The Midwest looks to R&D for a payoff

In 1987, industry performed almost three-fourths of the research and development (R&D) in the United States (see Figure 1). This share has not changed appreciably over the last 25 years. What has changed is the funding of industrial R&D. In the early 1960s, the federal government paid for more than 50% of industrial R&D. That share fell to 31% by 1980, before rising to 35% during the defense buildup of the 1980s.

With the remarkable, and seemingly irreversible, political changes taking place in the former communist bloc of Europe, many expect reductions in U.S. defense outlays—the so-called “peace dividend.” Such reductions will almost certainly adversely affect the federal funding of industrial R&D.

Out of step in the Midwest

Throughout the last quarter-century, the Midwest has never been quite in synch with the rest of the country in R&D. For example, Midwest industry has paid for much more of its R&D from internal funds. Over the 25-year period, Midwest industry has self-funded from 80% to more than 90% of its R&D (see Figure 2). This regional self funding of industrial research and development may well help it weather downturns in defense spending on R&D.

While Midwest R&D spending per dollar of manufacturing output began well behind the nation in 1963, it has steadily crept closer to the national level. In the early 1960s, Midwest industry spent only $6 on R&D for every $100 of output, compared to $10 per $100 of output for the nation as whole. That gap is closing—today the figure is $7 per $100 output in the Midwest, against $9 per $100 nationally.

Thus, at the same time that the region has been losing ground to the nation in share of manufacturing production, this sector has become more R&D intensive in expenditures. This is a significant and previously unnoticed trend in the region’s R&D orientation. This Fed Letter asks whether this trend reflects a revitalization effort by Midwest industry. Are the region’s factories attempting to enhance their market competitiveness by investing in R&D?

Technology and regional economies

Growth of R&D in the industrial sector can be an important indicator of a region’s economic vitality. Investment in R&D often leads to the development of new products, jobs, and even entire industries. So, too, R&D improves the productivity of industrial processes, lowers unit costs, improves product quality, and raises the competitive position of a region’s industry in global markets.

The manufacturing sector performs almost all industrial R&D (94%) with
only a small remainder performed by
the service sector. In turn, five so-
called high-technology industrial
sectors account for over three-fourths
of manufacturing R&D. These sec-
tors include chemicals and allied
products, machinery (including com-
puters), electrical equipment, aircraft
and missiles, and professional/scien-
tific instruments.

To a lesser extent, the industrial
sector encourages R&D performed
by other sectors, sponsoring 11% of
the R&D performed by nonprofit
institutions and 6% of the R&D at
colleges and universities.

**Industrial R&D in the Midwest**

Today, the Midwest is a major center
for R&D activity. Its share of the
nation’s R&D activity slightly exceeds
its overall economic size. Yet, as
noted above, industrial R&D expend-
itutes per dollar of manufacturing
output remain less than the nation’s.
Therefore, the large overall size of
R&D activity in the Midwest arises
not from an intense R&D orientation of
the Midwest manufacturing sector
but rather from the large relative size
of its manufacturing sector which, as
a share of regional output, exceeded
the nation’s by 38% in 1986.

In the broadest terms, Midwest
manufacturing does not tend to be of
the high-technology variety. Led by
facilities in Michigan, the automotive
industry remains, by far, the leading
R&D industry in the region. In the
remaining states, high-tech notables
are more heavily represented, includ-
ing chemicals, electrical equipment,
and machinery (see Table). Even
here, Midwest-specific machinery
industries such as construction and
farm equipment tend to be less R&D
intensive than, say, computers.

The region has cultivated several
_bona fide_ high-tech industry concen-
trations, such as the large telecommu-
nications industry in Illinois and
the drugs/pharmaceuticals industry
in Illinois, Michigan, and Indiana.
However, on average, the “basic”
industry mix and the relative lack of
high-tech, defense-oriented indus-
tries such as aircraft and aerospace
have resulted in a moderately lower
R&D orientation for the Midwest
manufacturing sector.

But, while the region’s manufactur-
ing production remains less “high-
tech” than the nation, the gap has
narrowed substantially. These gains
have not occurred because high-tech
industries have moved into the Mid-
west, displacing older, low-tech ones.
Rather, on an industry-by-industry
basis, R&D spending per unit of out-
put has been on the rise. Midwestern
industries, including machinery and
autos, have been heavily investing in
research and development.

**Behind the changes**

One explanation for the region’s
rising technological intensity can be
seen by recognizing that industrial
R&D and its consequent production
are not necessarily located together.
An auto may be designed in Michi-
gan but built at a factory in Georgia.
Semiconductor or computer R&D
may take place in New York or Cali-
ifornia but the product may be manu-
factured in Singapore or Taiwan.

With respect to the Midwest, this
means that the higher R&D intensity
of Midwest manufacturing in the
1980s may be the vestige of a now-
defunct set of factory production
activities rather than evidence of an
impending blue-collar revival or a
new Silicon Valley.

Regional theorists have long recog-
nized and documented the flight of
factories from the industrial heart-
land. During the 1960s and 1970s,
many factories fled the Midwest,
mainly to the American South, in
search of lower production costs and
less militant labor. Indeed, factory
flight was facilitated by large govern-
ment investments in roads and
bridges, chiefly the interstate high-
way system, which allowed cheap
transportation and distribution from
dispersed factory locales. To some
extent, midwestern corporate and
division headquarters and R&D facili-
ties remained behind rather than
following their factories to distant
locales. While this geographic sever-
ing of production activity from pro-
duction control continued into the
1980s, a second impetus—the high
and rising dollar—shifted the migra-
tion somewhat toward overseas pro-
duction facilities.

This process of factory decentraliza-
tion from the industrial heartland is
real enough. Overall, the Midwest
has deindustrialized, as evidenced by
its falling share of U.S. manufactur-
ning output. At the same time, how-
ever, real gains in R&D expenditures
have been realized. The region’s
share of industrial R&D has held
steady since 1963 as Midwest R&D
spending has grown apace with, or
slightly faster than, the nation (see
Figure 3). The character of the re-
region remains strongly rooted in
manufacturing. But within that sec-
tor and within many of its traditional

---

**Largest R&D-performing industrial sectors: 1987 (dominant industries)**

<table>
<thead>
<tr>
<th>R&amp;D rank</th>
<th>Illinois</th>
<th>Indiana</th>
<th>Iowa</th>
<th>Michigan</th>
<th>Ohio</th>
<th>Wisconsin</th>
<th>U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>electrical equipment (communications)</td>
<td>motor vehicles</td>
<td>machinery (industrial)</td>
<td>motor vehicles</td>
<td>aircraft &amp; missiles</td>
<td>machinery (industrial)</td>
<td>aircraft &amp; missiles</td>
</tr>
<tr>
<td>2</td>
<td>aircraft &amp; missiles</td>
<td>chemicals (drugs)</td>
<td>aircraft &amp; missiles</td>
<td>chemicals (drugs)</td>
<td>chemicals</td>
<td>motor vehicles</td>
<td>electrical equipment</td>
</tr>
<tr>
<td>3</td>
<td>non-mfg.</td>
<td>non-mfg.</td>
<td>electrical equipment</td>
<td>aircraft &amp; missiles</td>
<td>rubber products</td>
<td>fabricated metals</td>
<td>machinery (computers)</td>
</tr>
</tbody>
</table>

industries, spending to develop new products and processes has become a more commonplace activity than the routinized factory production that formerly typified the region.

Federal funds, company funds

In recent years, Midwest leaders have bemoaned the anemic distribution of federal spending in the Midwest in relation to taxes originating here. Yet, the Midwest surge in industrial R&D has occurred in spite of and, indeed, because of the region’s historically low ability to draw on federal funds for R&D. Over the 1963–87 period, Midwest growth lagged behind the nation in both components of industrial R&D—that derived from federal funds and that from companies’ own funds. However, because the region’s industries heavily tend to fund their own R&D, the region’s total R&D kept pace with and slightly exceeded the nation. Over the past 25 years, federal funding of industrial R&D has greatly lagged the growth of company-funded R&D. The Midwest’s concentration in company-funded R&D was large enough for this effect to raise overall R&D spending growth in the Midwest above the national rate.

Toward the future

No one knows whether the robust R&D spending by Midwest industries will continue or, indeed, whether recent investments will even payoff in terms of renewed competitiveness and economic vigor. However, it is encouraging that, in this important category of regional investment, Midwest industry continues to fight against its industrial slippage.

The sizable absolute gains in R&D spending suggest some revival of the region’s fortunes as its character is transformed into a center of industrial research and development activity. A further hope is that the R&D spending of today will eventually lead to a bolstering of factory production and jobs here, and a healthier income growth for semi-skilled workers.

Meanwhile, despite the surge in federal R&D funding for military defense systems during the 1980s, the region’s lesser ability to attract federal government funds has actually contributed, at least indirectly, to strong R&D reinvestment over the past 25 years. Certainly, the emerging potential for demilitarization and the so-called “peace dividend” in the U.S. can only boost R&D reinvestment in basic and new nonmilitary industries.

Greater federal funding of nonmilitary industrial research may now become available. As one possibility, displaced defense-oriented personnel could work toward transferring the existing technology from defense programs to civilian purposes. Such a program could both ease worker displacement and lend an immediate boost to basic industry.

In a less direct and longer term fashion, freeing the nation’s scientists and engineers to be hired by nondefense industries may also help to revive basic industries upon which the Midwest economy is built. As the swords are sheathed, these skilled workers may come to live where plowshares are made.

—Bill Testa and David Weiss


Karl A. Schield, Senior Vice President and Director of Research; David B. Allardice, Vice President and Assistant Director of Research; Edward G. Nash, Editor.

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The MMI in March rose 0.6%, following a strong February gain of 2.5%. The transportation sector (i.e., the auto industry) accounted for much of this expected rebound in Midwest manufacturing, rising 11% in February and 5% in March. Plants that had been temporarily closed to reduce car inventories began reopening.

Most other sectors of manufacturing also improved. Metalworking was up 1.3% in March, as steel shipments to the auto industry increased. The chemical sector gained 0.7%, and has been gaining steadily over the last several months. Machinery has been the only sector that has failed to improve since the beginning of the year.

NOTE: The MMI and the USMI are composite indexes of 17 manufacturing industries and are derived from econometric models that estimate output from monthly hours worked and kilowatt hours data. For a discussion of the methodology, see "Reconsidering the Regional Manufacturing Indexes," Economic Perspectives, Federal Reserve Bank of Chicago, Vol. XIII, No. 4, July/August 1989.