Market Organization and Propagation of Shocks: The Furniture Industry in Germany and Italy

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ABSTRACT. In this paper we study the furniture industry in two European countries, Germany and Italy. Although the two industries are characterized by very similar output and technology, they differ widely in terms of market organization, most notably the distribution of firms by size, and the organization of retail. We find some evidences that these differences have an influence on the dynamic behavior of industry output, prices and exports in the two countries.

1. Introduction

In this paper we study the furniture industry in two European countries, Germany and Italy. Although the two industries are characterized by similar output and technology, major differences emerge in terms of market organization. Most notably, the distribution of firms by size and the organization of retail are much more concentrated in Germany than in Italy, where small business accounts for a much larger share of industry output. The aim of our paper is to relate these differences in market organization to the different dynamic behavior of industry output, prices and exports in the two countries.

There are two motivations for our exercise. First, starting with the seminal paper by Nelson and Plosser (1982), macroeconomists have increasingly been interested in investigating the persistence of unanticipated shocks to aggregate output. More recently, there have been attempts to study the issue of persistence within a multisector and possibly multi-country framework (see for example Stockman, 1988, and Lee et al., 1992). A general finding is that there is considerable heterogeneity – both across industries and, for the same industry, across countries – in the response to aggregate and sector-specific shocks. Moreover, it appears that sector-specific shocks have a more persistent impact, on both sectoral and aggregate output, than aggregate shocks. A major limitation of these studies is that they do not explain why we observe such differences in responsiveness across sectors and, for the same sector, across countries. One important explanation may be differences in market organization, and particularly in industry structure.

These differences are substantial. For example, the variance of the distribution of firms by size in European industries is analyzed by Schwalbach (1994), who finds evidence of large cross-country variations within the same industries, as well as changes in favor of small firms in Southern europe, including Italy.

Second, traditional studies of the distribution of firms by size, across industries or across countries, pay limited attention to what differences in industry structure imply for the dynamic behavior of industry variables. This behavior cannot simply be reduced to the growth rates of a few indicators, such as output or prices. Rather, one needs to investigate the way in which supply and demand shocks are propagated and industries react to these shocks.

Market concentration is known to play a fun-

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damental role in industry dynamics. For example, Audretsch and Acs (1994) find that it has a negative and significant impact on new firms startup in the U.S.A. In addition, economic theory suggests an inverse relationship between the responsiveness of an industry to demand and supply shocks and its degree of concentration: if an industry is more concentrated, then output and price responses to shocks should be smaller and we would expect a stronger response to demand shocks than to technology shocks. These conclusions are easily derived by examining the comparative statics of two extreme cases: a perfectly competitive industry and a pure monopoly facing the same (linear) inverse market demand function and the same (linear) marginal cost function. They can also be derived from an oligopoly model of the Cournot type. Although these models are theoretical abstractions, it is interesting to ask whether their qualitative predictions agree with the observed behavior of industries that differ mainly in their market organization.

The furniture industry in Italy and Germany is a good laboratory to study these issues. The reasons for this are explained in some detail in the next Section. Obviously, if we were to find different dynamic responses between the two countries, this may be due to reasons other than market organization. But if the empirical findings display the expected behavior, our explanation has clear advantages in terms of simplicity.

The paper proceeds as follows. Section 2 summarizes the differences in market organization of the furniture industry in the two countries considered. Section 3 describes our methodology for analyzing the data. Section 4 analyzes the joint dynamic behavior of output, prices and exports in the two countries. Finally, Section 5 contains some conclusions.

2. The furniture industry in Germany and Italy

Germany and Italy have the largest furniture industry in Europe, and are among the largest exporters of furniture on the world market. Further, both countries are characterized by sustained growth rates of real exports. There are, however, important differences between the two industries, which we now outline briefly.

Although total industry output is about the same in both countries, the size of the domestic market is larger in Germany,[1] due both to a larger population and a higher per-capita expenditure on furniture. As far as output growth is concerned, the early 1980s recession had a much stronger impact in Germany than in Italy (Figures 1 and 2). Starting with 1986, Italian firms resumed investing heavily to increase their capacity, and even in periods when demand was highest, their production remained well below full capacity. On the other hand, German firms were operating at higher levels of capacity, reducing domestic investments and increasingly investing abroad.

The relative importance of imports and exports of furniture is different in the two countries. In 1990, imports accounted for about 21% of consumption in Germany (up from about 13% in 1980), but only 2.2% in Italy. In the same year, about 26% of the Italian output was exported, whereas for Germany this percentage was only 18%.

Export growth has been much stronger in Italy. Between 1980 and 1990, Italian exports increased by about 70% in volume, against 28% for Germany. In the early 1990’s, Italian exports increased rapidly (+38% between 1990 and 1994), thanks also to the currency devaluation, while Germany experienced a strong decrease in exports (–14%). As a result, Germany, which had been a net exporter until 1990, after that date became a net importer due to both a stronger currency and the additional demand from the Eastern Laenders.

As it is clear from Table I, in addition to the intense growth, one can also observe large shifts in the composition of Italian exports in terms of destination. On the other hand, the composition of German exports is much more stable, with over 60% of total exports absorbed by five neighbor countries.

The two industries differ somewhat in product specialization (Table II). Germany specializes in the production of kitchen and office furniture, whereas Italian production concentrates on bedroom and living room furniture, where unit values are lower. A similar degree of product specialization can be found at the export level.

More striking are the differences between the two countries in the distribution of firms by size. With reference to 1991, the last year for which

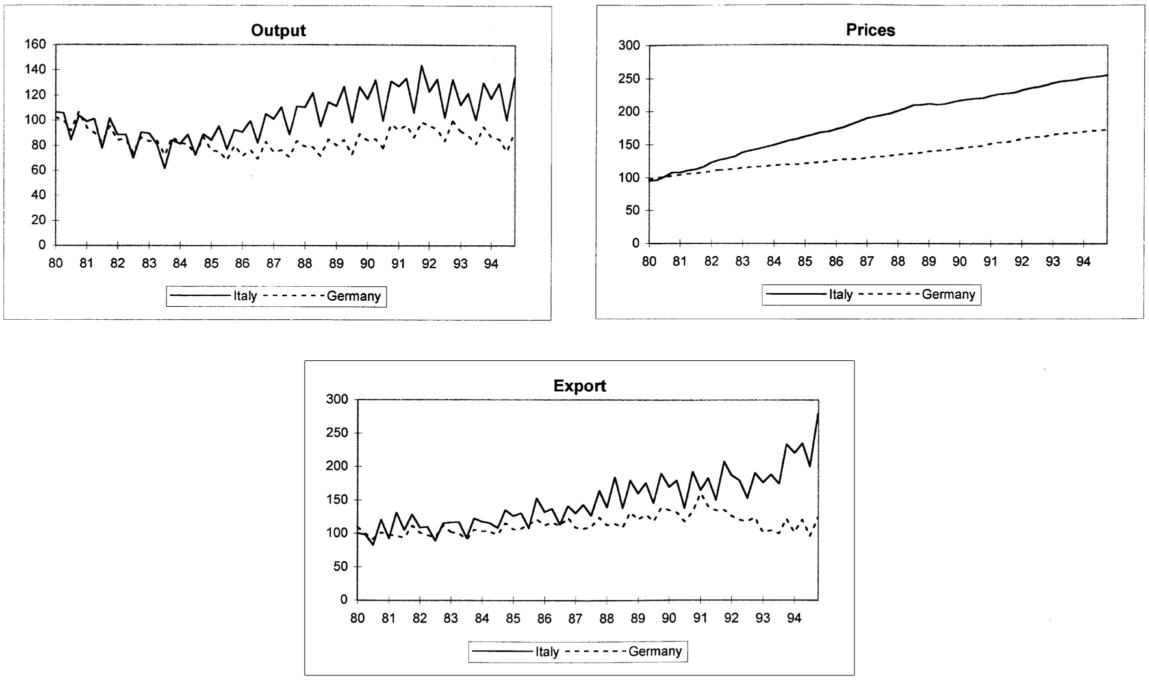

Figure 1. Data in levels (1980 = 100).

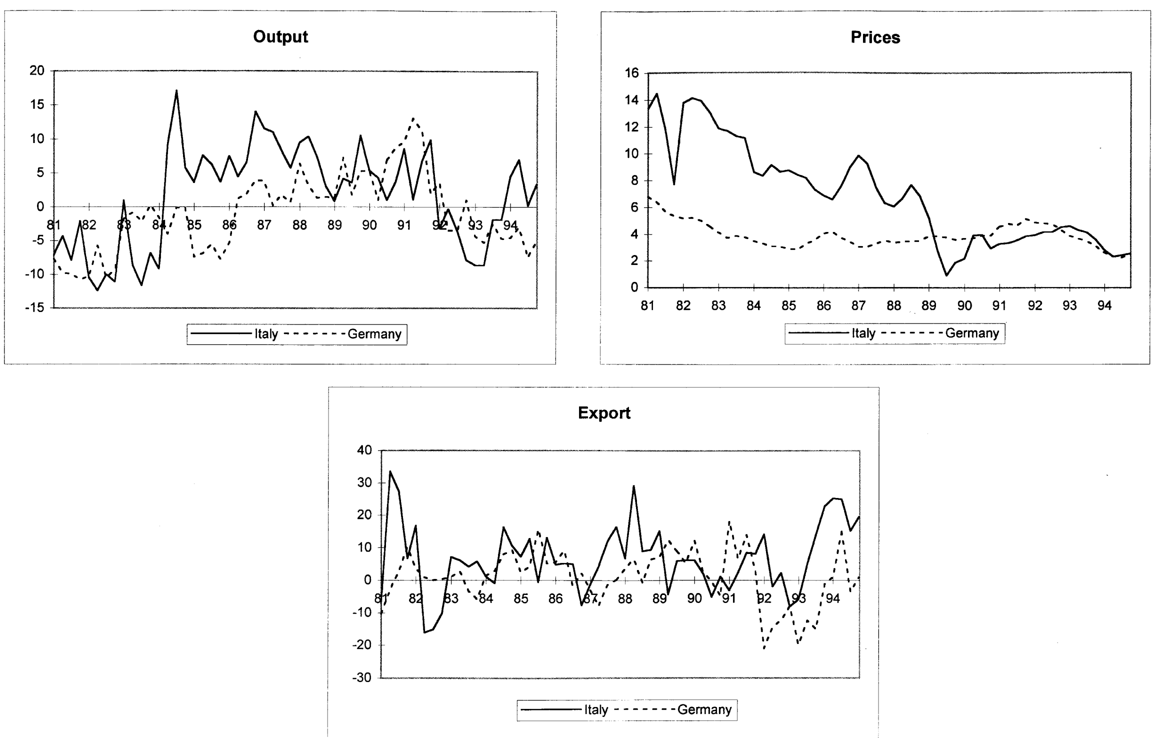

Figure 2. Annual growth rates.

TABLE I
Export shares by major destination. Percent, various years

	1980	1985	1990	1994
Germany, value				
Netherlands	29.0	18.5	20.2	18.1
Belgium-Luxembourg	15.1	7.8	11.9	9.8
France	11.9	11.5	12.4	9.3
Austria	12.8	13.5	13.0	16.7
Switzerland	10.3	13.5	14.6	15.1
Italy, value				
France	24.2	23.8	23.7	14.5
Germany	21.9	14.7	20.0	26.7
Arab countries	9.3	11.0	5.2	6.2
U.S.A.	2.4	12.6	10.2	8.7
U.K.	2.5	6.0	7.1	5.7

Source: CSIL (1995b).

TABLE II
Production by type of product. Values in million ECU, 1991

	Germany		Italy	
	Value	%	Value	%
Upholstered	2,374	15.0	2,250	14.9
Kitchens	2,571	16.3	1,324	8.8
Bedrooms	1,405	8.9	2,781	18.4
Living rooms	1,318	8.3	2,035	13.5
Other household-wood	1,481	9.4	2,044	13.5
Office	2,566	16.2	1,498	9.9
Community and other	4,096	26.0	3,172	21.0
Total	15,811	100.0	15,107	100.0

Source: CSIL (1995a)

figures are available for both countries, in Germany we had 1,073 firms with more than 20 employees in the wood furniture industry, while in Italy we had 1,912 firms (Table III). The corresponding total labor force was 115,941 in Germany and only 88,964 in Italy. The average size of Italian firms with more than 20 employees was therefore 47, against a German total average of 108. The turnover per employee at 1991 prices and exchange rates was, however, greater for Italian firms: 115,200 ECU compared with 99,400 ECU in Germany.

Table III shows also the differences between the two countries in the distribution of firms by number of employees. The furniture industry, albeit mostly a small business sector in both countries, is far more concentrated in Germany than in Italy. Firms with fewer than 50 employees are almost 75% of the Italian total against 47% for Germany. In the range 50–99 employees, we find

TABLE III
Distribution of firms by size, 1991

Class by number of employees	Firms		Employees		Turnover*	
	Number	%	Number	%	Million ECU	%
Germany						
20–49	503	46.9	16,698	14.4	1,252	10.9
50–99	250	23.3	16,992	14.7	1,378	12.0
100–199	172	16.0	22,358	19.3	2,136	18.5
200–499	122	11.4	36,508	31.5	4,194	36.4
500+	26	2.4	23,385	20.2	2,559	22.2
Total	1,073	100.0	115,941	100.0	11,520	100.0
Italy						
20–49	1,428	74.7	40,532	45.6	3,968	38.7
50–99	330	17.3	23,620	26.6	2,935	28.6
100–199	106	5.5	14,795	16.6	1,868	18.2
200–499	42	2.2	7,755	8.7	1,228	12.0
500+	6	0.3	2,262	2.5	252	2.5
Total	1,912	100.0	88,964	100.0	10,251	100.0

Source: Deutsche Statistische Bundesamt, ISTAT and CSIL.
* Italian turnover data are estimated.

23% of the German firms but only 17% of the Italian ones. Firms with fewer than 100 employees absorb 72% of the sector labor force in Italy and make up around 67% of the total turnover. In Germany these percentages fall to 29% for employees and 23% for turnover. In Germany the highest quota of industry turnover (55%) belongs to medium-sized firms with 100 to 500 employees, which represent 27% of the firms and employ 51% of the sector labor force. The differences between the two countries are even greater when large firms (over 500 employees) are considered: these are virtually non-existent in Italy, accounting for a mere 2.5% of turnover, against 22% in Germany.

Table IV presents some indices of concentration for the two countries.[2] The top 5 firms account for 11% of total sector turnover in Germany, against 3.2% in Italy. The top 10 German firms account for 16.8% of total sector turnover, a higher percentage than what is accounted for by the top 50 Italian firms, whose combined total is only 13.5%. If we compare, for both countries, the wood furniture figures with other industries, it becomes apparent that, in absolute terms, this industry is not strongly concentrated. However, as it is clear from both Table III and Table IV, there are strong differences between Italy and Germany, which make interesting to study the different dynamic behavior of industry variables.

The retail organization is also much more concentrated in Germany than in Italy. Distribution in Italy is very fragmented. Organized distribution (chains, purchasing groups, franchising) is virtually non-existent. The few groups which are present (about 10 in all) only handle 3% of total sales. Distribution is almost exclusively (94%) through individual shops (totaling some 25,300), among which "traditional" outlets are predominant (63%). The latter are usually small, both in terms of physical size and turnover (the average size is 370 square meters and average turnover is 0.4 million ECU), they sell many products and are often family-run. Large shops offering products in the economic-to-middle price range claim a 10% share of the market, as do multi-product shops which specialize in the top range of the market. Specialized outlets, most of which deal in kitchen furniture, only make up 5% of the market.

By contrast, distribution in Germany is very concentrated. Organized distribution represents

TABLE IV
Concentration indices. All firms, 1991. Values in million ECU

	Turnover		Exports		Employment		Turnover per employee
	Value	%	Value	%	Number	%	
Germany							
Leader	631	3.3	160	5.0	4,800	2.5	306.9
Top 5	2,112	11.0	520	16.4	13,721	7.3	250.9
Top 10	3,220	16.8	784	24.7	22,421	11.9	230.4
Top 20	4,847	25.3	1,175	37.0	33,911	18.0	197.1
Top 30	5,911	30.8	1,479	46.6	42,368	22.5	177.3
Top 40	6,791	35.4	1,694	53.3	48,633	25.8	164.9
Top 50	7,539	39.3	1,850	58.3	53,284	28.3	154.4
Total	19,171	100.0	3,176	100.0	188,606	100.0	114.9
Italy							
Leader	174	1.2	168	3.9	1,568	1.6	365.3
Top 5	491	3.2	335	7.7	4,723	4.7	345.5
Top 10	769	5.1	460	10.6	7,155	7.2	320.7
Top 20	1,220	8.1	635	14.6	10,508	10.6	289.7
Top 30	1,559	10.3	757	17.4	13,147	13.2	269.2
Top 40	1,825	12.1	852	19.6	15,295	15.4	255.7
Top 50	2,047	13.5	927	21.3	17,172	17.3	244.9
Total	15,107	100.0	4,356	100.0	99,460	100.0	135.4

Source: CSIL (1995a).

86% of the market, with the top 20 organizations claiming a 20% share. Also in Germany, individual shops predominate (80% market share) but the number of sales outlets is only 12,500, about half as many as in Italy, with an average size that is more than double that the Italian one (840 square meters and a turnover of 1 million ECU). The majority of outlets operate on an associative basis, and purchasing groups dominate, leaving only a small percentage of the market to independent dealers. Chains specializing in the economic-to-middle price range have a larger market share than in Italy, whereas 18% of total sales are through non-specialists (6% in Italy), divided more or less equally among department stores, hypermarkets and mail orders.

3. Methodology

Our data consist of quarterly time series on industry output, prices and exports. German data are from the Deutsche Statistische Bundesamt, Italian data are from ISTAT. The output indicator is the real turnover index for Germany, and the index of industrial production for Italy. Prices are domestic prices for both countries. The time series of Italian prices is obtained from two different series: the wholesale price index up to 1986 and the production price index afterwards. All variables are indices with base 1980 = 100. The sample covers the period from the first quarter of 1980 to the fourth quarter of 1994. This choice of the sample period is motivated by the poor quality of Italian industry data up to the late 1970s.[3]

The time series of the industry indicators are presented in Figure 1. Important features of the data are: the presence of trends in all the series, a strong seasonal pattern in output and exports, and the fact that both the trend and the seasonality appear to contain stochastic components.

We now describe briefly the methodology adopted for analyzing the data. Let time be indexed by $t = 1, \dots, T$. We regard the data for each country as a realization of an underlying discrete-time stochastic process, which we assume is well described by some, perhaps very complicated, linear dynamic simultaneous equation model of the form.

$$B(L)g(Z_t) = C(L)\varepsilon_t, \qquad (1)$$

where Z_t denotes an m-vector of industry-specific and economy-wide indicators for each of the two countries, $B(L)$ and $C(L)$ are finite-order polynomial matrices in the lag operator L, $g(\cdot)$ is a suitable monotonic transformation of Z_t, and $\{\varepsilon_t\}$ is an m-variate white-noise process, that is, a sequence of uncorrelated random vectors with zero mean and finite, positive definite (p.d.) variance matrix. The model also includes a constant, that is omitted for notational convenience.

We assume that the matrix $B(0)$ is non singular. To model the presence of stochastic trend and seasonal components in the data, we also assume that $B^{-1}(0)\ B(L) = \Phi(L)(1 - L^4)$ and $g(Z_t) = \ln Z_t$. Under these two assumptions, we can represent (1) as an m-variate autoregressive moving-average (ARMA) model

$$\Phi(L)Z_t = \Theta(L)\varepsilon_t$$

where $\Phi(0) = I_m$, the identity matrix of order m, $\Theta(L) = B^{-1}(0)\ C(L)$ and $Z_t = \ln Z_t - \ln Z_{t-4}$ is the vector of (instantaneous) growth rates of each variable with respect to the same quarter of the previous year.

Now partition the transformed data vector as $Z_t = (Y_t^T, X_t^T)$, where Y_t is a q-vector containing the growth rates of the industry indicators (output, prices and exports), and X_t contains the growth rates of other variables, such as macro-economic indicators, that may help to explain Y_t. Partition the vector of innovations in (1) accordingly as $\varepsilon_t = (U_t^T, V_t^T)^T$. In obvious notation, the joint process for $\{Y_t\}$ and $\{X_t\}$ may be written as

$$\Phi_{YY}(L)Y_t + \Phi_{YX}(L)X_t = \Theta_{YY}(L)U_t + \Theta_{YX}(L)V_t,$$

$$\Phi_{XY}(L)Y_t + \Phi_{XX}(L)X_t = \Theta_{XY}(L)U_t + \Theta_{XX}(L)V_t.$$

If $\{X_t\}$ is (weakly) exogenous with respect to $\{Y_t\}$, then the polynomial matrices Φ_{XY} and Θ_{XY} are identically equal to zero, and $\{U_t\}$ and $\{V_t\}$ are uncorrelated white-noise processes. If, in addition, all roots of the polynomial equation $\det[\Phi_{XX}(z)] = 0$ lie outside the unit circle, then $\{Y_t\}$ also possesses a q-variate ARMA representation

$$\Phi_Y(L)Y_t = \Theta_Y(L)\eta_t, \qquad (2)$$

where $\{\eta_t\}$ is a q-variate white-noise process.

As an approximation to (2), we consider the class of p-th order multivariate AR models

$$\Phi(L)Y_t = \eta_t, \qquad (3)$$

where $\Phi(L) = I_q - \sum_{h=1}^{p} \Phi_h L^h$ is a $q \times q$ matrix whose elements are p-th order polynomials in the lag operator, and $\{\eta_t\}$ is a q-variate white-noise process with finite, p.d. variance matrix equal to Ω. Under the causality assumption, the vector process $\{Y_t\}$ has the MA(∞) representation

$$Y_t = \Psi^*(L)\eta_t,$$

where the coefficients of the polynomial matrix $\Psi^*(L) = \sum_{h=0}^{\infty} \Psi_h^* L^h = \Phi^{-1}(L)$ are complicated non-linear functions of the parameters in $\Phi(L)$ [see e.g. Lütkepohl (1991)].

Because Ω is a symmetric positive definite matrix, there always exists a non-singular matrix H such that $H\,\Omega\,H^T = I_q$, and a corresponding MA(∞) representation of Y_t

$$Y_t = \sum_{h=0}^{\infty} (\Psi_h^* H^{-1})(H\eta_{t-h}) = \sum_{h=0}^{\infty} \Psi_h v_{t-h}$$

in terms of contemporaneously uncorrelated innovations $v_t = H\eta_t$. We can now interpret φ_{ijh}, the (i, j)-th coefficient in $\Psi_h = \Psi_h^* H^{-1}$ as the response of $Y_{i,\,t-h}$ to a unit change in v_{jt}, the innovation to the j-th variable in the system. Further, the proportion of the h-quarter ahead forecast error variance of the i-th variable in the system that is accounted for by the innovation in the j-th variable is given by

$$\pi_{ijh} = \frac{\sum_{k=0}^{h-1} \varphi_{ijk}^2}{\sum_{l=1}^{q} \sum_{k=0}^{h-1} \varphi_{ilk}^2}$$

The impulse response functions $\{\varphi_{ijh}\}$ and the variance decompositions $\{\pi_{ijh}\}$ are a convenient way of summarizing the dynamic behavior of the industry indicators in $\{Y_t\}$.

The matrix H is unique only when Ω is diagonal, that is, the components of η_t are contemporaneously uncorrelated. Otherwise, the same multivariate AR(p) model may imply different impulse response functions and variance decompositions depending on the particular choice of H. In this paper we assume that H is a Cholesky decomposition of Ω, that is, a lower triangular matrix with positive elements on the main diagonal. This corresponds to the assumption that (2) satisfies the recursive system

$$\Phi(\mathrm{L})H_{Y_t} = v_t, \tag{4}$$

where Y_{1t} is predetermined with respect to Y_{2t} and Y_{1t} and Y_{2t} are predetermined with respect to Y_{3t}.

4. Results and discussion

Table V presents summary statistics for each time series. Notice that Italian growth rates are higher on average than the German ones; moreover, the coefficients of variation of output and exports are higher in Germany than in Italy, while the reverse is true for prices. Dickey-Fuller tests [Dickey and Fuller (1981)] do not reject the null hypothesis of absence of unit roots. Ljung-Box tests (Ljung and Box (1978)] always reject the null hypothesis that

TABLE V
Summary statistics. Sample period 1980:1–1994:4

	Output growth		Price growth		Export growth	
	Germany	Italy	Germany	Italy	Germany	Italy
Mean	–0.013	0.019	0.041	0.076	0.005	0.055
Std.dev.	0.057	0.076	0.013	0.052	0.085	0.102
Coeff. var.	–4.458	4.029	0.309	0.686	16.765	1.838
p(1)[1]	0.783	0.696	0.894	0.806	0.551	0.394
p(2)	0.158	0.048	–0.229	–0.198	0.100	0.069
p(4)	–0.316	–0.126	–0.136	0.048	0.021	–0.386
p(8)	–0.168	–0.274	–0.081	0.077	–0.174	–0.228
Dickey-Fuller[2]	–2.987	–2.092	–3.420	–0.945	–0.122	–1.922
Ljung-Box[3]	120.000	66.900	141.000	136.000	34.900	28.800

[1] p(h) = residual autocorrelation at lag h.
[2] Dickey-Fuller test (critical value: 5% = –3.497).
[3] Ljung Box test based on first 8 autocorrelations (critical value: 5% = 15.507).

a series is a white-noise process. In fact, examination of the autocorrelation functions reveals a high degree of persistence in all time series.

Our objective is to examine the joint behavior of the endogenous variables in the system. In particular, we are interested in analyzing the dynamic response of each series not only to its own shocks but also to shocks in all other series. As it is clear from (4), a particular ordering of the variables in the system corresponds to specific assumptions about the causal relationships at the industry level. In our case, there are six possible orderings of the three variables (output, prices, export), and one can find some plausible justifications for almost all of them in terms of economic behavior of the industry. However, considering the characteristics of the furniture industry in the sample period, we believe that the ordering

$$\text{Output} \Rightarrow \text{Prices} \Rightarrow \text{Exports}. \qquad (5)$$

is the best representation of industry dynamics.

From the above discussion, this ordering corresponds to the assumption that shocks to price and export growth have no contemporaneous effect on output growth, and shocks to export growth have no contemporaneous effect on price growth. In fact, it seems quite plausible that, even in a highly competitive industry, where small firms are able to react very quickly to changes in their environment, output would respond with some lag to both price shocks and to export shocks, for the usual difficulties of adjusting production processes. At the same time, prices would display a lagged response to export shocks, typically because exporters tend to exploit, at least initially, all their new market opportunities. This seems to be true regardless the source of these shocks: domestic demand or cost reasons for price shocks, export demand or exchange rates reasons for export shocks.

In the furniture industry, the casual relationship in (5) can be related both to structural factors and to general macroeconomic trends. In fact, in a highly competitive industry (Italy in our specific case), we expect, in general, that a positive (negative) shock in output growth would determine a decrease (increase) in domestic price growth, which would result in higher (lower) export growth rates. In a more concentrated industry, and in presence of a concentrated retail sector (Germany), we expect a lower response of prices to output, typically because of rigidities in the contractual relationships between producers and retailers, and the related significant monopsony power of retailers, which make price transmission less efficient. In this context, we also expect a lower impact of price growth on export growth.

However, the situation may be complicated by the relationships between industry specific trends and general macroeconomic trends. In fact, if output growth increases (decreases) because of business cycle fluctuations, it would typically generate an impact in price in the same direction, and this effect may last for some periods; clearly, *ceteris paribus*, this situation would generate an opposite effect on exports.

Several multivariate AR models were fitted to the growth rates of output, prices and exports in each country, with a constant included in all models. For both Germany and Italy, the ‘best’ model on the basis of the Akaike and Schwarz criterion is a multivariate AR(1) model. Table VI presents the parameter estimates and the correlation matrix of the residuals for the ‘best’ model.

For both countries, the best econometric results are from the price equation, whose series can be well interpreted by this kind of model; on the contrary, the export equation is the most difficult to estimate, probably because of the particular trend pattern that we have in the sample period (Figure 2).

The main differences between Germany and Italy are in the output and price equations. The coefficient on lagged prices in the output equation is negative, but is only statistically significant for Italy. The coefficient on lagged output in the price equation is positive and significant for both countries, but the size of the coefficient is much larger in Germany than in Italy; again, the coefficient on lagged export in the price equation is positive for Germany and negative for Italy, although it is statistically significant only at the 10% level.

Notice that all residual cross correlations are positive, except for the price and export equation in Italy. Moreover, in absolute values, we have higher residual cross correlation for the German model.

To verify our prior hypothesis on industry dynamic behavior, it is more interesting however

TABLE VI
Multivariate AR(1) models. Sample period 1980:1–1994:4. Asymptotic standard errors in parentheses

Parameter estimates	Output growth		Price growth		Export growth	
	Germany	Italy	Germany	Italy	Germany	Italy
Output (–1)	0.766[1]	0.699[1]	0.013[1]	0.048[1]	–0.101	0.076
	(0.086)	(0.088)	(0.006)	(0.014)	(0.170)	(0.162)
Prices (–1)	–0.334	–0.256[2]	0.959[1]	0.984[1]	–1.084	–0.222
	(0.371)	(0.138)	(0.028)	(0.023)	(0.736)	(0.255)
Exports (–1)	0.016	–0.010[2]	0.007[2]	–0.019[2]	0.534[1]	0.378[1]
	(0.057)	(0.068)	(0.004)	(0.011)	(0.113)	(0.126)
Constant	0.011	0.028	0.001	0.000	0.046	0.053[2]
	(0.016)	(0.015)	(0.001)	(0.002)	(0.032)	(0.028)
Residual std. dev.	0.057	0.076	0.013	0.049	0.085	0.102

[1] Significant at the 5% level.
[2] Significant at the 10% level.

Correlation matrices of the residuals

	Germany			Italy		
	Output	Prices	Export	Output	Prices	Exports
Output	1.000	0.060	0.243	1.000	0.231	0.086
Prices	0.060	1.000	0.262	0.231	1.000	–0.059
Export	0.243	0.262	1.000	0.086	–0.059	1.000

to analyze the impulse response functions and variance decompositions implied by the estimated model. Table VII and VIII are based on the ordering (5): the first one shows the response of the *i*-th variable to one standard deviation shocks in all variables in the current period and 1, 4, 8, 12 and 16 quarters back in the past; the second one shows the corresponding variance decompositions. The impulse response functions and variance decompositions implied by the ordering (5) are also plotted in Figures 3 and 4 respectively.

The (i, j)-th panel of Figure 3 plots the response of the i-th variable (the *i*-th row) to a one standard deviation shock in the *j*-th variable (the *j*-th column), while the (i, j)-th panel of Figure 4 plots the percentage contribution of the *i*-th variable (the *i*-th row) to the forecast error variance of the *j*-th variable (the *j*-th column) *h* quarters ahead, with $h = 1, \ldots, 24$. For example, the third panel in the second row of Figure 3 plots the response of price to a one standard deviation shock in export, while the third panel in the second row of Figure 4 plots the percentage contribution of price shocks to the forecast error variance of exports *h* quarters ahead.

At first, one can notice that most responses of the Italian variables are higher, in absolute value, than the German ones; the only notable exceptions are the responses of exports to output and price shocks. Moreover, especially from the graphical representation (Figure 3), it appears clear that, most of the times, German responses, although lower in absolute value, show a higher degree of persistence, which means that the effects of shocks take longer to be absorbed.

This general trend provides some evidences that the Italian industry tend to react more promptly to unanticipated shocks, and its less concentrated structure may be a reason for this dynamic behavior.

In both countries and for all three variables, the stronger response is to their own shock. However, there are some differences in their dynamics. The initial response of output to output shocks is positive in both countries, but it becomes negative

TABLE VII
Impulse response functions. Ordering: Output ⇒ prices ⇒ exports

Lags	Output		Prices		Export	
	Germany	Italy	Germany	Italy	Germany	Italy
Response of output growth to one standard deviation shocks						
0	0.0349	0.0496	0.0000	0.0000	0.0000	0.0000
1	0.0270	0.0341	–0.0006	–0.0019	0.0010	–0.0009
4	0.0112	0.0084	–0.0023	–0.0049	0.0006	0.0007
8	0.0023	–0.0027	–0.0029	–0.0054	–0.0006	0.0018
12	–0.0006	–0.0049	–0.0025	–0.0048	–0.0009	0.0018
16	–0.0013	–0.0048	–0.0020	–0.0039	–0.0008	0.0015
Response of price growth to one standard deviation shocks						
0	0.0002	0.0019	0.0026	0.0079	0.0000	0.0000
1	0.0007	0.0041	0.0027	0.0079	0.0005	–0.0017
4	0.0014	0.0070	0.0023	0.0073	0.0009	–0.0026
8	0.0014	0.0072	0.0017	0.0061	0.0008	–0.0024
12	0.0011	0.0062	0.0012	0.0049	0.0006	–0.0019
16	0.0008	0.0051	0.0009	0.0039	0.0004	–0.0016
Response of price growth to one standard deviation shocks						
0	0.0168	0.0079	0.0172	–0.0074	0.0649	0.0910
1	0.0053	0.0063	0.0063	–0.0046	0.0347	0.0344
4	–0.0049	0.0004	–0.0038	–0.0033	0.0036	0.0027
8	–0.0046	–0.0025	–0.0040	–0.0030	–0.0015	0.0011
12	–0.0031	–0.0029	–0.0028	–0.0025	–0.0014	0.0010
16	–0.0021	–0.0026	–0.0019	–0.0021	–0.0010	0.0008

TABLE VIII
Variance decompositions. Ordering: Output ⇒ prices ⇒ exports

Steps ahead	Output		Prices		Export	
	Germany	Italy	Germany	Italy	Germany	Italy
Variance decomposition of output growth						
0	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000
1	99.9252	99.8740	0.0189	0.1048	0.0559	0.0212
4	99.4848	98.6862	0.3759	1.2798	0.1392	0.0340
8	98.4292	96.0181	1.4202	3.7498	0.1506	0.2321
12	97.3472	93.7844	2.4099	5.7163	0.2430	0.4992
16	96.6204	92.3463	3.0372	6.9556	0.3424	0.6981
Variance decomposition of price growth						
0	0.3598	5.3407	99.6402	94.6593	0.0000	0.0000
1	3.7648	13.6345	94.7231	84.4191	1.5121	1.9464
4	13.7494	30.8598	80.7003	64.3272	5.5503	4.8130
8	21.0726	40.8858	71.4760	53.6904	7.4515	5.4238
12	24.5413	45.1359	67.4210	49.3455	8.0377	5.5186
16	26.2099	47.1863	65.5361	47.2736	8.2540	5.5401
Variance decomposition of export growth						
0	5.9223	0.7429	6.1505	0.6548	87.9272	98.6023
1	5.1439	1.0605	5.5180	0.7857	89.3381	98.1538
4	5.3514	1.2404	5.4314	1.1174	89.2172	97.6423
8	6.7284	1.3760	6.3622	1.5005	86.9094	97.1235
12	7.4250	1.6935	6.9001	1.7831	85.6749	96.5234
16	7.7267	1.9775	7.1506	1.9706	85.1227	96.0518

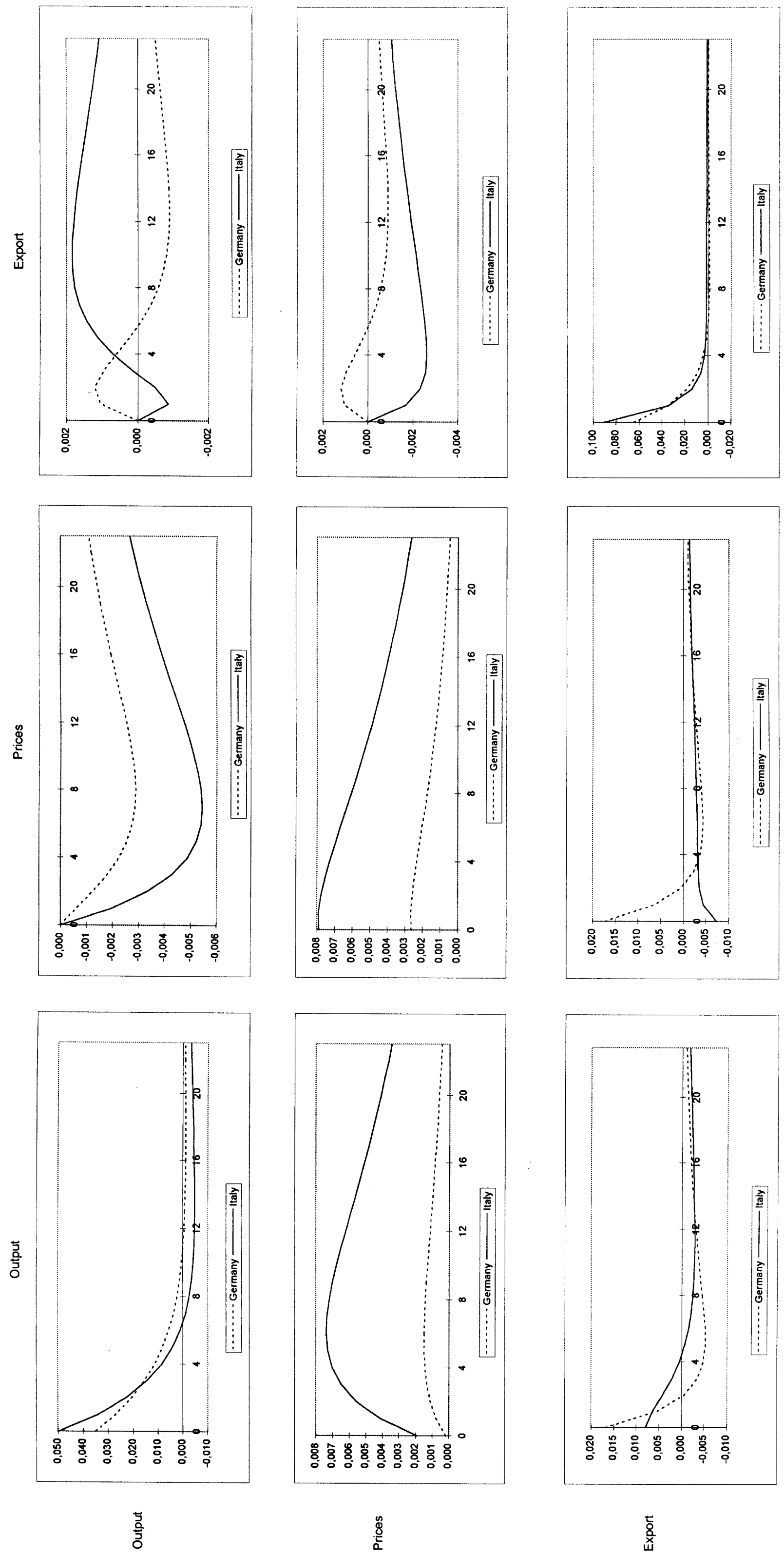

Figure 3. Impulse response functions.

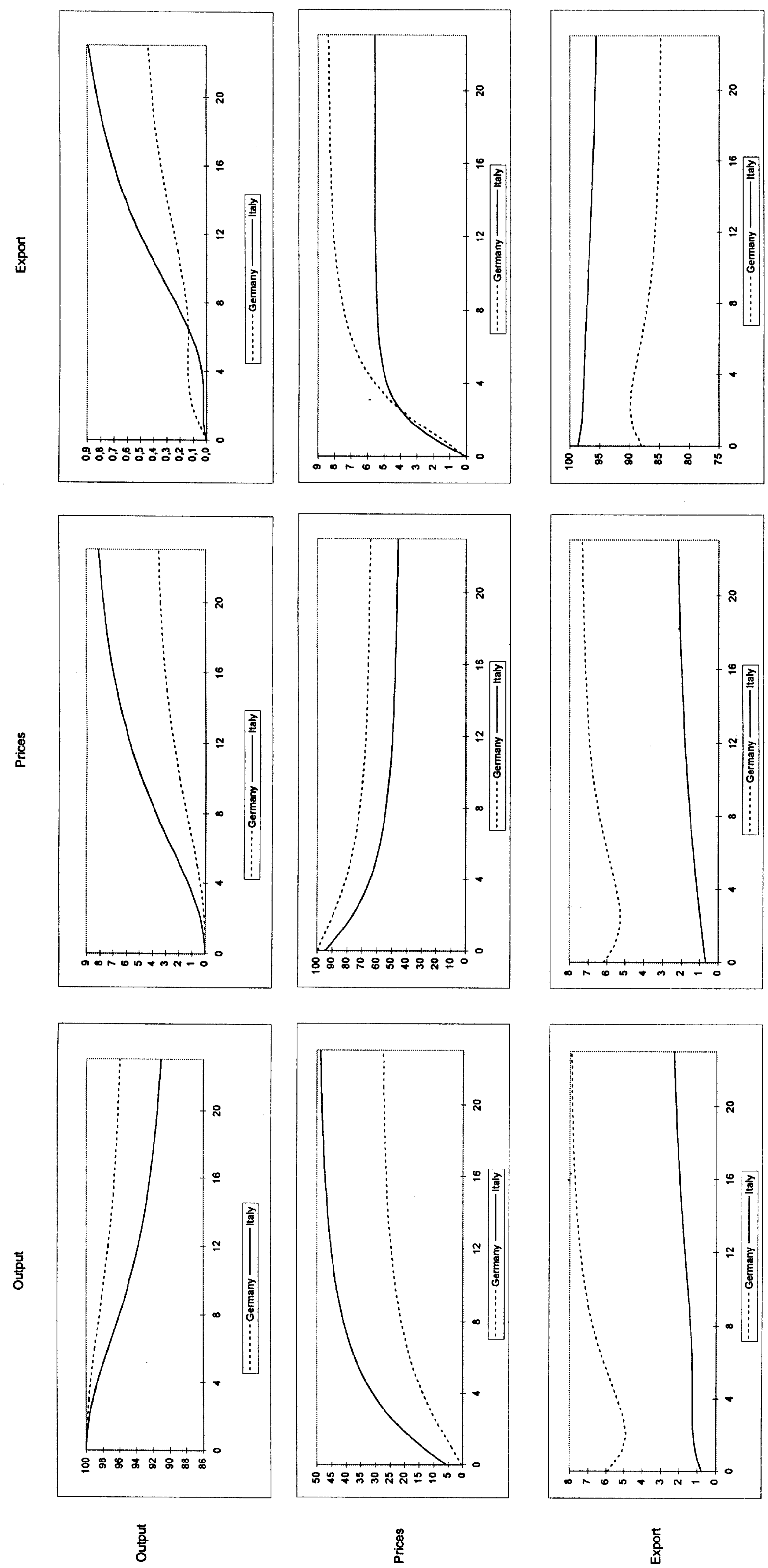

Figure 4. Variance decomposition.

earlier in Italy (six quarters) than in Germany. The response of exports to export shocks is initially positive for both countries, but in Germany this effect becomes negative after six quarters.

The effects of price shocks on output are negative for both countries, although very low in absolute value, while the response of output to export shocks displays an opposite behavior for the two industries: the response is initially negative in Italy, but it becomes positive very quickly (after three quarters), while in Germany is initially positive, and it gets negative only after more than one year. In general, however, these responses are quite low and seem to suggest that both industries have some difficulties in adjusting their output to export shocks; the Italian positive response remains larger in absolute value, although displayed with some lags.

Another important difference between the two countries has to do with the response of price growth to export shocks. The negative response of Italian firms seems to suggest that Italian producers react to positive export shocks with a further(low) reduction in prices, probably because they wish to fully exploit new market opportunities, while the response of German exporters displays the opposite sign, although very low in absolute value.

These conclusions seems to be supported by the export trends in the sample period. Table I and Figure 1 show that, during our sample period, Italian producers were quick to exploit market opportunities worldwide: in the early 1980s, by taking advantage of the booming demand from oil producing countries; in the second half of the 1980s, by exploiting the strength of the dollar and the British pound to impose their presence on the U.S.A. and U.K. markets (by 1990, these two markets had become the third and fourth in importance for Italian exports); in the early 1990s by taking advantage of the strong lira devaluation. A comparison of 1985 and 1990 export data also suggests that Italian producers have been able to reduce profit margins in order to maintain their market shares in the U.S.A. and U.K. This indicates substantial flexibility in setting prices on foreign markets, by letting the markup on costs vary with demand conditions.

Finally, the response of export to output shocks is initially lower in Italy, but it remains positive for a longer periods, which seems to suggest a more flexible management of output and stocks by Italian firms. The response of export to price shocks is negative in Italy, while the positive sign of the first two quarters in Germany is difficult to interpret.

When we analyze the forecast error variance of each series (Table VIII and Figure 4), we see that, in the first two quarters, most of it is due to the own shocks, while their importance tend to decline as one tries to predict further ahead in the future. Notable exceptions are Italian exports and output for both industries, whose forecast error variance is due for over 90% to the own shocks even four years ahead in the future.

The relative importance of the sources of forecast error variance differs markedly in the two countries. In the case of output, shocks in exports play almost no role in both countries, while in Italy the contribution of price shocks is typically higher. In the case of prices, shocks to exports are slightly more important in Germany, while output contribution, which is the most relevant for both countries, is much more important in Italy. In the case of exports, output and price shocks play a marginal role in Italy, while they become more important for Germany. These general patterns seems to suggest that in the Italian industry price variability tend to be markedly influenced by the dynamic of the other sectoral variables, and this phenomenon is typically stronger than in Germany. The same seems to be true for German exports, even though the dynamics is less marked.

Finally, it is worth noticing that, for both countries, the results are substantially robust to changes in the ordering of the variables in the system.[4] Some minor differences are present when export is casually prior to prices, but this hypothesis is not so easy to justify on economic ground.

5. Conclusions

In this paper we have applied multivariate time-series analysis to sectoral data for the furniture industry in Germany and Italy. Our objective was to verify that, when strong structural and organizational differences are present, industry variables display a different dynamic behavior. The furniture industry in Germany and Italy is a good laboratory to study these issues, because in Germany both production and retailing are far more concentrated than in Italy. Our analysis can easily refer to standard economic theory, which predicts that the higher the degree of concentration of an industry, the smaller output and price responses to shocks, as well as their speed of adjustment, ought to be.

Our results seem consistent with these a priori considerations. In particular, we find that the dynamic response of Italian variables are typically higher, in absolute value, than the German ones; moreover, German responses, although lower in absolute value, show a higher degree of persistence, which means that the effects of shocks take longer to be absorbed. This general trend seems to suggest that the Italian industry tend to react more promptly to unanticipated shocks.

Clearly, these different dynamic responses between the two countries may be due to reasons other than market organization, but, as it is detailed in Section 4, most of the dynamics that we observe can be explained in terms of firm strategies that depends on structural differences between Italy and Germany, and these results are consistent with our conclusions.

In conclusion, our exercise suggests that information about market structure may be relevant in interpreting differences in industry dynamics. However, further research is needed on a larger sample of sectors and countries in order to make more general statements on industry dynamics.

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Notes

[1] German data refer only to the former West Germany, even for the period after reunification (1991–1994).

[2] These indices are based on unpublished database at Centro Studi Industria Leggera, built in the framework of RAISA-CNR Project.

[3] German reunification (1991) clearly raise the issue of accounting for this classical “structural break”. To overcome this problem, we have used data that refer only to the former West Germany. Moreover, we have run the same model on a 1980:91 sample, which gave approximately the same results. A separate documentation of these results is available by the authors.

[4] A complete set of results for all the possible orderings is available from the authors upon request.

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