The Reindustrialization of the United States

Euler Hermes Economic Research Department

Economic Outlook
# Special Report
## The Reindustrialization of the United States

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Editorial

An alignment of the stars?

With the post-presidential election fever now gone, the immediate shift of the U.S. focus is squarely on the economy. Surely, the road to recovery looks like the Labors of Hercules. Of course no economic environment will ever be perfect, but the current uncertainty surrounding the fiscal cliff and the ongoing debt crisis in Europe are the two largest headwinds currently affecting the U.S. economy. Beyond the tumult in the short run, there are some positive macro- and micro-economic factors that have caused us to look more thoroughly to what the ‘new normal’ could look like for the U.S. Here begins a quest to better understand what underlying trends and dramatic regime changes may support a robust long-term growth in the U.S.

The potential key to America’s long-term growth lies in the very heart of the country, its manufacturing sector. Bullied throughout the last decade, its resilience and malleability, further tested by the most too recent crisis, may actually demonstrate why it now appears to be the backbone of the U.S. recovery. There are several determinants to this bold assumption which we analyze in this report:

> unit labor costs are among the lowest in the industrialized world;
> energy costs are low thanks to the gas bonanza;
> the cost of capital is very low given the Fed’s ultra-accommodative monetary policy;
> the weak dollar makes U.S. exports very competitive in the majority of U.S. export markets; and
> the housing market is slowly rebounding.

If you add to this a conducive policy environment and the definite commitment to continue to improve it, there are better days ahead for the U.S. and its private sector. After the perfect storm (the commodity, financial and jobs crises), now would be the time for an alignment of the stars. Manufacturing could lead the U.S. economy out of immobilism, and is poised to be a major contributor going forward.

What needs to be done to maintain the momentum? The private sector in the U.S. continues to be relatively self-reinventing without much intervention. But like a good gardener, the government may want to occasionally water the flowers. In this report, we outline several actions necessary to catalyze this rebirth.

Of course, we will continue to monitor this reindustrialization phenomenon and accompany our clients on the still bumpy road ahead. It is all about good ‘ol production, key industries such as the energy and chemicals sector and the agri-food businesses, and growth markets: the South, Texas, and California. If supported, the real economy should indeed regain its strength. _Ludovic Subran_
Ever since the Industrial Revolution began in the 1800s, the U.S. manufacturing sector has always been of vital economic importance. It has often been the engine of growth, historically providing strong contributions to Gross Domestic Product (GDP). During the nineteenth and twentieth centuries economic industrial concentrations developed across the U.S. In the South, proximity to cotton growers helped build the textile industry. From the Northeast to the central Midwest, steel and iron products emerged and as a result the automobile industry arose in the Midwest. In the Southwest, an abundance of oil and natural gas shaped the energy industry. And in the West, high technology emerged during and after WWII as a product of the defense industry.

However this robust manufacturing economy came under intense pressures in the latter half of the twentieth century from the development of the global economy. Countries such as Japan, Mexico and China emerged with enormous supplies of people who were willing to work for a fraction of U.S. wages, while concurrently, American consumers developed a thirst for inexpensive goods from overseas. American businesses could not resist the lure of much lower manufacturing costs available in these countries and began to send U.S jobs overseas, decimating many industries such as appliances, furniture, heavy equipment, shipbuilding, steel, textiles, and many others. As a result of this shift, the U.S. manufacturing industry shrank drastically as a percentage of the entire economy.
Beyond positive macroeconomic factors such as credit availability and low interest rates, the three determinants of this reindustrialization are:

> lower labor costs, especially in the southern States;
> lower cost of energy resulting from the shale gas bonanza; and
> the ability to steer the economic environment to leverage the positive cost reductions from which companies have been benefitting.

Another factor is the new awareness of operating vulnerability created by an over-stretched supply chain. In 2011, the localized production disruptions in Japan following an earthquake and a tsunami, and in Thailand from flooding, disrupted industrial operations all around the world. The incidents highlighted how dangerous exposure to foreign supply chains could be and how a lack of preparedness for these risks causes difficulty in implementing risk management protocols for what were previously thought to be unthinkable events.

Going forward, and when examining specific U.S. industry dynamics, it seems important to selectively support:

> The “shining” industries mentioned above, in order to identify more specifically the growing sub-sectors (agriculture, construction/mining, machinery, medical equipment, petroleum-related products, semiconductor-related products) and examine their dynamics. The automotive sector also seems to be reviving from its ashes;
> A conducive business climate with a clear emphasis on innovation. The new era in the business environment (tightening gap between Chinese and American wages, appreciation of the yuan, access to cheap energy in the U.S., structural high oil prices, mounting awareness of the vulnerability caused by an over-stretched supply chain) could help U.S. manufacturing sustain this momentum. U.S. computer/electronic product manufacturing, machinery, furniture and miscellaneous product manufacturing are expected to take advantage of the falling Chinese wage competitiveness. Chemicals and primary metal sectors should gain ground thanks to cheap shale gas; and
> Regional strengths make the efficient specialization of the individual states feasible. The dynamics in the South, Texas, and California - particularly with niche sectors, incentives, and opportunities - are particularly important as they appear to be the renewed growth centers of the U.S.

This degree of industrial investment demands that the U.S. economy present sound, reliable growth prospects and that the financial system (banks and bond markets) support these capital intensive projects. It also requires a confidence injection for the private sector to continue to re-shore and invest in the economy. Finally, the path to industrial rebirth will require a highly skilled workforce.
With the deceleration of the global economy and prolonged limbo of the euro zone, the U.S. economy appears to be particularly central to global recovery. However, domestically, several steps need to be taken to limit the damage of the fiscal cliff, curb unemployment figures, and benefit fully from the aggressive monetary policy stance chosen by the Fed. It will also be necessary to continue to unleash growth drivers: consumption, private sector investments, and exports to offset the gradual withdrawal of the post-crisis government spending, without causing damage. Is this feasible? We argue that there are some green shoots which could lead to a favorable macroeconomic backdrop, against which what we call the “Reindustrialization of the U.S.” is possible.

### A. Macroeconomic Forecasts for the U.S.

<table>
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<tr>
<th>U.S.A</th>
<th>share</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
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<tbody>
<tr>
<td>GDP</td>
<td>100%</td>
<td>1.8</td>
<td>2.2</td>
<td>1.9</td>
<td>2.5</td>
</tr>
<tr>
<td>Consumer Spending</td>
<td>71%</td>
<td>2.5</td>
<td>2.0</td>
<td>2.2</td>
<td>2.6</td>
</tr>
<tr>
<td>Public Spending</td>
<td>19%</td>
<td>-3.1</td>
<td>-1.9</td>
<td>-1.4</td>
<td>-1.3</td>
</tr>
<tr>
<td>Investment</td>
<td>13%</td>
<td>6.6</td>
<td>7.8</td>
<td>3.9</td>
<td>7.2</td>
</tr>
<tr>
<td>Construction</td>
<td>2%</td>
<td>-1.4</td>
<td>11.6</td>
<td>9.5</td>
<td>10.3</td>
</tr>
<tr>
<td>Equipment</td>
<td>10%</td>
<td>8.6</td>
<td>6.9</td>
<td>2.4</td>
<td>6.5</td>
</tr>
<tr>
<td>Stocks *</td>
<td>0%</td>
<td>-0.2</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Exports</td>
<td>13%</td>
<td>6.7</td>
<td>3.6</td>
<td>4.3</td>
<td>6.5</td>
</tr>
<tr>
<td>Imports</td>
<td>16%</td>
<td>4.8</td>
<td>2.8</td>
<td>3.5</td>
<td>6.5</td>
</tr>
<tr>
<td>Net exports *</td>
<td>-3%</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>-0.2</td>
</tr>
<tr>
<td>Current account **</td>
<td>-466</td>
<td>-508</td>
<td>-495</td>
<td>-477</td>
<td></td>
</tr>
<tr>
<td>Current account (% of GDP)</td>
<td>-3.1</td>
<td>-3.2</td>
<td>-3.0</td>
<td>-2.8</td>
<td></td>
</tr>
<tr>
<td>Employment</td>
<td>0.6</td>
<td>1.7</td>
<td>1.1</td>
<td>1.5</td>
<td></td>
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<tr>
<td>Unemployment rate</td>
<td>8.9</td>
<td>8.1</td>
<td>7.7</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>Wages</td>
<td>2.0</td>
<td>1.5</td>
<td>1.9</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td>Inflation</td>
<td>3.3</td>
<td>2.2</td>
<td>2.0</td>
<td>2.1</td>
<td></td>
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<tr>
<td>General government balance **</td>
<td>-1250</td>
<td>-1129</td>
<td>-1039</td>
<td>-981</td>
<td></td>
</tr>
<tr>
<td>General government balance (% of GDP)</td>
<td>-8.3</td>
<td>-7.2</td>
<td>-6.4</td>
<td>-5.8</td>
<td></td>
</tr>
<tr>
<td>Public debt (% of GDP)</td>
<td>101.0</td>
<td>104.8</td>
<td>108.1</td>
<td>110.1</td>
<td></td>
</tr>
<tr>
<td>Nominal GDP **</td>
<td>15 076</td>
<td>15 684</td>
<td>16 230</td>
<td>16 909</td>
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Change over the period, unless otherwise indicated: * contribution to GDP growth  ** U.S.D billions

Source: IHS Global Insight, Euler Hermes
The U.S. economy still faces significant headwinds resulting in expectations of sub-par GDP growth and elevated unemployment for 2013. The Federal Reserve has started another round of quantitative easing (QE3) to help stimulate the housing market and the broader economy. However, QE3 is likely to have a very limited effect and uncertainty surrounding the fiscal cliff is likely to contribute to the weakness.

► Recent Developments

The U.S. economy lost 9 million jobs in the recession and as of August 2012, more than three years since the recession ended, it has only recovered about half that amount. The unemployment rate, despite a recent decline, has remained above 8% for three and one half years and the labor participation rate is the lowest it has been in 30 years. GDP has been correspondingly weak, growing only 2.1% over the past four quarters. Manufacturing, which helped lead the economy out of recession, has been stumbling for several months, and while consumers have enjoyed some recent gains in income, consumption still remains weak. Positives have included surprisingly strong auto sales, a firming housing market, and falling insolvencies.

► Mixed perspectives for 2013

Looming events will make for yet another year of sub-par GDP growth in 2013 - around 2% - with unemployment most likely remaining near 8%. The uncertainty of the fiscal cliff at the beginning of 2013 is weighing on the economy. Even if a plan is devised to reduce the country’s debt, it will probably not have much effect until the middle of 2013 at the earliest. The fiscal cliff could push the economy into recession. However, the most likely scenario is that most of the fiscal cliff will be avoided since both Republicans and Democrats believe that such a rapid fiscal contraction would be politically dangerous and a serious blow to the economy. Yet uncertainty remains as the fiscal cliff issues may not be addressed entirely by a new session of Congress.

On the monetary side, while QE3 is intended to boost the housing sector by lowering mortgage rates, the plan is unlikely to help much since mortgage rates are already near historical lows. Risk-averse bankers have slowed the mortgage market, not high interest rates. Nonetheless, there has been some firming in several housing market measures such as prices and unit sales, but it is premature to call a bottom. Retailers are expecting slower holiday sales in 2012 compared to 2011. On an upbeat note, insolvencies are expected to fall 8% in 2013 due to positive, albeit weak GDP growth.

Estimating the impact of the fiscal cliff

> What: A combination of higher taxes and reduced spending at the start of 2013, if current statutory provisions apply.

> How much: Fiscal tightening would amount to a good 4% of GDP in 2013 (5% of GDP, if changes in revenues and spending unlinked to specific policies are included). If the so-called “Bush tax cuts” are extended and automatic spending cuts (across-the-board spending cuts) under the Budget Control Act are avoided, fiscal tightening would be reduced to between 1.8% of GDP and 2.7% of GDP, respectively. Applying an overall fiscal multiplier of 0.75, the drag on GDP growth would amount to between 1.4% and 2%, respectively.

> To put 2013 fiscal tightening into perspective: General government net borrowing amounted to 8.7% of GDP in H1 2012, down from 10.25% of GDP in 2011.
Which favorable market conditions support a full-fledged U.S. recovery?

> The favorable economic environment in the short-run for private sector development is a product of distinctly unfavorable conditions which actually started well before the Great Recession. Accommodating monetary policy, credit availability, lower cost of capital and the (timid) rebound in the housing market are some of the major positive contributors to this. In the late ’90s and early 2000s, the Federal Reserve kept monetary policy too loose for too long. When the housing bubble burst in 2006, it destroyed billions of dollars of wealth and wreaked havoc on the economy. As a result, the subprime mortgage crisis developed in 2007, impairing the financial markets. In 2008 oil prices rose to a record high creating yet another huge drag on the economy. And as the financial crisis reached its height in the Fall of 2008, credit markets came to a virtual standstill, paralyzing the economy.

To counteract the chaos, the Federal Reserve drove short-term interest rates virtually down to 0%, and then injected $1.4 trillion of liquidity into the financial system, more than doubling its balance sheet in just a few weeks. Congress and the President passed the $700 billion Troubled Asset Relief Program (TARP) to keep impaired banks functioning, and in early 2009, an $800 billion stimulus package was passed in an attempt to jump-start the economy. By this time the economy was losing over 700,000 jobs per month, the fastest rate in over 60 years (Figure 1). Although the recession technically ended in June of 2009, only about half of the total jobs lost have been recovered, and GDP has averaged a mere 2.2% annualized growth rate since then, well below the long-term average of 3.3%.

> Yet this chaotic backdrop helped set the stage for an economic recovery, which although tepid, was ideal for a manufacturing rebound. The deep recession had caused manufacturers to cut employment to the bone, so after the recovery began they were able to operate with minimal labor costs using highly productive, motivated workers. Unit labor costs plunged in the manufacturing industry, particularly in some southern states. At the same time that labor costs were falling, so were the costs of capital. The Fed had driven short-term rates virtually to zero, which was an open invitation for investment. Starting in the fourth quarter of 2009, the investment component of GDP set a blistering pace over four quarters, growing at annualized rates of 41%, 20%, 15% and 16% respectively - while the economy as a whole grew less than 3%. Credit conditions eased substantially and commercial and industrial loans have grown more than 10% annually since the Fall of 2010 versus a long-term average of 6% (Figure 2).

> In addition, high credit quality manufacturers are also able to tap the corporate bond market at historically low rates. The Fed’s QE programs further lowered the cost of capital by boosting stock prices. Energy costs for manufacturers have also fallen, due in part to the emergence of very cheap shale gas. The housing market is now firming (Figure 3), setting the stage for a rebound in manufacturers of home building materials and appliances.

> Approximately three quarters of U.S. manufacturing is sold domestically, where conditions are very good, yet the export markets are also in surprisingly good condition. Canada is the largest market for U.S. exports. While Canadian GDP has experienced slow growth recently and is expected to grow only about 2% in 2013, the Canadian economy is in much better fiscal and monetary condition than most industrialized nations, and therefore offers some stability to U.S. exports. Mexico is the next largest importer of U.S. goods, conso-
ming about 14% of all U.S. exports. Unlike much of the world since the recession ended in 2009 Mexico has enjoyed steady and strong growth, with robust annual GDP growth of 4.6% versus a long-term average of 2.7%, clearly boding well for future U.S. exports. Central and South America absorb 11% of U.S. exports, and prospects for continued strength in these emerging economies are good. China absorbs 7% of U.S. exports, and the long-term growth of the Chinese economy is expected to remain very strong, despite a recent soft patch. Asia (ex-China and ex-Japan) consumes 13% of exports and like Latin America, growth in these emerging economies is likely to be robust. Together these major, strong markets buy 64% of U.S. exports. Europe is of course a weak spot and may be for some time, but exports to the European Monetary Union comprise only 13% of total U.S. exports. Furthermore, the Fed’s quantitative easing policies have devalued the dollar, making export prices cheaper and boosting their competitiveness. Between the end of 2009 and August 2012, exports from the U.S. have risen 45%, a 15% annualized rate compared to the long-term average of 7.8%.

Another positive sign for the industrial fabric: insolvencies on the decrease

> As shown in Figures 4 and 5, business insolvencies have overall been on a slightly downward trend over the past decade. Insolvencies rose as the economy deteriorated through 2007, and increased further in 2008. Insolvencies often are a leading indicator, as they were when they fell sharply in 2009 as the recession came to an end. By that time, most of the vulnerable businesses had already failed, and those that survived had done so by:
> reducing debt on their balance sheets,
> becoming more risk-averse by not extending as much risky credit to other businesses, and
> by reducing headcount.

These factors allowed businesses to survive even though they put a weight on the economy which has yet to be fully removed.

Looking at 2013, expectations are that the downward trend in insolvencies will continue. We expect the decrease in insolvencies to be 10% in 2012 and 6% in 2013. This will happen for two reasons: first, GDP growth in 2013 is forecast to be around 2%. This should suffice to help decrease the number of insolvencies in the economy. Secondly, businesses are still operating in the risk-averse manner which helped them survive the recession. They are carrying lower debt levels on their balance sheets, providing them more of a cushion should there be another downturn. And they still running in a very lean mode by keeping operational costs and payrolls as tight as possible.

> Manufacturing tends to be more sensitive to the business cycle as Figure 5 below clearly shows, and as such tends to be riskier as well. Manufacturing insolvencies rose more sharply than the total economy in the recession and fell more sharply in the recovery, and were higher than the total throughout virtually all of this time period. However, it is important to note that after the recent recession, manufacturing insolvencies closed the gap with the total economy because of the sector’s outperformance. The services sector is less sensitive to the business cycle, as demonstrated by how much less insolvencies fluctuated. Since it is less risky it also has an insolvency rate lower than the total economy.
Manufacturing: the cornerstone of the reindustrialization of the U.S.

For many years and even decades, the U.S. manufacturing sector has become synonymous with economic decline, heavy job cuts, dark Dickensian facilities and a hopeless outlook in collective minds. The three year-long manufacturing revival marks an opportunity to review these entrenched stereotypes. The last decade has reshaped the U.S. industrial landscape and provided the foundations for this improvement, but since 2010 a handful of buoyant sectors have accomplished what had been inconceivable for many years: restoring faith in U.S. manufacturing.
Limited role in the U.S. economy?

During the previous decade, the manufacturing weight in the U.S. economy remained fairly steady, at 12.4% (real value added) of GDP in 2000 and 2010, with limited fluctuations over the period (high of 12.9% in 2007 / low of 11.5% in 2009). The growth years witnessed noticeable contributions from the manufacturing sector to the improvement of the economy – a bit higher than would have been expected given its weight in the U.S. economy – but they were always less than the contributions from the services sector. Conversely, the significant drops in manufacturing value-add, which occurred during the recessions, were a significant drag on the U.S. economy and, generally speaking, were major downward economic drivers.

Sharp restructuring in manufacturing employment

Between 2000 and 2010, the manufacturing sector lost 5.7 million jobs (-33%). In Figure 6, we compare the actual employment in manufacturing from 2000-2010 and two scenarios estimated:

- the Productivity 2000 scenario shows the number of jobs needed to produce the actual output with productivity held constant;
- the Output 2000 scenario shows the number of jobs it would have taken to create that output with the actual productivity gains. This scenario more closely matches what actually happened, suggesting that any drop in output during a recession had a smaller effect on employment.

The analysis shows that manufacturers did not lay off workers because the economy was so bad, but because productivity was so good that they needed fewer workers. The main driver for manufacturing job losses during the last decade was certainly productivity gains. The output decrease resulting from the recession, shipping jobs overseas, and the lower competitiveness of U.S. manufacturing in the global economy contributed much less to the decline in jobs. The impact of productivity improvement on job losses was more than three times as high as the impact of economic contraction.

Different goods, different stories?

We carried out the same analysis for durable goods manufacturing, which posted a -35% decrease in employment during the last decade – or 3.8 million jobs. The impact on employment that productivity improvements had, compared to the impact that the recession had, was only about two and a half times greater, as opposed to three times greater for all manufacturing.

The difference suggests that durable goods manufacturing was more sensitive to economic conditions than overall manufacturing. Durable goods meant to last three years or more - such as appliances, cars and planes - represent discretionary purchases which can be more easily delayed than those for non-durables such as food.

The computer and electronic manufacturing sector witnessed a sharper drop in employment (-40% or loss of 735,000 jobs). The dramatic decline in jobs was a result of the adverse effects of strong productivity improvements (+79% over the period), which were only partially offset by jobs created due to increasing activity.

Between 2000 and 2010, the machinery sector demonstrated better resistance to erosion as its employment dropped by a relatively smaller -32% (-467,000 jobs). Lower productivity enhancement (+27% during the decade) led to a lower adverse impact on job losses.

In 2010, non-durable goods manufacturing jobs dropped -30% from 2000 (-1.9 million jobs). The impact of productivity improvements was four times as large as the impact of activity fluctuations during the last decade.
Further sector concentration of the U.S. manufacturing landscape

Figure 7 shows industries plotted on the horizontal axis of growth in value added, versus the vertical axis of growth in total output, over the time period 2000-2010. The strongest industries are seen in the upper right quadrant, with the computer and electronics industry the clear standout with real value added, growing +417% since 2000. The petroleum and coal industry was also a strong performer with other attractive industries including food and chemicals. In general, durable goods manufacturing, such as machinery and “other transportation” (excluding automotive), along with “miscellaneous others” performed quite well. The weaker industries are in the lower left quadrant and are dominated by lower value-added, mature businesses such as apparel, furniture, textiles, and wood.

Table B summarizes the most buoyant sectors for the period 2000-2010. A gap has widened between them and the lackluster group leading to a stronger concentration in U.S. manufacturing. The contribution of the top five sectors to U.S. manufacturing value added has risen from 51% in 2000 to 59% in 2010.

Further sector concentration of the U.S. manufacturing landscape

U.S. manufacturing has expanded along with the world market in terms of total sales, but has steadily lost market share of sales, contracting from 22% in 2000 to 17% in 2011 (estimated). On the other hand, U.S. manufacturing has managed to preserve its position in global value added, with a market share sliding only slightly from 23% to 22% over the same period, increasing slightly in 2012. The data suggest two possible explanations. First, it could be that U.S. manufacturing has shifted toward higher value added activities and has deserted those manufacturing sub-industries with lower value added. This possibility corresponds with the notion that it has proven difficult for the U.S. to compete with low labor cost countries. For example, simple goods can be made in China much more cheaply than in the U.S., driving U.S. manufacturers out of those markets. The huge influx of simple, cheap Chinese goods is a perfect example of this phenomenon. Labor and capital displaced by lower cost goods will then be moved to higher value-added manufacturing. This condition is a perfect demonstration of the uncomfortable notion of “creative destruction” which is often very necessary for an economy to grow in the long run but which is so painful in the short run. In this case the data may actually indicate a positive phenomenon.

A second explanation arises from the fact that the difference between sales and value added can be thought of conceptually as a proxy for profit margin. Thus, the data might suggest that American manufacturers are taking smaller profit margins in a global environment of slow growth and low inflation creating very strong downward pricing pressures. This second explanation does not indicate a flaw in U.S. manufacturing, since manufacturers around the world have to contend with the same conditions.

B. Breakdown of the manufacturing value added by Sector

<table>
<thead>
<tr>
<th>Ranking 2010</th>
<th>Ranking 2000</th>
<th>Sector</th>
<th>Weight manufacturing value added in 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Computer and electronic product mfg</td>
<td>15.6%</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>Chemical mfg</td>
<td>13.3%</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>Food, beverage and tobacco product mfg</td>
<td>12.2%</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td>Petroleum and coal product mfg</td>
<td>10.1%</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>Machinery mfg</td>
<td>8.2%</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>Fabricated metal product mfg</td>
<td>7.1%</td>
</tr>
<tr>
<td>7</td>
<td>10</td>
<td>Miscellaneous mfg</td>
<td>5.2%</td>
</tr>
<tr>
<td>8</td>
<td>7</td>
<td>Other transportation equipment mfg</td>
<td>4.2%</td>
</tr>
<tr>
<td>9</td>
<td>7</td>
<td>Plastics and rubber products mfg</td>
<td>3.9%</td>
</tr>
<tr>
<td>10</td>
<td>9</td>
<td>Paper mfg</td>
<td>3.3%</td>
</tr>
<tr>
<td>11</td>
<td>5</td>
<td>Motor vehicle, body, trailer, and parts mfg</td>
<td>3.2%</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>Electrical equipment, appliance and component mfg</td>
<td>2.6%</td>
</tr>
<tr>
<td>13</td>
<td>11</td>
<td>Primary metal mfg</td>
<td>2.5%</td>
</tr>
<tr>
<td>14</td>
<td>14</td>
<td>Non metallic mineral product mfg</td>
<td>2.1%</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>Printing and related support activities</td>
<td>1.9%</td>
</tr>
<tr>
<td>16</td>
<td>16</td>
<td>Furniture and related product mfg</td>
<td>1.7%</td>
</tr>
<tr>
<td>17</td>
<td>17</td>
<td>Wood product mfg</td>
<td>1.3%</td>
</tr>
<tr>
<td>18</td>
<td>17</td>
<td>Textile mills and textile product mills</td>
<td>0.9%</td>
</tr>
<tr>
<td>19</td>
<td>19</td>
<td>Apparel and leather and allied product mfg</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

Source: Bureau of Economic Analysis

7. Production and Value added index changes 2010/2000 (Real Terms)

Source: Bureau of Economic Analysis – Bureau of Labor Statistics
Over-performing in the aftermath of the crisis to regain higher ground

Manufacturing rebound in the aftermath of the crisis

By the end of 2011, U.S. GDP had recovered to levels just before the recession started in the fourth quarter of 2007. This recovery has been boosted by a substantial contribution from the manufacturing sector. In 2010, manufacturing was only 12.4% of the economy, yet it accounted for 44.6% of its growth. In 2011, those same proportions were 12.8% and 37.2%. From this perspective, manufacturing indeed led the economy out of the severe recession of 2008 and 2009. Furthermore, as shown in Figure 8, the only sector to provide slightly more growth in 2010 and 2011 was the entire services sector, which is six to seven times larger than the manufacturing sector.

Figure 9 demonstrates that since 2001 the U.S. manufacturing sector has shown higher sensitivity to the economic environment than the services sector has. It displays the annual increase in value added by sector, highlighting how much manufacturing fell during the recession and how rapidly it has rebounded since. Manufacturing has dramatically outpaced services for the last two years and has fully demonstrated its role as the engine of the economic recovery. The only sector to fall more steeply than manufacturing was construction, which plummeted as a result of the burst housing bubble, and has still yet to fully recover.

In the wake of the decline caused by the economic crisis, the manufacturing sector has been a modest contributor to the improvement of the employment scenario. However, this tepid increase of manufacturing employment also signaled the end of a continued decline which has been ongoing for decades.

8. Contribution to U.S. GDP Changes by Sector

9. Annual Change in real value added

C. Contribution of the manufacturing sector to US economic growth

<table>
<thead>
<tr>
<th>Year</th>
<th>Part in U.S. GDP (in %)</th>
<th>Manufacturing part in economic growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>11.7%</td>
<td>(43.2%)</td>
</tr>
<tr>
<td>2002</td>
<td>11.8%</td>
<td>17.1%</td>
</tr>
<tr>
<td>2003</td>
<td>11.9%</td>
<td>17.4%</td>
</tr>
<tr>
<td>2004</td>
<td>12.4%</td>
<td>30.8%</td>
</tr>
<tr>
<td>2005</td>
<td>12.5%</td>
<td>15.5%</td>
</tr>
<tr>
<td>2006</td>
<td>12.7%</td>
<td>19.7%</td>
</tr>
<tr>
<td>2007</td>
<td>12.9%</td>
<td>25.9%</td>
</tr>
<tr>
<td>2008</td>
<td>12.2%</td>
<td>(108.3%)</td>
</tr>
<tr>
<td>2009</td>
<td>11.5%</td>
<td>(28.8%)</td>
</tr>
<tr>
<td>2010</td>
<td>12.4%</td>
<td>44.6%</td>
</tr>
<tr>
<td>2011</td>
<td>12.8%</td>
<td>37.2%</td>
</tr>
</tbody>
</table>

GDP in real value; ( ): negative
Source: Bureau of Economic Analysis
Broad improvement of the manufacturing sector

As shown in Figure 10, while manufacturing production is still 4.5% below its 2007 peak, it steadily rebounded during 2010 and 2011, and continued to grow in the first half 2012. Manufacturing productivity has dramatically improved over the last decade (+45% in the first half of 2012 compared to 2000) despite slowing somewhat during the recession. This improvement in productivity is a result of a 6% increase in output from 2000 to 2012, while the workforce shrank by more than 30% over the same period. U.S. manufacturing operating profitability bounced back dramatically in 2010/2011, and has so far stabilized at the highest level in a decade despite previous periods of more robust economic growth. Unit labor costs in manufacturing have fallen below their 2000 level, with much of the downturn coming after the recession. Manufacturing employment bottomed out in 2010 and has started to slowly regain ground after two decades of deterioration. Exports of manufactured goods have jumped for much of the last decade and displayed record growth in 2010 into 2011.

The "shining" manufacturing sectors during the 2010/2011 rebound and afterward

U.S. manufacturing has continued along the path begun in the previous decade and the aforementioned leading sectors have played a crucial role in the dramatic 2010 and 2011 growth. Let’s consider more precisely the underlying factors which contributed to these improvements amid the most buoyant sectors.

Computer and electronic products manufacturing

This sector has retained its leadership and even strengthened its weight within the U.S. manufacturing sector during the last decade. For the last three years, two segments have especially outperformed, demonstrated by current outputs higher than their pre-recession levels:

- Semiconductor and other electronic equipment manufacturing has proven to be a powerful engine of growth as its output skyrocketed more than four-fold between 2000 and 2012. For the last five years (except for 2009), the sharp expansion of new markets fuelled by the emergence of electronic devices, such as smartphones, tablets, e-readers, has continued to drive production (+32.7% and +12.0% in 2010 and 2011 respectively). Nevertheless, 2012 has seen a slowdown caused by less favorable sector and economic environments.

- Navigational, measuring, electro medical and control instruments manufacturing also helped the sector expand during the last decade and rebound in the wake of the crisis. While shrinking in 2009, the segment posted 6.5% and nearly 11% growth in 2010 and 2011 respectively. Boosted by its markets (aerospace, automotive, machinery, semiconductor manufacturing), 2012 has also seen a fairly robust increase for this subsector.

Another notable segment, computer and peripheral equipment production hit a landmark in 2008, punctuating a six year increase with an all-time high. But since then, lackluster PC and notebook sales contrac-
Economic Outlook n° 1187 | Special Report | The Reindustrialization of the United States

11. Industrial Production Index: the "shining" manufacturing sectors

Index basis 100 = 2007

- **Machinery**
  This sector contributed strongly to U.S. manufacturing output expansion with double digit growth in 2010 and in 2011. It is also expected to regain its pre-recession average annual production in 2012. All the subsectors have posted significant production increases during this period following a rebound in investment in the aftermath of the crisis. Two subsectors have been significant growth drivers and have shown higher levels of production in 2012 than in 2007/2008:
  - Mining, oil field and gas field machinery (output: +2.6% in 2010 and +21.3% in 2011 and +14.9% (estimated) in 2012). This segment has thrived in the wake of the surges in oil industry extraction capacity and that of the shale gas industry in the U.S., driven by the development of new technologies.
  - Engine, turbine and power transmission equipment (output: +9.7% in 2010 and +22.6% in 2011 and +18.5% (estimated) in 2012). The noticeable development of the renewable energy sector has fostered growth in this segment.

- **Petroleum and coal product manufacturing**
  This sector has reclaimed its pre-recession benchmark due to momentum posted by the “paving, roofing and other petroleum and coal products” sector, which increased its production by 8.6%, 15.1% and 13.1% (estimated) in 2010, 2011 and 2012 respectively. This momentum was due in large part to the federal stimulus package aimed at boosting the U.S. economy and included $36.2 billion for transportation (highway infrastructure, high-speed rail corridors) and $30.0 billion for infrastructure. In 2013, the petroleum and coal product manufacturing sector won’t be able to rely on such public support and is likely to suffer from this less favorable environment.

- **What about the car industry?**
  Despite uneven global economic performance, including weakness in Europe, many global automakers have reported rising sales and profitability, driven by growth in emerging markets and China in particular. In the U.S., auto sales posted a second year of growth due to easier credit, low interest rates, and pent-up demand resulting from the recent recession and an aging vehicle fleet. North American auto suppliers are benefiting from rising automotive production and leaner cost structures. Many are now more profitable than before the downturn. The outlook for both the automotive manufacturers and suppliers is positive, reflecting expectations for rising demand in the U.S. In addition, emerging markets led by China should drive global demand, despite slowing regional economic growth and debt issues affecting European demand. The U.S. automotive market is still strengthening: it will grow 12% to 14.8 million vehicles in 2012 and we expect it to grow 5% more to 15.5 million vehicles in 2012. That will still be 1.5 million vehicles short of the pre-crisis benchmark.
The combination of high output, productivity and profitability, and low unit labor costs lays a solid foundation for continued strength in the U.S. manufacturing sector. This section analyzes the positive contribution of falling labor costs to U.S. competitiveness. We argue that this continuing trend will be a major determinant of the reindustrialization momentum. This performance relative to China and Europe, for instance, must be cultivated. However, a too conservative U.S. wage policy and low labor pricing could eventually cap productivity gains and human capital accumulation, especially for niche industries.

As shown in figures 12 and 13 below, comparing U.S. trends regarding manufacturing productivity and unit labor cost with the other leading industrialized countries underscores America’s enviable position. Indeed, U.S. manufacturing has dramatically reinforced its productivity over the last decade and cut its unit labor costs by more than 10% (on U.S.$ basis). In contrast sharply with its global competitors, it should be noted that the falling U.S.$ versus the euro may have contributed to the difference. Additionally, from 2000-2010 manufacturing productivity in the U.S. has grown at an annual rate of 5.2%, greater than most industrialized nations except for the rapidly emerging economies of Taiwan, the Czech Republic, and South Korea. At the same time, the U.S. has been one of only two major countries where manufacturing unit labor costs have actually fallen. While this is a significant competitive advantage, it arises from the fact that productivity has grown sharply while real wages have hardly changed at all.

**Competitiveness: Advantage U.S.A**

As shown in figures 12 and 13 below, comparing U.S. trends regarding manufacturing productivity and unit labor cost with the other leading industrialized countries underscores America’s enviable position. Indeed, U.S. manufacturing has dramatically reinforced its productivity over the last decade and cut its unit labor costs by more than 10% (on U.S.$ basis). In contrast sharply with its global competitors, it should be noted that the falling U.S.$ versus the euro may have contributed to the difference. Additionally, from 2000-2010 manufacturing productivity in the U.S. has grown at an annual rate of 5.2%, greater than most industrialized nations except for the rapidly emerging economies of Taiwan, the Czech Republic, and South Korea. At the same time, the U.S. has been one of only two major countries where manufacturing unit labor costs have actually fallen. While this is a significant competitive advantage, it arises from the fact that productivity has grown sharply while real wages have hardly changed at all.

**12. Manufacturing Labor Productivity**

*Index basis 100 = 2002*

**13. Manufacturing Labor Costs**

*Index basis 100 = 2002*

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**Source:** Bureau of Labor Statistics, Euler Hermes
A New era of Manufacturing: “On-shoring”

The Chinese competitive edge in labor costs has been so overwhelming that it often eclipsed all other parameters in the economic and strategic equation. The refreshed set of parameters of “Made in America” (cheap energy, supply chain risk management, etc.), are major advantages to reshoring. Other factors include quality, easier communication, faster time to market and cheaper inventory costs.

While real American labor costs have barely changed over the past decade, the dramatic increase in Chinese wages has resulted in a steady erosion of the gap between American and Chinese wages. For the previous two decades this gap had been a crucial incentive for U.S. manufacturers to relocate industrial facilities to China. Although there is no doubt that the Chinese competitive edge is likely to remain significant for a while, the recent years have marked a tipping point in the industrial relationship between the two countries wherein the wage gap will shrink enough to become less important.

Figure 14 below points to a sharp increase in Chinese wages, fueled by buoyant economic growth despite the determination to keep inflation low, resulting in a sharp closing of the wage gap. Combined with the depreciation of the U.S. dollar versus the Chinese yuan, the supremacy of China as the best location to manufacture is likely to be weakened in any case. The current and foreseeable global environment may pave the way toward the reshoring of industrial capacities in the U.S. We assume the reshoring of manufacturing capacities will mainly affect production currently based in China but aimed at the U.S. market. This trend does not imply that the U.S. companies will automatically scale back their operations in China.

The sectors expected to be the most proactive in reshoring in the short and medium term can be characterized by two conditions:

- high exposure to labor costs in their cost structure; and
- the ability to absorb higher labor costs by having a lower labor cost component of value-added.

Figure 15 and Table D below summarize the first and second tier of sectors which would initially participate and contribute to reshoring. The activity potentially affected by reshoring these industries from China to the U.S. would be equal to the current exports to the U.S. from China in these two industries. This amount is estimated to be $282 billion annually.

D. The candidates for reshoring

Tier 1: Four sectors representing 56% of the U.S.
imports from China

- Computer and electronic product manufacturing
  - U.S. import from China (in 2011) $146bn
- Machinery
  - $21bn
- Furniture
  - $15bn
- Miscellaneous product manufacturing
  - $36bn

Tier 2: The Challengers

- Fabricated metal product manufacturing
  - $17bn
- Electrical equipment and appliance
  - $29bn
- Plastic and rubber products
  - $12bn
- Non-metallic mineral products
  - $6bn

Source: Bureau of Economic Analysis, Euler Hermes
The Southern U.S. enjoys significant compensation, productivity and unit labor cost advantages compared to the rest of the country. These advantages caused an influx of foreign automakers and are expected to continue. Additionally, exports are providing a boost to southern state economies while the expansion of the Panama Canal in 2014 is likely to contribute to economic activity in the region.

The South has outperformed the U.S. in terms of GDP growth in ten of the past twelve years. And while the U.S., as a whole, had two negative years of growth in 2008 and 2009, the more resilient South actually grew in 2008. More recently, the South grew more than twice as fast as the U.S. in 2011, and expectations are that this outperformance will continue.

Total compensation, which includes wages and benefits, are lowest in the South as shown in Figure 17 below.

Total employment in the South has more than doubled over the past 50 years with an average growth rate 35% higher than the U.S. as a whole. Much of this job growth relative to the rest of the country can be attributed to the South’s lower labor costs, which in turn are due to its slower transition from an agricultural economy and to the lesser role of organized labor.

Productivity and unit labor cost statistics are not available by state or region, but proxies can be estimated using other data. The result of our analysis (see Table E below) show that four of the top six states in terms of productivity are Southern: Louisiana, Texas, North Carolina and New Mexico. When it comes to unit labor costs, five of the top eight are Southern.

The Auto industry

One sector that has benefitted from this reindustrialization wave is the auto industry, as summarized in Table 6 below. It is noteworthy that the list is comprised only of foreign automakers and none of the U.S. “Big Three” of Chrysler, Ford, and General Motors.

Expansion of the Big Three into the South has been hampered by labor unions which have vehemently opposed moving production to “right-to-work” states in the South. By contrast, foreign automakers have taken advantage of this situation and moved production to the U.S. South where they could avoid elevated union wages and high legacy costs. Their lower costs, in turn, make the total cost of manufacturing cars in the South lower than manufacturing overseas and shipping to the U.S. In addition to the Big Three, the U.S. auto industry now has a second concentration in the seven Southern states of Alabama, Georgia, Kentucky, Mississippi, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.
E. Top 10 U.S. States

<table>
<thead>
<tr>
<th>State</th>
<th>GSP/employee hour 2011</th>
<th>rank</th>
<th>GSP/Compensation 2010</th>
<th>rank</th>
<th>combined rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Louisiana</td>
<td>209.3</td>
<td>1</td>
<td>5.0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Oregon</td>
<td>163.4</td>
<td>2</td>
<td>4.1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Wyoming</td>
<td>159.5</td>
<td>3</td>
<td>3.3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>North Carolina</td>
<td>93.0</td>
<td>5</td>
<td>2.8</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Texas</td>
<td>102.3</td>
<td>4</td>
<td>2.6</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Alaska</td>
<td>83.9</td>
<td>8</td>
<td>2.8</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>New Mexico</td>
<td>92.7</td>
<td>10</td>
<td>2.7</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Delaware</td>
<td>82.2</td>
<td>11</td>
<td>2.4</td>
<td>8</td>
<td>10</td>
</tr>
</tbody>
</table>

Source: Euler Hermes

Methodological Note:

A proxy for productivity by state can be calculated as follows:

> Gross State Product (GSP) in the manufacturing sector is known and can be divided into 52 weeks;
> then the number of employees and the average number of weekly hours can be multiplied to determine the total number of "employee-hours/week";
> when this number is divided into GSP/week, the result is GSP/employee-hour. Conceptually, this is the dollar amount of output created by one worker in one hour. A proxy for Unit Labor Costs can be derived made simply by dividing GSP by total compensation (wages and benefits), effectively showing how many dollars of GSP are created by each dollar of total compensation. The combined ranking is the simple average of the productivity and cost ranks.

F. Auto Plants in the Southeast

<table>
<thead>
<tr>
<th>Opened</th>
<th>Company</th>
<th>Location</th>
<th>Employees</th>
<th>Annual production capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>Nissan</td>
<td>Smyrna, Tenn.</td>
<td>6,000</td>
<td>550,000</td>
</tr>
<tr>
<td>1986</td>
<td>Toyota</td>
<td>Georgetown, KY</td>
<td>7,000</td>
<td>n/a</td>
</tr>
<tr>
<td>1994</td>
<td>BMW</td>
<td>Greer, South Carolina</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>1997</td>
<td>Nissan</td>
<td>Decherd, Tenn.</td>
<td>1,250</td>
<td>n/a</td>
</tr>
<tr>
<td>1997</td>
<td>Mercedes-Benz Vance, Ala.</td>
<td>2,800</td>
<td>174,000</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>Toyota</td>
<td>Huntsville, Ala.</td>
<td>768</td>
<td>n/a</td>
</tr>
<tr>
<td>2001</td>
<td>Honda</td>
<td>Lincoln, Ala.</td>
<td>4,000</td>
<td>300,000</td>
</tr>
<tr>
<td>2003</td>
<td>Nissan</td>
<td>Canton, Miss.</td>
<td>4,500</td>
<td>400,000</td>
</tr>
<tr>
<td>2005</td>
<td>Hyundai</td>
<td>Montgomery, Ala.</td>
<td>2,500</td>
<td>300,000</td>
</tr>
<tr>
<td>2010</td>
<td>Kia</td>
<td>West Point, Ga.</td>
<td>3,000</td>
<td>300,000b</td>
</tr>
<tr>
<td>2011</td>
<td>Volkswagen</td>
<td>Chattanooga, Tenn.</td>
<td>2,000c</td>
<td>150,000</td>
</tr>
<tr>
<td>Fall 2011*</td>
<td>Toyota</td>
<td>Blue Springs, Miss.</td>
<td>2,000</td>
<td>150,000</td>
</tr>
</tbody>
</table>

Notes: *projected to be 380,000 in 2012; projected to be 2,300 by fall 2011; projected opening date
Source: Individual companies, Congressional Research Service, Chambers of Commerce
The Southern export routes revisited

Total U.S. exports have grown faster than the rest of the economy in twelve of the past thirteen quarters. In 2011 when nominal GDP grew 4.0% over the entire year, exports grew 13.5%. And in the Southeast, the export growth rate was even stronger, over 20%. According to the Federal Reserve, “Exports have become an increasingly significant part of the region’s economy. The Southeast’s globally interconnected economy—with its fortuitous location and plentiful ports and coastline—is contributing to surging, if surprising, exports, such as the flood of international travelers whose Southeastern expenditures constitute a major export.” Commerce Department data showing the top exports and their markets from the Southeast are listed in Table 7 below. It would appear that the Southern strength in auto manufacturing for the domestic market has also contributed to strong exports for transportation equipment.

Finally, in 2014 a planned expansion of the Panama Canal should be completed, allowing wider and deeper vessels to transit the canal. Currently, most goods from Asia are unloaded at the country’s two largest ports, Los Angeles and Long Beach, and are then shipped by rail or truck to the rest of the U.S. The expansion of the canal will establish an alternate competing route sending Asian goods through the Panama Canal to U.S. ports closer to the concentration of U.S. population. In preparation, southeastern ports such as Savannah, GA, Gulfport, MS, and New Orleans, LA, among others, have undertaken large-scale projects to upgrade their facilities. These preparations are likely to continue to boost manufacturing in the South, while an increase in port activity from the new Panama Canal trade route, including both imports and exports, will contribute to even more economic activity.

G. Exports: top sector, top destinations

<table>
<thead>
<tr>
<th>Top exports from the Southeast (2011)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation Equipment</td>
<td>$31B</td>
</tr>
<tr>
<td>Chemicals</td>
<td>$29B</td>
</tr>
<tr>
<td>Petroleum &amp; Coal Prods.</td>
<td>$24B</td>
</tr>
<tr>
<td>Computer and Electronic Prods.</td>
<td>$23B</td>
</tr>
<tr>
<td>Agricultural Prods.</td>
<td>$21B</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Top export markets for the Southeast (2011)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>$26B</td>
</tr>
<tr>
<td>China</td>
<td>$17B</td>
</tr>
<tr>
<td>Mexico</td>
<td>$17B</td>
</tr>
<tr>
<td>Brazil</td>
<td>$10B</td>
</tr>
<tr>
<td>Japan</td>
<td>$9B</td>
</tr>
</tbody>
</table>

Source: Department of Commerce

Even though these new Southern employers pay well below average for the U.S. automotive industry, they still pay well above average for manufacturing jobs in the South. The story is similar for other capital-intensive industries, such as aerospace and pharmaceutical manufacturing. Looking beyond the current business cycle, prospects for manufacturing in the South appear promising. The transition to more advanced industrial growth in countries such as China and India is far from complete, so demand for the South’s more advanced manufactured goods is likely to continue for some time. New capital investments should continue to reduce costs and increase productivity…

Jeffrey Lacker
The Future of Manufacturing in the South
The energy factor has been particularly favorable to the reindustrialization of the U.S. and this trend should be confirmed in the short run for two main factors. First, in spite of global oil price increases, and the subsequent stabilization at historical highs (expected to linger), U.S. domestic oil prices have been $15-$20 below the global price for almost two years. This has boosted the relative performance of U.S. companies, just as it hit the operating profitability of foreign manufacturing and drove shipping costs up. Second, an abundance of shale gas on the American market, resulting from more intensive production has triggered downward pressure on domestic gas prices and provided American companies with access to a cheap energy supply.

The main risks to this positive contribution are:

> the effective potential of the shale gas reserves both in terms of volume and usage for different sectors of the economy; and
> should prices continue to decrease, incentives for the extractors (and their profitability) would fall, causing instability in the value chain.

▶ As shown below in Figure 18, net U.S. imports of foreign oil have been falling as domestic production has been increasing over the past several years. As a result, imported oil, as a percentage of all oil produced and imported, has dropped from a high of over 68% in 2005 to 58% in 2012, in part because the price of crude oil doubled over that same period. This dramatic shift will reduce America’s significant dependence risk on foreign oil. It may also lead to lower costs and increased reindustrialization since, as shown in Figure 19, a glut of West Texas Intermediate (WTI) oil in the U.S. led to prices significantly below that of the global price of Brent crude.

▶ In addition, prices for natural gas have plummeted due to rapid developments in drilling technologies including horizontal drilling and hydraulic fracturing, or "fracking." Fracking is a technique in which water, sand and chemicals are injected thousands of feet below the surface under very high pressure to break up rock formations, thereby releasing trapped natural gas. These techniques have revealed dramatic amounts of new reserves over the past few years, particularly in the Marcellus shale which extends from New York through Pennsylvania and into West Virginia, and the Bakken shale in North Dakota and Montana.
As shown in Figures 20 and 21 below, the result is that natural gas production and storage have risen sharply while prices have plummeted. Regarding reserves, the Energy Information Agency now estimates that “…there are 2,214 trillion cubic feet (Tcf) of natural gas that is technically recoverable in the United States. Of the total, an estimated 273 Tcf are proven reserves, which includes 60 Tcf of shale gas. At the rate of U.S. natural gas consumption in 2010 of about 24 Tcf per year, 2,214 Tcf of natural gas is enough to last about 92 years*.

Furthermore, the substantial natural gas price differential the U.S. enjoys will add to its industrial competitiveness, specifically in manufacturing. In the U.S., one million BTU costs $4.01 (in Canada, $3.47). Comparatively, costs are twice as much in the UK ($9.03) and Europe ($10.61), and more than three times as much in Japan (LNG is at $14.73). UBS estimates that the boost to U.S. manufacturing could add 0.5% to GDP growth in each of the next five years.

Note that the industrial, commercial and residential and electrical power sectors each consume about one-third of the current natural gas supply. In the electric power sector, as older coal plants go offline, they are quite likely to be replaced with gas-fired plants. The industrial sector currently sources 44% of its energy from petroleum; natural gas could begin replacing that over time. Finally, in addition to being a source of energy, natural gas is used as a feedstock in the production of many chemicals, plastics, and fertilizers. As a result, these industries are likely to return some production from overseas back to the U.S., taking advantage of the low price of natural gas. The development of shale gas extraction has created a glut of natural gas and near record low prices. The discovery of vast new reserves, bringing the total up to around 100 years, is paving the way for the future reindustrialization of the U.S.

* Questions remain about the environmental damage fracking might cause, including the consumption of large amounts of water, disposal of wastewater, seismic tremors, and possible contamination of groundwater. These concerns have led to some temporary restrictions in exploration and production in the U.S., but in Europe fears over fracking could prove to be much bigger hurdles to its use in that region.

The potential for substitution.

The greatly reduced price and greatly increased supply could be strong contributors to the reindustrialization of the U.S. As shown below in Figure 22, U.S. dependence on foreign oil is largely due to the transportation sector. Thirty seven percent of all energy supplied to the U.S. comes from petroleum and most of that, seventy two percent, goes straight into transportation, mostly to gasoline for passenger cars, then diesel for trucks and trains, and finally to jet fuel.
22. Use of energy sources by sector

<table>
<thead>
<tr>
<th>Supply Sources</th>
<th>Percent of Source</th>
<th>Demand Sector</th>
<th>Percent of Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petroleum</td>
<td>37%</td>
<td>Transportation</td>
<td>28%</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>25%</td>
<td>Industrial</td>
<td>20%</td>
</tr>
<tr>
<td>Coal</td>
<td>21%</td>
<td>Residential &amp; Commercial</td>
<td>11%</td>
</tr>
<tr>
<td>Renewables</td>
<td>8%</td>
<td>Electric Power</td>
<td>41%</td>
</tr>
<tr>
<td>Nuclear</td>
<td>9%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Energy Information Administration, Annual Energy Review 2009

Unconventional gas: the cash cow?

Increased unconventional gas activity will contribute to capital investment, job opportunities, economic growth, government revenue, and lower prices across the country including:

> Nearly $3.2 trillion in investments in the development of unconventional gas are expected to fuel the increase in production between 2010 and 2035
> In 2010, unconventional gas activity supported 1 million jobs; this will grow to nearly 1.5 million jobs in 2015 and to over 2.4 million in 2035
> Between 2010 and 2015, the Top 10 producing states — as ranked by employment generated by their unconventional gas activity — will experience a compound annual employment growth rate of nearly 8%. Total U.S. employment is expected to grow at an average rate of 1.6% during the same time period
> By 2015, unconventional gas activities will contribute nearly $50 billion in federal, state and local government tax and federal royalty revenue. Between 2010 and 2035, continued development of unconventional gas will generate a cumulative total of nearly $1.5 trillion in federal, state, and local tax and royalty revenue.

The Economic and Employment Contributions of Unconventional Gas Development in State Economies, IHS report for America’s Natural Gas Alliance (June 2012)

Double-tanked cars

Much of the consumption of petroleum could be replaced with natural gas. The technology exists now to operate a passenger car on natural gas. Furthermore, it is possible to have two separate tanks, one for gasoline and one for natural gas, and to simply flip a switch between the two on the fly. Many municipalities are now running buses and garbage trucks on natural gas. However, there are still only 110,000 natural gas vehicles on the road in the U.S., as compared to Iran and Pakistan which have nearly 3 million vehicles each. There is enormous potential for the development of natural gas powered vehicles in the U.S. And since there currently is only one natural gas powered passenger vehicle for sale in the U.S. - the Honda Civic CNG - there would appear to be plenty of market share available for more than one manufacturer. The cost per mile to run a vehicle on natural gas now is a fraction of that of on gasoline, although distribution and relative price changes could increase or decrease that margin. Clearly natural gas could be a contributor to the reindustrialization of the U.S. through increased demand for new natural gas powered vehicles. Natural gas is also increasingly being used by 18-wheel trucks, ships and trains, and there are even proposals for natural gas powered aircraft.

Part of the challenge in developing natural gas vehicles for the U.S. will be establishing the necessary infrastructure of refueling stations, a costly investment for the future when current demand is so low. In the U.S. each refueling station currently supports only 102 vehicles on average, as opposed to 1,589 in Iran and 856 in Pakistan. While the lack of infrastructure is an obstacle, it also represents an opportunity for further U.S. reindustrialization.
The U.S. shale gas supply is a game-changing factor for American industries all across the board, as manufacturers may now:

> access lower energy prices as many electric power suppliers have been shifting their coal-fired plants to gas-fired plants;
> switch their energy supply from oil to gas; and
> switch their feedstock supply from oil to gas.

These developments will help reinforce the ongoing improvement of the competitive position of U.S. manufacturers, especially in comparison to European and Japanese counterparts. Beyond the strengthening of operating profitability, the foreseeable outcome of this growing competitive edge is that U.S. manufacturers will regain ground in global trade, expanding exports and putting downward pressure on imports. The sector which is first in line to take advantage of cheaper energy is chemicals, especially basic chemicals and fertilizers, since these industries will benefit from both cheaper energy and cheaper feedstock supplies. This competitive advantage is likely to filter to downstream sectors such as agriculture, coatings, manufacturing, paint, and plastics.

Considering the size of the trade and the characteristics of the sector, the primary metals industry could also be a significant winner, improving its competitive advantage and gaining global market share. In the short/intermediate run, these trends may also fuel substantial investments in these sectors to keep pace with probable production increases. Players in the chemicals sector have already planned to invest $16 billion in the next five years.

**H. Top sectors benefitting from a decrease in energy prices**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Part of energy costs in sector input cost (%)</th>
<th>Part in U.S. manufacturing energy input costs (%)</th>
<th>Imports ($Bn) 2011</th>
<th>Exports ($Bn) 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>3%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonmetallic mineral products</td>
<td>11%</td>
<td>6%</td>
<td>17.7</td>
<td>10.7</td>
</tr>
<tr>
<td>Paper products</td>
<td>10%</td>
<td>12%</td>
<td>21.9</td>
<td>25.7</td>
</tr>
<tr>
<td>Primary metals</td>
<td>8%</td>
<td>16%</td>
<td>103.5</td>
<td>76.5</td>
</tr>
<tr>
<td>Wood products</td>
<td>5%</td>
<td>2%</td>
<td>11.3</td>
<td>5.9</td>
</tr>
<tr>
<td>Chemicals</td>
<td>5%</td>
<td>22%</td>
<td>201.8*</td>
<td>197.1*</td>
</tr>
<tr>
<td>Textile mills and textile product mills</td>
<td>4%</td>
<td>1%</td>
<td>24.4</td>
<td>12.6</td>
</tr>
<tr>
<td>Plastics and rubber products</td>
<td>3%</td>
<td>3%</td>
<td>40.2</td>
<td>29.7</td>
</tr>
<tr>
<td>Food/beverage and tobacco products</td>
<td>3%</td>
<td>18%</td>
<td>67.9</td>
<td>66.7</td>
</tr>
<tr>
<td>Apparel/leather and allied products</td>
<td>3%</td>
<td>−0%</td>
<td>116.4</td>
<td>9.0</td>
</tr>
</tbody>
</table>

* $108.7Bn and $149.2Bn excluding pharmaceuticals

Source: Bureau of Economic Analysis – International Trade Administration
Texas is the second largest state economy in the U.S. after California, comprising 8.8% of U.S. GDP in 2011. The Texas economy has grown faster than the rest of the U.S. in nine of the past 12 years as shown below in Figure 23.

Texas is also the second largest employer with 8.8% of all U.S. jobs, and through most of 2011 and 2012 has outperformed the rest of the U.S. in job growth as shown below in Figure 24. In fact, of all the 2.6 million jobs created between January 2000 and August 2012, 1.8 million, or 70%, were created in Texas. Forecasts for 2013 Texas GDP and job growth are expected to significantly outperform the U.S. as a whole. Texas comprises 7.1% of all U.S. manufacturing jobs.

One outstanding feature of the Texas economy is the housing market, which was relatively resilient compared to the entire U.S. From the period just before the housing bubble burst, January 2006 to May 2012, housing prices in Dallas fell only 2.7%, the least of any of the 20 major cities nationwide measured by the Case-Shiller home price index. The average housing loss for the 20 cities nationwide over that time period was a remarkable 31%. Median single-family home prices in Texas were up 5% in August 2012 compared to a year ago. Sales of existing single-family homes over the same time period were up 17% compared to a nationwide average of 10%. Permits were up 36% versus 24% nationwide. The strength in the housing market will provide a boost to the entire state economy and a robust environment for manufacturers of building materials going forward.

23. Real GDP growth

24. Manufacturing employment

Source: BEA
Source: BLS
Petroleum

The Texas economy has long been dominated by the energy sector. Texas is the number one producer of crude oil, natural gas and total energy in the U.S., with a 15.3% share of total U.S. energy production. It has 24% of U.S. crude reserves, 31% of its production, and is the number one consumer. Texas also has 29% of U.S. dry natural gas reserves, 30% of its production and is the number one consumer.

In 2011, its 26 refineries accounted for 27% of all U.S. refining capacity. The refinery business is likely to see steady growth going forward as demand from the chemical industry will be ramped up by cheap natural gas. Several of the largest oil companies in the world are headquartered in Texas, including ExxonMobil and ConocoPhillips. It has nine major sea ports for exporting and importing petroleum products. West Texas Intermediate (WTI) remains the benchmark grade for crude oil in the U.S. and its price is currently between $15 and $20 per barrel less than the global benchmark, Brent crude, because the U.S. currently has a glut of WTI. High production combined with limited pipeline capacity to transport to refineries has contributed to the excess. While Texas is the number one producer of crude oil in the U.S., output has fallen to less than one third of its peak in 1972. Although there is no doubt that crude production will remain a robust industry for decades to come, growth prospects may be limited. By contrast, natural gas production is on the rebound. Huge new reserves of shale gas have become recoverable because of developments in fracking and horizontal drilling. Much of the natural gas production goes directly to electricity production, which will likely be a growth industry for the foreseeable future. Texas is the number one producer and consumer of electricity in the U.S. Another significant source of demand is from chemical manufacturers who use natural gas as a feedstock. The adoption of natural gas as a fuel for vehicles also offers great promise in the long run.

Texas also leads the country in coal consumption with the majority of its supplies coming from Wyoming. Coal mining and consumption is likely to be a weaker industry in the long run because of its emissions and because of competition from cheap natural gas. One bright spot in the coal industry is increasing demand from China, which is the world’s largest consumer and importer of coal.

Despite being an economy being heavily dependent on fossil fuels, Texas is also the nationwide leader in wind power. There are over 2,000 turbines in west Texas alone, and the largest wind energy facility in the world is located in central Texas. While crude oil pro-

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### Sector opportunities

Manufacturing industry GDP in Texas is $192 billion or 10% of all U.S. manufacturing. The concentration of industries within Texas manufacturing is shown in Table 9 below. The first column in the table indicates that petroleum and coal products comprise 26% of all manufacturing in Texas. Along with chemicals at 20%, these top two industries are responsible for nearly half of the manufacturing output of Texas. There are significant contributions from computer and electronic products and machinery as well. The second column indicates that of all the petroleum and coal product manufacturing in the U.S., 26% of it is performed in Texas. Texas also produces 15% of all U.S. chemical products. Once again, there are significant contributions from computer and electronic products and machinery.

<table>
<thead>
<tr>
<th>H. Texas’ ID card</th>
<th>% of Texas manufacturing</th>
<th>% of total US in Texas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>100%</td>
<td>10%</td>
</tr>
<tr>
<td>Petroleum and coal products</td>
<td>26%</td>
<td>26%</td>
</tr>
<tr>
<td>Chemicals</td>
<td>20%</td>
<td>15%</td>
</tr>
<tr>
<td>Computers and electronic products</td>
<td>14%</td>
<td>9%</td>
</tr>
<tr>
<td>Machinery</td>
<td>10%</td>
<td>12%</td>
</tr>
<tr>
<td>Fabricated metal products</td>
<td>6%</td>
<td>9%</td>
</tr>
<tr>
<td>Food, beverage and tobacco products</td>
<td>6%</td>
<td>5%</td>
</tr>
<tr>
<td>Other transportationequipment</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Plastics and rubber products</td>
<td>3%</td>
<td>7%</td>
</tr>
</tbody>
</table>

Source: BEA
duction and refining are likely to be in high demand going forward, it would appear that true growth opportunities in Texas energy lie more in natural gas and renewables.

▶ Chemicals

As in the petroleum industry, Texas is the leader in U.S. chemical production with over 200 chemical plants. The industry provides employment for over 70,000 workers at an average salary of over $85,000 per year. The state’s abundant supply of natural gas and its large refining capacity are the main contributors to the strong presence of the chemical industry in Texas. But unlike crude oil production and refining, the chemicals industry is set for strong growth, due to the emergence of very cheap natural gas. Natural gas is used as a “feedstock” or basic raw material in the production of many chemicals, so its precipitous fall in price is also lowering prices for many goods downstream. There are thousands of products which use chemicals extensively for their manufacturing: apparel, auto parts, clothes, fertilizer, packaging, paints, pharmaceuticals, rubber, and all the plastic products which make up so many everyday items such as appliances, furniture, and the seemingly endless array of consumer electronics such as personal computers, tablets, smartphones, TVs and many others.

The drop in natural gas prices along with lower unit labor costs now make the U.S. one of the cheapest chemical producers in the world. According to Price-waterhouse Coopers, “U.S. chemical manufacturers now have a 50-to-1 price advantage over foreign competitors forced to rely on much more expensive petroleum products. Shale gas represents a once-in-a-century change in the competitive balance worldwide.” This change is likely to move significant numbers of jobs back onshore. As a result, at least a dozen major chemical plants are rapidly expanding in Texas, and expectations are that these projects will entail $15 billion in investments, and create as many as 20,000 new jobs. Clearly the chemicals industry in Texas is poised for strong growth.

Public incentives and export routes are contributing to this favorable outlook in Texas

Texas offers a number of government incentives to promote growth:
> Value Limitation tax credits are available for job-creating construction projects;
> The Texas Emerging Technology Fund is designed to attract R&D to the state; and
> The Texas Enterprise Fund also provides financing to worthy projects. Recently the Fund provided approximately $1 million each to chemical manufacturers Dow Chemical and Kuraray America to help finance their expansions.

As far as exports are concerned, like in so many other measures, Texas is number one in the nation, exporting $250 billion in 2011 with a 17% share of all U.S. exports. Exports grew in 2011 over 2010 at a blistering 21% rate. Over 20% of Texas exports were refined petroleum products, followed by coal, chemicals, computer and electronic products, non-electrical machinery, and transportation equipment. The top export markets were Mexico with a 35% share, followed by Canada at 8%, and China at 4%. These top three countries buy almost half of Texas’ exports. A significant portion of exports to Mexico is likely to be goods which are then assembled or modified in Mexico and re-exported to the U.S.

[Image]
As we have seen from the response to the financial crisis, policy responses including the stimulus package, have been a decisive factor in shaping the U.S. recovery. Going forward, the question is how can the policy environment help sustain the positive first signs of a reindustrialization of the U.S. What hampers the realization of its full potential? Is corporate cash hoarding a reality? How did the private sector organize to cope with new challenges and an uncertain economic environment? Confidence and forward visibility are key as uncertainties, a still cloud the decision-making of entrepreneurs. Are there other options?

**25. GDP Growth VS. R&D Growth**

*averaged annualized rates 1987-2009*

Source: OECD
Objective: Innovation

Research and Development (R&D) is critical to competitiveness and innovation, and the U.S. needs to boost efforts in this sector. For example, the U.S. is beginning to fall behind its global competitors in patent generation. Patents represent the end-product of R&D efforts, which can then be used for commercial purposes and competitive advantage.

▶ The benefits of a strong national R&D program and the resulting growth in the number of patents granted are obvious. Figure 25 below demonstrates that from 1995 to 2012, nations that had a higher average annualized growth rate in the number of patents granted tended to also have a higher growth rate of GDP. Clearly the growth rate of patent issuance in the U.S. at under 5% is insufficient to contribute to robust GDP growth. By contrast, China’s R&D programs are growing the number of patents issued there by a remarkable 22%, resulting in an equally remarkable GDP growth of 10% annually. U.S. industry needs to take this competitive threat seriously if it expects to continue on the path of reindustrialization.

▶ The threat appears in other measures of innovation as well, such as the absolute number of patents granted in each country. Note in Figure 26 below that the U.S. and Japan lead this measure with about the same number of patents granted in 2010. But more importantly, the chart clearly shows the rise of China’s R&D programs and to a lesser extent those of South Korea. These countries are rapidly closing the gap with the U.S. and eroding its competitive advantage.

Even after patent applications are made, the U.S. stumbles. Figure 27 shows the increase or decrease since 1993 in the length of time required for patent approval, by country. Here the U.S. is a serious laggard as well. It took more than twice as much time to approve a patent in the U.S. in 2009 as it did in 1993. By comparison, the approval time in South Korea has fallen 40%, and in Japan 20%. U.S. manufacturing and the economy in general would be well served by improvements in the process of approving patents.

▶ The composition of the increase in patents shows threats and opportunities as well. Table J shows the percentage contribution of each industry to the growth in patents between 1995 and 2008. The first columns show the contribution to total patents granted worldwide, and as might be expected, seven of the top 10 industries are related to electronics, with computers and electrical machinery taking the top spots. The remaining columns show the industry breakout by country. The U.S. contribution by industry is the most highly concentrated with a full 19% in computers. Computer technology is also in the top three in Japan and South Korea, representing significant competition.
from those countries. The positive view here is that the U.S. has focused on the highest growth industry since 1995, and its lead may make it well-suited for further competitive gains.

However, the concentration in one industry is rather risky to U.S. manufacturing as a whole. An offset to that risk is that the second largest U.S. concentration is in medical technology; none of the other major economies have that in their top three, representing a competitive U.S. advantage in this industry. Similarly, the third largest U.S. industry concentration – pharmaceuticals - appears in only one other country’s list: China. Other countries show concentration risk. Over 40% of Japan’s increase in new patents is related to computers or electronics. This situation is especially dangerous given that Japan’s once dominant electronics manufacturers are now struggling to survive in the global marketplace. South Korea is less concentrated with only about 16% in high technology. China however is the most diverse, suggesting that the Chinese leadership is fostering development across many industries as the country seeks to support its rapid growth rate.

Another measure of a country’s innovation compares the number of patent applications to its GDP, as shown below in Table K in the first column. This measure conceptually shows a country’s commitment to its R&D efforts, and by this measure U.S. dedication to R&D is very weak at only a fraction of that of South Korea’s and Japan’s and only a bit more than half of China’s. Clearly the U.S. needs to increase its dedication and funding to R&D to compete in the future global economy. The last column in the table shows how effective a country’s R&D program is by comparing how many patent applications are made relative to the amount of R&D spending. Once again, South Korea, Japan, and China far outpaced the U.S. in 2010.

Finally, Figure 28 below shows two measures of R&D activity, averaged from 2000-2012. The U.S. performs reasonably well by these measures. For example, Japan and the U.S. have the largest number of research workers per 1,000 total workers. But while U.S. R&D spending as a percentage of GDP exceeds the average for the OECD countries, it still lags behind Japan, Korea, and Switzerland.
Cash hoard instinct: debunking the myth

Clearly the U.S. is falling behind in critical R&D programs. So how will the U.S. increase its investment in R&D spending? What policies can the federal government undertake to encourage this effort? An examination of current business practices reveals some possibilities.

▶ U.S. manufacturers have grown their profits rapidly over the past decade, largely due to increased productivity. Yet over the same period, manufacturers have increased investment much more slowly, and employment has actually fallen in the sector. Clearly, U.S. manufacturers need to resume a faster pace of investment to become more competitive in the global marketplace. Profits need to be re-distributed to promote investment.

Figure 29 below shows the growth in corporate and non-corporate business profits as a percentage of total assets. The rising profits are clearly evident here also, but this chart breaks the profits down into dividends and undistributed profits. It is evident that over the past decade, manufacturers have paid out dividends at approximately the same rate, but they have more than tripled the portion of profits which remain undistributed. Where have the undistributed profits been allocated on balance sheets?

▶ The good news is that although this risk aversion strategy is still in place, it has been easing. Banks have started to make commercial and industrial loans again. Consumer confidence is on the rise. The housing market may have bottomed, and employment has firmed in recent months, although it is well below the rate of job creation needed to bolster the anemic recovery. Expectations are that all of these trends will continue and that businesses will start to increase their risk appetite such that profits will be used less to bolster the balance sheet and more to increase investment.

29. Distribution of profits as a % of assets

30. Net worth, liabilities and liquid assets as a % of total assets
But the federal government could do more to stimulate increased R&D spending. First, the corporate tax code should be reformed. At the moment, U.S. corporations are holding large amounts of accumulated earnings overseas which would be taxed if they were repatriated. This tax structure obviously impedes the flow of capital back into domestic operations, constraining investment. If that money could be repatriated untaxed, there would most likely be a flood of new capital coming in to stimulate investment and create the new jobs which the U.S. desperately needs.

The government could also spur investment by creating a less uncertain business environment. Specifically, Congress should resolve the fiscal cliff as quickly as possible. The details of the resolution are less important than actually doing it. Continued deadlock in Congress, or some sort of temporary fix will only extend the uncertainty, impeding investment and job growth.

Surprisingly though, the U.S. does have one advantage in this regard compared to the European Monetary Union (EMU); it has one federal government, not 17. This structure has allowed for a rapid and concerted U.S. crisis response before. For example, during the meltdown of the housing market, the financial crisis, and the resulting recession, the Presidency, the Congress, and the Federal Reserve all took extraordinary measures to mitigate the damage. But in Europe, there has been little real progress in creating a coherent plan to deal with the sovereign debt crisis which is approaching its fourth year. And the largest E.U. impediment is that there are 17 countries, the International Monetary Fund, and the European Central Bank (the troika) all involved. While overcoming deadlock in Washington may be very difficult, it is not nearly as challenging as trying to mount a singular effort in Europe.

And when Washington has acted in concert, there were positive results. For example, the American Recovery and Reinvestment Act (ARRA) allocated almost $70 billion to the construction industry, which significantly slowed the rate of job loss. Similar targeted stimulus in the manufacturing industry could help spur new R&D spending, more investment, and more employment. One logical target would be the industry with the highest value-added but one which is exposed to increasing global competitive pressures - the computer and electronic products manufacturing. California is the center of this industry.

While California has suffered significant job losses in manufacturing over the past decade, conditions are ripe for improvement. California is by far the largest state in terms of nominal GDP at $1.96 trillion in 2011, which is 13% of the entire U.S. economy. California alone is the world’s ninth largest economy, and is larger than Russian, India, Canada, Spain, and Australia. As shown in Figure 31, California’s GDP growth rate has usually outperformed the U.S. as a whole and was ranked 10th among all states in 2011.

California is also the largest employer in the U.S. with 16.4 million jobs at the end of 2011, or 12% of all 132 million U.S. jobs. California has recently led the nation in job creation. Perhaps more importantly, job growth in California is expected to outpace the rest of the U.S. over the next two years. According to a University of California at Los Angeles (UCLA) Anderson Business School forecast, jobs in California are expected to grow in 2013 by 1.9% vs. 1.5% for all of the U.S., and in 2014 the numbers are 2.5% vs. 1.6% respectively. In addition, while the unemployment rate is among the highest in the nation, it appears that it may be due to an increasing labor force, suggesting that relatively fewer workers are becoming discouraged and leaving the labor force.

![31. Real GDP growth](source: BEA)
California’s ID

<table>
<thead>
<tr>
<th>Industry</th>
<th>% of California manufacturing</th>
<th>% of total U.S. manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>100%</td>
<td>13%</td>
</tr>
<tr>
<td>Computers and electronic products</td>
<td>31%</td>
<td>25%</td>
</tr>
<tr>
<td>Petroleum and coal products</td>
<td>17%</td>
<td>21%</td>
</tr>
<tr>
<td>Food, beverage and tabacco products</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Chemicals</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>7%</td>
<td>17%</td>
</tr>
<tr>
<td>Fabricated metal products</td>
<td>5%</td>
<td>9%</td>
</tr>
<tr>
<td>Machinery</td>
<td>4%</td>
<td>7%</td>
</tr>
<tr>
<td>Other transportation equipment</td>
<td>5%</td>
<td>12%</td>
</tr>
<tr>
<td>Plastics and rubber products</td>
<td>2%</td>
<td>7%</td>
</tr>
</tbody>
</table>

Source: BEA

GDP for the manufacturing industry in California is $230 billion or 12% of all U.S. manufacturing. The concentration of industries within California manufacturing is shown in Table 12 below. The first column indicates that computer and electronic products comprise 31% of all the manufacturing in California, by far the largest single industry. Along with petroleum and coal product manufacturing, these top two industries are responsible for nearly half of the manufacturing output of California. There are significant contributions from food beverage, and tobacco, and chemicals as well.

The second column indicates that of all the computer and electronic products manufactured in the U.S., 25% of it is made in California. California also produces 21% of all the U.S. petroleum and coal products. And once again there are significant contributions from food, beverage and tobacco, and chemicals as well.

The computer industry is clearly the shining star in California manufacturing. The industry is heavily concentrated in the Silicon Valley region surrounding San Francisco. Corporations such as Apple, Cisco, Facebook, Google, Intel, and others have added tens of thousands of jobs and created billions in wealth over the past decade. The development of the industry is something of a random historical accident, largely emerging from innovations at Stanford University. As the industry blossomed in the 1980s, a secondary industry of venture capital formed in the region, helping to fuel growth. California’s share of total venture capital funding in the U.S. is approximately 50%, the majority of which has gone into hi-tech industries. Part of the remarkable growth surrounding the industry is due to the multiplier effect where one new job creates other related jobs, as in venture capital. The Milken Institute estimates that in the computer manufacturing industry one new job may create as many as 16 others.

These fast-growing businesses do require a highly educated and highly paid workforce. The San Francisco Bay area has the highest percentage of college graduates in the U.S. workforce; 44% vs. 28% nationwide. This is a hallmark of industries where the U.S. does not have to compete on labor costs; rather they compete on high quality, high value-added production.

Maintaining competitive advantage in this industry is critical, and the federal government should help in this effort. Educational standards in science, math, and engineering must be raised. Legal immigration must be promoted to keep talented workers on these shores after college graduation, instead of sending...
them away to compete against the U.S. Taxes on repatriated capital should be removed.

The overwhelming success this industry enjoys is due to insatiable global demand for its products such as personal computers, smart phones, and tablets. Competition and continuous innovation have created demand for products unimagined just a few years ago. Yet this same competition continuously drives prices down due to increased productivity, automation, off-shoring, and continuous improvement in semiconductor design. The industry is further characterized by a convergence of features on new products, such as cameras, web browsers and email on phones. Research and Design (R&D) spending is critical in this industry.

Globally the consumer electronics industry is expected to grow somewhat more slowly in 2012 than previously anticipated, around 2.5%. The industry is expected to exceed $1 trillion in added value in 2012. Much of the growth is due to emerging markets which are not yet fully penetrated. In the U.S. in 2013 however, consumer electronics revenues are expected to grow 4.5% and exceed $215 billion, according to the Consumer Electronics Association (CEA). Smartphone sales will comprise the largest segment of revenue at $34 billion but will only grow 24%. Tablet sales will skyrocket over 80% higher to almost $30 billion. Personal computers have slowed due to cannibalization from tablets, but ultrabook laptop sales are still expected to reach $15 billion. The Manufacturers Alliance for Productivity and Innovation (MAPI) forecasts high-tech industrial production (computers and electronic products) to grow by 5.7% in 2013 in the U.S. Higher growth in production vs. revenues is to be expected in this industry with ever-falling prices.

Petroleum

California has large crude oil reserves and is the third largest producer of crude in the nation. Much of the demand for this crude comes from within the state itself and this demand is not expected to drop off in the foreseeable future. Of all the states, California has by far the most vehicles. There are 20 million cars in California, 15% of the nation’s total of 135 million. The next closest state, Texas, has a little more than half that many. Including trucks, buses and commercial vehicles, there are a total of 33 million vehicles in California, or 14% of the nation’s total. The vast majority of these vehicles run on gasoline, followed by diesel fuel, and natural gas. Forty percent of all energy consumed in California is for transportation.

California has always been at the vanguard of environmental protection and as such it has unique requirements for the gasoline that can be used there. As a result, California refineries are ranked third in capacity nationwide and are basically the only ones which produce these blends. The refineries run at almost 100% capacity to meet demand. Furthermore, California refineries have no competition from outside of the state and are not expected to soon. These present very good conditions for business going forward — unquenchable demand and no competitors. California is also the 12th largest producer of natural gas and, again, demand is built-in within the state. Over 57% of the state’s electricity is derived from natural-gas fired plants. And as the price of natural gas fallen, the cost advantages for running vehicles on this fuel will become more apparent. Municipal busses, commercial trucks, and other vehicles are already making the switch. Building the infrastructure to support the growing use of natural gas is likely to be a significant industry going forward as there are very few filling stations available.

Despite its somewhat spotty record, renewable energy is making strong inroads in California and will certainly be a growth industry going forward. For instance, California ranks first in electricity production from renewables such as biomass and geothermal energy. Given the state’s propensity to take the lead on improving energy efficiency, California will likely be the premier market for the development of renewable energy. For example California has passed a global warming bill which, according to the state, “establishes a first-in-the-world comprehensive program to achieve cost-effective reductions in greenhouse gases through energy conservation and rene-
wable energy production, effectively making Califor-

nia a hotbed of renewable energy and energy effi-

ciency innovations.” The state has also established

the California “million solar roofs initiative” aiming to

create one million solar roofs in California by 2018.

▶ Other incentives

California is trying to lure manufacturing jobs back to

the states with many different programs. One such

effort is the “Innovation Hub,” which according to the

state government “seeks to improve the state’s na-

tional and global competitiveness by stimulating part-

nerships, economic development and job creation

around specific research clusters throughout the

state.”. Innovation Hubs “target young, innovative

companies that have been in business for less than

eight years in a technology cluster…”. Other efforts

include Industrial Development Bonds and Small

Business Loan Guarantees.

The state government is currently providing a menu

development to California

of tax incentives to lure manufacturing to California

as well. These include a Research and Development

Tax Credit, a Film and TV Production Tax Credit, a

Work Opportunity Tax Credit, a Net Operating Loss

Carryover provision and finally, in an attempt to fur-

ther promote “green energy”, the state is offering

Sales & Use Tax Exemptions for Clean Tech Manu-

facturing.

▶ Exports

To support exports, the state has twelve cargo airports and

eleven cargo seaports including the two largest in the

nation, the ports of Los Angeles and Long Beach. The

state’s 17 Foreign Trade Zones (FTZ) are intended to pro-

mote exports by delaying, or even foregoing export or

import taxes and duties. The computer and electronics

manufacturing industry is of course well represented in

exports, comprising 29% of the state’s total. California’s top

export markets include the stable Canadian economy and

the more rapidly growing economies of Mexico, China and

South Korea.
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