Creating innovation networks among manufacturing firms: How effective extension programs work

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I. Introduction

Since its most recent peak employment level in the year 2000, the U.S. manufacturing sector has lost over 2.5 million jobs. This represents almost one fifth of its pre-recession total. The question of how to stop this catastrophic employment loss is clearly a critical one, but there are no easy answers.

Manufacturers are eligible for a variety of general business subsidies; the vast majority of these are tax abatements for locating or expanding an operation in a particular area (Lynch, 2004). These tax incentives, however, do not increase manufacturing efficiency. The main federal program for increasing the efficiency of manufacturing is the Manufacturing Extension Partnership. Despite its very small level of funding ($106 million in 2003, or $7 per manufacturing worker), it has been hit hard by budget cuts. Its

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2004 appropriation was only $39.6 million.[2] There is a lack of consensus on how government could assist manufacturing, or whether such assistance is even really possible.

In this paper, we examine data on a subsector of manufacturing, small and medium-sized (less-than-500-employee) component manufacturing firms. Component manufacturers typically sell to other firms (rather than to consumers), and thus form a key part of the manufacturing supply chain. We are able to characterize these firms' strategies in some detail using national data gathered by the Michigan Manufacturing Technology Center's Performance Benchmarking Service. In the first section of this paper, we describe the sector and some of the data we used to perform our analysis. In the second section, we summarize some of our previous research on factors that seem to be correlated with high value-added per worker and high sales growth. Our research has focused strongly on urban manufacturing firms, and we argue that these firms should be a special focus for economic development assistance. The third section discusses arguments for various economic development approaches, and examines how the MEP program has worked in practice. The fourth section concludes.

SECTION 1: Sector Description and Data

The U.S. Component Manufacturing Sector

The component manufacturing sector has long been important to the economies of the US Midwest. Firms in this sector fabricate and/or assemble molded, forged, formed,

[2] In fall 2004, the House of Representatives approved a FY 2005 budget of $106 million for the program while the Senate Appropriations Committee approved $112 million (Taylor, 2004).

and machined goods made of metal and plastic, principally for sale to other manufacturers. The sector stands at the base of such industries as automobiles and other transportation equipment; industrial, farm, and construction machinery; electrical appliances; and medical instruments. It accounts for more than 10 percent of U.S. manufacturing employment. The sector is heavily concentrated geographically, with 45 percent of total employment in the Great Lakes states of Wisconsin, Illinois, Indiana, Michigan, and Ohio (as against these states' 36 percent of U.S. manufacturing generally). The customers and suppliers of these firms are also heavily concentrated in those states.

In contrast to the OEMs and large first-tier suppliers they serve, most of these firms have fewer than 500 employees. In part because of their small size, they are often deeply anchored in their regions, and dependent on surrounding regional institutions in obtaining new knowledge. However, this cluster is dispersing, spreading out both within the US and around the world. For example, in 1975 50% of US employment in the auto industry (assembly and parts) was concentrated in just 16 of the more than 3,000 US counties. By 1990, these counties accounted for only 30% of automotive employment, a dramatic decline.

Like the rest of the US manufacturing sector, the component manufacturing industry has lost a substantial number of jobs to foreign competition during the recent recession. US Department of Labor data for the three most relevant industry classifications shows a loss of almost 20% of the 3.8 million jobs that existed in these industries in June 2003.[3] Interviews with plant managers and some of the data in our survey indicate that many of these job losses can be ascribed to competition from cheaper

[3] Based on data for the Fabricated Metal Products, Machinery, and Electrical Equipment manufacturing sectors, from the Bureau of Labor Statistics B series of establishment payroll data between June 2000 and June 2003 (http://www.bls.gov/webapps/legacy/cesbtab1.htm).

foreign imports. Component manufacturing is thus a good case study in the effects of globalization on manufacturing in the US.

As our data source in examining this sector, we draw on two surveys conducted as part of the Michigan Manufacturing Technology Center's (MMTC) ongoing Performance Benchmarking Service (http://www.mmtc.org/services/PBS). The project enlists a panel of about 600 plants to submit benchmarking data on a continuing basis to the MMTC. Each year, firms in the panel are also mailed a more detailed survey that asks additional questions about their business practices. The panel is not a random sample (firms must volunteer to participate), but it is broadly representative of the component manufacturing industry.

During the winter of 2003, we submitted a survey to all 600 firms that included detailed questions about the nature of their ties to other firms, including customers and competitors. Firms also submitted basic accounting data on their revenues, costs, employment, and wages. 250 surveys were returned by US firms.

We then linked the survey data to data from the U.S. Census Bureau's Zip Code Business Patterns file released in the year 2002. This file contains information on the number of establishments by detailed industry in every zip code in the United States as of 2000. We use this information to create measures of the urban density of the firm's location, and whether or not the firm is located in a cluster of firms in similar industries.

SECTION 2: Some Research Findings

There are, of course, numerous determinants of productivity and success in this sector, as in all of manufacturing. In our research, we have focused on the issue of agglomeration economies (Stanley and Helper, 2003). These are the productivity benefits that emerge from locating in areas of concentrated economic activity, either in the same industry or in an urban location more generally (Rosenthal and Strange, 2003). Agglomeration economies offer an important potential "lever" in economic development strategies, since it may be possible to manipulate either the location of firms or the interconnections among nearby firms so as to generate a productive cluster. Economic development theorists and practitioners have eagerly adopted the language of agglomeration, or "cluster economies," as part of their efforts (Porter, 1998). Our findings are thus quite relevant to economic development policy. That said, we do not pretend to fully analyze sources of productivity and success in this sector. Our key findings are listed below.

<u>This manufacturing sector is characterized by urban economies, but not by cluster economies.</u> We differentiate between two types of agglomeration economies. One is associated with location in dense concentrations of other establishments (urban economies), while the second (cluster economies) results from location close to similar firms in the same industry. We find that *firms located in urban areas have considerably higher levels of value-added per worker than non-urban firms with similar levels of capital investment, even after controlling for industry*.[4] Location in clusters of other

[4] Our measure of urban location is the number of non-manufacturing firms located within 10 miles of the plant. Our measure of same-industry clustering is the number of firms in the plant's same 2-digit industry located within 10 miles of the plant. We derive these from the Zip Codes Business Pattern database.

manufacturing firms in the same or similar industry, however, is associated with no additional productivity benefit beyond the effects of the urban location.

Urban economies can have a considerable impact on firm productivity. An increase in our urbanization measure from the 25th to the 75th percentile leads to a 10% increase in value-added per worker, with capital held fixed.

Many of the benefits of location in urban areas are captured by workers, not firms. Increases in our urbanization measure seem to be associated with firm payroll premiums roughly proportional to the extra value-added. This is true even after controlling for industry and the (limited) measures of worker skill that we have.

Certain types of urban firms appear to earn higher profits in our sample. Because we do not have perfect measures of the value of capital, we are hesitant to make definitive statements about profits. But at least in our sample, firms in more urbanized areas appeared to earn higher profits than other firms. This naturally raises the question of why all firms do not move to urbanized areas. Preliminary findings indicate that only smaller firms are able to earn a profit advantage due to urban location; larger firms do not seem to receive the same kinds of profit benefit. We are continuing to investigate this finding. A rationale for this finding is that small firms are particularly dependent on their environment to provide inputs such as skilled workers, specialized inputs, and new ideas. (The economist Alfred Marshall called these resources provided by a firm's environment "external economies".) In contrast, large firms have enough scale to profitably provide many services in-house. For example, they can set up a program to train their own workers, rather than rely on a pool of skilled workers that already resides near the plant.

Self-reported social capital and networking measures do not seem to account for the agglomeration economies we found. On the smaller supplemental survey, there are a series of questions that ask firms to self-report both the extent of their networking contacts with other firms in the same industry, and the perceived value of those contacts. We found that both the extent and perceived value of inter-firm networking was completely uncorrelated with location in urban areas, and also with location in clusters of firms in the same industry. Firms appeared able to network with their peers independently of their geographic location.

However, information transfer through networking does have an effect on productivity for single-plant firms. In general, we found no clear effect of either the extent or value of inter-firm networking for our full sample of firms. But we did find that single-plant firms – firms that had only a single plant and no branch plants – showed a strong correlation between the perceived value of inter firm networks and value-added. A move from the 25^{th} to the 75^{th} percentile on our measure of the value of firm networking was associated with a jump of over 10% in value-added at these firms. In contrast, firms with multiple plants showed a negative relationship between information transfer through networking and value added.

Firms that do extensive amounts of engineering to order and design work appear to get stronger productivity impacts from urban location. Firms that had a relatively large fraction of sales from engineered-to-order products (engineering a customized prototype, as opposed to working with a pre-determined product), or that performed significant design work, appear to get a larger benefit from urban location than other firms. Depending on the model specification, the urban impact on productivity could be up to

50% higher for firms in the top quartile on our measures of design intensity. However, urban location still has a significant productivity impact for other firms as well.

Trends in manufacturing are running against the kind of firms that are most successful in urban agglomerations. Over the 2001-2003 period, we found that high-wage firms were particularly likely to lose sales and employment. Among firms that paid less than the median level of annual earnings in our sample (about $37,000), employment dropped by about 4% and sales by less than 1% over the 2001-2003 period. In contrast, sales dropped by 13% and employment by over 14% among firms paying more than the median annual earnings level. These trends can be seen using skill measures as well. Sales dropped by only 5% for firms that did high levels of repetitive mass production, a relatively low-skill production style that requires little customized design. But sales dropped by 15% for firms below the median on our measure of repetitive mass production.

Urban location may still provide some protection from the general trend against high-wage, high-skill firms. High-skill urban firms apparently have been able to weather the storm better than similar firms located further away from urban concentrations. To take one striking example, firms that are above the median on our measure of the percentage of sales from engineered-to-order products and are also located in urban areas lost 4% of sales and 12% of employment over the 2001-2003 period. Firms that did similar percentages of engineer to order work but were located in areas that showed less urban concentration lost 20% of both their sales and employment over the same period.

SECTION 3: What Can (and Should) Economic Development. Policy Do?

Our analysis suggests several ways in which markets may fail to maximize social welfare, leading to potential improvements from public policy. Below, we describe three types of market failures: 1) wage externalities, 2) information externalities, 3) training externalities, 4) coordination problems, and 5) liquidity constraints. These failures lead to the possibility that government intervention could increase social welfare. That is, a dollar of public spending might lead to more than a dollar's worth of benefits. Our research suggests that at least the first two forms of market failure may be operating, and that coordination problems may be present as well. It is also possible that government intervention could *reduce* social welfare. In this section, we examine these potential effects of government policy.

We will also examine other research on how the MEP program has performed in these areas, and present some new information from our survey on the extent of MEP use among these smaller firms.

First, our findings on urban wages suggest a potential "wage externality" for highly productive urban firms. Firms that pay a higher wage benefit their workers as well. Profit-maximizing owners will not take into account the benefits to higher wages that accrue solely to workers. Luria (1996) has found that certain production practices, such as capital intensity and distinctive products, are associated with higher wages. We also found that firms in urban areas are more productive than are other firms, and that most of these productivity benefits are captured by wage-earners. Assuming the correlation between urban location and productivity can be interpreted causally, since firm owners do not benefit much from the increased productivity of urban locations, they

are likely to undervalue the urban productivity advantage, leading to inefficiently low urban employment. In economic language, *the urban productivity advantage is largely an 'externality', a benefit not taken into account by those who make firm location decisions*. Policies that benefit urban firms can remedy some of this inefficiency. That is, a dollar of tax money spent in some way on an urban firm has the potential to return more than a dollar of benefits to society, in the form of a rise in productivity that is shared among firm owners, workers, and consumers.

Second, our finding that single-plant firms benefit from networking with other firms implies potential market failure. Information exchange is subject to many market failures. A key issue is that knowledge is "expensive to produce, but cheap to reproduce" (Varian and Shapiro, 1999). That is, if one firm knows something, it is inefficient for another firm to discover that same thing for itself. Yet, it is usually not profitable for a firm to give away its knowledge for free[5]. Therefore, spending a dollar of tax money on knowledge diffusion may yield more than a dollar of benefits by avoiding duplication of discovery.

The discovery process is particularly expensive and difficult if changes are complementary (for example, if two modifications made together yield greater performance gains that the sum of the two modifications made separately). For example, adopting Toyota-inspired "lean production techniques" leads to higher quality and lower inventory—but only if inventory reduction and quality control are coupled (MacDuffie, 1995). Each of these initiatives is complex, but firms that do inventory reduction without quality control are likely to be plagued by supply shortages.

[5] Firms can benefit from 'know-how trading' with other firms that reciprocate (von Hippel, xx), or by gaining a reputation as a cooperator (Rege, 2003). However, unless firms gain all of the benefit of the knowledge they share, there will be a partial externality.

A third problem is training externalities. In our data, we find that employees work for several firms during their careers. As Becker (1975) has pointed out, if workers are mobile, profit-maximizing firms will provide less than the socially optimal amount of general training, because they fear that they will not get the full benefit of their training expenditure because the trained employees will be hired away by other firms.

A fourth problem are liquidity constraints. Adopting the production processes that lead to high wages and high value-added requires capital and product development capability. These upgrading activities require fairly large upfront expenditures. Since many of these expenditures do not result in a tangible asset, banks are usually not willing to lend money to hep finance them.

A final problem is coordination. Most component manufacturers serve a number of customers. We found that the typical firm gets only 30% of its sales from its largest customer. If customers can rely on suppliers to provide timely delivery and high-quality products, they can adopt more efficient production processes. For example, they can eliminate receiving inspection and expediters. But if suppliers don't all invest in these activities, customers cannot risk running low-inventory production processes.

Our findings on urban agglomeration economies may also imply the potential for coordination failure, although this is unclear without further investigation of the causes of the agglomeration economies. If these economies depend on the simultaneous presence of many different types of firms and institutions, firms may create significant externalities by locating in urban areas. However, our finding that cluster economies do not appear to be important for this manufacturing sector does lower the chance that these

externalities are taking place within manufacturing; they are likely present in other supporting institutions or in urban infrastructure. Further research is necessary here.

The above processes suggest ways that government intervention could improve welfare. But there also are a variety of ways in which it could reduce welfare. It is possible that programs such as MEP might be welfare-reducing: 1) by promoting capabilities that the market does not want, 2) by subsidizing firms to do things they would otherwise pay for themselves, and 3) by allowing low-wage firms to obtain skills they would otherwise have to pay higher wages to get.

As we have seen, the trend in component manufacturing appears to go against the types of firms that do relatively better in urban areas, and those that pay high wages. Above we considered the possibility that market failures are leading firms to under-invest (from a social point of view) in training, wages, and capital. But it is also possible that public money spent on capability improvement does not have an acceptable rate of return even when these externalities are considered.

A second possibility is that subsidized assistance merely substitutes for expenditures on training and consulting services that firms (rather than taxpayers) would otherwise make themselves.

Even worse is the possibility that subsidized assistance helps drive out more responsible competitors who develop capabilities on their own. In this scenario, the subsidy would be a negative externality to 'good' firms (Luria, 1996).

To summarize briefly, we suggest that policy would be likely to be welfare-improving if it a) promotes the growth of firms that are urban and high-wage, b) provides firms with information about techniques that may be useful to them, and c) helps

suppliers and customers coordinate on adopting complementary modern manufacturing methods. It would be welfare-reducing if a) firms were not able find a use for capabilities gained through MEP training, b) it duplicated services already available on the private market, or c) it primarily benefited low-wage firms (and did not lead to higher wages).

To move from theory to more specific policy options, there are three kinds of policies typically recommended for improving manufacturing. The first set are essentially transfers, such as tax reduction, from some other group toward manufacturers.. Despite their strong backing by groups such as the National Association of Manufacturers, these policies typically do not influence plant location, let alone increase national welfare. The reason is that a) taxes are a small part of manufacturers' costs and, b) when taxes fall, so do public services that manufacturers depend on, such as roads, police protection, education, etc. (See the review by Lynch, 2004). The second set of policies tries to improve the supply of high-quality inputs, by subsidizing such activities as training, R&D, and capital. Many of these policies have positive effects. The third set attempts to improve the way that the inputs are mixed together. That is, these policies attempt to change firms' production functions.

The Manufacturing Extension Partnership has tried to implement the second and third types of policies. The MEP program was loosely modeled on the agricultural extension program, although the rate of subsidy was much lower (Shapira, 1995). The MEP was set up in 1989 and is administered by the National Institute of Standards and Technology (NIST). Federal support for manufacturing extension activities grew from $6.1 million in 1988 to $138.4 million in 1995, before dropping to $106.6 million in

recent years. Federal support to individual centers must be at least matched by state and local sources. Jarmin (1999) describes the activities of the centers:

> *Manufacturing extension centers provide technical and business assistance to small and medium-sized manufacturers, much as agricultural extension agents do for farmers. This assistance often consists of providing "off-the-shelf" solutions to technical problems. Examples might include helping a plant install a CAD/CAM system or switching to newer, lower cost, higher performance materials. Manufacturing extension centers can also channel more recent innovations generated in government and university laboratories to SMEs that lack access to such information. Besides helping plants adopt modern manufacturing technologies, most centers also offer business, marketing, and other "softer" types of assistance.*

How well have MEPs done in improving firm productivity? Jarmin (1999) conducted a careful study of the early years of the MEP program that is superior to what is possible with our data. Using the Census Bureau's Longitudinal Research Database, he estimated that productivity at MEP client firms rose 3.4-16% more between 1987 and 1992 compared to productivity at non-client firms (depending on the method of estimation).

Jarmin's study takes a novel approach to the problem that participation in the program is not random. Firms who are either more productive than average (and therefore more aggressive) may be more likely to seek out the program, or firms who are less productive than average (and therefore more desperate for help) may be more likely to use the program. In either case, the estimates of the effect of the MEP 'treatment' will be biased. Jarmin corrected for this bias by observing that firms that are closer to an MEP are more likely to use it. His statistical method thus implicitly compares the productivity of two firms that are identical except that one is close to an MEP center and one is not.

Jarmin does not attempt to compare these benefits to the costs of the program. However, a rough estimate is possible using data contained in Jarmin and in Shapira (2004). Project costs for the client are $67,787; Shapira says that these are typically 1/3 of total costs (1/3 of the total comes from the federal government and 1/3 from the state match), so total costs would be $191,361. If the increase in value-added is conservatively estimated at 3.4%, the average firm had $306,340 more value-added as a result of the program than it would have had otherwise. If we assume that the gain compared to non-clients dissipates over time, so that after five years value-added is the same as at non-clients, the payback period is 1.6 years—not a bad investment. If the productivity advantage continues, then the investment is even more productive.

This result suggests that total benefits to society outweigh the costs. This finding, plus overwhelming reports by participants that the services provided were useful (Shapira 2004), suggests that MEP is developing capabilities that have market applicability. However, the case for MEP intervention in the previous section relied heavily on the existence of externalities—benefits that flow to people other than those who make decisions for the firm. Benefits that flow to workers could relatively easily be measured by comparing wages in treatment and control groups. Using a different methodology, Luria (1997) did this comparison, and found no difference. The benefits to customers would be hard to measure. To the extent that the MEP program increases the supply of qualified suppliers, component prices will fall. This effect would cause measured productivity (dollar value of output/ labor hour) to fall—suggesting that Jarmin's estimate of total productivity increase is conservative.

Jarmin also provides data on who participates in MEP programs. Firms are much more likely to participate if an MEP center is geographically close to them. Since centers are more likely to be in urban areas, this benefits urban firms.

Small firms benefit more from MEP programs, but participate less. We found that most of the small firms we surveyed did not appear to take advantage of MEP assistance. Only 6% of these small manufacturing firms reported receiving external assistance from a publicly supported manufacturing extension center at any time in the past three years. Since these centers are especially targeted at small manufacturing firms, this is somewhat surprising (Shapira, 2003). There may be some recall error here, but use of the centers does not appear to be widespread in our sample.

Why do small firms make so little use of this resource? MEPs often teach courses piecemeal, without offering an overall improvement plan to the firm. Even if such a plan is offered, liquidity constraints and lack of organizational slack make it difficult for small firms to undertake a sustained program of improvement (Helper and Kiehl, 2004). Cutbacks in federal funding since the time of Jarmin's study have caused several MEPs, such as CAMP, the MEP in Northeast Ohio, to focus efforts even more on large firms, which may require less subsidy (interview with CAMP president Stephen J. Gage, January 2004). On the other hand, the Pennsylvania MEPs are serving disprortionately small firms (Deloitte and Touche, 2004).

Most MEPs focus their work on either remedying information problems or coordination failures. MEPs offer a wide variety of activities, and the programs emphasized by centers vary even within states. (For example, in Pennsylvania, some centers focus almost exclusively on teaching lean production, while others do very little

on lean production, and much more on introducing new technology.) However, MEPs could do much more to remedy coordination failures by working organizing their work by value chain rather than focusing on individual firms.

An exception is the consortial model of supply chain modernization used by the Wisconsin MEP. It set up the Wisconsin Manufacturers' Development Consortium (WMDC), which provides a single voice to training providers and trains suppliers in general (rather than OEM-specific) competences, and promotes mutual learning by harmonizing supplier certification and encouraging cross-supplier communication. This framework meets diverse supplier needs through multiple institutional supports. For example, major improvements at formerly struggling suppliers resulted from a mix of WMDC supplier training, OEM-led (project-based) development, and internal initiatives at suppliers (Whitford and Zeitlin, 2004).

It is hard to evaluate the argument that MEPs are keeping alive 'bad' competitors given the available evidence. The argument would be true if MEP clients systematically provided fewer externalities than did non-clients. For example, they might pay lower wages for similar work, an argument weakened by the finding that wages of clients and non-clients did not differ. Other data about the differences between clients and non-clients is not conclusive either way. For example, Deloitte and Touche (2004) found that the credit scores of Pennsylvania MEP clients are worse than those of non-clients. Deloitte and Touche argue that this is a positive finding, since it means that the MEPs are not cream-skimming. (That is, MEP's are not subsidizing services for firms that would pay for them anyway.) Jarmin (1999) finds that the typical MEP user is a fast-growing, low-productivity firm. These firms could either be firms that have a distinctive product

but are inefficient, or are low-cost, 'commodity' firms (Luria and Wiarda, 1996). Luria and Wiarda (1996) found that MEP customers improve faster than non-MEP customers in adopting most technologies, except information technologies. What can we make of this? In his review of this literature, Shapira (2003) concludes, "[the studies] suggest that not all desired policy outcomes can be achieved simultaneously". This seems correct, although policy could further reduce the possibility that MEP undercuts good competitors by targeting MEP subsidies toward firms that either provide or commit to providing large externalities (for example, by paying above-median wages, or hiring hard-to-employ workers).

CONCLUSION

This paper has argued that the Manufacturing Extension Program has been a modest success in its current form. A careful study by Jarmin finds significant productivity increases for MEP clients. A variety of studies suggest that the benefits to the public outweigh the costs (Shapira, 2003). Changes to the program could increase these spillover benefits, by renewing the focus on urban firms, and coordinating more directly with firms' customers. It would be useful to restore MEP's ability to provide subsidized training, allowing the program to reach out with an integrated program to small firms that lack the capability to plan a coherent change effort, giving priority to firms that plan to increase wages as a result of the services.

However, the MEP program is not universally popular. According to the Detroit Free Press (2004), "critics call the program corporate welfare and say it gives an unfair advantage to small companies. The Bush administration agrees, and has repeatedly tried to cut federal funding despite protests from Republicans in key election states like

Michigan and Ohio. Michael LaFaive of the Mackinac Center for Public Policy, a Midland, Mich., think tank that promotes free markets, said the program uses tax revenue from companies that might otherwise have spent the money to train their own workers. 'Robbing Peter to pay Paul is no way to improve the overall economy,' he said. "

These comments seem to misunderstand the nature of the program. In contrast to tax abatements, the MEP is not just a transfer from taxpayers to companies. As discussed above, MEP assistance improves efficiency, providing the potential to make both companies and taxpayers better off.

However, government intervention should not be the only response to market failures. The benefits of supplier upgrading accrue most strongly to manufacturers. Associations of these firms could capture the general interest that manufacturers share in an improved supply chain, and could internalize the training externality. Firms could maximize their collective self-interest by changing existing institutions (for example, by requiring measurable progress at suppliers in order for an OEM to renew its ISO quality certification). Private consultants can and do help with knowledge diffusion, but they will tend to emphasize short-term cash generation rather than long-term capability development (Helper and Kiehl, 2004).

As Honeck (1998) points out, the US has lacked an effective ''regional productivity coalition'' that can lobby for broad-based industrial upgrading. Countries such as Germany, Italy, and Japan have a more integrated, 'redundant' approach to industrial upgrading that the US could learn from. However, even an excellent program may not be enough to restore the health of sector. There are frequent

reports of Chinese firms that offer finished product for less than US makers' cost of raw material, due to cheap labor, subsidized capital and subsidized exchange rate.

Thus, the Manufacturing Extension Program is not a cure-all. A variety of policies are necessary to deal with a problem as multi-faceted as manufacturing job loss. Such policies may include re-training for laid-off workers, and revised trade policies as a complement to an expanded MEP program.

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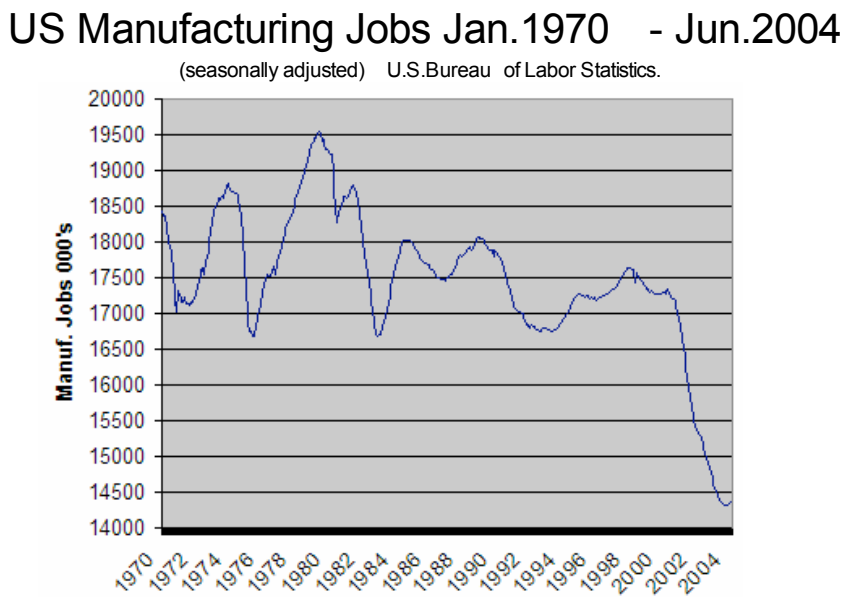
Figure 1.


US Manufacturing Jobs Jan.1970 - Jun.2004
(seasonally adjusted) U.S.Bureau of Labor Statistics.
Manuf. Jobs 000's
20000
19500
19000
18500
18000
17500
17000
16500
16000
15500
15000
14500
14000
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004