HEAVYWEIGHTS
THE IMPACT OF LARGE BUSINESSES ON PRODUCTIVITY GROWTH

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Abstract

The idea of an industrial policy that promotes large businesses—heavyweights—as the best way to compete in a globalized world has become, again, en vogue among European politicians. The only apparent controversy about the idea revolves around whether it is better to promote national champions or, instead, European champions. Empirical evidence on the issue is rare and contradictory. A uniquely rich industry-level dataset for Germany is used in this paper to test whether large business size in an industry fosters growth in terms of total factor productivity (TFP). The results suggest that the overall effects of firm size on TFP growth are negative.

JEL Code: L11, L16, O33, O40.

Keywords: firm size, productivity growth, total factor productivity, innovation.

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1. Introduction

In boxing, the heavyweight class has been variously defined over time. In the 19th century, for example, many heavyweight champions weighed around 170 pounds. In 1920, the minimum weight for a heavyweight was set at 175 pounds. Today, for most boxing organizations, the minimum weight for a heavyweight is 201 pounds.

More or less the same is true for industrial heavyweights. The 20th century gave birth to the first traditional industrial heavyweights (for an overview, see Heblich, 2007). During this century, firms grew larger due to the realization of economies of scale and scope, a situation that led to industries characterized by mass production and a highly vertical form of integration. The economic historian Gerschenkron (1962) argues that in such a situation relatively backward economies, such as Germany or France during the 19th century, could rapidly reduce their *Gerschenkronian backwardness* by large investments and technological imitation. Further, long-term relationships, high average firm size and firm age, and little firm selection was supposed to be especially favorable to productivity growth. In such a situation, firms can best appropriate rents realized by their investments and imitation.

As economic wealth rose and markets became increasingly saturated with consumer goods, customers started demanding more individualized products, a process nicely illustrated by an example from the U.S. shirt production industry. Until the 1960s, men's shirts were a basic commodity and 70% of all shirts produced were white and of the same cut. By 1986, the market share of standardized white shirts had decreased to 20% (Abernathy et al., 1999). Within a span of 20 years, uniformity was out, individuality in. This led to a change in production processes as individualized customer requirements could not be met with standardized mass production. Smaller batch numbers were produced and former economies of scale vanished. Manufacturers vertically disaggregated their production and started relying more on suppliers instead of producing everything themselves.

The 1970s are thought to be the best decade ever in heavyweight boxing—Muhammad Ali returned in 1970 from his forced retirement to take on Joe Frazier, who was world champion at the time. However, recent times have not been as favorable for industrial heavyweight champions. These days, to compete on the global technology frontier, further productivity growth can be realized only by pure innovation, not by imitation. In such a technologically advanced economy, the market selection process and firm turnover resulting from a process of creative destruction (Schumpeter, 1934) are the ultimate bases of innovation and, thus, productivity growth. Industries are now characterized by short-term relationships, younger firms, and less investment—changes modeled by Acemoglu, Aghion, and Zillibotti. (2002).

The remainder of the paper is organized as follows. Section 2 provides a brief overview of the theoretical arguments both in favor of and against large firms—the heavyweights—in an innovation-based economy. Section 3 reviews the literature on the relationship of firm size distribution and productivity growth. Section 4 is dedicated to an empirical analysis. Section 5 contains a summary and draws some conclusions.

2. The Impact of Firm Size on Productivity Growth in an Innovation-Based Economy

2.1. Productive Innovation

"Nowadays, nobody would question that a positive relationship exists between … innovation on the one side and country-level performance … on the other" (Brusoni, Cefis, and Orsenigo, 2007). However, there is disagreement over whether large firms are more or less innovative than their smaller counterparts. Could it be that large firms are simply innovative in a different way than that of their smaller counterparts? Basically, all arguments in favor and against large businesses being more innovative or innovative in a different way than their smaller counterparts refer to the ability of coping with uncertainty related to innovation and the internal (within an organization) and external (within the market) appropriability of post-innovative benefits.

Generally, a business's decision to innovate involves a high degree of uncertainty. Knight (1921, p. 231) remarks that such decisions "deal with situations which are far too unique, generally speaking, for any sort of statistical tabulation to have any value for guidance." Against this background, Schumpeter (1942) basically argues that large businesses can better handle this uncertainty as they have more internal financial resources and more collateral assets with which to raise external funds and thus are more successful in dealing with the Knightian uncertainty related to innovation. By raising enough resources to establish large specialized research laboratories, large businesses manage, over time, to change innovation from being a sequence of fortuitous occurrences into a business-like activity that can be relied upon and is reasonably predictable (Baumol 2002, p. 55).

However, even if, in principle, large businesses can better handle this uncertainty, the organizational structure of large businesses is often assumed to be unsupportive of innovation. Acs et al. (1997) argue that an innovator in a large firm often has only limited property rights in his or her innovation. The new product or process generally belongs to the firm, not the employee who invented it. Thus, even in organizations with performance-oriented remuneration systems, the employee must share the returns from his or her innovative effort with many other employees, even if these others are not specifically associated with the innovation. Further, Bénabou and Tirole (2003) argue that rewards on "engagement" (innovative activity) have only a limited impact and possibly even a negative impact on "re-engagement." This second phenomenon may be the result of the employee's interest in protecting the cash flow generated by his or her old innovations (cf. Acs, Morck, and Yeung, 1999).

Furthermore, on the firm level, the appropriability of innovative rents may also depend on firm size and the firm's market share. Cohen and Klepper (1996a, b) present a model of firm size and the nature of innovation. They distinguish between product and process innovation. Process innovations increase the firm's price-cost margin by lowering the average cost of production. If the firm does not license process innovations, the only way the firm can benefit from the process innovations is in its own output. The higher the volume of production, the higher the total gross benefit of the process innovation. Hence, larger firms are able to derive a higher return from a process innovation than are smaller firms simply because the larger firms can spread this benefit over a greater volume. The same is not obvious for product innovation resulting in ground-breaking new products that create a completely new market. If there are no strong reasons for believing that the volume of sales on the new market is related to ex-ante size, there is obviously no reason why large businesses should spend relatively more time or money on product innovation than do their smaller counterparts.

In conclusion, from a theoretical perspective, a priori, there is no evidence on whether large firms are more innovative—and thus more prone to productivity growth—than their smaller counterparts. Nevertheless, they do perform relatively more process innovation than product innovation.

2.2. Unproductive Innovation—Rent Seeking

Baumol (2002) warns against assuming that all innovation is productive per se and thus enhances productivity growth. There may be activities that are highly innovative but nevertheless make little or no contribution to the real output of the economy. In this context, Baumol discusses innovative rent seeking. Rent seeking is any activity whose objective is the acquisition of economic rents that are available in the economy but that would be allocated to someone else in the absence of rent seeking. The most obvious example of this is when an incumbent firm finds a new way to persuade politicians or a regulatory agency to impose barriers to market entry so that the incumbent can skim additional rents.

Krueger (1974), Helpman and Grossman (2002), Rajan and Zingales (2003), and Morck, Wolfenzon, and Yeung (2005) emphasize that large incumbent firms are especially prone to invest in political rent seeking as a means of locking in the status quo. These firms are often assisted in this endeavor by politicians who also prefer the status quo, especially when seeking reelection. Roe (2003) argues that governments might lock in the status quo to please voters who prefer slow but smooth growth over faster but erratic growth. In this situation, one would not be too surprised to find a "save the lame ducks" campaign. "Lame ducks" are incumbent firms that were once at the front lines but have now fallen far behind. However, they are "too big to fail" (Vives, 2001) as their failure might have serious negative effects on employment in the short run. However, the "death" of a large business can have long-term effects on employment too, particularly when the labor market is inflexible and immobile. In this situation, state intervention can, at best, merely delay the inevitable, but politicians, who usually manage to think short term, especially those up for reelection, may wish to smooth out the process of decline and thus ease social tension.

This "save the lame duck at all costs" phenomenon is also found in the banking sector, as reported by Vives (2001). Politicians are apparently very taken with the idea that a national champion in the form of a bank must not be allowed to fail as the fallout would have such a negative impact on national industry. Particularly large banks are believed to be "too big to fail."

Thus, the direction in which innovations are finally canalized—productive or unproductive—is heavily dependent on a society's institutions. Morck, Wolfenzon, and Yeung (2005) go even further and argue that there might be a dynamic feedback loop between weak institutions and firm concentration. Weak institutions place sweeping corporate governance powers in the hands of a tiny elite group, who will, in turn, lobby on behalf of the weak institutions so as to preserve their concentrated control over the nation's large businesses.

3. Survey of the Empirical Literature

To date, there has been little empirical work analyzing the impact of firm size distribution on productivity growth. The four analyses on the industry or economy level that I am aware of come to different conclusions. The design and the main results of these four analyses are briefly summarized below.

Acs, Morck, and Yeung (1999) were the first to analyze the impact of firm size distribution in an industry on industry-level total factor productivity (TFP). They analyze 1991 cross-sectional data for 450 4-digit-level U.S. manufacturing industries. They find that industries in which larger firms have a greater market share have a higher TFP. Market share is defined as employment share or establishment share. Their concentration on U.S. data may be helpful in pointing out how productivity growth and firm size distribution may be influenced by institutional environment (cf. Morck, Wolfenzon, and Yeung, 2005). To control for differences in industries, they add industry capital intensity and industry gross value added as controls. As TFP is calculated under the assumption of perfect competition and constant return to scale, they also control for possible "rents" in the TFP values by interacting the firm size distribution variables with indicators for competition intensity, such as firm turbulence or, again, capital intensity. However, they do not find "rents" in the TFP measure.

Carree and Thurik (1998, 1999) analyze 13 manufacturing industries in 12 European countries for the period 1990 to 1995. They regress growth of real value added from 1990 to 1993, to 1994, or to 1995 on large-firm presence in the year 1994. To control for country differences in the industry size distributions, they add GDP per capita index as an interaction term. Furthermore, they estimate the regression in differences from the overall industry means. Their results indicate that an industry with a low large-firm presence relative to the same industries in other countries has performed better, on average, in terms of growth of value added.

Pagano and Schivardi (2003) analyze the impact of firm size distribution in 22 industries (manufacturing, services, and construction) across eight European countries. Their analysis clearly shows that intra-industry size differences between countries are quite important. This finding underlines the importance of institutions for productivity and firm size distribution. Furthermore, they find positive effects of size in 1994 on per capita GDP growth between 1994 and 1998. However, this positive effect disappears when controlling for country-specific effects. As Pagano and Schivardi (2003) theorize that the positive effect of firm size distribution on growth is mainly driven indirectly via the positive effects large firms exert on innovation, they interact firm size distribution with input-oriented innovation indicators, such as the share of personnel employed in R&D, R&D expenditure over investment, or R&D expenditure over value added in an industry. They find that size matters for growth only through its influence on innovation.

The most recent analysis, by Fogel, Morck, and Yeung (2006), differs from the ones discussed above in two ways. First, the analysis is at the country level, not at the industry level. Second, and more important, it takes a very long perspective by analyzing the effects of big business stability in 44 countries during the period 1975 to 1996 (data are available for the years 1975 and 1996) on economic growth (real per capita GDP growth or TFP growth) in the period 1990 to 2000. To control for differences in the countries under consideration, the authors add to their model the country's income level, physical capital stock, and human capital stock. Furthermore, they implement several controls for institutional differences in the countries. These controls range from the size of the government sector to indicators for the functioning of the financial system to the openness of a country. Their results suggest that countries with larger big business stability from 1975 to 1996 exhibited slower economic growth in the 1990s.

In summary, the results of these four studies suggest that the more "cross-section" in nature the data are (Acs et al., 1999), the more likely it is that the impact of large firms on economic growth will be found to be positive. In contrast, data of a more "time-series" nature (Fogel, Morck, and Yeung, 2006) lead to the result that the impact of large firms on economic growth is negative. This insight motivates the analyses presented below, which is based on an industry-level time-series dataset spanning 21 German manufacturing industries over the time period 1991 to 2004.

4. Empirical Work

4.1. Data

The data are at the industry level and cover 21 manufacturing industries over the timespan 1991 to 2004. The data are the result of a merger of the Ifo Industry Growth Accounting Database (cf. Roehn, Eicher, and Strobel, 2007), the Ifo Innovation Survey (cf. Penzkofer, 2004), and the establishment file of the German Social Security Statistics (cf. Brixy and Fritsch, 2004). Each of these datasets is a source of rich information on its own—the cumulative effect should be a much more vivid and accurate picture of German industry development.

Information on productivity growth in terms of total factor productivity (TFP) growth is gleaned from the Ifo Industry Growth Accounting Database. By decomposing industry-level value-added (VA) growth, one can derive TFP growth as a residual:

$$\Delta \ln VA_{i,t} = \bar{\upsilon}_{K,i,t} \Delta \ln K_{i,t} + \bar{\upsilon}_{L,i,t} \Delta \ln L_{i,t} + \Delta \ln TFP_{i,t} \qquad (1)$$

where $K_{i,t}$ and $L_{i,t}$ denote capital services and adjusted labor of industry *i* in period *t*. The two-period average nominal input shares of capital and labor are $\bar{\upsilon}_{K,i,t}$ and $\bar{\upsilon}_{L,i,t}$, respectively. Capital services are flows of services by which each capital asset type contributes to the production process. The Ifo Industry Growth Accounting Database distinguishes 12 assets, which are derived by the perpetual inventory method. The 12 assets include three ICT assets (Computer and Office Equipment; Communication Equipment; Software), eight additional equipment assets (Metal Products; Machinery; Electrical Generation and Distribution; Instruments, Optics, and Watches; Furniture, Music, and Sports Equipment; Other Machines and Equipment; Automobiles; Other Vehicles), and investments in Buildings and Structures. Data on quality adjusted labor at the industry level are taken from the Groningen Industry Level Growth Accounting Database.

Industry-specific innovation activities of firms can be derived from the Ifo Innovation Survey. More than 1,000 surveyed firms report yearly whether or not they have introduced an innovation, i.e., product or process innovation. As the number of employees reported by the surveyed firms and the size distribution of firms in a respective industry are known, a projection of the survey data across the population is possible. The Ifo Innovation Survey thus makes it possible to derive indicators for the product and process innovation intensity in an industry.

The German Social Insurance Statistics requires all employers to report information about every employee who is subject to obligatory social insurance. The information collected can be transformed into an establishment file that provides longitudinal information about the establishments and their employees. Thus, one can derive information on the establishment size distribution (in terms of employment) in an industry. Furthermore, as each establishment with at least one employee subject to social security has a permanent individual code number, it is possible to identify business start ups and closures. The appearance of a new code number can be interpreted as a startup; the disappearance of a code number can be interpreted as a closure. Businesses without employees are not included. The unit of measurement is the "establishment," not the company. The empirical data thus derived include two categories of entities: firm headquarters and subsidiaries. In the following analysis, the term *business* is used for both entities.

The industry-level variables are summarized in Table 1. Tables 2a through 2c display some descriptive statistics of the variables in use.

Table 1: *Industry-Level Variables*

Variable	**Definition** ***Source***
TFP growth	Residual from the decomposition of yearly value-added growth *Ifo Industry Growth Accounting Database*
Value-added	Additional value created in an industry *German Federal Statistical Office*
Capacity utilization index	Relation of actual value-added to the trend component of value-added (Hodrick-Prescott Filter with $\lambda = 100$)
Share of large business employment	Number of employees in businesses with at least 1,000 employees over the number of employees in all businesses in an industry *Establishment File of the German Social Insurance Statistics*
Change of share of large business employment	Yearly change of the share of large business employment *Establishment File of the German Social Insurance Statistics*
Capital intensity	Capital stock over employees subject to social security *Ifo Industry Growth Accounting Database and German Social Insurance Statistics*
Turbulence rate	Sum of number of startups and closures over the number of existing businesses *Establishment File of the German Social Insurance Statistics*
Share of product innovators	Number of product innovating businesses over number of all businesses in an industry *Ifo Innovation Survey*
Share of process innovators	Number of process innovating businesses over number of all businesses in an industry *Ifo Innovation Survey*

Table 2a: *Descriptive Statistics, 1991–2004*

Industries	TFP Growth (%)				Value Added (millions)				Capacity Utilization Index			
	Mean	Max	Min	Std.Dev.	Mean	Max	Min	Std.Dev.	Mean	Max	Min	Std.Dev.
Food and Tobacco	-1.43	6.99	-13.49	5.56	35.28	39.14	33.57	1.51	1.00	1.06	0.96	0.03
Textiles	1.38	8.29	-9.00	4.49	6.24	8.65	4.91	1.19	1.00	1.05	0.91	0.05
Apparel	4.22	11.18	0.60	3.28	3.57	5.22	2.78	0.74	1.00	1.09	0.93	0.05
Leather	2.47	16.80	-4.86	5.96	1.23	1.72	0.96	0.25	1.00	1.09	0.92	0.05
Wood Products	2.21	12.41	-8.37	5.43	7.67	8.30	6.50	0.51	1.00	1.08	0.90	0.05
Paper, Pulp	1.41	11.64	-15.77	6.96	9.25	9.86	7.93	0.52	1.00	1.06	0.88	0.05
Publishing, Printing	-0.33	13.55	-6.89	5.34	23.06	25.21	19.77	1.64	1.00	1.08	0.94	0.03
Coke, Petroleum, Nuclear Fuels	-16.44	115.87	-240.39	92.78	10.97	51.41	1.51	12.57	1.12	2.39	0.20	0.69
Chemicals	4.31	9.38	-0.93	2.85	39.28	47.46	33.97	4.26	1.00	1.03	0.95	0.02
Rubber, Plastic	1.67	5.71	-2.93	2.55	18.83	21.66	16.70	1.52	1.00	1.03	0.97	0.02
Non-Metallic Mineral Products	2.13	7.28	-1.25	2.63	15.67	16.83	14.81	0.65	1.00	1.06	0.96	0.03
Basic Metals	3.53	12.00	-6.95	5.21	16.24	18.15	14.21	1.07	1.00	1.06	0.92	0.04
Fabricated Metal Products	1.10	7.15	-7.80	4.04	36.50	39.50	33.65	1.99	1.00	1.06	0.94	0.03
Machinery	1.27	9.10	-6.15	4.02	61.42	69.51	57.62	3.29	1.00	1.09	0.93	0.04
Office Machinery and Computers	27.18	44.60	0.48	16.43	3.60	11.92	0.70	3.80	1.03	1.25	0.83	0.13
Electrical Apparatus n.e.c.	1.29	7.92	-15.92	7.27	30.39	33.31	27.98	1.96	1.00	1.11	0.93	0.05
Radio, TV, and Comm. Equipment	6.67	25.65	-15.63	14.00	10.55	18.26	6.81	3.05	0.99	1.24	0.72	0.16
Instruments, Optics, and Watches	1.66	14.63	-11.49	6.76	15.45	17.42	13.51	1.38	1.00	1.11	0.92	0.06
Motor Vehicles	0.22	13.28	-17.08	9.06	52.06	60.41	42.41	5.41	1.00	1.10	0.87	0.07
Other Transport Equipment	4.05	22.48	-13.84	11.81	7.05	9.69	4.23	1.89	1.00	1.24	0.72	0.15
Furniture and Manufacturing n.e.c	-1.17	4.61	-8.51	3.88	12.29	15.58	9.17	1.97	1.00	1.07	0.93	0.05
All	2.26	115.87	-240.39	21.85	19.84	69.51	0.70	16.63	1.01	2.39	0.20	0.16

Table 2b: *Descriptive Statistics, 1991–2004*

Industries	Share of Large Business Employment (%)				Change of Share of Large Business Employment (%)				Capital Intensity (millions per employee)			
	Mean	Max	Min	Std.Dev.	Mean	Max	Min	Std.Dev.	Mean	Max	Min	Std.Dev.
Food and Tobacco	5.21	6.78	4.16	1.10	-0.13	0.93	-1.02	0.44	0.09	0.10	0.06	0.01
Textiles	6.52	10.55	4.59	2.10	-0.29	1.18	-2.48	0.89	0.09	0.12	0.04	0.02
Apparel	2.60	4.98	0.00	1.50	-0.23	1.29	-1.60	0.95	0.03	0.06	0.01	0.01
Leather	3.92	7.07	2.20	1.41	0.34	1.61	-1.59	0.89	0.06	0.09	0.03	0.01
Wood Products	5.67	8.43	3.40	1.70	0.39	1.96	-3.32	1.46	0.05	0.07	0.03	0.01
Paper, Pulp	11.54	14.40	7.17	2.32	-0.54	0.78	-1.40	0.61	0.12	0.14	0.08	0.02
Publishing, Printing	9.07	12.96	6.27	1.80	0.22	1.76	-1.52	1.06	0.07	0.09	0.04	0.02
Coke, Petroleum, Nuclear Fuels	42.02	58.90	28.32	7.18	0.92	30.58	-8.05	9.88	0.35	0.40	0.23	0.06
Chemicals	49.61	61.17	44.00	5.68	-0.45	7.77	-3.75	3.05	0.14	0.18	0.09	0.03
Rubber, Plastic	15.91	20.34	13.57	2.05	-0.29	1.27	-3.68	1.23	0.06	0.07	0.04	0.01
Non-Metallic Mineral Products	14.96	24.29	8.67	5.12	0.53	5.40	-5.45	3.22	0.10	0.13	0.06	0.02
Basic Metals	21.11	30.15	17.66	3.91	-0.36	4.45	-3.72	2.17	0.09	0.10	0.06	0.01
Fabricated Metal Products	10.09	15.25	7.54	2.23	-0.37	2.85	-2.44	1.21	0.05	0.06	0.03	0.01
Machinery	20.98	28.65	18.54	2.89	-0.18	5.22	-4.23	2.15	0.05	0.06	0.03	0.01
Office Machinery and Computers	30.96	44.11	22.45	6.52	-0.46	7.81	-16.39	7.05	0.15	0.18	0.09	0.03
Electrical Apparatus n.e.c.	38.18	43.82	35.50	2.58	0.21	4.44	-3.91	2.17	0.07	0.09	0.05	0.01
Radio, TV, and Comm. Equipment	38.05	43.82	34.25	2.86	0.22	4.44	-3.91	2.59	0.07	0.11	0.04	0.02
Instruments, Optics, and Watches	13.24	17.98	11.07	2.53	-0.33	1.45	-3.07	1.14	0.03	0.04	0.02	0.00
Motor Vehicles	49.95	53.46	48.47	1.59	-0.32	0.94	-2.23	0.97	0.10	0.12	0.08	0.01
Other Transport Equipment	70.58	85.94	59.69	7.85	1.84	14.23	-7.57	5.84	0.07	0.09	0.04	0.02
Furniture and Manufacturing n.e.c	3.24	3.87	2.37	0.49	0.09	0.96	-0.29	0.34	0.06	0.08	0.04	0.01
All	22.07	85.94	0.00	19.06	0.04	30.58	-16.39	3.26	0.09	0.40	0.01	0.07

Table 2c: *Descriptive Statistics, 1991–2004*

Industries	Turbulence Rate (‰)				Share of Product Innovators (%)				Share of Process Innovators (%)			
	Mean	Max	Min	Std.Dev.	Mean	Max	Min	Std.Dev.	Mean	Max	Min	Std.Dev.
Food and Tobacco	107.69	117.72	100.14	6.18	33.83	47.83	26.37	6.13	19.07	27.40	8.89	5.48
Textiles	153.47	175.92	110.23	16.86	34.74	46.15	23.53	7.14	18.88	33.82	14.00	5.01
Apparel	225.91	265.39	186.37	19.46	27.08	38.71	6.90	9.33	14.88	31.82	0.00	9.35
Leather	149.50	181.30	124.48	15.05	38.97	52.38	16.67	9.81	12.81	26.67	0.00	8.08
Wood Products	120.99	151.06	84.66	24.89	13.97	28.33	5.66	5.82	15.35	25.00	9.09	4.70
Paper, Pulp	114.03	137.36	91.46	14.64	19.26	25.69	10.75	4.37	17.36	22.47	8.60	3.93
Publishing, Printing	148.24	171.91	122.96	16.83	12.39	19.35	5.62	4.51	19.72	27.42	11.96	4.71
Coke, Petroleum, Nuclear Fuels	136.15	222.80	76.19	46.40	13.10	33.33	0.00	12.28	8.10	33.33	0.00	11.75
Chemicals	124.27	141.30	102.30	12.59	51.25	64.71	30.00	8.25	34.99	45.28	24.00	7.10
Rubber, Plastic	131.04	157.68	117.44	10.80	32.85	41.89	25.77	5.08	25.67	36.17	16.44	6.05
Non-Metallic Mineral Products	142.67	165.31	128.69	10.26	21.67	27.66	13.33	4.30	19.58	25.86	16.16	3.15
Basic Metals	128.52	164.09	111.49	14.84	21.73	48.28	8.70	9.31	23.16	41.38	8.70	9.31
Fabricated Metal Products	161.63	175.68	138.07	8.67	20.20	28.28	15.04	3.93	20.08	25.52	13.04	3.78
Machinery	128.19	138.39	111.74	6.61	37.99	42.11	33.23	3.19	24.33	31.32	19.34	3.28
Office Machinery and Computers	212.99	252.44	186.30	21.57	10.00	40.00	0.00	16.49	6.19	33.33	0.00	12.67
Electrical Apparatus n.e.c.	147.46	168.97	135.32	9.41	47.67	59.74	36.80	6.80	33.06	41.03	21.60	6.34
Radio, TV, and Comm. Equipment	171.77	203.92	140.12	23.31	54.44	87.10	34.21	13.00	45.27	59.26	32.35	8.56
Instruments, Optics, and Watches	121.76	155.31	103.44	13.45	48.72	63.16	43.59	5.75	25.72	29.82	19.51	3.04
Motor Vehicles	124.96	140.54	105.53	11.86	51.67	69.57	33.33	10.74	38.09	65.22	14.29	16.82
Other Transport Equipment	182.92	204.50	149.01	15.16	30.88	50.00	12.50	13.37	23.52	50.00	11.11	11.25
Furniture and Manufacturing n.e.c	148.35	169.18	112.03	16.81	40.84	62.03	29.23	9.30	21.41	36.00	8.77	7.83
All	146.79	265.39	76.19	34.66	31.58	87.10	0.00	16.29	22.25	65.22	0.00	12.12

4.2. The Impact of Large Businesses on Productivity Growth

The final dataset consists of 19 manufacturing industries over a period of 14 years. As TFP growth in “Coke, Petroleum, Nuclear Fuels” and in “Office Machinery and Computers” follows a rather different pattern than that of the other industries (cf. Table 2a), these two industries are excluded from all regressions. Along the same lines, Acs, Morck, and Yeung (1999, p. 391) point out: “Our results would be ‘cleaner’ if computer related industries were taken out of our sample because these industries are known to have productivity trends very different from those of other industries.”

Beck and Katz (2004) call this special type of data, which has a finite and roughly equal number of units and number of observations per unit, *time-series-cross-section* (TSCS). Most recent literature has either concentrated on data where the number of units and the number of observations per unit are both very large or where the number of units is large and the number of observations per unit is small. The first type gave rise to the so-called *panel co-integration models for heterogeneous panels* (cf. Pesaran, Shin, and Smith, 1999). The latter type is discussed in the *dynamic panel* literature (cf. Arellano and Bond, 1991; Blundell and Bond, 1998). In the TSCS case, first preference is give to a fixed effects (FE) model with panel (White) corrected standard errors (cf. Williams, 2000). The FE model uses the changes in the variables over time to estimate the effects of the independent variables on the dependent variable.

In a first step, the relationship between TFP growth and large business presence is estimated, where large business presence is calculated as the share of employees in businesses with at least 1,000 employees over all employees in an industry and as the yearly change of the share of large business employment. A set of control variables is added, e.g., a full set of year dummies to capture time-series variation that is common to all industries, an industry-specific capacity utilization index to control for industry-specific business cycles, or a lagged dependent variable to control for serial correlation because it often takes time to adopt productivity improving technologies.

Table 3 displays the results of the first step. Except for Regression IV, all regressions are FE models with a full set of year dummies and panel corrected standard errors, as tests for the equality of the residuals' variances by industry clearly suggest that there is a remaining cross-sectional heteroscedasticity by industry. Regression IV is the only between estimation, i.e., a regression run on the means (over time) of the variables. It is the only regression that results in a significantly positive impact of large business presence on TFP growth.

Table 3: *Regressions on Total Factor Productivity*

Variable	I	II	III	IV
Lagged share of large business employment	-0.2892* (0.1624)	-0.3065* (0.1712)	-0.1589 (0.1475)	0.0436* (0.0228)
Change of share of large business employment	-0.5858** (0.2931)	-0.7458** (0.3604)	-0.8845*** (0.3100)	___
N	247	228	247	19
Adj. R^2	0.08	0.08	0.30	0.13
Industry fixed effects	Yes	Yes	Yes	___
Period fixed effects	Yes	Yes	Yes	___
White (diagonal) corrected standard errors	Yes	Yes	Yes	Yes
Controls	___	Lagged Dependent Variable	Capacity Utilization Index***	___

I–III cross-section-time-series; IV pure cross-section, between estimates.
*** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level.
Standard errors in parentheses.

Regression I is the basic model. The share of large business employment and its change both have a significantly negative impact on TFP growth. An inspection of the serial correlation between the lagged residuals shows that even in the basic model there is no remaining partial correlation. Hence, there is no obvious necessity to add a dependent lagged variable to reduce serial correlation. Inclusion of the lagged dependent variable—Regression II—does not change the basic results dramatically. Furthermore, the slope coefficient of the lagged dependent variable is not significantly different from zero. Basically, one should not overvalue the results of the FE regressions with the inclusion of a lagged dependent variable. It is well known that the inclusion of a lagged dependent variable in an FE model may cause problems because of its correlation with the fixed effects. In this case, Nickell (1981) shows that the FE estimator is biased of order *1/T*. However, since the time series examined in this paper is relatively long, the fixed-effects estimator is more likely to be consistent.

Inclusion of the capacity utilization index in Regression III to control for industry-specific business cycles changes the results in that the coefficient of the share of large business employment becomes insignificant, whereas the coefficient of the change of large businesses employment share stays significantly negative. The slope coefficient of the capacity utilization index is significantly different from zero.

Regressions were also run with other limit values for the share of large business employment. In the case of smaller values (e.g., businesses with at least 500 employees), the results were ambiguous. In the case of larger values (e.g., businesses with at least 5,000 employees—the "real" heavyweights), there was an increasing number of industries with a zero share of large business employment.

Even in the case of a negative average relationship between large business presence and TFP growth, there might be some industries where this relationship is positive. To allow for heterogeneity in the relationship between TFP growth and large business presence over industry, in a further step the large business variables are interacted with (time-invariant) industry characteristics.

The first candidates for interaction are capital intensity and business turbulence rate. These variables might serve as proxies for competition intensity in the industry and, therefore, control for the possibility that TFP growth contains "rents." Acs, Morck, and Yeung (1999) argue that TFP growth in industries with more market power may register higher TFP growth not because they experience higher TFP growth, but because the TFP calculation may include rents due to the market power of incumbent firms in the industry. This measurement error might than be captured by the large businesses slope coefficient in the basic model. If “rent” is the only explanation for the impact of large business presence on TFP growth, the large businesses slope coefficient should become zero while the slope coefficient of the interaction between large business presence and competition intensity should be significantly different from zero. Capital intensity and business turbulence rate enter the model as industry-specific means over the entire time period. They therefore represent time-invariant industry characteristics.

Table 4 displays the results of regressions expanded by the interaction of large business presence with proxies for competition intensity. In all specifications, the slope coefficient of the share of large business employment is significantly different from zero. Calculating the point estimates of the effect of large businesses employment share on TFP growth for each industry depending on the industry-specific value of capital intensity or the value of the turbulence rate, respectively, one sees that in industries with high values of capital intensity (at least €0.12 million per employee in the specification without controls) or low values for the turbulence rate (maximum 132 net entries per 1,000 incumbent businesses in the specification without controls), the industry-specific effect of the share of large business employment on TFP growth is positive (e.g., Chemicals or Paper and Pulp). The point estimates are the sum of the slope coefficients of the share of large business employment and the slope coefficients of the respective interaction term multiplied by the value of capital intensity or turbulence rate in an industry. However, it turns out that neither of the positive estimates is significantly different from zero assuming a 5% significance level. This clearly suggests that the argument that the TFP measure contains “rents” cannot be supported by empirical evidence.

Table 4: *Regressions on Total Factor Productivity*

Variable	I	II	III	IV	V	VI
Lagged share of large business employment	-1.0161***	-1.2938***	-0.6967**	1.7473**	1.8978**	1.5819**
	(0.3758)	(0.4251)	(0.3597)	(0.7871)	(0.8316)	(0.8005)
Change of share of large business employment	-1.1932**	-2.1233**	-2.1264***	0.5183	0.5542	1.8805*
	(0.6228)	(0.9395)	(0.6315)	(1.0933)	(1.7469)	(1.0523)
Lagged share of large business employment * Capital intensity	8.2147***	11.4838***	6.2080**	___	___	___
	(3.1992)	(3.7651)	(3.1917)			
Change of share of large business employment * Capital intensity	7.0628	17.7083*	15.0012***	___	___	___
	(5.7811)	(9.9899)	(5.6597)			
Lagged share of large business employment * Turbulence rate	___	___	___	-0.0133***	-0.0143***	-0.0113**
				(0.0053)	(0.0056)	(0.0055)
Change of share of large business employment * Turbulence rate	___	___	___	-0.0069	-0.0076	-0.0170**
				(0.0072)	(0.0113)	(0.0070)
N	247	228	247	247	228	247
Adj. R^2	0.09	0.09	0.32	0.10	0.10	0.33
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Period fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
White (diagonal) corrected standard errors	Yes	Yes	Yes	Yes	Yes	Yes
Controls	___	Lagged Dependent Variable	Capacity Utilization***	___	Lagged Dependent Variable	Capacity Utilization***

*** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level.
Standard errors in parentheses.

To test whether large business presence supports TFP growth in innovation-intensive industries, the large business variable is interacted with innovation intensity. To allow for different types of innovation, large business presence is either interacted with process innovation intensity or product innovation intensity. Process innovation intensity and product innovation intensity are calculated as industry-specific means over the entire period. Table 5 displays the results of these regressions. In all specifications except those including the capacity utilization index as control, the slope coefficient of large business presence remains significantly negative. The slope coefficients of the interaction of large business presence and share of product innovators or share of process innovators are generally positive. The coefficients for the interaction with share of process innovators are generally higher than the coefficients for the interaction with share of product innovators. However, these coefficients sometimes turn out to be not significantly different from zero. Calculating the industry-specific point estimates for the effect of large business presence, there are some innovation-intensive industries (at least 51 product innovators or 34 process innovators per 100 firms in the basic specification without controls) where this effect is positive (e.g., Chemicals, Motor Vehicles, and Radio, TV, and Comm. Equipment). Interestingly, Radio, TV, and Comm. Equipment is an industry with a high degree of market selection (this industry has one of the largest turbulence rates in the sample), whereas Chemicals and Motor Vehicles are both industries characterized by very little selection. It might be stiff international competition between incumbents with large research laboratories that drives innovation in the latter two industries. However, neither of these positive point estimates is significantly different from zero assuming a 5% significance level.

Table 5: *Regressions on Total Factor Productivity*

Variable	I	II	III	IV	V	VI
Lagged share of large business employment	-0.7361* (0.4234)	-1.1035** (0.5145)	0.1864 (0.3978)	-1.0984* (0.6339)	-1.5251** (0.7821)	0.1936 (0.5503)
Change of share of large business employment	-2.1153*** (0.7281)	-3.2261*** (1.0743)	-1.7712*** (0.7149)	-2.5065*** (0.9263)	-3.6447*** (1.3429)	-2.0683** (0.9492)
Lagged share of large business employment * Share of product innovators	0.0142 (0.0119)	0.0266* (0.0153)	-0.0092 (0.0106)	___	___	___
Change of share of large business employment * Share of product innovators	0.0459** (0.0206)	0.0785** (0.0339)	0.0263 (0.0190)	___	___	___
Lagged share of large business employment * Share of process innovators	___	___	___	0.0331 (0.0250)	0.0517* (0.0315)	-0.0129 (0.0207)
Change of share of large business employment * Share of process innovators	___	___	___	0.0756** (0.0366)	0.1194** (0.0569)	0.0456 (0.0362)
N	247	228	247	247	228	247
Adj. R^2	0.10	0.12	0.31	0.11	0.12	0.32
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Period fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
White (diagonal) corrected standard errors	Yes	Yes	Yes	Yes	Yes	Yes
Controls	___	Lagged Dependent Variable	Capacity Utilization***	___	Lagged Dependent Variable	Capacity Utilization***

*** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level.
Standard errors in parentheses.

5. Summary and Conclusions

The results suggest that in industries with high competition and/or market selection, there is a positive effect of large business on productivity growth in the presence of innovation. This is especially true for process innovation. The latter result is in line with Cohen and Klepper's (1996a, b) model of firm size and the nature of innovation. However, this positive effect is overshadowed by a negative impact of large business presence on productivity growth. Accompanying the fact that large firms' organizational structures often are not supportive of innovation, is the bitter after-taste of large businesses in their role as successful lobbyists. Wealthy families, elite cadres of professional managers, or bureaucrats (in the case of state-owned firms) often have control over large businesses and are well connected to politics. They thus have the power to lobby on behalf of weak institutions so as to preserve their concentrated control over the nation's large businesses. This concentrated control over large businesses may lead to various market power distortions, particularly in regard to innovation. Morck, Wolfenzon, and Yeung (2005) call this state of affairs "oligarchic capitalism," and state that when this situation exists, economic policy is no longer available as a cure for economic ills. The only way to break this stranglehold is to set up strong institutions that will prevent rent seeking. This is not a new conclusion—nor even a new solution to it—but as long as there is such a paucity of theoretical and empirical work aimed at the design of strong institutions, it is not a conclusion that can realistically be rewritten in a more hopeful form. Therefore, research and discussion on these issues should be intensified—theoretically and empirically—and the issue should be kept alive in political debate.

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References

Abernathy, F., J. Dunlop, J. Hammond, and D. Weil (1999). A Stitch in Time. New York: Oxford University Press.

Acemoglu, D., P. Aghion, and F. Zilibotti (2002). Distance to Frontier, Selection, and Economic Growth. NBER Working Paper 9066.

Acs, Z., R. Morck, M. Shaver, and B. Yeung (1997). "The Internationalization of Small and Medium-Sized Enterprises: A Policy Perspective." Small Business Economics 9, 7–20.

Acs, Z., R. Morck, and B. Yeung (1999). Productivity Growth and Firm Size Distribution. In Acs, Z., B. Carlsson, and C. Karlsson (eds.), Entrepreneurship, Small and Medium Enterprises and the Macroeconomy. Cambridge: Cambridge University Press.

Arellano, M. and S. Bond (1991). "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations." Review of Economic Studies 58, 277–297.

Baumol, W. (2002). The Free-Market Innovation Machine. Princeton and Oxford: Princeton University Press.

Beck, N. and J. Katz (2004). Time Series Cross Section Issues: Dynamics, 2004. Mimeo, New York University.

Bénabou, R. and J. Tirole (2003). "Intrinsic and Extrinsic Motivation." Review of Economic Studies 70, 489–520.

Blundell, R. and S. Bond (1998). "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models." Journal of Econometrics 87, 115–143.

Brixy, U. and M. Fritsch (2004). “The Establishment File of the German Social Insurance Statistics.” Schmollers Jahrbuch/Journal of Applied Social Science Studies 124, 183–190.

Brusoni, S., E. Cefis, and L. Orsenigo (2007). Innovate or Die? A Critical Review of the Literature on Innovation and Performance. In Cassis, Y. and A. Colli (eds.), Business Performance in the XX Century: A Comparative Perspective. Cambridge: Cambridge University Press.

Carree, M. and A. R. Thurik (1998). “Small Firms and Economic Growth in Europe.” Atlantic Economic Journal 26, 137–146.

Carree, M. and A. R. Thurik. (1999). Industrial Structure and Economic Growth. In Audretsch, D. B. and A. R. Thurik (eds.), Innovation, Industry Evolution, and Employment. Cambridge: Cambridge University Press.

Cohen, W. and S. Klepper (1996a). “A Reprise of Size and R&D.” Economic Journal 106, 925–951.

Cohen, W. and S. Klepper (1996b). “Firm Size and the Nature of Innovation Within Industries: The Case of Process and Product R&D.” Review of Economics and Statistics 78, 232–243.

Fogel, K., R. Morck, and B. Yeung (2006). Big Business Stability and Economic Growth: Is What’s Good for General Motors Good for America? NBER Working Paper 12394.

Gerschenkron, A. (1962). Economic Bachwardness in Historical Perspective. Cambridge: Harvard University Press.

Heblich, S. (2007). Eigenverantwortliche Individuen und Pro-Aktive Unternehmen [Self-Reliant Individuals and Pro-Active Companies]. Discussion Paper V-48-07, University of Passau.

Helpman, E. and G. Grossman (2002). Interest Groups and Trade Policy. Princeton: Princeton University Press.

Knight, F. (1921). Risk, Uncertainty, and Profit. Boston: Hart, Schaffner & Marx.

Krueger, A. (1974). "The Political Economy of the Rent-Seeking Society." American Economic Review 64, 291–303.

Morck, R., D. Wolfenzon, and B. Yeung (2005). "Corporate Governance, Economic Entrenchment and Growth." Journal of Economic Literature 43, 657–720.

Nickell, S. (1981). "Biases in Dynamic Models with Fixed Effects." Econometrica 49, 1399–1416.

Pagano, P. and F. Schivardi (2003). "Firm Size Distribution and Growth." Scandinavian Journal of Economics 105, 255–274.

Penzkofer, H. (2004). Innovationstest (Ifo Innovation Survey). In Goldrian, G. (ed.), Handbuch der umfragebasierten Konjunkturforschung, ifo Beiträge zur Wirtschaftsforschung 15.

Pesaran, M. H., Y. Shin, and R. Smith (1999). "Pooled Mean Group Estimation of Dynamic Heterogeneous Panels." Journal of the American Statistical Association 94, 621–634.

Rajan, R. and L. Zingales (2003). "The Great Reversals: the Politics of Financial Development in the Twentieth Century." Journal of Financial Economics 69, 5–50.

Roe, M. (2003). Political Determinants of Corporate Governance. Oxford: Oxford University Press.

Roehn, O., T. Eicher, and T. Strobel (2007). The Ifo Industry Growth Accounting Database. CESifo Working Paper 1915,

Schumpeter, J. A. (1934). The Theory of Economic Development. Cambridge: Harvard University Press.

Schumpeter, J. A. (1942). Capitalism, Socialism and Democracy. New York: Harper & Brothers.

Vives, X. (2001). “Restructuring Financial Regulation in the European Monetary Union.” Journal of Financial Services Research 19, 57–82.

Williams, R. L. (2000). “A Note on Robust Variance Estimation for Cluster Correlated Data.” Biometrics 56, 645–646.

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