

Market Perceptions of Manufacturing: A Regional Exploration of Capital Availability in the United States

Ronald V. Kalafsky*

University of Tennessee

William W. Graves**

University of North Carolina
at Charlotte

The manufacturing sector is in a unique situation. Its overall employment numbers have been reduced and yet it remains an important component of the United States economy, with increased value-added per worker and by individual firms. Many existing manufacturers have moved toward the production of increasingly sophisticated products that in turn, entail high-end production processes. This necessitates firm-level investments on a relatively large scale. Problematically, many manufacturers cannot obtain capital with the relative ease seen in other industries, particularly various types of services or information technologies. This paper will examine the secondary sector's position with respect to equity markets. It will look at the national situation and will also seek to identify whether there are regional variations in spatial capital flows. This analysis will also take place in the context of its implications for manufacturers and their sustained viability.

Keywords: Manufacturing, capital, investment.

Manufacturing is in a distinctive and paradoxical position. Secondary sector activity constitutes an increasingly smaller component of the United States economy during the past several decades, yet parts of this sector remain generators of jobs and moreover, manufacturing imparts noteworthy multiplier effects on regional and national economies. To provide just an example of manufacturing's continued importance, one only needs to witness the efforts made by states to attract the assembly operations of numerous international motor vehicle manufacturers and their supplier networks (CanagaRetna, 2004; Cobb, 2005). Individual states and counties have spent millions of dollars on promotion and in the eventual incentive packages for these firms, indeed indicating the importance and impacts of manufacturing

*Department of Geography, University of Tennessee, Knoxville TN 37996. E-mail: kalafsky@utk.edu

**Department of Geography and Earth Sciences, University of North Carolina at Charlotte, Charlotte NC 28223. E-mail: bgraves@uncc.edu

to regional economies. On the other hand, it is clear that overall manufacturing employment has decreased in the U.S. and indeed, across most of the OECD countries throughout the past several decades. A great deal of manufacturing activity has moved to offshore sites based largely upon cost factors and facilitated by advanced logistics networks. In many cases, surviving manufacturers in advanced economies have moved into higher value-added functions, utilizing large amounts of advanced industrial equipment and implementing increasingly sophisticated production and management processes (see Deitz and Orr, 2006). Many of parts of the textile industry, for example, are utilizing modern equipment and moving into higher-end production techniques (Wheeler, 1998).

This transition has essentially become a necessity in many core industries such as metalworking, chemicals, and machinery. These shifts, of course, dictate that manufacturers have the latest, most advanced industrial equipment, which in turn requires large capital infusions. Unfortunately, in many manufacturing subsectors, capital availability has long been a problem (Graves, 2003). The lack of access has been attributed to a number of reasons, such as the relatively small size of most manufacturers and second, and perhaps most important, the general perception of manufacturing in the United States. To provide just one example, U.S. machine tool producers have often encountered difficulties in obtaining capital when compared with competitors in Germany and Japan (Finegold et al., 1994). In the eyes of many observers, such situations have contributed to the overall decline of domestic manufacturing firms and industries.

It appears that at least within the U.S., most producers are painted with a broad brush with regard to the state of the secondary sector. For example, observers view a research-intensive, advanced manufacturing pursuit such as high-speed machining as having the same situation and trajectory as basic textile production. A particular concern is found with the banking community understanding the nature of modern manufacturing and the needs of individual operations (NAM, 2006). This paper examines whether manufacturing firms have continued to experience greater difficulties in obtaining capital due to investor perceptions of deindustrialization and due to the move toward a service-based economy. Moreover, this issue will also be examined within a regional context, in order to uncover whether there is any location bias in capital disparities for manufacturers.

Recent analyses from Deitz and Orr (2006) and Essletzbichler (2004) have examined regional and process-focused shifts in U.S. manufacturing, at both the firm and regional levels. In these works, particular emphasis was placed on employment changes. No research has been conducted which examines the attitudes of financial markets towards the manufacturing sector. The primary purpose of this paper is to examine regional differences in the attitudes of equity markets towards domestic manufacturers. More specifically, do investors still meet the needs of manufacturers as they become increasingly focused on other sectors? Put another way, while there are changes in employment and the types of manufacturing, is capital being allo-

cated to these regions in order to enable retooling and retraining?

MANUFACTURING IN THE UNITED STATES

It is evident that the U.S. manufacturing sector has endured many recent difficulties. Production workers have been particularly impacted, as employment numbers have decreased significantly within the past two decades. Despite this, national value-added from manufacturing has remained relatively steady. In other words, the contribution of the secondary sector to gross domestic product has remained stable, despite steady job losses. This point highlights added productivity by the average U.S. manufacturing worker. Indeed, there is strong evidence that manufacturing workers are, on balance, much higher skilled and nationally, there has been an actual increase in high-end manufacturing jobs (see Deitz and Orr, 2006). In real terms, the value-added per worker employed in manufacturing has increased by over 60 percent since 1992, as seen in Figure 1. This reinforces that many manufacturers have become progressively more capital intensive and more productive. The increase in capital intensity underlines the need for access to financial markets in order to fund these firm-level transformations.

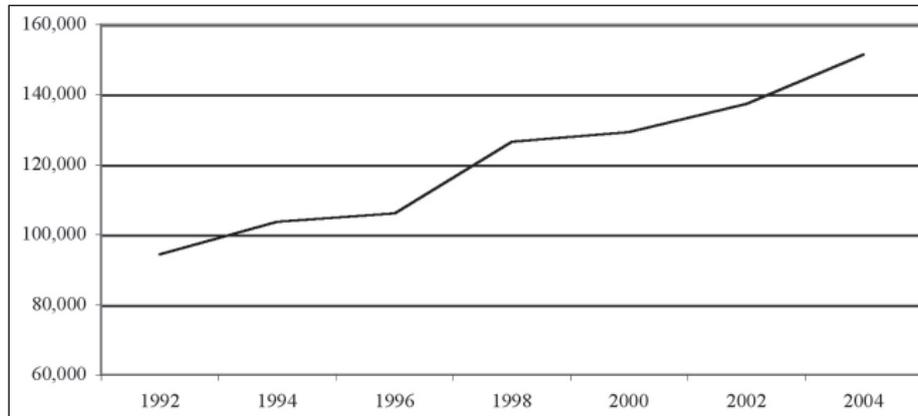


Figure 1: Value-added per employee in the US manufacturing sector.

Note: Adjusted for inflation in 2004 dollars

Source: U.S. Census Bureau: County Business Patterns (various years).

Given the recent trends and media coverage of manufacturing, one could initially assume that the secondary sector as a whole offered relatively poor returns to investors. It should be mentioned however, that it has actually provided a relatively steady rate of return during the past fifty years. Figure 2 illustrates the net income before

taxes for all U.S. manufacturers since 1980. The trends are interesting given that the fortunes of many manufacturing industries, mainly durable goods producers, are somewhat cyclical and indeed this figure does indicate signs of ups and downs during domestic economic slowdowns. Despite the cyclicality, however, one does not see the negative returns that would be expected given the recent coverage of the secondary sector. In other words, one would expect to see negative numbers across the board for manufacturing taken as a whole, but this is not the case. With respect to these returns, manufacturing taken as a whole appears to be relatively stable when compared to industries such as information technology and telecommunications, providing an average return of 6.4 percent over a 25-year period. This point is reinforced in Figure 3, which illustrates profit rates for shareholders in the manufacturing sector. With the exception of downturn between 2000 and 2001, the manufacturing sector again offered returns exceeding 10 percent. At the outset, then, the U.S. manufacturing sector provides every sign of continuing to be a viable, productive, and lucrative component of the economy.

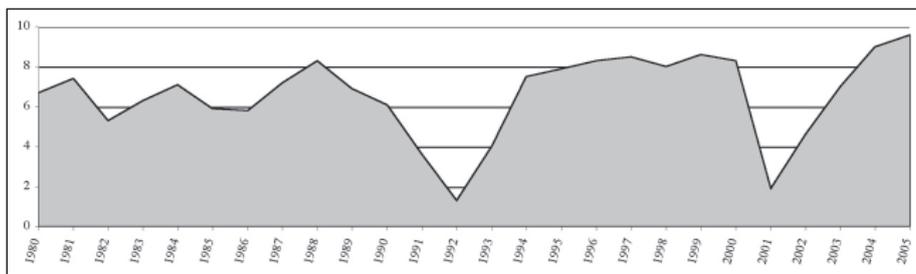


Figure 2: Net return before taxes for US manufacturers (in percent).
Sources: U.S. Census Bureau: Quarterly Financial Report for Manufacturing, Mining, and Trade Corporations (various years); Association for Manufacturing Technology, Economic Handbook of the Machine Tool Industry (various years).

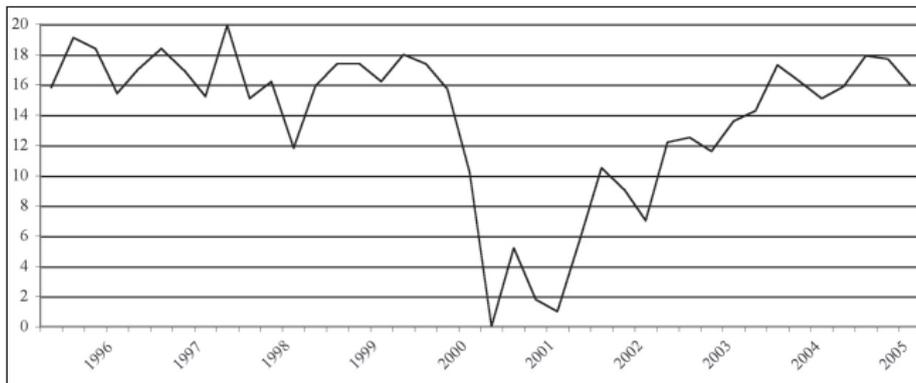


Figure 3: After-tax Profit rates for Shareholders, 1996-2005 (in percent).
Source: U.S. Census Bureau, Quarterly Financial Report for Manufacturing, Mining, and Trade Corporations, various years.

MANUFACTURING INVESTMENTS: DECISIONS AND PATTERNS

Deitz and Orr (2006) illustrated the wide-ranging transition in U.S. manufacturing toward advanced production. Essentially, domestic manufacturing can maintain a much smaller, but well-trained workforce that is involved in increasingly higher value-added activities. To move into new manufacturing environments requires significant investments in new machinery and in many cases, requires that global capital markets are willing to invest in this strategy. On a regional basis, the above research indicated above-parity concentration of skilled labor in the traditional Manufacturing Belt. Additionally and perhaps surprisingly, concentrations were found in the Pacific and Mountain regions. More important were the changes that they found with regard to high-skilled manufacturing employment. While all regions, with the exception of the Middle Atlantic, exhibited positive growth in high-skilled manufacturing employment, it must be noted that the West South Central states (Arkansas, Louisiana, Oklahoma, and Texas) grew by over 144 percent from 1983 to 2002. This work demonstrated that across the country, there were increases in skilled manufacturing employment, despite overall job losses from the manufacturing sector. At the same time, however, there was spatial unevenness in this growth.

Investment in manufacturing is a complex process and the overall evidence points to initial difficulties with firms reaching the investment decision. For most individual factories and industries, capital equipment investment is volatile, as product cycles require manufacturers to periodically retool (Doms and Dunne, 1998; Cooper et al., 1999). Yet, additional factors enter into an investment decision that extends well beyond market demands (see Tan et al., 2006). Among these elements are the cost of capital and access to it (Tootell et al., 2001). Assarsson et al. (2004) additionally found that there are difficulties in analyzing short-term considerations of investments in manufacturing, but that the cost of capital does play a role.

Before further analyzing investments, it is also worth taking a regional perspective on manufacturer issues, since it is obvious that the landscape of production is uneven. Do manufacturers within the U.S. have similar production techniques which would dictate similar capital demand patterns? Within the U.S., there have been changes as traditional manufacturing industries in the Northeast and Midwest has experienced plant closures or wholesale changes in production. Moreover, there has been growth in new firms in the manufacturing sector, especially in the West (Essletzbichler, 2004). Essletzbichler's research also noted regional turnovers in employment due to industry-level changes such as plant closings and expansions. Regional disparities were often the result of job creation, rather than job destruction. Along these lines, there is also evidence of regional trends in the practices of manufacturing firms, as companies in different parts of the U.S. have exhibited significantly different manufacturing methods (Rigby and Essletzbichler, 1997).

Even in reportedly declining regions, empirical evidence has indicated that some manufacturers have become innovative, implementing increasingly advanced proc-

esses and utilizing high levels of human capital (Florida, 1996; Essletzbichler, 2004). Within the past two decades, the implementation of flexible manufacturing processes and equipment (which most often require large capital infusions) have made manufacturing firms competitive on an international stage (Knudsen et al., 1994). In the automobile industry (a key production sector by any measure), there is every indication that motor vehicle manufacturers and their key suppliers are becoming increasingly capital-intensive (Fasenfest and Jacobs, 2002). Moreover, these firms employ an increasingly highly-trained workforce and are applying numerous advanced production processes. However, the transition to post-Fordist production modes requires the shedding of non-core assets and a greater reliance on intangible assets such as expertise. This reduces the firm's access to tangible collateral thus forcing modern firms to rely on equity capital markets to a greater degree than ever before. A notable observation is that these transformations are not just occurring in the relatively new automobile plants located in the Sunbelt: these transitions continue to occur throughout what is viewed as the traditional U.S. Manufacturing Belt.

It is apparent that regional production is following different paths and therefore firms may have different capital demands. This leads one to question whether there are divergences in capital allocation due to the regional manufacturer differences. It must be mentioned that these patterns are not unique to U.S. manufacturing. Similar patterns of uneven development have occurred in advanced manufacturing locations as varied as Norway (Wessel, 2005) and Japan (Hanham and Banasick, 2000). In general, the unevenness in production and techniques seems to be an issue as industrialized economies restructure.

Domestically, equity finance is the largest source of capital for firms (Clark 2000), so in this case it is understood that equity markets provide indicators (rightly or wrongly) whether manufacturing firms are indeed good investments. Graves (2003) found a significant decline in equity investment throughout the historic U.S. Manufacturing Belt from 1990 to 2001. The decline in investment in this region was attributed to manufacturing firms being unable to effectively compete for capital during the dot.com boom of the late 1990s. At this point, there are three questions to be asked: is there a bias against manufacturing in equity markets; second, are there regional disparities in equity for manufacturers; and last, do regional disparities exist in the market value of manufacturing firms?

METHODOLOGY

Data for this examination derive from Standard and Poor's Research Insight, which offers balance sheet and market-generated data on 2250 firms (in June 2005) with self-declared standard industrial classification codes (SIC) in manufacturing. This data set includes approximately 9,000 firms from all economic sectors. In aggregate these firms employ just over half of the U.S. labor force. While these data

tend to favor larger firms, and represent only a fractional portion of all manufacturing firms, these data provide the only objective measure of investor perception of firms. Aside from the large firm bias, these data do match the sectoral distribution of the population of manufacturing firms according to the Census of Manufacturing. In addition, since these data are updated daily, this is the most up-to-date data with which to analyze inter-sector and inter-regional capital flows.

In order to maintain consistency with previous command and control studies, these data are geocoded according to the state that is the home of each firm's headquarters office. All data is then aggregated to the state level. This headquarters approach has been criticized as an oversimplification of intra-firm geography since it ignores branch plant and subsidiary locations, yet this technique does effectively capture variation in command and control status. While these data cannot be used to identify the location of production within a firm, this study is limited to examining investor perceptions of the innovative capacity of firms as a whole. Using the market value of a firm as a measure of its importance is an improvement upon traditional command and control studies since the value captures investor attitudes on a firm's relative importance and its potential for growth – two firm characteristics that go unnoticed in traditional corporate headquarters studies (Graves, 2003).

ANALYSIS

Descriptive statistics for the group of manufacturers in the data set are provided in Table 1. The data reveal that the number of U.S. manufacturing firms has increased slightly since 1990, along with the mean market value of manufacturing firms. However, manufacturing firms, on average, have grown (in terms of tangible assets as measured by book value) from a size roughly equivalent to the market's mean to nearly double the average size firm. Despite the increase in the number and size of manufacturing firms, the portion of total equity allocated to the sector has decreased from 49 percent of total investment in 1990 to 47 percent of total investment in 2005. This erosion of more than \$200 billion of equity from the sector is indicative of the market's reallocation of capital away from the sector.

Given the importance of equity markets to manufacturer investment in the U.S., a question worth considering concerns whether investors discount the perceived prospects of manufacturing in their investments. One way to do this is to examine the price-to-earnings (PE) ratios of investments in manufacturing firms and compare those valuations to investments to the body of domestic non-manufacturers. In other words, do the markets value manufacturers less than the average non-manufacturing firm? Table 2 suggests that investment as a percent of the firm's earnings are similar when measured by PE ratios, a point confirmed by a difference of means test and the lack of statistically significant differences. At the least, these results provide indications that within the U.S., there is little sign of bias against manufactur-

ers in equity markets when taken as a whole. In fact, both groups demonstrate rapid expansion in PE ratios from 1990 to 2005. It is worth noting that examinations of PE ratios can be misleading given survivor-bias issues. Firms that fall from favor may be more likely to cease operations, thus low valuation firms are unlikely to remain in this data set.

Table 1: Descriptive characteristics of the data set.

Characteristic	1990	1999	2005
Total Firms	5,938	8,348	6,333
Manufacturing Firms	2,166	2,978	2,393
Total Market Value	\$2,952,221,363	\$15,918,754,407	\$13,754,337,867
Mean Market Value	\$497,175	\$1,906,895	\$2,171,852
Manufacturing Market Value	\$1,450,282,276	\$7,340,659,729	\$6,532,043,239
Mean Manufacturing Market Value	\$669,567	\$2,464,963	\$2,729,646
% of Total Equity in Manufacturing Firms	49.13%	46.11%	47.49%
Total Book Value	\$1,829,402,583	\$3,805,291,438	\$2,218,754,000
Mean Book Value	\$308,084	\$455,833	\$421,656
Manufacturing Book Value	\$697,800,770	\$1,277,248,434	\$1,640,860,000
Mean Manufacturing Book Value	\$322,161	\$428,894	\$767,833

Note: Adjusted for inflation in 2005 dollars.

Source: Standard & Poor's Research Insight. Accessed June, 2005.

Table 2: Mean price-to earnings ratio.

	1990	2005
Non-manufacturing Firms	11.54	23.15
Manufacturing Firms	10.88	22.15
All Firms	11.28	22.60

Source: Standard & Poor's Research Insight. Accessed June, 2005.

Given the absence of valuation disparities between manufacturing and the market as a whole, are there regional variations in capital availability to the sector? It is hypothesized here that secondary-sector firms from the traditional U.S. Manufacturing Belt (i.e. the Northeast and Midwest) are generally older, more tied to Fordist traditions and are generally less flexible than newer companies in the Sunbelt and West. So, one expects that manufacturing firms located within the Manufacturing Belt will have lower PE ratios than firms located outside the region. This regional variation in flexibility and management style has been noted by Florida (1996). Graves (2003) suggested that this condition of regional economic stasis is a component in capital market decision-making: investors frequently label all firms in a region as declining.

Table 3 reveals that the mean PE ratios of manufacturing firms in the nation's four census regions¹ are either consistent with (Midwest and Northeast) or slightly below (West and South) the market average (see Table 2) in 1990. The same pattern exists for manufacturing firms in 2005 although firm valuations have converged towards the market average since 1990. These relatively high valuations do suggest that investors are not penalizing healthy manufacturing firms in the capital distribution process. It should be noted here that a portion of these high firm valuations are a product of the classification system, the manufacturing firm category includes pharmaceutical, semiconductor and computer producers – all industries attracting a significant investment premium during this time period. The concentration of the pharmaceutical industry is most significant in the Northeastern region – New York and New Jersey headquartered pharmaceutical firms accounted for over 12 percent of US market capitalization in 2005. Despite the superficial comparison of the mean PE values in Table 3 there is no statistically significant difference in the mean PE ratios of manufacturing firms between regions in either in 1990 or 2005.

Table 3: Mean price to earnings ratio by region.

Non-manufacturing Firms	1990	2005
West	13.58	22.60
Midwest	11.26	22.29
South	11.99	24.53
Northeast	8.78	19.00
Manufacturing Firms	1990	2005
West	10.0	16.9
Midwest	11.3	22.9
South	10.8	22.6
Northeast	11.4	26.2

Source: Standard & Poor's Research Insight. Accessed June, 2005.

Tables 2 and 3 examine the value that investors place on manufacturing firms relative to non-manufacturing firms, therefore providing some measure of investor enthusiasm about manufacturing industries. In addition to the attitudes of investors, a significant reallocation of capital has occurred since 1990 that has resulted in the closure of many U.S.-based manufacturing companies. This structural shift can be seen in changes in the volume of investment flowing to manufacturing firms in each state. Changes in state level market value can be seen in Figure 4. Eight of the top-ten states which lost the most capital in the manufacturing industry were located in the traditional Manufacturing Belt. The state with the most striking change was New York, which increased its share of overall investment but lost nearly a quarter of its 1990 share of investment in manufacturing firms. States that experienced the largest relative increase in manufacturing investment were typically isolated areas

with little legacy of Fordist-era manufacturing such as Arizona (its share of national investment in manufacturing increased by 20 percent) and Nebraska (a 7 percent increase). Other states with a significant relative increase in manufacturing included Colorado and Nevada, all areas unburdened by large fixed investments in obsolete manufacturing infrastructure.

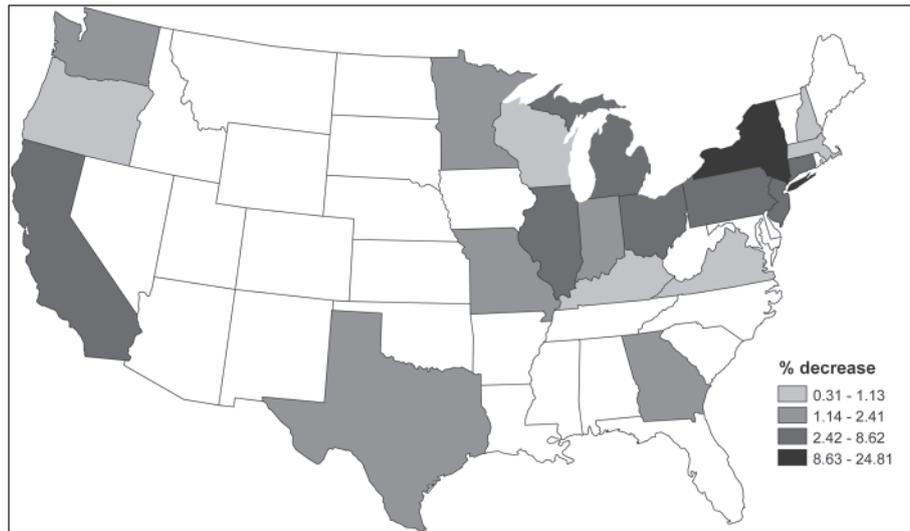


Figure 4: Greatest decreases in share of manufacturing market value, 1990 - 2005.

Regional shifts in market value are even more pronounced than state level reallocations, as seen in Table 4. At the regional scale, manufacturing firms in the South and particularly the West have received the greatest volumes of capital while the Midwest and particularly the Northeast may have been the source region for this capital. The divergence in capital flows in the Northeast between manufacturing and non-manufacturing firms is largely reflective of growing investor preferences for financial firms. Note that while there is no significant difference in regional market value change for non-manufacturers, there is a statistically significant difference ($p < 0.05$) in market value change for manufacturers among the four regions. The tremendous erosion of capital flow into the Northeast and Midwest hints at investor bias against manufacturing firms in these regions. Additionally, it shows a reallocation of capital into the two other regions of the country. The data in Table 4 also reinforce Graves' (2003) findings that regional variations in management style, production systems and average firm age are evident in aggregate capital flows. These findings also lend tentative support to Essletzbichler's (2004) work, as they suggest capital flows into relatively newer regions for production activities.

Table 4: Changes in total sectoral market value, by region: 1990-2005 (Kruskal-Wallis tests).

	Non-manufacturing Firms	Manufacturing Firms
Midwest	1.06%	-6.33%
Northeast	7.54%	-10.73%
South	1.18%	3.21%
West	-0.35%	4.43%
p-value	0.968	0.021

Source: Standard & Poor's Research Insight. Accessed June, 2005.

DISCUSSION AND CONCLUDING REMARKS

When looking at PE ratios, the data suggest no market bias against manufacturers relative to the larger national firm population and moreover, there is no statistically significant difference in PE ratios by region. Market value, however, is another story as manufacturing firms from the Northeast experienced a large decline in market value since 1990. Indeed many firms in this region remained linked to Fordist practices and as a whole, the region did not undergo the industrial changes in the Midwest described by Knudsen et al., (1994), Florida (1996), and others. Perhaps the relatively good PE numbers in the Northeast are influenced by the performance of pharmaceutical firms. On the other hand, the West enjoyed large gains in market value by secondary sector firms.

Overall, these analyses support the findings by Esseletzbichler (2004) and Deitz and Orr (2006) regarding spatial changes and unevenness in manufacturing. The above research saw distinct differences in manufacturing activities, especially with regard to employment. The analyses in this paper suggest that there are also regional disparities in the market value of manufacturing firms. This was not found when comparing regional groupings of non-manufacturers and moreover, additional statistical tests confirmed that there were no significant differences when combining manufacturers and non-manufacturers.

The salient findings of Deitz and Orr indicate that while manufacturing employment is shrinking, the remaining manufacturing workforce is in transition toward higher-skilled positions. This would appear to require that firms invest in their workforces. Likewise, it stands to reason that these same firms, in their advanced manufacturing processes, are also employing more capital. The move toward advanced capital and subsequent need for an even higher-skilled workforce was described in detail by Fasenfest and Jacobs (2002).

A question worth asking is whether firms are valued well by the market. Second, can these firms access the necessary capital needed to retool their factories and restrain their workers? The analyses contained in this paper suggest that manufacturing firms in the Midwest and Northeast are not as favored by the capital markets as

firms located elsewhere. Regardless, these findings also lend support to this previous work showing that in addition to reallocation of manufacturing employment, there is also a reallocation of market value. This provides a critical dilemma. The evidence from previous work described here suggests that nationally, manufacturers are employing workers at higher skill levels. At the same time, there is a growing disparity in manufacturing, according to employment and total market valuation numbers in this sector. In the regions being impacted hardest, even if workers are retrained with high-end manufacturing skills, will there be producers there to hire them?

From a policy standpoint, what can be done? Tax credits for new equipment purchases as proposed by industry trade groups are certainly one route. Recent market changes may also precipitate changes in firm processes and product lines. The domestic automobile industry, a large driver of the manufacturing sector, has been going through a rough period of change. For many tier 1 and 2 suppliers, the recent market situation may compel firms to modernize in order to compete on international markets.

One potential limitation of this work is related to how manufacturing is defined by analysts and the markets. This gets to the root difficulty of classifying firms that encompass production, research, and services, with an increasing amount of value-added coming from the latter two components. Moreover, the aggregate nature of the data and the survivor bias problem make it difficult to draw more substantive conclusions. That is, many of the more inefficient and outdated manufacturers have departed the market during shakeouts during the 1980s and 1990s, leaving what amounts to leaner producers. Data issues aside, this glimpse at the market's opinion of the U.S. manufacturing sector suggests that investors have looked beyond the sector's scarred image and allocated capital in a remarkably efficient manner.

NOTE

1. The Census regions are defined as:

Northeast: CT, MA, ME, NH, NJ, NY, PA, RI, VT;

South: AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV;

Midwest: IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD;

West: AK, AZ, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA

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