employment	Average share in total employment	Contribution to total employment change	Contribution to total employment change	Number of firms	Value in billion FF (1986–1987)	Value in billion FF (1991–1992)
Less than 20 employees	All	0.03	1.00	0.03	22,355	300,288	22	35
	Continuing firms							
	Never exports	0.10	0.37	0.04	30,819	105,274	0	0
	Starts exporting	0.29	0.05	0.01	10,375	5317	0	1
	Stops exporting	−0.07	0.04	0.00	−2512	5547	1	0
	Continuously exports, increasing ratio of exports to sales	0.09	0.06	0.01	4387	5244	4	10
	Continuously exports, constant or decreasing ratio of exports to sales	0.06	0.06	0.00	2863	5168	7	5
	Dying firms							
	Does not export	−2.00	0.15	−0.29	−231,942	81,422	0	0
	Exports	−2.00	0.07	−0.14	−113,038	10,478	10	0
	New-born firms							
	Does not export	2.00	0.14	0.29	228,352	72,758	0	0
	Exports	2.00	0.06	0.12	93,050	9080	0	19
20 to 199 employees	All	−0.03	1.00	−0.03	−46,069	27,672	98	145
	Continuing firms							
	Never exports	0.07	0.13	0.01	13,104	4710	0	0
	Starts exporting	0.24	0.06	0.02	22,300	2037	0	3
	Stops exporting	−0.11	0.05	−0.01	−8478	1720	5	0
	Continuously exports, increasing ratio of exports to sales	0.07	0.29	0.02	29,386	6680	31	68

Table 5 (*continued*)

		Rate of growth of employment	Average share in total employment	Contribution to total employment change	Contribution to total employment change	Number of firms	Value in billion FF (1986–1987)	Value in billion FF (1991–1992)
	Continuously exports, constant or decreasing ratio ofexports to sales	0.04	0.24	0.01	14,227	5769	38	33
	Dying firms							
	Does not export	−2.00	0.03	−0.06	−91,268	1251	0	0
	Exports	−2.00	0.10	−0.20	−290,371	2777	25	0
	New-born firms							
	Does not export	2.00	0.02	0.04	61,332	807	0	0
	Exports	2.00	0.07	0.14	203,699	1921	0	40
200 employees and above	All	−0.13	1.00	−0.13	−308,665	2985	435	616
	Continuing firms							
	Never exports	0.03	0.01	0.00	673	70	0	0
	Starts exporting	−0.14	0.04	−0.01	−14,285	72	0	11
	Stops exporting	−0.23	0.01	0.00	−3989	52	0	0
	Continuously exports, increasing ratio of exports to sales	−0.07	0.45	−0.03	−73,918	1297	201	343
	Continuously exports, constant or decreasing ratio of exports to sales	−0.09	0.34	−0.03	−71,687	965	168	168
	Dying firms							
	Does not export	−2.00	0.00	0.00	−2170	3	0	0
	Exports	−2.00	0.09	−0.18	−443,095	308	67	0
	New-born firms							
	Does not export	2.00	0.00	0.00	11,143	13	0	0
	Exports	2.00	0.06	0.12	288,662	205	0	93

Source: Customs Files and BAL, 1986–1987 and 1991–1992. Total number of firms: 330,945 in manufacturing industries.

We know that internationally active firms are bigger (see the second column of Table 3, labeled average share in employment, and, again, Table A.1). Therefore, we present in Table 4 for imports and in Table 5 for exports the exact same statistics as were presented in Table 3 for three categories of firm size (measured as average employment over the period): less than 20 employees, 20 to 199 employees, and 200 employees and more. Bigger firms, irrespective of their trade status, tend to destroy more employment. However, large importing firms also destroy more employment than smaller importing firms. For instance, among firms continuously importing which increased their (ratio of) imports (to sales) over the period, the largest firms destroyed more than 98,000 jobs whereas firms with less than 200 workers created 30,000 jobs. In addition, large firms that start importing destroy employment (17,000), while smaller firms that start importing create employment (33,000 jobs). Results in Table 5 for exports are not very different from those in Table 4. Large firms that start exporting destroy jobs while smaller firms create jobs. Large firms continuously exporting also destroy jobs while smaller firms create employment.

Tables 6 and 7 have essentially the same structure as Table 3 but differentiate imports by type, FG for Table 6 and II for Table 7. Each Table then further focuses (in the lower panel) on imports from "low-wage" countries. Most results are essentially similar to those presented in Table 3. But, one striking feature appears for imports of FG, and even more strikingly for those that import FG from low-wage countries. Compare firms that continuously import FG with firms that continuously import (FG or II, see Table 3). The first group, a subset of the second, has much lower growth. Furthermore, the subset of firms that import FG from low-wage countries (this is also true for firms that import II from low-wage countries) have even lower growth rates than firms which import FG or II. More specifically, firms continuously importing FG (resp. II) from low-wage countries destroyed 151,000 jobs (resp. 162,000); firms continuously importing FG (resp. II) destroyed 120,000 jobs (resp. 93,000); and firms continuously importing destroyed 88,000 jobs (see Table 3).[9] But, in the meantime, firms continuously importing FG from low-wage countries increased their imports from 20 to 29 billions FF; firms continuously importing FG increased their imports from 169 to 236 billions FF; and firms continuously importing increased their imports from 295 to 414 billions FF.

Obviously, firms importing FG, and even more so firms importing FG from low-wage countries, destroy employment — more employment than non-importing firms — even though this destruction does not appear to be directly associated with large increases in such imports.

To describe these data further and disentangle the various composition effects that we just described, we apply a simple regression analysis to the set of continuing firms. We do not attach any causal interpretation to our specification or results.

To try to sort out the various elements potentially associated with employment growth, we estimate the following simple first-difference regression:

$$\Delta L_i = \alpha \Delta \mathrm{Tr}_i + \alpha \Delta Z_i + \delta S_i + \varepsilon_i \tag{1}$$

where ΔL_i is the employment growth rate for firm i during the sample period (defined as before), $\Delta \mathrm{Tr}_i$ is a vector of measures of trade growth at firm i (described just below), ΔZ_i is a vector of measures of economic shocks potentially affecting firm i (also described just below), S_i includes the firm's characteristics at the beginning of the sample period (4-digit industrial affiliation indicators, size categories indicators, an indicator for firms importing at the beginning of the

[9] Clearly, the first group is a subset of the second group which a subset of the third group.

period, and indicators for firms that are part of a French or a foreign group), and ε_i is an i.i.d. shock. Our vector of measures of internationalization includes the change in imports of FG (resp. II, resp. exports) between the beginning and the end of the period as a fraction of sales. To control

Table 6
Employment growth and imports of final goods (FG)

	Rate of growth of employment	Average share in total employment	Contribution to total employment change	Contribution to total employment change	Number of firms	Value in billion FF (1986–1987)	Value in billion FF (1991–1992)
All	−0.072	1.000	−0.072	−332,380	330,945	207	287
Continuing firms							
Never imports FG	0.055	0.195	0.011	49,848	124,543	0	0
Starts importing FG	0.149	0.050	0.007	34,301	5484	0	5
Stops importing FG	−0.122	0.016	−0.002	−9147	3771	1	0
Continuously imports FG, increasing ratio of FG imports to sales	−0.069	0.299	−0.021	−95,891	7880	73	148
Continuously imports FG, constant or decreasing ratio of FG imports to sales	−0.025	0.219	−0.006	−25,844	8244	96	88
Dying firms							
Does not import FG	−2.000	0.049	−0.098	−454,885	87,835	0	0
Imports FG	−2.000	0.077	−0.154	−716,995	8404	38	0
New-born firms							
Does not import FG	2.000	0.045	0.090	420,391	78,283	0	0
Imports FG	2.000	0.050	0.100	465,847	6501	0	46
All	−0.072	1.000	−0.072	−332,380	330,945	26	41
Continuing firms							
Never imports FG from low wage countries	0.050	0.382	0.019	88,855	141,700	0	0
Starts importing FG from low wage countries	0.062	0.108	0.007	30,944	3817	0	2
Stops importing FG from low wage countries	−0.180	0.018	−0.003	−15,057	1190	1	0
Continuously imports FG from low wage countries, increasing ratio of FG imports to sales	−0.123	0.188	−0.023	−107,578	1917	8	22
Continuously imports FG from low wage countries, decreasing ratio of FG imports to sales	−0.113	0.083	−0.009	−43,898	1298	12	7
Dying Firms							
Does not import FG from low wage countries	−2.000	0.085	−0.170	−790,317	94,416	0	0
Imports FG from low wage countries	−2.000	0.041	−0.082	−381,564	1823	6	0

(continued on next page)

Table 6 (*continued*)

	Rate of growth of employment	Average share in total employment	Contribution to total employment change	Contribution to total employment change	Number of firms	Value in billion FF (1986–1987)	Value in billion FF (1991–1992)
New-born firms							
Does not import FG from low wage countries	2.000	0.067	0.134	620,967	82,956	0	0
Imports FG from low wage countries	2.000	0.029	0.057	265,272	1828	0	9

Source: Customs Files and BAL, 1986–1987 and 1991–1992. Total number of firms: 330,945 in manufacturing industries; FG = Final Goods (same 3 digit imported product as importing firm industry).

for shocks that might have affected the firm, ΔZ_i includes the growth rate of firm's total sales, and the change in the ratio of firm's domestic purchases to total sales.[10,11]

Table 8 reports the estimation results. The Table has the following structure. We present four regressions. The first two, presented in the first two sets of columns, are un-weighted whereas the last two, presented in the last two sets of columns, are weighted by average firm employment. Within each set of columns, the first column uses measures of trade aggregated over all origins (for imports) or destinations (for exports). The next three columns use measures of trade by groups of countries.

Concentrating on the measures of internationalization, estimates appear to confirm the general impression conveyed above. For our continuing firms, employment destruction appears to be associated with imports, in particular imports of finished goods. Indeed, changes in local purchases as a fraction of sales (capturing changes in the local sourcing strategies) are also negatively associated with employment growth, again as suggested by our economic discussion. The coefficient of FG intensity change is significantly larger than the coefficient of II imports (the standard deviations of these two explanatory variables are roughly equal, see Table B.1 in the Appendix). However, because the change in local purchases have the larger standard deviation of the three sourcing variables, its impact is strongest. Finally, exports turn out to have a small positive association with employment.

Concentrating on the second set of columns, where origins and destinations are differentiated, the previous comments are essentially confirmed. Important, or interesting at least, are the following facts. First, the impact of FG is larger than the impact of II for all origins. Second, even though the coefficient on imports of FG from low-wage countries is larger than the coefficient on imports of FG from the EC, because the standard deviation of the latter is twice the standard deviation of the former, imports of FG from the European community have a larger impact on employment. Finally, employment creation is associated with exports only for the EC destination. Some of these exports may reflect horizontal foreign direct investment, and part of the local production process being replaced by production abroad.

All these conclusions are virtually unchanged when examining the employment weighted regressions: import growth is associated with employment destruction. This association between

[10] These three firm-level variables come from BAL-SUSE and are described in the Appendix. In comparison with previous tables, we excluded a tiny number of continuing firms because they had anomalous values for these exogenous variables.

[11] All programs are available from the authors. Furthermore, we tested the regression without including the indicators for importing at the beginning of the periods and the results are robust to such exclusion.

Table 7
Employment growth and imports of intermediary inputs (II)

	Rate of growth of employment	Average share in total employment	Contribution to total employment change	Contribution to total employment change	Number of firms	Value in billion FF (1986–1987)	Value in billion FF (1991–1992)
All	−0.072	1.000	−0.072	−332,380	330,945	164	215
Continuing firms							
Never imports II	0.081	0.100	0.008	37,702	110,860	0	0
Starts importing II	0.077	0.052	0.004	18,666	8486	0	4
Stops importing II	−0.100	0.022	−0.002	−9956	6583	1	0
Continuously imports II, increasing ratio of II imports to sales	−0.028	0.320	−0.009	−41,774	12,241	45	105
Continuously imports II, constant or decreasing ratio of II imports to sales	−0.039	0.285	−0.011	−51,372	11,752	80	70
Dying firms							
Does not import II	−2.000	0.035	−0.069	−321,733	83,531	0	0
Imports II	−2.000	0.091	−0.183	−850,148	12,708	39	0
New-born firms							
Does not import II	2.000	0.030	0.061	283,270	73,134	0	0
Imports II	2.000	0.065	0.130	602,968	11,650	0	35
All	−0.072	1.000	−0.072	−332,380	330,945	20	25
Continuing firms							
Never imports II from low wage countries	0.065	0.306	0.020	91,942	138,905	0	0
Starts importing II from low wage countries	0.070	0.113	0.008	36,803	5234	0	3
Stops importing II from low wage countries	−0.105	0.027	−0.003	−13,021	1834	0	0
Continuously imports II from low wage countries, increasing ratio of II imports to sales	−0.113	0.210	−0.024	−110,615	2221	5	13
Continuously imports II from low wage countries, decreasing ratio of II imports to sales	−0.091	0.123	−0.011	−51,843	1728	8	4
Dying firms							
Does not import II from low wage countries	−2.000	0.076	−0.153	−709,004	93,889	0	0
Imports II from low wage countries	−2.000	0.050	−0.100	−462,877	2350	6	0
New-born firms							
Does not import II from low wage countries	2.000	0.059	0.117	545,854	82,129	0	0

(continued on next page)

Table 7 (*continued*)

	Rate of growth of employment	Average share in total employment	Contribution to total employment change	Contribution to total employment change	Number of firms	Value in billion FF (1986–1987)	Value in billion FF (1991–1992)
New-born firms							
Imports II from low wage countries	2.000	0.037	0.073	340,384	2655	0	5

Source: Customs Files and BAL, 1986–1987 and 1991–1992. Total number of firms: 330,945 in manufacturing industries; FG = Final Goods (same 3 digit imported product as importing firm industry); II = Intermediary Inputs (other imported products).

imports and employment appears to be stronger in large firms. In particular, the coefficients of import intensity changes are much larger, and estimated with higher precision. As before, because imports from the EC have a larger standard deviation than imports from low-wage countries, the first is most strongly (negatively) related to employment growth. All exports have now a significant and positive association with employment.

To conclude this section, imports — more particularly FG imports, and even more so FG imports from the EC but also from low-wage countries — are associated with employment destruction in continuing firms, and more strongly in large firms. Of course, importing is only one sourcing possibility for French firms. Our results show that an increase in local purchases has the potential to destroy even more employment. Finally, exports are only mildly associated with employment creation, and, by contrast, large exporting firms create more employment.

5. Skills and trade

In this section, we examine the skill side of the relation between employment and trade. We focus on two variables, the share of blue-collar workers in employment and, among blue-collar workers, the share of unskilled blue-collar workers.[12] Our second measure, the fraction of unskilled blue-collar workers in blue-collar employment, should be a better indicator of those most likely to be affected by trade competition, as well as by the prior increase in the minimum wage.[13] The French classification of occupations identifies unskilled blue-collar workers as "those whose job requires little specific training." They embody little specific human capital and should be more easily substitutable by foreign "low-wage" blue-collar workers than their skilled counterparts. According to the skill biased technical change view, however, they should also be the most vulnerable to substitution by technology-intensive equipment and associated organizational change.

In order to compare our results with previous analysis (Berman et al., 1994; Bernard and Jensen, 1997), we decompose aggregate changes into two components. As usual, we contrast between and within-industry changes. Then, we decompose the within-industries changes into two parts: between-firm changes and within-firm changes of the skill structure. Such a

[12] The share of blue-collar workers is similar to that of production workers often available in North-American studies. Indeed, the share of production workers is often used as the measure of unskilled work (Berman et al., 1994; BJ).

[13] In contrast, the minimum wage is relatively stable during period under study.

Table 8
Employment growth and trade

	Employment growth							
	All origins	EC	Non-EC OECD	Low wage	All origins	EC	Non-EC OECD	Low wage
Δ (FG imports/sales)	−0.445**	−0.432**	−0.352*	−0.517**	−0.579**	−0.523**	−0.904**	−0.589**
	(0.041)	(0.046)	(0.149)	(0.080)	(0.012)	(0.015)	(0.033)	(0.025)
Δ (II imports/sales)	−0.224**	−0.239**	−0.210	−0.161	−0.352**	−0.337**	−0.305**	−0.445**
	(0.039)	(0.044)	(0.132)	(0.087)	(0.013)	(0.015)	(0.040)	(0.032)
Δ (exports/sales)	0.103**	0.135**	−0.027	0.054	0.126**	0.137**	0.070*	0.102**
	(0.034)	(0.040)	(0.099)	(0.072)	(0.009)	(0.011)	(0.029)	(0.021)
Δ (local purchases/sales)	−0.482**		−0.482**		−0.634**		−0.635**	
	(0.014)		(0.014)		(0.009)		(0.009)	
Growth of sales	0.745**		0.745**		0.716**		0.717**	
	(0.003)		(0.003)		(0.002)		(0.002)	
Weighted by employment	No		No		Yes		Yes	
R^2	0.575		0.576		0.676		0.676	

Sources: Customs Files, BAL 1986–1987 and 1991–1992; 116,426 continuing firms in the manufacturing industry (with non-zero average employment across the period); FG = Final Goods (same 3 digit imported product as importing firm industry); II = Intermediary Inputs (other imported products).
** and * Denote coefficients significant at less than 1% and less than 5%. Standard errors are between parentheses. The regression includes indicators for initial firm size, initial import status, NAP 600 affiliation, and for being part of a French or foreign group. The coefficients are not reported.

decomposition allows us to see if most of the movements are due to changes in the size of industries, changes in the composition of firms within an industry (some firms growing when others shrink), or changes in the composition within the firms.

To pursue this task, we use the most detailed industry classification that is available among our firm-level data sources, the NAP600 with 600 classifications for the whole economy. To decompose production employment, for instance, we use the following decomposition (see Davis and Haltiwanger, 1999 as well as Berman et al., 1994; Bernard and Jensen, 1997):

$$\Delta P = \sum_s \Delta S_s \bar{P}_s + \sum_s \Delta P_s \bar{S}_s$$

where:[14]

$$P_s = \frac{Q_s}{L_s}, \quad S_s = \frac{L_s}{L}$$

$$\Delta P_s = P_s^E - P_s^B, \quad \Delta S_s = S_s^E - S_s^B$$

$$\bar{P}_s = \frac{P_s^E + P_s^B}{2}, \quad \bar{S}_s = \frac{S_s^E + S_s^B}{2}$$

with Q denoting blue-collar employment (resp. unskilled blue-collar employment), L total employment (resp. blue-collar employment), s is the industry, E and B denote the end and the

[14] Δ denotes in this section first differencing and not a growth rate as in the previous section.

beginning of the sample period, defined as in the previous section. Hence S_s is the share of total employment (resp. of blue-collar employment) of industry s in total employment (resp. in total blue-collar employment).

The first term in this exact decomposition gives the contribution to the aggregate change of between-industry reallocations. Whereas the second component gives the contribution of the within-industries reallocations.

Results are presented in Table 9. The first two columns of Table 9 present the results for the production workers whereas the last two columns present the results for the unskilled blue-collar workers. For each category, the first column gives the between-industry contribution and the second column gives the within-industry contribution. The first line of the Table gives the overall change for the category. The "All" panel presents the first decomposition. Then, each panel of the same Table presents different components of this overall decomposition based on the internationalization status of the *industries*. To define this status, we measure for each decomposition the change between the beginning and the end of the period in the ratio of each measure of international trade that we use (imports, exports, imports of FG, of FG from low-wage countries, of II, of II from low-wage countries) to sales. And, we contrast those industries in which the ratio increased with those in which the ratio decreased or was constant. First, results show the usual fact. The declining share of production workers in total employment (−0.020) is mostly a within-industry phenomenon. Similarly, the declining share of unskilled blue-collar workers in production jobs is mostly a within-industry phenomenon (Berman et al., 1994; Bernard and Jensen, 1997). However, when we contrast industries using the changes over the

Table 9
Skill structure changes and the import–export status of industries: aggregate decomposition

	Share of production workers in total employment		Share of unskilled workers in production employment	
Aggregate change	−0.020		−0.039	
	Between industries	Within industries	Between industries	Within industries
All	0.002	−0.022	0.002	−0.042
Increasing ratio of imports to sales	−0.004	−0.014	−0.003	−0.030
Constant or decreasing ratio of imports to sales	0.006	−0.008	0.006	−0.011
Increasing ratio of exports to sales	0.014	−0.009	0.011	−0.021
Constant or decreasing ratio of exports to sales	−0.012	−0.013	−0.009	−0.021
Increasing ratio of FG imports to sales	−0.009	−0.013	−0.006	−0.028
Constant or decreasing ratio of FG imports to sales	0.011	−0.009	0.009	−0.014
Increasing ratio of II imports to sales	−0.002	−0.013	−0.001	−0.032
Constant or decreasing ratio of II imports to sales	0.003	−0.009	0.003	−0.010
Increasing ratio of FG imports from low wage countries to sales	−0.003	−0.018	−0.002	−0.036
Constant or decreasing ratio of FG imports from low wage countries to sales	0.004	−0.004	0.004	−0.006
Increasing ratio of II imports from low wage countries to sales	−0.001	−0.019	−0.001	−0.034
Constant or decreasing ratio of II imports from low wage countries to sales	0.002	−0.003	0.003	−0.007

Source: Customs Files and BAL, 1986–1987 and 1991–1992, ESE same years.
Total number of firms : 17,190 continuing firms in the manufacturing industry.
FG = Final Goods (same 3 digit imported product as importing firm industry); II = Intermediary Inputs (all other imports).

period in their use of foreign markets, Table 9 shows something different. In those industries that increased their use of imports of FG over the period, the fraction of production of workers as well as the fraction of unskilled workers among them decreased (whereas it increased for those industries that did the reverse, i.e. decreased their use of imports). Hence, the smallness of the between-industry components hides two opposing effects related to changes in access to foreign markets for FG of the various industries. These between-industry changes, although slightly smaller than those contained in the within-industry columns, are far from trivial (most particularly in the decomposition for blue-collar jobs).

The analysis of the within part of the changes is pursued in Table 10. It is based on the following decomposition of the within-industry change:

$$\Delta P_S = \sum_{i \in S} \Delta S_i \overline{P}_i + \sum_{i \in S} \Delta P_i \overline{S}_i$$

where ΔP_s denotes the within-industry change in s, $\overline{S}_i$ is the average share of firm i in employment of industry s, ΔS_i is its change, $\overline{P}_i$ is the average share of blue-collar workers in total employment of firm i, and ΔP_i its change. Once again, this decomposition allows us to get a between-firm and a within-firm component. These two components are further decomposed using the firm strategy vis-à-vis the international markets. Finally, all these elements are aggregated across industries to obtain the within-industry measure from the previous decomposition using:

$$\Delta P^{\text{WITHIN}} = \sum_s \overline{S}_s \sum_{i \in s} \Delta S_i \overline{P}_i + \sum_s \overline{S}_s \sum_{i \in s} \Delta P_i \overline{S}_i$$

Results are presented in Table 10. This Table has almost the same structure as Table 3 of BJ. We just add a small twist to their table by contrasting firms that are continuously present (in the

Table 10
Skill structure change and the import–export status: within-industry decomposition

	Share of production workers in total employment		Share of unskilled workers in production employment	
Within industry change	−0.022		−0.042	
	Between firms	Within firms	Between firms	Within firms
All	0.003	−0.024	0.002	−0.043
Never imports	0.001	0.000	0.000	−0.001
Starts importing	0.002	0.000	0.001	0.000
Stops importing	−0.001	0.000	0.000	0.000
Continuously imports, increasing ratio of imports to sales	0.000	−0.013	−0.001	−0.022
Continuously imports, constant or decreasing ratio of imports to sales	0.000	−0.010	0.001	−0.019
Never exports	0.001	0.000	0.001	−0.001
Starts exporting	0.003	0.000	0.002	−0.001
Stops exporting	−0.001	−0.001	−0.001	−0.001
Continuously exports, increasing ratio of exports to sales	0.004	−0.012	0.002	−0.020
Continuously exports, constant or decreasing ratio of exports to sales	−0.004	−0.011	−0.002	−0.020

Notes: Same as Table 9.

export or the import market, their "Thru" category) into firms that increased their use of imports or exports (as a ratio of sales) and those that decreased it. Most results have the same flavor as that found by others in the literature: the action is within-firms. Also, interestingly for our purpose, most changes take place in firms that are continuously present in foreign markets. Such firms contribute to the bulk of (within-firm) destruction of production jobs, in particular unskilled jobs. But, our decomposition into firms that increased and firms that decreased their use of foreign markets also tells us something new. Imports do not play the same role as exports: firms that increase the share of imports in their sales destroy more production jobs and even more unskilled production jobs than firms that decreased this share; but firms that decrease the share of exports in their sales destroy slightly more production jobs. However, all firms constantly exporting destroy the same amount of unskilled production jobs.

Tables 11 and 12 are similar to Table 10. They present results for FG and II imports (total as well as from low-wage countries), respectively. The decomposition gives very similar results. More precisely, it is only for imports of FG from all origins as well as from low-wage countries and imports of II from low-wage countries that firms that increase their use destroy more production jobs and more unskilled production jobs. In that respect, II imports from all origins behave like exports.

As before, a regression framework helps disentangle the role of various factors affecting the skill structure of French firms. This is done in the last three Tables. The estimating framework is similar to that used in the employment regressions based on Eq. (1). The main difference is in the variables to explain, now the change in the share of blue-collar workers in total employment

Table 11
Skill structure changes and final goods (FG) imports: within industry decomposition

	Share of production workers in total employment		share of unskilled workers in production employment	
Within industry change	−0.022		−0.042	
	Between firms	Within firms	Between firms	Within firms
All	0.003	−0.024	0.002	−0.043
Never imports FG	0.003	−0.002	0.002	−0.003
Starts importing FG	0.003	−0.001	0.002	−0.001
Stops importing FG	−0.001	0.000	0.000	0.000
Continuously imports FG, increasing ratio of FG imports to sales	−0.003	−0.013	−0.004	−0.028
Continuously imports FG, constant or decreasing ratio of FG imports to sales	0.000	−0.008	0.002	−0.011
Never imports FG from low wage countries	0.005	−0.006	0.004	−0.012
Starts importing FG from low wage countries	0.006	−0.002	0.004	−0.004
Stops importing FG from low wage countries	−0.002	−0.001	−0.001	−0.001
Continuously imports FG from low wage countries, increasing ratio of low wage FG imports to sales	−0.003	−0.010	−0.004	−0.021
Continuously imports FG from low wage countries, cst or decreasing ratio of low wage FG imports to sales	−0.003	−0.005	−0.002	−0.005

Source: Customs Files and BAL, 1986–1987 and 1991–1992, ESE same years. Total number of firms: 17,190 continuing firms in the manufacturing industry.
FG = Final Goods (same 3 digit imported product as importing firm industry); II = Intermediary Inputs (all other imports).

Table 12
Skill structure changes and intermediary inputs (II) imports: Within industry decomposition

	Share of production workers in total employment		Share of unskilled workers in production employment	
Within industry evolution	−0.022		−0.042	
	Between firms	Within firms	Between firms	Within firms
All	0.003	−0.024	0.002	−0.043
Never imports II	0.001	0.000	0.000	−0.001
Starts importing II	0.003	0.000	0.002	0.000
Stops importing II	−0.001	0.000	0.000	0.000
Continuously imports II, increasing ratio of II imports to sales	0.003	−0.012	0.001	−0.021
Continuously imports II, constant or decreasing ratio of II imports to sales	−0.003	−0.011	−0.001	−0.020
Never imports II from low wage countries	0.004	−0.004	0.002	−0.007
Starts importing II from low wage countries	0.008	−0.002	0.006	−0.006
Stops importing II from low wage countries	−0.001	−0.001	−0.001	−0.002
Continuously imports II from low wage countries, increasing ratio of low wage II imports to sales	−0.006	−0.011	−0.004	−0.020
Continuously imports II from low wage countries, decreasing ratio of low wage II imports to sales	−0.003	−0.006	−0.002	−0.009

Source: Customs Files and BAL, 1986–1987 and 1991–1992, ESE same years. Total number of firms: 17,190 continuing firms in the manufacturing industry.
FG = Final Goods (same 3 digit imported product as importing firm industry); II = Intermediary Inputs (all other imports).

over the period and the change in the share of unskilled blue-collar workers within blue-collar employment over the same period. The format of Tables 13 and 14 is exactly the same as that of Table 8 (see means and standard deviations of the variables in Table B.2 of the Appendix).

We start by analyzing results for production jobs. First, focusing on "all origins" imports of both types (FG or II) have a negative impact on the share of production jobs, more markedly and robustly so for FG (see the weighted regression), as we expect. Second, exports have a small but positive impact on this employment category, mainly in large firms (see again the weighted regression). Third, local purchases — buying inputs rather than producing them — has a large negative impact (slightly larger than that of FG imports; its standard deviation is almost twice that of FG imports). But the analysis by origin or destination tells us something more complex. Imports of FG are more strongly associated with the destruction of production jobs when they come from close countries within the EC, or from other OECD countries (in particular in the weighted regression). By contrast, low-wage countries do not seem to have the "negative role" that they appear to have on employment growth (except for II in the weighted regression, but the standard deviation of that variable is more than half that of its EC equivalent). When French firms compete with firms from developed economies, production may decrease but when French firms compete with firms from developing countries, some establishments may disappear, shedding employment of all types and not only production jobs.

Results for the unskilled tell a complementary story. First, there is basically no association between unskilled job losses and imports in the un-weighted regression. But, the negative association between trade — imports and exports — and unskilled blue-collar employment is

Table 13
Skill structure changes and trade (production workers)

	Change in the fraction of production workers in total employment							
	All origins	EC	Non-EC OECD	Low wage	All origins	EC	Non-EC OECD	Low wage
Δ (FG imports/sales)	−0.077**	−0.076**	−0.126**	−0.068**	−0.070**	−0.062**	−0.143**	−0.050*
	(0.012)	(0.013)	(0.041)	(0.024)	(0.010)	(0.012)	(0.024)	(0.020)
Δ (II imports/sales)	−0.033**	−0.037**	−0.040	−0.011	−0.017	−0.013	−0.049	−0.018
	(0.011)	(0.012)	(0.039)	(0.027)	(0.010)	(0.011)	(0.030)	(0.026)
Δ (exports/sales)	0.027**	0.024*	0.030	0.036	0.035**	0.025**	0.097**	0.039*
	(0.009)	(0.010)	(0.024)	(0.019)	(0.007)	(0.008)	(0.020)	(0.015)
Δ (local purchases/ sales)	−0.062**		−0.062**		−0.074**		−0.075**	
	(0.007)		(0.007)		(0.007)		(0.007)	
Growth of sales	0.008**		0.008**		0.007**		0.007**	
	(0.002)		(0.002)		(0.002)		(0.002)	
Weighted by employment	No		No		Yes		Yes	
R^2	0.043		0.043		0.184		0.186	

Sources: Customs Files, BAL-ESE 1986–1987 & 1991–1992; 17,190 continuing firms in the manufacturing industry; FG = Final Goods (same 3 digit imported product as importing firm industry); II = Intermediary Inputs (other imported products).
** and * Denote coefficients significant at less than 1% and less than 5%. Standard errors are between parentheses. The regression includes indicators for initial firm size, initial import status, NAP 600 affiliation, and for being part of a French or foreign group. The coefficients are not reported.

obvious in the weighted regressions. Hence, among relatively large firms, only the largest destroy unskilled jobs in relation with imports (more strongly for FG) and exports (see again the standard deviations of the explanatory variables in Table B.2). In this Table, and in contrast with all

Table 14
Skill structure changes and trade (unskilled production workers)

	Change in the fraction of unskilled workers within production workers							
	All origins	EC	Non-EC OECD	Low wage	All origins	EC	Non-EC OECD	Low wage
Δ (FG imports/sales)	−0.025	−0.034	0.102	−0.032	−0.054**	−0.028	−0.177**	−0.072
	(0.023)	(0.026)	(0.082)	(0.046)	(0.019)	(0.022)	(0.047)	(0.040)
Δ (II imports/sales)	0.001	−0.015	−0.005	0.106*	−0.071**	−0.070**	−0.197**	0.023
	(0.022)	(0.024)	(0.075)	(0.053)	(0.019)	(0.021)	(0.059)	(0.049)
Δ (exports/sales)	−0.027	−0.044*	0.025	0.013	−0.054**	−0.042**	−0.094*	−0.090**
	(0.017)	(0.019)	(0.047)	(0.036)	(0.013)	(0.015)	(0.039)	(0.030)
Δ (local purchases/ sales)	−0.028*		−0.029*		−0.034*		−0.034*	
	(0.014)		(0.014)		(0.014)		(0.014)	
Growth of sales	0.013**		0.013**		0.019**		0.019**	
	(0.003)		(0.003)		(0.003)		(0.003)	
Weighted by employment	No		No		Yes		Yes	
R^2	0.030		0.031		0.179		0.180	

Notes: Same as Table 13.

previous ones, results tend to be sensitive to the inclusion of firms with extreme export or import growth rates. Quite robust however are the coefficients of FG and II for imports coming from OECD countries (other than EC) in the weighted regressions. They are by far the largest (negative) coefficients in this regression (the standard deviation of the FG (resp. II) variable is half (resp. a third) that of its EC equivalent). These countries must have special role in the sourcing strategies of French firms that the analysis pursued here cannot easily identify. A possible explanation consists in interpreting geographical origin of imports in terms of imported input "quality".

Finally, in the weighted regression, export growth has a negative association with unskilled production jobs for all three zones (the magnitude of the effect is comparable, at one standard

Table 15
Employment growth and skill structure changes: trade and (or) innovation

	Employment growth		Change in fraction of production workers		Change in fraction of unskilled production workers	
Δ (FG imports/sales)	−0.635**	−0.644**	−0.087**	−0.091**	−0.066**	−0.069**
	(0.026)	(0.026)	(0.012)	(0.012)	(0.023)	(0.023)
Δ (II imports/sales)	−0.416**	−0.417**	−0.020	−0.023	−0.086**	−0.085**
	(0.029)	(0.029)	(0.012)	(0.012)	(0.023)	(0.023)
Δ (exports/sales)	0.071**	0.062**	0.036**	0.036**	−0.048**	−0.050**
	(0.018)	(0.019)	(0.008)	(0.008)	(0.016)	(0.016)
Δ (local purchases/sales)	−0.704**	−0.705**	−0.079**	−0.084**	−0.025	−0.024
	(0.021)	(0.021)	(0.009)	(0.009)	(0.017)	(0.017)
Growth of sales	0.729**	0.727**	0.006	0.007*	0.019**	0.018**
	(0.005)	(0.005)	(0.002)	(0.002)	(0.004)	(0.004)
Substantial improvement of existing products		−0.027**		−0.005*		−0.004
		(0.005)		(0.002)		(0.004)
New product at the market level		0.018**		0.002		0.009**
		(0.004)		(0.002)		(0.003)
New product for the firm, but preexisting on the market		0.012**		−0.007**		0.006
		(0.004)		(0.002)		(0.003)
New technological process		−0.014**		−0.009**		−0.001
		(0.004)		(0.002)		(0.003)
Substantial improvement of existing technological process		0.009*		0.007**		−0.004
		(0.005)		(0.002)		(0.003)
Organisational innovation		0.001		−0.006**		0.004
		(0.004)		(0.002)		(0.003)
Commercial innovation		0.016**		0.005*		0.003
		(0.005)		(0.002)		(0.004)
R&D, internal to the firm		0.027**		0.000		0.001
		(0.006)		(0.002)		(0.005)
R&D, internal to the group		−0.013**		0.003		−0.002
		(0.004)		(0.002)		(0.003)
Number of firms	14,537	14,537	11,188	11,188	11,086	11,086
R^2	0.743	0.745	0.222	0.230	0.219	0.221

Sources: Customs Files, BAL 1986–1987 and 1991–1992, ESE same years, Innovation Survey. All regressions are weighted by firm employment. FG = Final Goods (same 3 digit imp. product as imp. firm industry); II = Intermediary Inputs (other imp. products) ** and * denote coefficients significant at less than 1% and less than 5%. Standard errors are between parentheses. The regression includes indicators for initial firm size, initial import status, NAP 600 affiliation, and for being part of a French of foreign group. The coefficients are not reported.

deviation). French firms' comparative advantage is obviously not in unskilled jobs, when compared with most other countries, in particular given the high minimum wage policy.

Table 15 adds measures of innovation to test the robustness of the results to the alternative explanation that changes are due to biased technical change. Table 15 presents regressions similar to those included in the columns "all origins" of Tables 8, 13 and 14). All these regressions are again weighted by firm employment. For each dependent variable (total employment, fraction of production workers in total employment, and fraction of unskilled workers among production workers), we present two specifications of each regression. The first specification, presented in the columns 1, 3, and 5, is identical to that used in Tables 8, 13 and 14). The number of firms, however, differs, as we only retain those firms for which our innovation variables are available. The second specification adds a range of measures of technical, commercial and organizational innovations. Comparing the coefficients of international trade variables in both specifications for all three dependent variables shows that controlling for innovation does not affect the results obtained for imports and exports, even though some innovation variables have a significant association with employment growth and employment structure. This pattern is, however, complex and sometimes sensitive to the composition of the sample. We therefore focus on the most stable results.

Product innovation and commercial innovation have a very clear association with total employment growth. Interestingly, a new product even benefits the unskilled. On the other hand, process innovation as well as product improvement have a negative association with employment growth. The firms that have substantially improved their technological processes experience a positive change in employment, benefiting production workers. The opposite holds for other types of improvements. But, unskilled production workers do not appear to be more affected by these improvements than skilled production workers: changes affect total production. Finally, firms that innovated through internal R&D experience higher employment growth; the opposite holds for external R&D.

To the extent that these results tell us something about two competing explanations, trade and technical change, for observed changes in employment (total and composition), these regressions suggest that these explanations are complementary rather than substitutes.

6. Conclusion

We have related total employment growth, changes in the proportion of production workers in total employment, and changes in the proportion of unskilled production workers in total production labor, to changes in trade variables, namely imports and exports of firms. We find evidence that firms importing finished goods (FG) always destroy more employment than firms importing only intermediary inputs (II) conditional on changes in local purchases. The first type of imports may reflect outsourcing strategies. Imports from low-wage countries have a slightly more negative association than average imports, but the difference is minor. Exports are positively associated with employment growth.

Turning to skills, we find the usual result that most changes occur within firms, a fact often interpreted as evidence of skill-biased technical change. Using a regression framework, we find that increased FG imports have a negative association with production labor, as well as unskilled labor (at least in the largest firms). Controlling for innovations taking place at the firm does not alter any of our conclusions.

Our approach is purely descriptive. To go a step further and identify causal effects, two directions can be taken. In one, valid instruments for firms' imports and exports have to be found.

A potential route is the use of variations in exchange rates. In the second direction, the estimation of structural models (as those of Eaton and Kortum, 2002 or Melitz, 2003), should help identify the effects of trade on employment.

Appendix A

Up to 1992, all movements of goods entering or leaving France were declared to French customs either by their owner or by the authorized customs commissioners. These declarations constitute the basis of all French trade statistics. Each movement generates a record. Each record contains the firm identifier, the SIREN, the country of origin (for imports) or destination (for exports), a product identifier (6-digit classification), and a date. All records are aggregated first at the monthly level. In the analysis files accessible to researchers, these records were further aggregated by year and by 3-digit product (NAP 100 classification, the equivalent of the 3-digit SIC code). Therefore, each observation is now identified by a SIREN, a NAP code, a country code, an import or export code, and a year. Hence, the analysis file contains, for all exporting or importing firms, the amount of their total transactions in each year between 1986 and 1992 for each product of the NAP 100, by destination for exports and origin for imports. Product codes (for exports or imports) are sometimes missing. This virtually never happens in the first years but is more frequent in 1992. In our analysis, we keep track of these unknown products. Transactions are recorded in French Francs and measure the amount paid or *received* by the firm (i.e. including discounts, rebates, etc.). Even though our file is exhaustive — all exported and imported goods are present — direct aggregation of all movements differ from published trade statistics, the latter being based on list prices (as opposed to transaction prices). In addition, the analysis files include imports or exports made by manufacturing firms but also those made by trade firms or firms from the service industries.

To give an idea of the size of our data source, the import analysis file available to researchers has 730,921 observations (SIREN identifiers times NAP 100 codes) for year 1986 and 786,299 for year 1987 (Similarly, the export analysis file has 832,072 observations for year 1986 and 859,115 for year 1987).

In order to make this information tractable, we further aggregate the geographic classification into 3 categories: European Community (plus Switzerland), Other OECD countries and low-wage countries. To deflate these measures of firm-level trade, we use 3-digit import and export prices computed for three geographic zones (EC, OECD outside EC, outside OECD) by the statisticians from the French National Accounts.

Since the Customs file contains only information on the trade of goods — nothing on services — we will focus on firms from the manufacturing sectors (excluding the construction industry).

The resulting file contains one observation per firm and year between 1986 and 1992, with international trade variables consisting of deflated imports of FG and II by broad geographic origin, as well as deflated exports by broad geographic destination. When the product is unknown, we construct a third category of product (aggregated with II in some of our analyses after due checks that results are unaffected). This file is first matched with the BAL-SUSE database, which provides firm-level information.

The BAL-SUSE database is constructed from the mandatory reports of French firms to the fiscal administration. These reports are then transmitted to INSEE where the data are validated. All firms subject to the "Bénéfices Industriels et Commerciaux" regime (a fiscal regime mandatory for all firms with a turnover above 3,000,000 FF in 1990 and 1,000,000 FF in 1990 in the service industries) are included. In 1990, these firms comprised more than 60% of the total

number of firms in France whereas their turnover comprised more than 94% of total turnover of firms in France. Hence, the BAL-SUSE is representative of French enterprises in all sectors except the public sector.

From this source, we use balance sheet information (total sales, total labor costs, total wage-bill, sales, value-added, total purchases, total assets, total employment). To deflate those variables, we use various industry-level prices, production, value-added, and wages. All these prices come from French National Accounts using a 2-digit level of aggregation (24 manufacturing industries, in the NAP classification).

The BAL-SUSE database contains 330,945 firms belonging to manufacturing industries (excluding construction) over the period 1986–1992. There are 149,922 "continuing firms" present over the period. Among these firms, a significant fraction has zero employment both at the beginning and at the end of the sample period. Our regression analysis eliminates these firms from the continuing firms. In addition, some observations with extreme values of the explanatory variables are deleted. The regression analysis includes 116,426 firms.

This previous dataset does not provide information on the composition of firm employment by category of skill. To measure skills, the only available source over the 1986–1992 period is the Employment Structure Survey (ESE, "Enquête sur la Structure des Emplois"). The ESE is a yearly survey carried out jointly by the French Ministry of Labour and INSEE. All establishments with more than 10 employees until 1988, 20 employees thereafter, are requested to provide information on their skill structure of employment by sex. We use the 1986 to 1992 surveys aggregated at the firm-level, to supplement the information on firm employment provided by the BAL-SUSE database. This aggregation of establishment level information to the firm level may induce measurement error for firms with a large number of establishments below the threshold of 10 or 20 employees, and thus not surveyed by the ESE. The 1986 survey has a number of 105,821 firms, while the 1992 survey has 69,072 firms. Merging with the BAL-SUSE dataset leaves us with 39,459 firms. Among them, 17,190 are present in the ESE at both dates and have valid variables.[15]

Skill groups correspond to the 2-digit French Classification of Occupations and Social Categories. We divide these categories into six groups : executives, technicians, intermediate administrative occupations, clerks, skilled production workers and unskilled production workers. We first compute the proportion of production workers in total employment. We then compute the ratio of the number of unskilled production workers to the total number of production workers.

The previous literature raised the issue of the extent to which technical change versus international trade is responsible for changes in employment structure. As a final step, we merge these two datasets with the 1991 Innovation survey. This survey covers manufacturing firms with 20 employees or more. Firms are asked to report their product innovations, process innovations, commercial innovations and organizational innovations for the period 1986–1990. Hence, innovations carried out in 1991 and 1992 are not reported, leading to an underestimate in the link between innovation and employment. This is however the closest we can get to measuring firms' innovation behavior over our period of analysis. Merging the Innovation Survey with the ESE file reduces the sample size from around 17,000 to around 13,000 continuing firms.

[15] We eliminate firms with anomalous growth rates for at least one of the variables in our regressions. All programs are available from the authors.

Table A.1
Distribution of employment and the import–export status

	Number of firms	First quartile	Median	Third quartile
Continuing firms				
Never imports	106,909	0	2	4
Starts importing	8653	4	9	20
Stops importing	7145	3	7	17
Continuously imports, increasing ratio of imports to sales	13,928	11	30	72
Continuously imports, constant or decreasing ratio of imports to sales	13,287	9	25	59
Dying firms				
Does not import	81,332	0	1	2
Imports	14,907	2	6	18
New-born firms				
Does not import	71,283	0	1	2
Imports	13,501	2	5	14
Continuing firms				
Never exports	110,054	0	2	5
Starts exporting	7426	4	9	23
Stops exporting	7319	3	8	19
Continuously exports, increasing ratio of exports to sales	13,221	11	29	73
Continuously exports, constant or decreasing ratio of exports to sales	11,902	9	25	58
Dying firms				
Does not export	82,676	0	1	2
Exports	13,563	2	6	18
New-born firms				
Does not export	73,578	0	1	2
Exports	11,206	2	5	15

Source: Customs Files and BAL, 1986–1987 and 1991–1992. Number of firms: 330,945 in manufacturing industries.

Table B.1
Employment growth and trade descriptive statistics (full sample)

	Means and standard deviations							
	All origins	EC	Non-EC OECD	Low wage	All origins	EC	Non-EC OECD	Low wage
Δ (FG imports/sales)	0.000	−0.001	0.000	0.001	0.006	0.002	−0.001	0.005
	(0.044)	(0.039)	(0.011)	(0.021)	(0.406)	(0.315)	(0.150)	(0.171)
Δ (II imports/sales)	0.001	0.000	0.000	0.001	0.003	0.001	0.001	0.002
	(0.046)	(0.042)	(0.012)	(0.019)	(0.352)	(0.305)	(0.101)	(0.130)
Δ (exports/sales)	0.002	0.003	0.000	−0.001	0.013	0.016	−0.001	−0.002
	(0.049)	(0.042)	(0.017)	(0.023)	(0.485)	(0.404)	(0.145)	(0.198)
Δ (local purchases/sales)	0.004				0.017			
	(0.122)				(0.566)			
Growth of sales	0.121				0.124			
	(0.508)				(2.301)			

(continued on next page)

Table B.1 (*continued*)

	Means and standard deviations							
	All origins	EC	Non-EC OECD	Low wage	All origins	EC	Non-EC OECD	Low wage
Weighted by employment	No		No		Yes		Yes	

Sources: Customs Files, BAL 1986–1987 and 1991–1992; 116,426 continuing firms in the manufacturing industry (with non-zero average employment across the period); FG = Final Goods (same 3 digit imported product as importing firm industry); II = Intermediary Inputs (other imported products).

Table B.2
Employment growth and trade descriptive statistics (ESE sample)

	Means and standard deviations							
	All origins	EC	Non-EC OECD	Low wage	All origins	EC	Non-EC OECD	Low wage
Δ (FG imports/sales)	0.002	0.000	0.000	0.002	0.006	0.002	−0.001	0.005
	(0.056)	(0.051)	(0.015)	(0.026)	(0.849)	(0.647)	(0.339)	(0.356)
Δ (II imports/sales)	0.001	0.000	0.000	0.001	0.001	−0.001	0.000	0.001
	(0.061)	(0.056)	(0.016)	(0.022)	(0.754)	(0.664)	(0.212)	(0.265)
Δ (exports/)	0.007	0.010	−0.001	−0.002	0.011	0.016	−0.002	−0.003
	(0.070)	(0.061)	(0.025)	(0.032)	(1.008)	(0.871)	(0.334)	(0.421)
Δ (local purchases/sales)	0.015				0.021			
	(0.094)				(1.162)			
Growth of sales	0.134				0.097			
	(0.374)				(4.334)			
Weighted by employment	No		No		Yes		Yes	

Sources: Customs Files, BAL-ESE 1986–1987 and 1991–1992; 17,190 continuing firms in the manufacturing industry.

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