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Trends in market power and productivity growth rates in US and Japanese manufacturing

Daniel J. Ryan*

Economics Department, Temple University, Philadelphia, PA 19122, USA

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Abstract

Trends were estimated for market power (measured by the price–marginal cost ratio) and the total factor productivity growth rate for US and Japanese manufacturing. Both trends are negative in both countries, but Japan's are significant and much steeper. © 1997 Elsevier Science S.A.

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1. Introduction

The total factor productivity growth rate has been studied extensively for decades; nearly all analyses have concluded that productivity growth rates have been trending downward in the US, Japan and other developed countries (Fagerberg, 1994). On the other hand, studies of market power (Schmalensee, 1989) have reached no consensus regarding the existence or direction of a trend. Shepherd (1982) concluded that the level of competition increased (i.e. market power decreased) in the US during the 1960s and 1970s, due to antitrust efforts, deregulation and increased imports. However, Domowitz et al. (1986) determined that price–cost margins increased in the 1960s and 1970s. For Japan, Imai (1980) discussed concentration (which in Japan is more strongly correlated with profitability than in the US; see Caves, 1976) and determined that concentration declined in the 1960s but began increasing in the 1970s. However, Ohmae (1981) offers anecdotal support for the view that Japanese firms were intensely competitive even in the 1970s. And there is a wide-spread belief that Japan's increasing export penetration into a large (hence elastic) world market has reduced monopoly power. Thus, for both countries, disagreement remains on the direction of market power.

Recent works have analyzed productivity growth rates in conjunction with measurements of market power; see Morrison (1992), Domowitz et al. (1988), Hall (1988), and Kamerschen and Park (1993). This is an improvement over earlier studies, since the assumption of perfect competition can yield

*Tel.: 215-204-8167; fax: 215-204-8173; e-mail: danryan@vm.temple.edu

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biased estimates in the presence of imperfect competition. But none of these have explicitly estimated the trends in productivity growth and market power.[1]

This paper modifies Hall's method, using panel data to analyze thirteen manufacturing industries in the United States and Japan over the time period 1965–1984. Productivity growth rates and price–marginal cost ratios are obtained for each industry and, more importantly, the trends are also estimated.

2. Procedure and results

Hall's equation can be written as

$$y_t^i = \mathrm{PROD}^i + \mathrm{PMC}^i \cdot x_t^i + e_t^i. \tag{1}$$

PROD^i and PMC^i are the productivity growth rate and the price–marginal cost ratio in industry i; y_t^i is the log difference of real value-added output per unit capital; x_t^i is the log difference of real labor input per unit capital times the wage share; and e_t^i is the error term.

To determine trends in the productivity growth rate and the price–marginal cost ratio, the coefficients PROD^i and PMC^i are replaced as follows:

$$\mathrm{PROD}^i = \mathrm{AVPROD}^i + \mathrm{TPROD} \cdot t, \tag{2}$$

$$\mathrm{PMC}^i = \mathrm{AVPMC}^i + \mathrm{TPMC} \cdot t, \tag{3}$$

where TPROD and TPMC are the trend coefficients.[2] The time variable is indexed as $t = -9, -8, \ldots, 0, \ldots, 8, 9$; thus AVPROD^i and AVPMC^i represent the average values of PROD^i and PMC^i over time.

A better approach is to assume each industry has different trends that are distributed normally around the mean values TPROD and TPMC:

$$\mathrm{PROD}^i = \mathrm{AVPROD}^i + (\mathrm{TPROD} + u^i) \cdot t, \tag{4}$$

$$\mathrm{PMC}^i = \mathrm{AVPMC}^i + (\mathrm{TPMC} + v^i) \cdot t, \tag{5}$$

where u^i and v^i are industry error terms. In this varying coefficients approach, the variances of u^i, v^i and all e_t^i must be estimated then used to obtain the coefficients via generalized least squares (GLS). However, this yielded negative variances for u^i in the U.S. and u^i and v^i in Japan, thus those error terms had to be dropped. In the case of Japan, this reduced Eqs. (4) and (5) to Eqs. (2) and (3), meaning it was no longer a varying coefficients model; however it still had to be estimated iteratively as panel data since TPROD and TPMC appear in each industry equation.

The procedure was as follows. Each industry was first estimated via ordinary least squares to obtain

[1] Morrison obtained year-by-year estimates that suggested there were no significant trends; however, her approach employed cross-industry regressions so may have been subject to aggregation bias.

[2] Attempts to estimate separate trends for each industry were inconclusive due to insufficient degrees of freedom.

initial estimates of $PROD^i$ and PMC^i. These were used to obtain the residuals and thus the variances, then new coefficients estimates were obtained via GLS. This process was repeated until the coefficients and variances converged (approximately 15 iterations).

The results are shown in Table 1. Productivity growth rates and price–marginal cost ratios vary

Table 1
Estimation results

	United States			Japan		
	AVPROD	AVPMC	*R*-sq	AVPROD	AVPMC	*R*-sq
TR	0.03322	1.536	0.70	0.05873	2.250	0.23
	(0.01787)	(0.232)		(0.03332)	(1.311)	
TE	0.05246	1.562	0.60	0.01850	0.728	0.18
	(0.01532)	(0.293)		(0.01304)	(0.410)	
PR	0.00654	1.396	0.61	0.06294	2.700	0.69
	(0.00681)	(0.306)		(0.01445)	(0.582)	
PE	−0.00451	1.695	0.23	−0.01134	0.300	0.08
	(0.01605)	(0.801)		(0.05685)	N/A	
PA	0.06881	3.031	0.81	0.03521	2.344	0.02
	(0.01287)	(0.355)		(0.05910)	(2.507)	
ME	0.02334	1.977	0.84	0.05829	2.656	0.12
	(0.01295)	(0.210)		(0.05176)	(1.997)	
MA	0.03496	1.342	0.63	0.07931	3.107	0.35
	(0.01433)	(0.234)		(0.02746)	(1.018)	
IN	0.01328	0.975	0.52	0.06866	2.897	0.73
	(0.01239)	(0.232)		(0.02229)	(0.603)	
FO	0.00625	0.300	0.00	−0.00692	0.545	0.17
	(0.00959)	N/A		(0.01533)	(0.694)	
FA	0.02068	1.477	0.80	0.01189	1.638	0.19
	(0.02268)	(0.210)		(0.04012)	(1.094)	
EL	0.04903	1.442	0.77	0.10246	3.683	0.52
	(0.01123)	(0.171)		(0.02303)	(1.059)	
CH	0.05478	2.545	0.19	0.01745	1.014	0.00
	(0.02979)	(1.298)		(0.05626)	(3.229)	
CE	0.02793	1.892	0.86	0.02637	1.870	0.60
	(0.00771)	(0.197)		(0.01708)	(0.721)	
Average:	0.02964	1.562		0.04088	1.909	
	TPROD	TPMC		TPROD	TPMC	
	−0.000143	−0.0312		−0.001681	−0.1497	
	(0.000148)	(0.0226)		(0.000297)	(0.0474)	

Standard errors in parentheses.

Data: Time period: 1965–1984. U.S. data was obtained from the National Income and Product Accounts, and the Survey of Current Business. Japan data was obtained from the Japan Statistical Yearbook, and the Corporate Statistics Annual; the Primary Metals category for Japan was constructed by combining the Iron and Steel and the Non-Ferrous Metals categories. All data was weighted by the average industry share of value-added output in manufacturing.

Two of the AVPMC estimates (FO for the US, PE for Japan) were originally negative, which is impossible, so the arbitrarily chosen value of 0.3 was imposed; this had a negligible effect on the other estimates.

TR, transportation equipment; TE, textiles; PR, printing and publishing; PE, petroleum and coal; PA, paper and pulp; ME, primary metals; MA, ordinary machinery; IN, precision instruments; FO, foodstuffs; FA, fabricated metal; EL, electric equipment; CH, chemicals; CE, ceramics.

considerably among industries, though most industries show the presence of market power. The weighted average values of PROD and PMC are also given; both are larger for Japan.

The trend estimates, the main objective of this analysis, are given at the bottom of Table 1; all are negative. For Japan the coefficients are significant at better than the 1% level; for the US TPMC is significant at the 10% level.

There is no evidence of a productivity slowdown in the US; TPROD is small and insignificantly different from zero. However, Japan has a large, negative, significant TPROD, indicating that productivity growth rates are decreasing by 0.17 percentage points each year.

The US has a negative TPMC but, due to its low significance, it provides only slight support for the hypothesis that market power is decreasing in the US. Japan's TPMC is large, negative and significant, indicating that price–marginal cost ratios fell rapidly from 1965–1984. On average, PMC in Japanese industries fell by 0.15 every year.

Lastly, attempts were made to impose more structure on the trends; for example, fitting quadratic trends or using dummy terms to allow two different slopes over the time period. These all yielded inconclusive results.

3. Conclusions

Results show that: Japan has significant, negative trends in productivity growth rates and price–marginal cost ratios; the US also has negative trends, but of low significance. Thus the productivity slowdown hypothesis is supported for Japan, but not for the US. The negative trend for price–marginal cost ratios indicates that markets are becoming more competitive (less monopolistic) over time in Japan and possibly in the US. Both trends are steeper in Japan indicating that productivity growth rates and price–marginal cost ratios are falling more rapidly, though from higher levels, than in the US.

References

Caves R., 1976. Industrial Organization. In: Patrick, H., Rosovsky, H. (Eds.), Asia's New Giant: How the Japanese Economy Works. Brookings Institution, Washington D.C., 1976.

Domowitz, I., Hubbard, R.G., Petersen, B.C., 1986. The Intertemporal Stability of the Concentration–Margins Relationship. Journal of Industrial Economics 35, 427–442.

Domowitz, I., Hubbard, R.G., Petersen, B.C., 1988. Market Structure and Cyclical Fluctuations in U.S. Manufacturing. Review of Economics and Statistics 70, 55–66.

Fagerberg, J., 1994. Technology and International Differences in Growth Rates. Journal of Economic Literature 32, 1147–1175.

Hall, R., 1988. The Relationship Between Price and Marginal Cost in U.S. Industry. Journal of Political Economy 96, 921–947.

Imai K., 1980. Japan's Industrial Organization. In: K. Sato (Ed.), Industry and Business in Japan. M.E. Sharpe, White Plains, NY, 1980.

Kamerschen, D., Park, J.-H., 1993. An Alternative Approach to Market Structure and the Markup Ratio. Applied Economics 25, 111–124.

Morrison, C., 1992. Unraveling the Productivity Growth Slowdown in the United States, Canada and Japan: the Effects of Subequilibrium, Scale Economies and Markups. Review of Economics and Statistics 74, 381–393.

Ohmae K., 1981. Japan vs Japan: Only the Strong Survive. Wall Street Journal, January 26, p. 20.
Schmalensee R., 1989. Inter-Industry Studies of Structure and Performance. In: Schmalensee, R., Willig, R. (Eds.), Handbook of Industrial Organization. North-Holland, New York, 1989.
Shepherd, W., 1982. Causes of Increased Competition in the U.S. Economy, 1939–1980. Review of Economics and Statistics 64, 613–626.