Did tough antitrust policy lead to lower mark-ups in the US manufacturing industry?

Frederic Warzynski*

University of Leuven, LICOS Centre for Economic Transition, Deberiotstraat 34, 3000 Leuven, Belgium

Received 27 April 1999; accepted 18 July 2000

Abstract

This paper tests whether antitrust policy in the US has an impact on the price cost margin. Using a unique database the methodology developed by Domowitz et al. [Review of Economics and Statistics, 70 (1988) 55–66] is applied to find estimates of the price cost margin. The estimates indicate presence of market power in many industries but also substantial heterogeneity of behaviour, both across time and industries. Finally, it confirms the hypothesis that mark-ups were lower when the antitrust policy was very tough. © 2001 Elsevier Science B.V. All rights reserved.

Keywords: Mark-up; Antitrust policy

JEL classification: K21; L1; L4

1. Introduction

It has become a common feature to divide the post-WW II US experience with respect to the enforcement of antitrust law in two separate subsets. During the first period (from 1945 through 1973) antitrust laws were implemented very toughly, reflecting the widespread belief among economists that market structure was the major determinant of conduct and performance. In the second period (from 1973 to 1991) the authorities applied the law more laxly, influenced by the Chicago School that opposed the previous view considered as too simplistic (see e.g. Mueller (1996) or Van Cayseele and Van Den Bergh (1998)).

This paper tries to detect whether these different policies were reflected in the behaviour of firms in the US manufacturing industry. Did firms price in a more competitive way when the antitrust policy was tough? The NBER-CES Manufacturing Productivity Database compiled by Barterlsman, Becker

*Tel.: +32-16-326-583; fax: +32-16-326-599.
E-mail address: frederic.warzynski@econ.kuleuven.ac.be (F. Warzynski).
and Gray is employed to estimate mark-up ratios in manufacturing industry as a whole as well as in many subindustries. The database furnishes information about real output and inputs for 450 industries from 1958 to 1994, and is available on the NBER website. The methodology developed by Hall (1986, 1988) and Domowitz et al. (1988) is used to estimate unobservable behaviour of firms in an industry from observable standard economic data.

The paper is organised as follows. Section 2 presents the model upon which the estimation is based. Section 3 discusses the data and reports the econometric results. Section 4 concludes.

2. The model

A firm $i$ in time $t$ operates according to a production function:

$$ Q_{i,t} = \Theta_{i,t} F(K_{i,t}, N_{i,t}, M_{i,t}) $$

$\Theta_{i,t}$ is the Hicks neutral technical progress. The firm chooses capital stock $K_{i,t}$ in advance of the realisation of demand ($K_{i,t}$ depreciates over time). On the input markets the firm can engage any amount of labour at wage $W_{i,t}$ and buy any amount of materials at price $p_{M,i,t}$. The firm chooses labour-input $N_{i,t}$ and materials $M_{i,t}$ so as to maximise profit $\Pi_{i,t}$ after the realisation of demand. Demand for the output is stochastic. In a competitive environment, it is easy to show that:

$$ \Delta q_{i,t} = \alpha_{L,i,t} \Delta n_{i,t} + \alpha_{M,i,t} \Delta m_{i,t} + \theta_{i,t}, \quad (1) $$

where:

$$ \Delta x_{i,t} = \Delta \log \left( \frac{X_{i,t}}{K_{i,t}} \right) (X = Q, N, M) $$

$$ \alpha_{L,i,t} = \frac{W_{i,t} N_{i,t}}{p_{i,t} Q_{i,t}} = \text{factor share earned by labour} $$

$$ \alpha_{M,i,t} = \frac{p_{M,i,t} M_{i,t}}{p_{i,t} Q_{i,t}} = \text{the share of materials in turnover} $$

$$ \theta_{i,t} = \Delta \log (\Theta_{i,t}). $$

In a non-competitive environment, Eq. (1) can be generalised as:

$$ \Delta q_{i,t} = \mu (\alpha_{L,i,t} \Delta n_{i,t} + \alpha_{M,i,t} \Delta m_{i,t}) + \theta_{i,t}, \quad (2) $$

where $\mu = p/c \geq 1$ is the mark-up ratio. This also can be written as:

$$ \Delta q_{i,t} - \alpha_{L,i,t} \Delta n_{i,t} - \alpha_{M,i,t} \Delta m_{i,t} = \Delta y_{i,t} = \beta_i \Delta q_{i,t} + (1 - \beta_i) \theta_{i,t} \quad (3) $$

where $\beta_i$ is the Lerner index or the price cost margin (PCM) ($\beta = (p - c)/p$).


The error term is modelled as the growth of productivity plus a standard measurement error, so that:
Theoretically the PCM can be calculated for every year if the number of observations is sufficient. What most authors have done is to calculate the average PCM over a long period for a given industry because only time-series information was available. This approach has been criticised (Hylleberg and Jørgensen, 1998) since the pricing behaviour in an industry is likely to evolve according to market structure or other parameters influencing competition in a given industry. One of these parameters is the toughness of antitrust policy enforcement.

In other words the toughness of price competition can vary following a change in the attitude of judges towards antitrust policy. Such an evolution has important implications for market structure in the medium and long run (Sutton, 1991; Symeonidis, 1998). Here we will focus on short run effects, or the direct effect on prices.

In this paper, the average mark-up in manufacturing industry as a whole (averaging across 450 industries) is estimated for every year as well as the mark-up in each industry over the period 1958–1994 (averaging over time). Advantage is taken of the richness of the panel in both dimensions: cross-section and time-series.

Then it is tested whether PCM were lower when antitrust policy was applied toughly relatively to the period when antitrust policy was very lax. The division proposed by Mueller (1996) is followed, dividing the sample in two periods: 1958–1973 when antitrust authorities monitored very closely market structure, and 1973–1994 when the influence of the Chicago School induced a dramatic shift in antitrust policy relatively to the previous period.

Specifically a dummy variable \( D_{5873} \) is created, equal to 1 if the observation belongs to the period 1958–1973 and equal to 0 otherwise. This dummy variable is interacted with \( \Delta q \) so that it can capture the ‘switch of regime’ effect. Then the coefficients \( \beta_1 \) and \( \beta_2 \) are estimated separately in Eq. (5) and it is verified whether \( \beta_2 \) is negative and significant

\[
\Delta q_{i,t} = \alpha_{n_{i,t}} \Delta n_{i,t} - \alpha_{m_{i,t}} \Delta m_{i,t} = \Delta y_{i,t} = (\beta_1 + \beta_2 D_{5873}) \Delta q_{i,t} + \epsilon_{i,t}. \tag{5}
\]

Because of the simultaneous determination of the LHS of (5) and \( \Delta q \), instruments must be used to get unbiased estimates. The selected instrumental variables (IV) are the growth of output in the manufacturing industry as a whole — but excluding the industry selected — minus the growth of capital in the industry, and sector dummies (2-digit SIC). All instruments are not correlated with the error term and are correlated with \( \Delta q \).

3. Data and results

The database contains information about annual production and cost data for 450 manufacturing industries from 1958 to 1994, extracted primarily from the Annual Survey of Manufactures and completed with information about price deflators and real capital stock. Data are available at the 4-digit SIC level.

1Exceptions are Levinsohn (1993) and Konings et al. (1999), who used firm level data — respectively for Turkey, and Belgium and the Netherlands — and were able to compute the dynamics of the mark-up, although on a very limited period.
Table 1
Average PCM in manufacturing industry: 450 subindustries, 1959–1994

<table>
<thead>
<tr>
<th></th>
<th>OLS</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dep. var.: Δy</td>
<td>Coeff.</td>
<td>t-stat.</td>
</tr>
<tr>
<td>Δq</td>
<td>0.34**</td>
<td>73.18</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.27</td>
<td>0.24</td>
</tr>
</tbody>
</table>

Note: *(* indicates statistical significance at the 10% (5%) sensitivity level.

Table 2
Average PCM for selected industries: 1959–1994

(a) Code 3325: structural wood members
<table>
<thead>
<tr>
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<th>OLS</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dep. var.: Δy</td>
<td>Coeff.</td>
<td>t-stat.</td>
</tr>
<tr>
<td>Δq</td>
<td>0.23**</td>
<td>5.36</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.44</td>
<td>0.35</td>
</tr>
</tbody>
</table>

(b) Code 2111: cigarette industry
<table>
<thead>
<tr>
<th></th>
<th>OLS</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dep. var.: Δy</td>
<td>Coeff.</td>
<td>t-stat.</td>
</tr>
<tr>
<td>Δq</td>
<td>0.77**</td>
<td>15.78</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.88</td>
<td>0.78</td>
</tr>
</tbody>
</table>

(c) Code 2834: pharmaceutical preparations
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<th></th>
<th>OLS</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dep. var.: Δy</td>
<td>Coeff.</td>
<td>t-stat.</td>
</tr>
<tr>
<td>Δq</td>
<td>0.73**</td>
<td>12.26</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.81</td>
<td>0.81</td>
</tr>
</tbody>
</table>

Note: see Table 1.

Real output Q is the value of shipments in million dollars divided by the price deflator of shipments. Employment N is the number of employees in thousands. Real material cost M is equal to the cost of material inputs divided by the material deflator. Capital K is the real capital stock. α_L is the total compensation of employees divided by the value of shipments and α_m is the cost of material inputs divided by the value of shipments as defined in the previous section.

I start with estimating Eq. (3), exploring the cross-section and time dimension of the panel. Table 1 gives OLS and IV estimates of the average PCM over the entire period and across industries. However this figure does not reflect the heterogeneity in both time- and industry-dimension. Table 2 presents estimates of PCM for some specific industries: the estimate is low and not significant for many non-differentiated goods — such as the structural wood members industry (code 3325) — but high and significant for advertising-intensive industries — such as the cigarette industry (code 2111) — and R&D intensive industries — such as pharmaceutical preparations (code 2834). The PCM fluctuates very much through time as well. Fig. 1 illustrates the variations of PCM from 1958 to 1994. A kernel estimate is used to smooth the pattern. The trend gradually increases from 1973 onwards, bolstering our claim. There seems to be some cyclicality although no clear evidence of a pro-cyclical or counter-cyclical behaviour was found. This finding is not surprising given the relative inconclusiveness that emerges from the literature.
The result we are more interested in lies in Tables 3 and 4. The first part of Table 3 shows the estimate of the Lerner index during the first period, that is from 1958 to 1973. The second part displays the same variable for the second period. The difference is striking. Finally, in Table 4, Eq. (5) is estimated: it is shown that this difference in the PCM between the two periods is significant. It seems to indicate that the mark-up ratio was lower when antitrust policy was tough in the US.

### Table 3

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<tbody>
<tr>
<td></td>
<td>OLS</td>
<td>IV</td>
</tr>
<tr>
<td>Δq</td>
<td>0.32**</td>
<td>0.23**</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.52</td>
<td>0.48</td>
</tr>
</tbody>
</table>

Note: see Table 1.

### Table 4
Interactive antitrust policy effect

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<tbody>
<tr>
<td></td>
<td>OLS</td>
<td>IV</td>
</tr>
<tr>
<td>Δq</td>
<td>0.37**</td>
<td>0.29**</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.27</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Note: see Table 1; ΔS5973 was also included.
4. Conclusion

Using a unique database the methodology developed by Domowitz et al. (1988) was applied to find estimates of the price cost margin. The estimates indicate presence of market power in a lot of industries but also much heterogeneity of behaviour both across time and industries. Finally, the hypothesis that mark-ups were lower when the antitrust policy was very tough was confirmed.

There has been much debate about the fact that antitrust policy was too tough during this period, impeding efficiency gains to be realised. This paper illustrates the basic trade-off that the antitrust regulator is facing: too much laissez-faire sends a wrong signal to firms which might induce them to behave in a noncompetitive way, as exemplified during the second period (1973–1994). However, too tough antitrust policy discourages firms to achieve efficiency gains that are not necessarily increasing market power, as critics have mentioned.

Acknowledgements

I am grateful to Jozef Konings and Patrick Van Cayseele for useful comments. Of course I am solely responsible for remaining errors.

References