Nanotechnology Update: Corporations Up Their Spending as Revenues for Nano-enabled Products Increase

Governments, corporations, and private investors (venture capitalists) invested $18.5 billion in nanotechnology in 2012, increasing their spending 8% relative to 2010. The U.S. contributed 36% of this amount. Corporations expanded spending by 21% over 2010, while governments and private investors reduced their investments by 5% and 10% respectively. The United States maintained its lead over all other governments, with $2.1 billion of federal and state funding in 2012. U.S. corporations also led global spending on nanotechnology research and development, investing $4 billion in 2012, which was approximately $1 billion more than the next country, Japan. The revenue from nano-enabled products has continued to grow, from $339 billion in 2010 to $731 billion in 2012. This total is a slight decrease in our estimate relative to our last update on nano-enabled product revenues released in 2009. Our expanded forecast for nano-enabled products reveals the global value of nano-enabled products, nano-intermediates, and nanomaterials reaching $4.4 trillion by 2018.

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Executive Summary

Total spending on nanotechnology research and development (R&D) and start-ups by governments, corporations, and venture capital (VC) investors reached $18.5 billion in 2012, an 8% increase over 2010, with $6.6 billion of this spending from the U.S. Both government and VC spending declined, by 6% and 10% respectively, while corporate spending on R&D increased by 21%. Revenues from nano-enabled products grew to $731 billion in 2012, from $339 billion in 2010. Examining the nanotechnology landscape, we found that:

- The U.S. leads in government (state and federal) nanotechnology funding, with $1.9 billion spent in 2011 and $2.1 billion spent in 2012. Europe's collective spending (European Commission and individual country programs) was slightly more than $2.0 billion in 2012, a decline of 24% from 2010.
- While some countries, such as the U.S., continue to have centralized government programs to coordinate nanotechnology activities, most countries no longer do. In fact, many countries no longer explicitly fund nanotechnology, although it may be a part of initiatives that are funded under different technology support programs. Because of this change, it is difficult to determine with certainty the level of nanotechnology funding by country or region, so in many cases, we have made our best estimate of the level of nanotechnology funding in the country.
- The U.S. and Japan continue to serve as role models for the rest of world when it comes to corporate spending on nanotechnology, with the U.S. contributing $4.1 billion and Japan $2.9 billion in 2012 – a combined 13% increase over 2010.
- U.S.-based companies received the vast majority of VC investments, capturing 70% (a drop from 89% in 2010) of the $580 million invested in companies developing nanotechnology in 2012. Investments continue to be weighted toward later-stage funding rounds, indicating a commitment from investors to focus on start-ups they have supported in the past. Very few Series A investments were made in 2012.
- Nano-enabled product revenue – total sales of final products that incorporate emerging nanotech in some fashion – grew from $339 billion in 2010 to $731 billion in 2012, an increase of 116%. However, this total is lower than our previous expectations for revenue growth. While the penetration of nanotechnology into products increased over that time frame, the total economic output across relevant countries and sectors was lower than previously anticipated.
- Nano-intermediates grew 158% from 2010 to 2012. We upgraded our estimates slightly, given the better-than-anticipated growth in Asia and parts of Europe (such as Germany) where intermediates production is higher. The global value of nanomaterials increased 29% over 2010 to $1.4 billion in 2012.

This report is an independent study conducted by Lux Research with funding support from the U.S. National Nanotechnology Coordination Office and U.S. National Science Foundation. The analysis and views presented herein are entirely those of Lux Research.

Nanotechnology Update

Once again, corporations funnel more money into nanotechnology than governments and investors, and it pays off in increased revenues.

This report focuses on emerging nanotechnology. While nanotechnology – working at scales below 100 nm – has been an important part of the semiconductor and other industries for many years, we do not include established nanotechnology (nanoscale objects and devices based on long-known processes and technology) in our projections. We focus on emerging nanotechnology because the established nanotechnology is well-understood and not where our clients are looking for new sources of growth or high returns on investment.[1]

Global Nanotechnology Government Spending Down Slightly from 2009 High

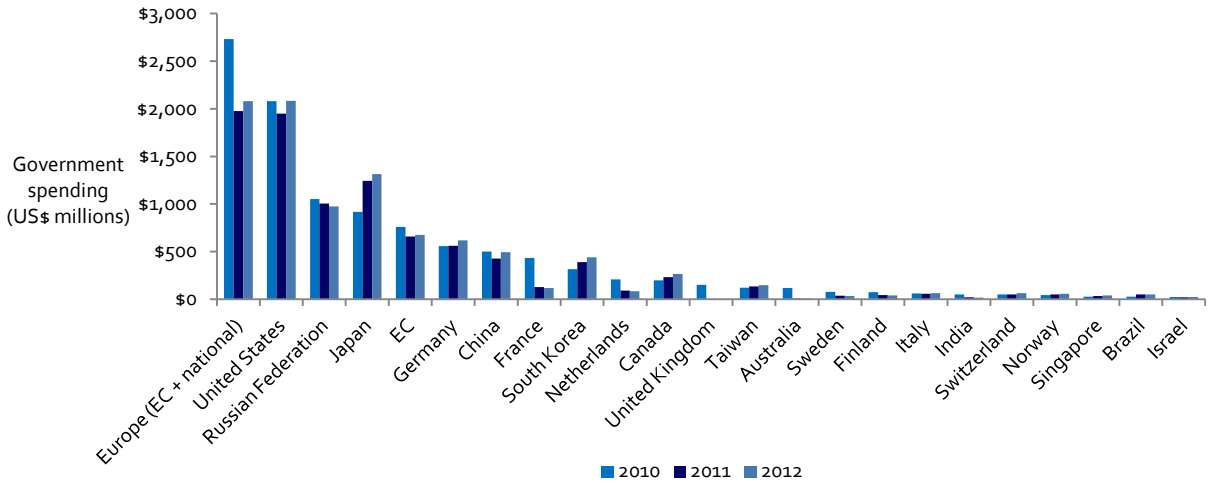
Our last update on emerging nanotechnology spending report was in April 2011 (see the report "Nanotechnology Funding: Corporations Grab the Reins"), with coverage of 2009 and 2010 spending. Many national programs to support nanotechnology ended prior to 2011, thus data collection for this update was particularly challenging. All of the countries with nanotechnology funding in the past were contacted to confirm 2011 and 2012 expenditures; in many cases, country representatives noted that nanotechnology funding was no longer tracked as it had been in the past. This change is not surprising, as nanotechnology has become an integral part of many emerging technologies, and countries have shifted their attention to focus on broader, more market-or application-oriented topic areas (e.g., health care technologies, green energy) for which nanotechnology is an enabling technology. Nevertheless, some countries, such as Germany and Japan, clearly have nanotechnology in mind when allocating funding, while other countries, such as the United Kingdom, take the approach that nanotechnology is not an important part of their decision-making process for funding – for example, the U.K. Department of Business, Innovation and Strategy's Technology Strategy Board states, "[T]he previously identified area of nanoscale technologies is now embedded in all themes where there are such opportunities."[2] In some cases (such as the U.S., the European Union [EU], and the Netherlands), we have data directly from the agencies that oversee the spending. In many others (such as China, Singapore, and Canada), we estimated funding based on the current position of nanotechnology in the country (e.g., if nanotechnology is still identified as an important area for funding even if no dedicated program exists), previous allocation of nanotechnology funding as percentage of gross domestic product (GDP), and specific projects for which we found funding data that were clearly heavily focused on nanotechnology.

Europe Declines as Asia and the Americas Increase Spending

In 2011, global government spending on nanotechnology was $7.5 billion, a 10% decline from $8.3 billion in 2010. Spending rebounded slightly in 2012 to reach $7.9 billion. Funding levels had begun to decline in 2010 as many nanotechnology programs began to wind down. In 2010, Europe (including European Commission [EC] funding and individual state spending) captured the largest share of nanotechnology funding with 33% of spending, but its share fell to 26% by 2012, leaving the region behind the Americas and Asia. Europe's spending dropped from $2.7 billion in 2010 to $2.1 billion in 2012. The Americas represented roughly 28% of total government funding in 2010, and by 2012 was responsible for 30% of funding (largely from the U.S.). Asia represented 30% of funding in 2012, while the rest of the world (ROW) – Australia, Israel, New Zealand, and Russia – dropped slightly from 15% to 13% of global spending. Specifically:

- **United States remains the world leader in government funding for nanotechnology.**
  After a slight decline in spending in 2011, the U.S. picked up spending in 2012 to reach $2.1 billion of primarily national funding, but also some state-level funding for nanotechnology (see Figure 1). State funding dropped slightly from 2010, while national funding increased slightly. Some state programs that previously funded nanotech, such as Texas's Emerging Technology Fund, did not explicitly fund nanotechnology by 2012, although the state did fund university nanotechnology activities.

Fig. 1: Past Leaders Continue to Support Nanotechnology



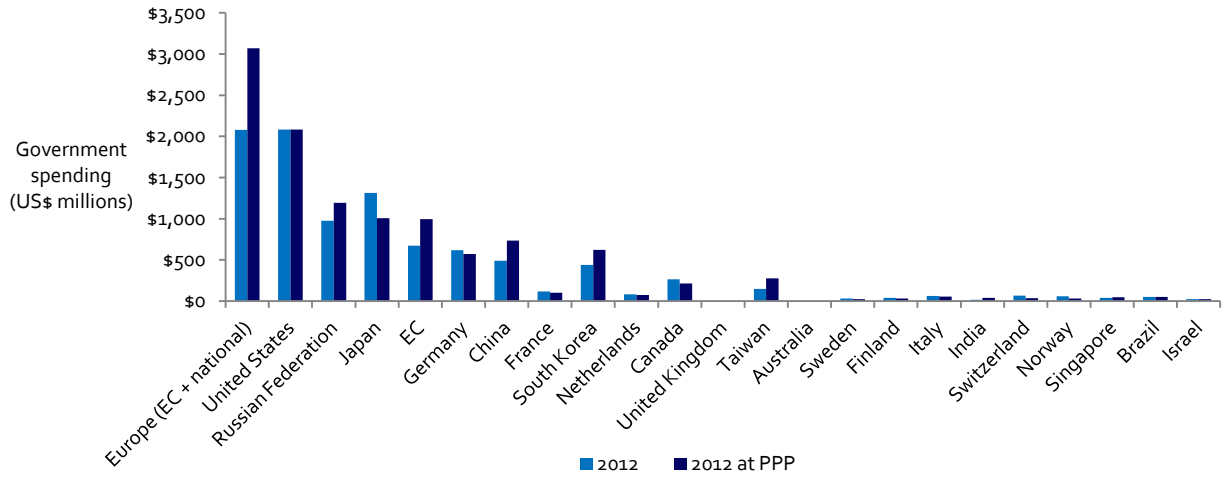
- **Japan no longer has a program for nanotech, but it is still an important technology area.**
  Japan's Third Science and Technology (S&T) Plan – in place from 2006 to 2010 – allocated $918 million to nanotechnology research and development (R&D) in 2010, a slight decrease from $960 million in 2009. However, the Fourth S&T Pan, from 2011 to 2015, does not call out nanotechnology as its own funding area. The new areas of focus are clean and affordable energy, health and wellness of an aging society, improved infrastructure, revitalization of natural resource production, and recovery from the earthquake.[3] Nevertheless, nanotechnology continues to play an important role in Japan's technology research and development, thus we estimate funding has increased in line with overall S&T spending and GDP growth in Japan to reach $1.3 billion in 2012.

- **Russia falls back behind Japan in funding.**
  In 2011, the Russian Nanotechnology Corporation (RUSNANO) transitioned from a state corporation to an open joint stock company that is backed by the Russian government. The mission of RUSNANO is to be a co-investor in both Russian and foreign nanotechnology companies. Even though in this way it acts more like a VC firm, because it is still owned and supported by the government we have included it in our government funding estimates. Despite its name, RUSNANO invests in a variety of technology companies, not just those specifically focused on nanotechnology; thus, we assessed each line item of RUSNANO's investments to determine whether it fit our criteria for being a nanotechnology play. Of the $1.6 billion RUSNANO allocated in 2011, we determined around 60% went toward nanotechnology investments. The rest were either not nanotechnology companies, or no information was available to determine whether they were nanotechnology investments (e.g., "other" categories). We also added funding that was allocated to university research programs, to reach a total of $1 billion in 2011 and $974 in 2012 million spent on equity investments and R&D.

- **China maintains nanotechnology funding.**
  China continues to be a leader in nanotechnology spending. In 2011, China spent $426 million on nanotech, a decrease of 15%, but then increased it back to approximately $500 million by 2012. On

purchasing power parity ($PPP) – an exchange rate that converts domestic currency into the USD value of that money within the local context – China's spending of $734 million exceeds spending by Germany and the EC (see Figure 2).

Fig. 2: China and Russia Stand Out in PPP Spending



- **The European Commission funding falls in 2011 and 2012 compared to 2010.**
  As part of the EU's effort to boost science and technology innovation in Europe, the EC launched a seven-year R&D program in 2007, the Seventh Framework Programme (FP7). The Nanosciences, Nanotechnologies, Materials, and New Production Technologies (NMP) sub-program will grant $4.7 billion over the seven years to drive nanotechnology development. The funds are divided among the EU members on a project basis via a bidding process, often going to international consortia. In 2010, the EC allocated $760 million to member countries; this figure dropped to $657 million in 2011 and then increased to $675 million in 2012. The EC does not keep a record of the funding that goes to each member country, and many projects that are funded have multiple parties spread across Europe.

- **Germany keeps its lead as the top spender in Europe.**
  Germany's Nano-Initiative Action Plan 2010, its comprehensive five-year nanotechnology plan active from 2006 to 2010, spent $556 million in 2010. In January 2011, Germany adopted a new nanotechnology funding program called the "Nanotechnology Action Plan 2015" for the years 2011 through 2015. The new program is expected to further increase nanotechnology funding relative to its predecessor, making additional investments in areas like energy and environment, transportation, and health and life sciences. However, an exact amount of funding has not been released (officials have indicated that Germany will release a report in early 2014 with spending figures). We estimate that Germany will slightly increase its funding as a percent of GDP, which amounts to nanotechnology spending of $562 million in 2011 and $617 million in 2012.

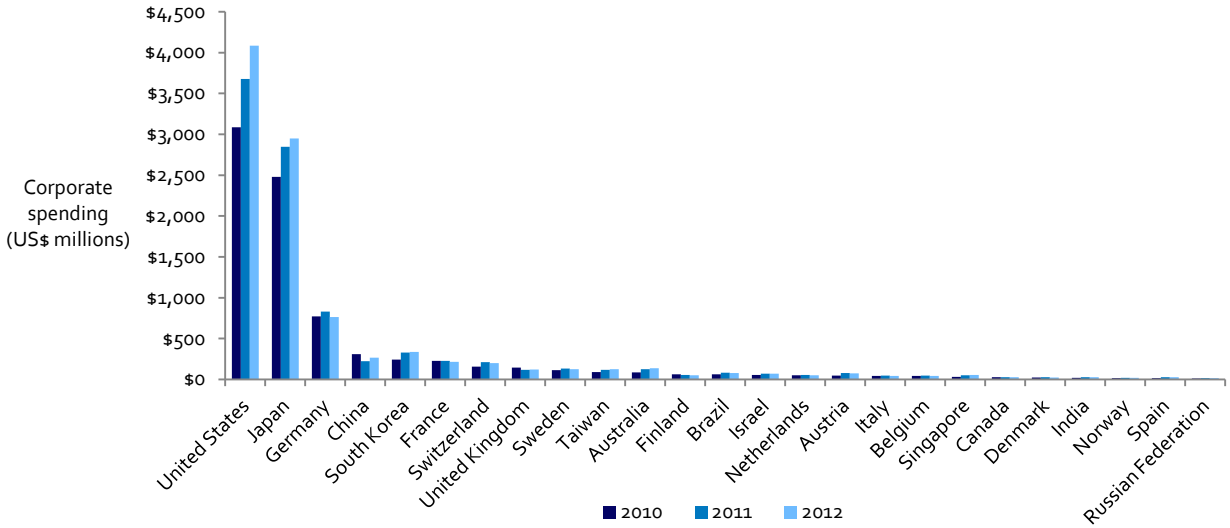
Corporations Continue Funding Nanotechnology R&D

Rebounding from the downturn in the economy, nanotechnology spending among corporations increased 3% from 2009 to 2010 to reach more than $8 billion (see Figure 3). That trend continued through 2011 and 2012, with year-on-year growth of 15% and 5%, respectively. In 2011, companies spent $9.5 billion ($8.7 billion in $PPP) on nanotechnology R&D, and spent $10 billion ($9.4 billion in $PPP) in 2012. Changes in

nanotechnology spending are largely driven by two factors in our model: gross domestic product (GDP) and corporate spending on R&D as a percentage of GDP. We incorporate nanotechnology spending within R&D budgets into our model, though we do not forecast major changes in nanotechnology spending versus other types of R&D spending among the industries covered. While GDP (based on $PPP) increased in 2011 for nearly all countries in our assessment (Greece was the exception), industry-financed R&D as a percentage of GDP declined or was stagnant for many of them in 2011 – though several countries, including China, India, Mexico, and Turkey, witnessed double-digit GDP growth from 2010 to 2011. In 2012, GDP (based on $PPP) did not grow as much as it did in 2011, with only China experiencing a double-digit increase and many countries seeing a small decrease in GDP. However, overall the impact was positive and resulted in a growth in nanotechnology spending due to increased overall R&D spending.

- **Corporate spending is up dramatically across all geographies.**
  Corporate spending on R&D has increased substantially between 2010 and 2012 in each region, with the United States exhibiting the fastest increase of 32%, followed by ROW with a 22% increase and Asia at 11%. Europe showed the smallest increase at 3% between 2010 and 2012.

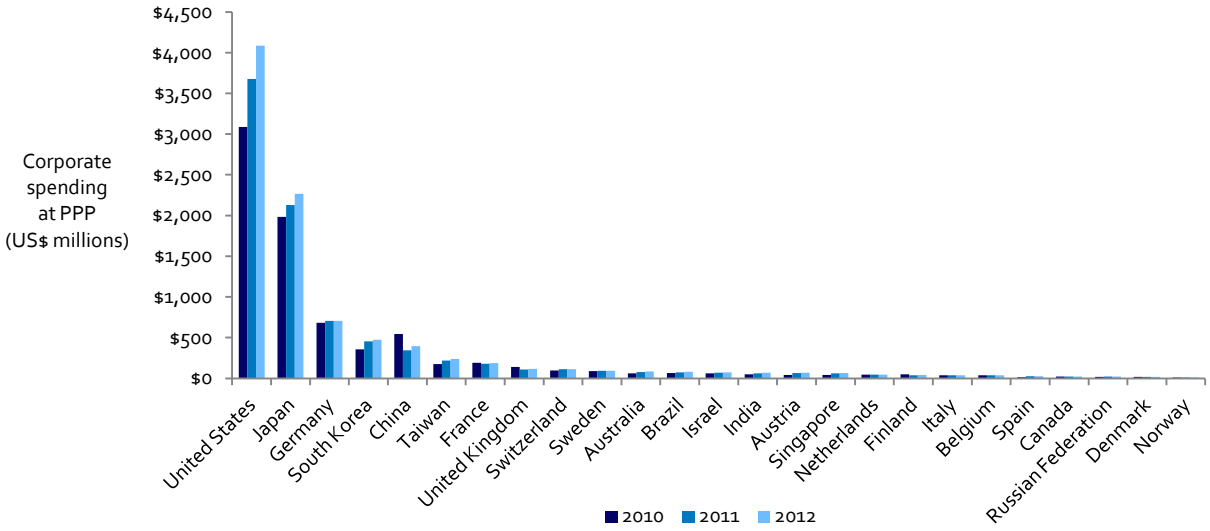
Fig. 3: Corporate Spending on Nanotechnology R&D Is Still on the Rise



Together, U.S., Japanese, and German companies combined to spend $5.8 billion on nanotechnology R&D (based on $PPP), equivalent to 77% of all corporate spending on nanotechnology in 2010. In 2011, these three countries spent $6.5 billion, or 75% of the total nanotechnology R&D spending; and in 2012 they spent $7.0 billion – again, 75% of the total. This trend comes as no surprise, as 15 out of the top 20 companies on the Global Innovation 1000 list (the list of the highest R&D spenders) hail from the U.S., Germany, or Japan. Looking at individual countries, we found that:

- **The U.S. is once again the leader in corporate nanotechnology spending.**
  The U.S.'s $16 trillion GDP and, to a much lesser extent, relatively high amount of R&D spending as a percent of GDP allowed it to maintain the top position. Total nanotechnology spending increased more than 19% between 2010 and 2011, and 11% between 2011 and 2012 to reach $4.1 billion (see Figure 4). Traditional U.S. leaders in nanotechnology continue the charge. For example, in late 2013, IBM announced that its four-year-old nanomedicine program participated in the development of an anti-fungal nanofiber.

Fig. 4: U.S. and Japan Still Reign Supreme Compared to the Rest of the World at PPP



- **Japan's very large R&D expenditures contribute to its leadership position.**
  Japanese corporations spent just under $2 billion ($PPP) on nanotechnology R&D in 2010, up 1% from 2009. Spending increased to $2.1 billion (7% growth) in 2011 and to $2.3 billion (6% growth) in 2012, though the growth in 2012 spending was slightly below the 7% average for all Asian countries. Japan's nanotechnology spending was spread across many sectors, with spending highest in office and computer equipment, chemical manufacturing, and the automotive industry.

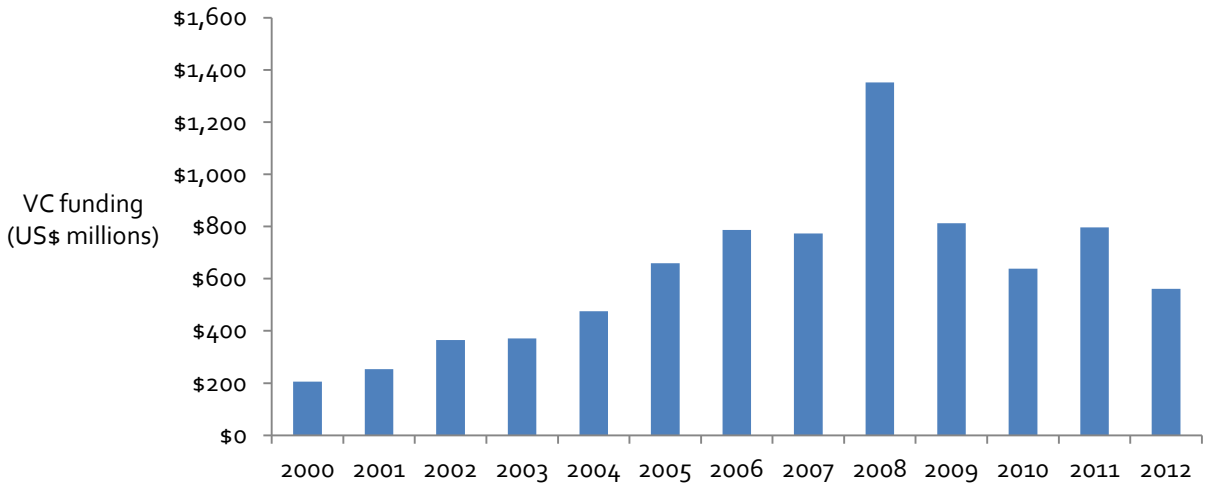
- **Germany's R&D spending trails other leaders.**
  At $3 trillion, Germany's GDP is in the same league as Japan's $4.6 trillion, and furthermore, its corporate R&D spending of just under 2% of GDP is also on par with Japan's 3%. Yet its corporations only spent $684 million on nanotechnology in 2010, and slightly more than $707 million in 2011 and again in 2012. What sets it apart from Japan is its industry composition, which has lower nanotechnology penetration rates. As with Japan, chemicals and motor vehicles are major sources of nanotechnology spending in the country. Even though Germany trails Japan and the U.S. in this respect, it continues to be by far the top nanotechnology investor in Europe.

- **China and South Korea exchange places.**
  In 2010, Chinese corporations increased R&D spending on nanotechnology by 19% to $545 million ($PPP); spending decreased to $344 million in 2011, and ticked back up to just under $400 million in 2012. South Korea gained ground on China in 2011 by growing to $454 million, a 27% increase over 2010. Korea's growth did slow a bit in 2012, growing 4% to $474 million, versus China's growth of 15% to $395 million. Office and computing equipment, chemicals, and motor vehicles drive corporate nanotechnology R&D spending in Korea, while electronic equipment (TVs, radios) and chemicals are the leading industries in China.

Venture Capital Picked Up in 2011, but Was Still Below 2008 High Point

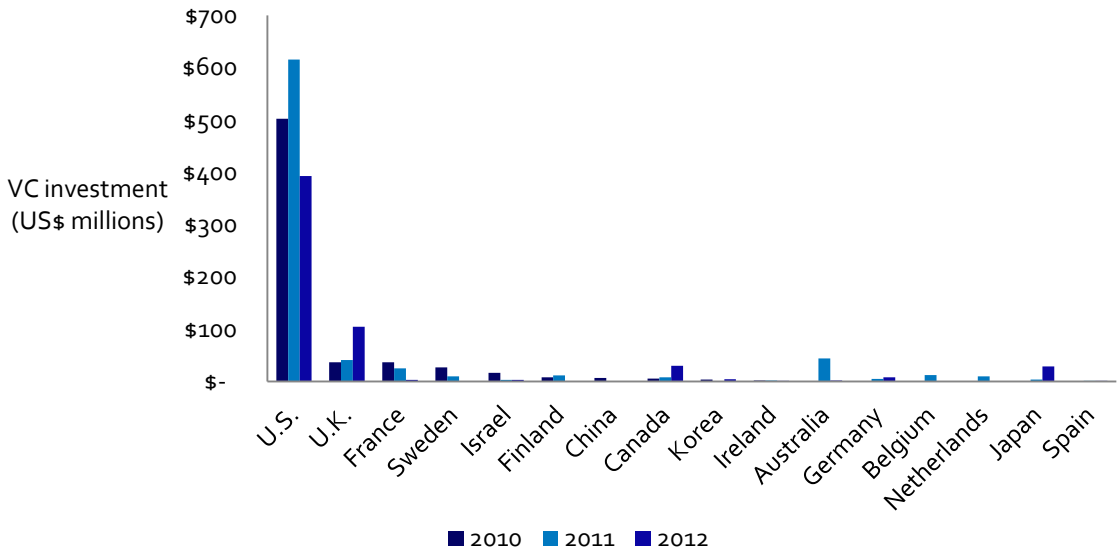
In 2012, VC investment in nanotechnology companies dropped 27% relative to 2011, from $793 million to $580 million – its lowest level since 2004. However, this drop follows a significant increase in funding between 2010 ($646 million) and 2011 (see Figure 5).

Fig. 5: VC Funding of Nanotechnology Start-ups Slips in 2012



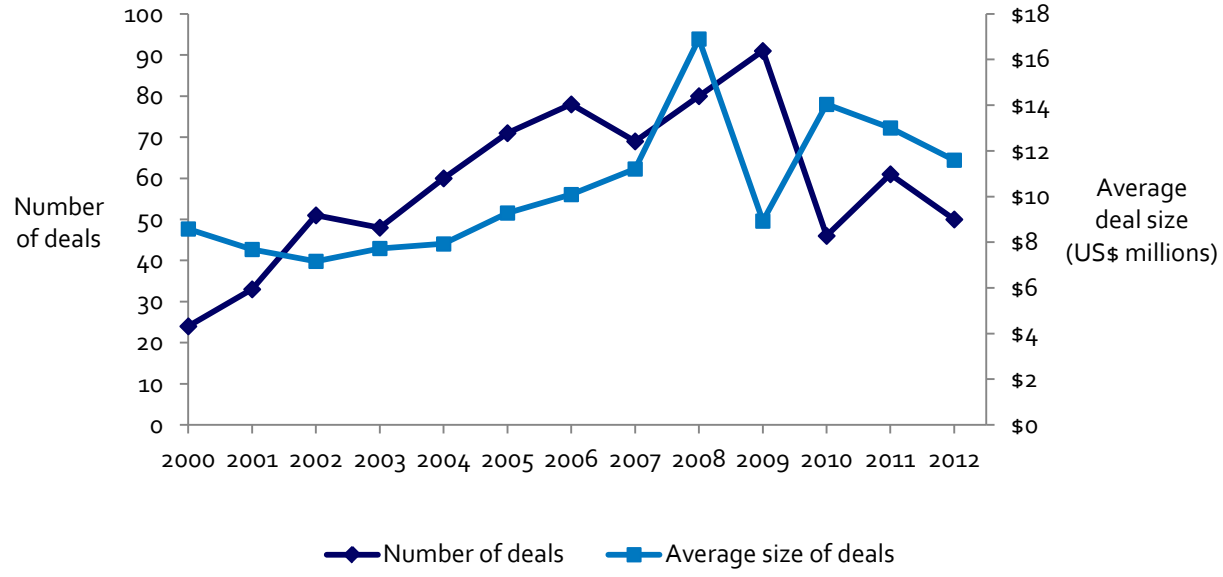
- **U.S. companies continue to wrangle VC funding.**
  In 2012, U.S.-based companies like Nanosolar and NanoH2O captured more than $400 million, or nearly 70% of total global VC/private funding in nanotechnology (see Figure 6), though their share decreased from the $502 million and 78% of total funding received by U.S. companies in 2010. Over the past three years, the U.K. has emerged as the second-largest recipient of VC funds for nanotech, growing from $37 million in 2010 to more than $100 million in 2012. Companies receiving funding in the U.K. include Oxis Energy and Oxford Nanopore Technologies. Japan has also seen a notable increase in privately funded nanotechnology in 2012, with $28 million worth of funding for NanoCarrier.

Fig. 6: VC Funding Dropped in Most Leading Nanotechnology Countries in 2012[4]



- **The total number of VC deals picked up in 2011, but fell again in 2012.**
  After a sharp decline in the number of VC deals in 2010, the number of nanotechnology investments picked up in 2011, reaching 61 deals for the year. This was followed by another drop, to only 50 deals in 2012, which was still slightly higher than 2010's 46 deals. The average deal size in 2011 was lower than 2010 at approximately $13 million, and fell further in 2012 to nearly $12 million (see Figure 7).

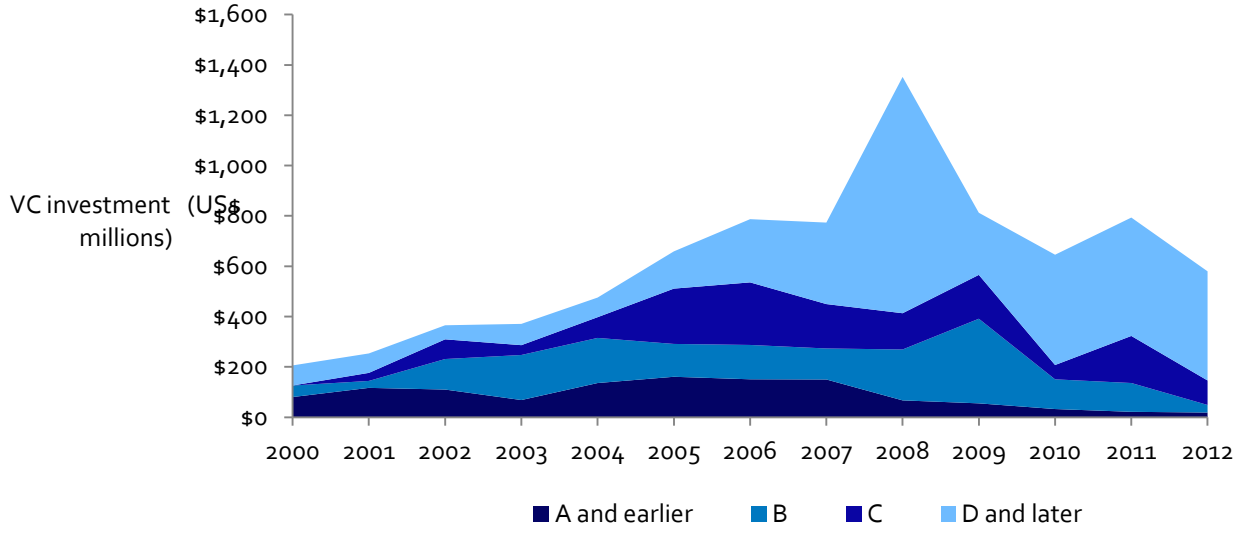
Fig. 7: The Number of VC Deals Improves over 2010 Drop



- **Funding spread out among multiple technology developers.**
  Unlike previous years where only a few companies dominated private funding, in 2012 investments were more evenly distributed among nanotechnology developers. Nanosolar stood out from the pack with $90 million in funding from Mohr Davidow Ventures and Arsenal Venture Partners, among others (and Nanosolar was also a leading recipient in 2008 when investment levels peaked). However, there were many companies receiving between $20 million and $50 million in 2012. Similarly in 2011, Stion Technologies received the most funding with $130 million, but again, many companies received between $20 million to $50 million in funding. Several of the recipients of venture funding in 2011 were also recipients in 2012, including Oxford Nanopore, Nanosolar, NanoString, Dais Analytic, and Dyesol.

- **VCs continue to support old investments.**
  In 2010, Series D or later rounds were the most common VC investments, and this trend continued in 2011 and 2012 (see Figure 8).[5] Series D and later investments amounted to 68% of the total value of funding in 2010, 59% in 2011, and 75% in 2012. Series A investments continued a downward trajectory, reaching their lowest amount since 2000 with $18.1 million in 2012.

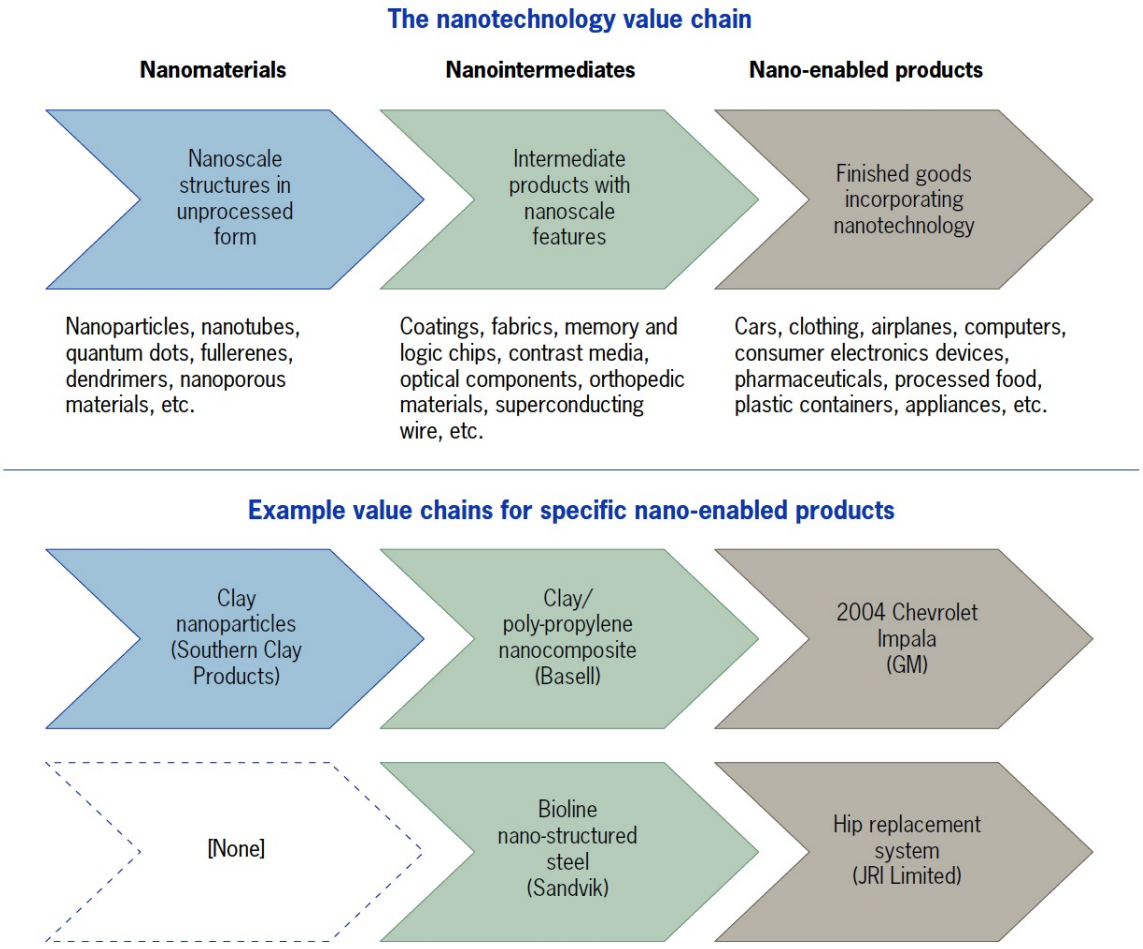
Fig. 8: Series D or Later Account for the Majority of VC Funding



Revenue from Emerging Nanotechnology Rises, though Less Rapidly than Forecast

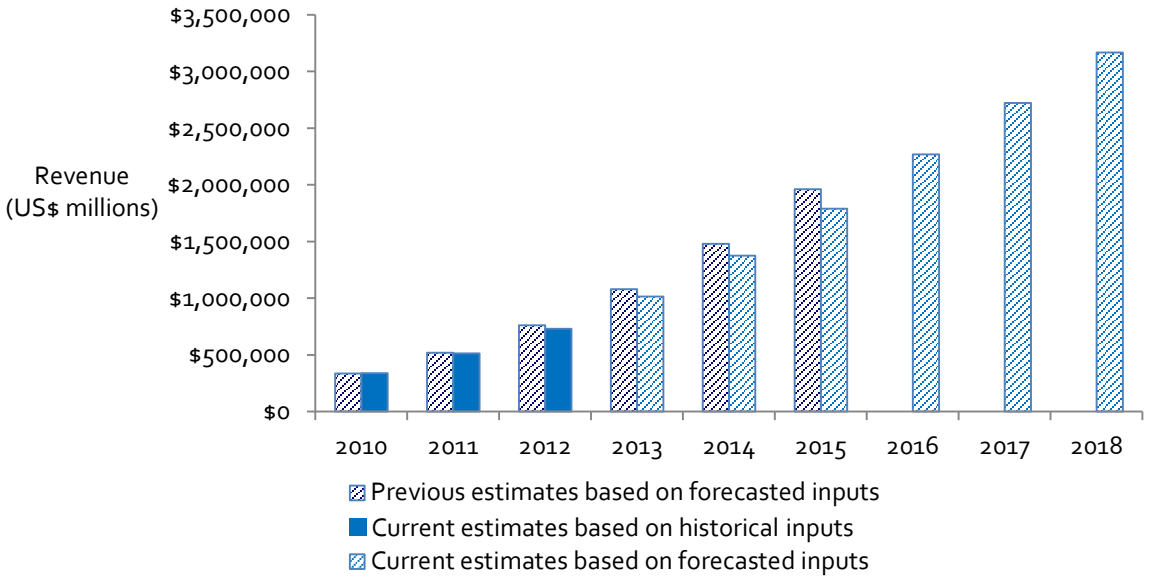
Our last estimate of nanotechnology revenues from nano-enabled products, nano-intermediates, and nanomaterials was in 2009 (see Figure 9). At that time, we estimated that nano-enabled products would generate $336 billion in global revenues in 2010 (see Figures 10 and 11). Our current modeling indicates that nano-enabled products did slightly better than that in 2010, with more than $339 billion in revenue. Even though our 2012 estimate was downgraded from $762 billion to $731 billion – mainly due to overestimation of the rebound in the economy – this total is still a significant growth over 2010.

Fig. 9: Nanotechnology is an Enabling Technology in Many Industries



We use International Monetary Fund (IMF) GDP growth estimates for our forecasts of sector outputs, and our own estimates of nanotechnology penetration rates to determine nanotechnology-based revenues. Our current projections revaluated the timeline for nanotechnology to penetrate the manufacturing sectors. While we saw some cases of faster adoption than expected, such as for highway/bridge construction, we slowed adoption timelines for others, such as processed foods (nanotechnology is found mostly in packaging and in emulsifiers).

Fig. 10: Revenue* from Nano-enabled Products Grows More Modestly than Previously Expected



*Previous estimates were based on projected global output for each year, as well as our estimates of nanotechnology penetration rates for products. Current estimates were based on historical output data for 2010-2012, and projected output from 2013-2018, along with our estimates of nanotech penetration rates.

Fig. 11: Revenue from Nano-enabled Products (in US$ Millions)

	2010	2011	2012	2013	2014	…	2018
Previous estimates	$336,062	$519,425	$762,204	$1,081,025	$1,480,928	…	N/A
Current estimates	$338,515	$514,162	$730,717	$1,014,359	$1,375,198	…	$3,167,706
Change in forecast	1%	-1%	-4%	-6%	-7%	…	N/A

- **Materials and manufacturing lead nano-enabled products.**
  The products that fall under the materials and manufacturing category (such as construction, automobiles, and industrial equipment) account for more than 50% of nano-enabled products each year (see Figures 12 and 13). We estimate materials and manufacturing nano-enabled products generated $435 billion in revenue globally in 2012, and will grow to $1.8 trillion by 2018. Energy and environment products are expected to grow at the fastest rate, starting at just $5 billion in 2010 and reaching almost $90 billion by 2018, with the vast majority of growth in power generation products.

Fig. 12: Materials and Manufacturing Generate the Most Revenue from Nano-enabled Products

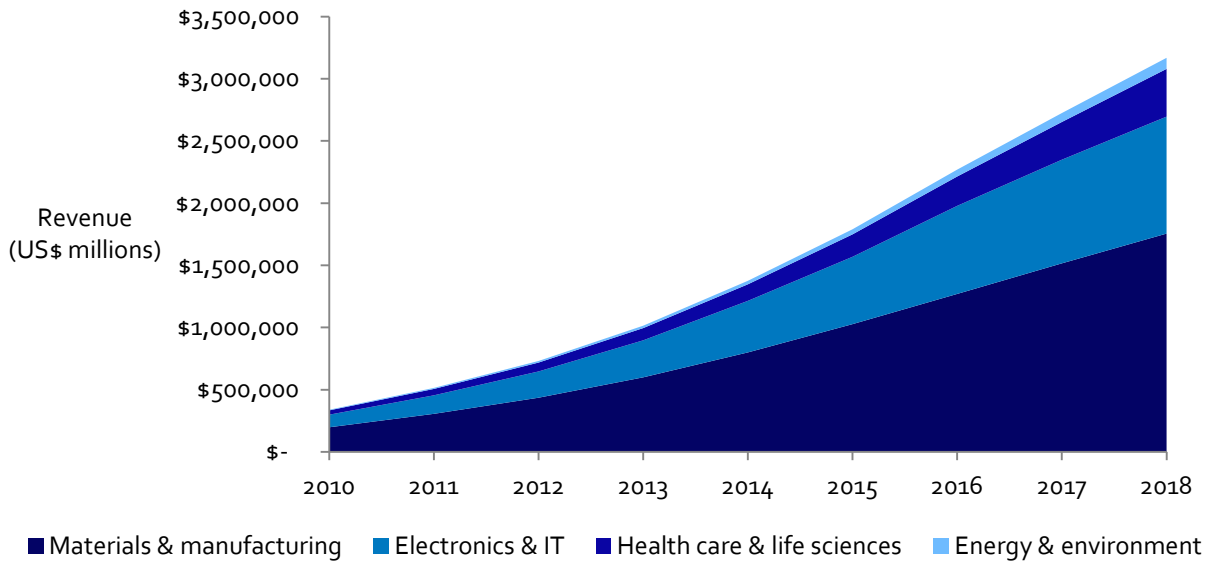


Fig. 13: Global Revenue from Nano-enabled Products by Sector (in US$ Millions)

Sector	2010	2011	2012	2013	2014	…	2018
Materials and manufacturing	$197,543	$305,644	$435,278	$599,133	$799,490	…	$1,754,653
Electronics and IT	$101,329	$148,882	$211,174	$297,534	$414,527	…	$940,405
Health care and life sciences	$34,583	$51,308	$71,369	$98,381	$133,068	…	$383,720
Energy and Environment	$5,060	$8,329	$12,896	$19,311	$28,114	…	$88,928
Total	**$338,515**	**$514,162**	**$730,717**	**$1,014,359**	**$1,375,198**	…	**$3,167,706**

- **Asia will overtake Europe and U.S. next year.**
  In our last report, we estimated that Europe and the U.S. generated comparable amounts of revenue from nano-enabled products. For example, we previously projected the U.S. would generate $117 billion in revenue in 2010, while Europe would generate $108 billion. We currently estimate that in 2010, the U.S. sold $110 billion and Europe sold $112 billion in nano-enabled products (see Figures 14 and 15). While both regions have strong materials and manufacturing sectors, the U.S. is stronger in health care and life sciences, while Europe is stronger in electronics and IT as well as energy and environmental products that have leveraged nanotechnology. However, by 2018, Asia will emerge as

a leading producer of nano-enabled products with more than $1 trillion in revenue, compared to more than $900 billion in the U.S. and more than $940 billion in Europe.

Fig. 14: Revenue from Nano-enabled Products Will Grow More Quickly in Asia

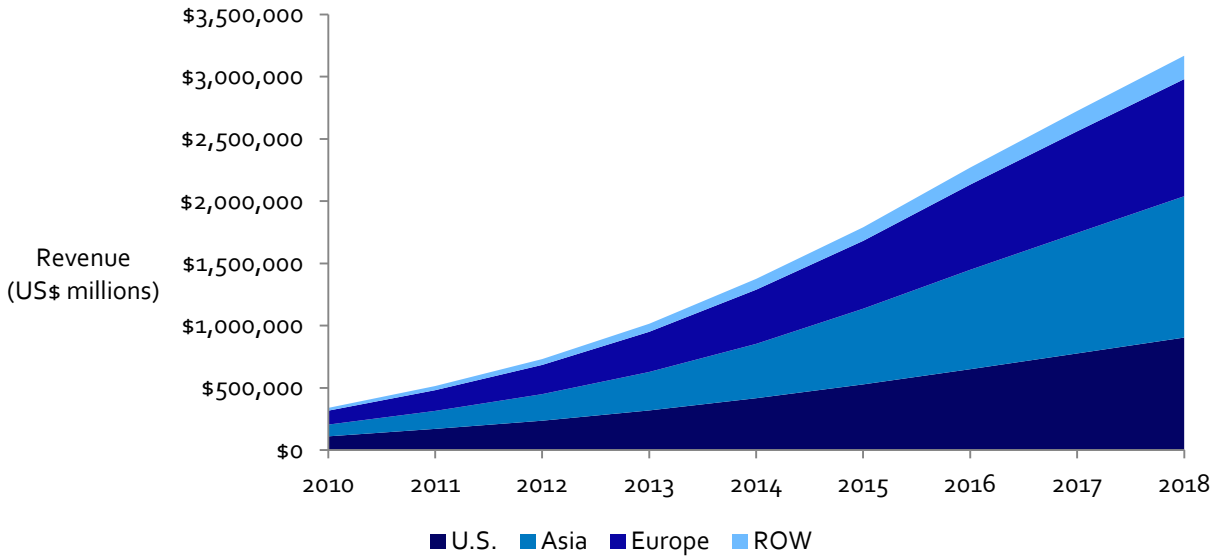
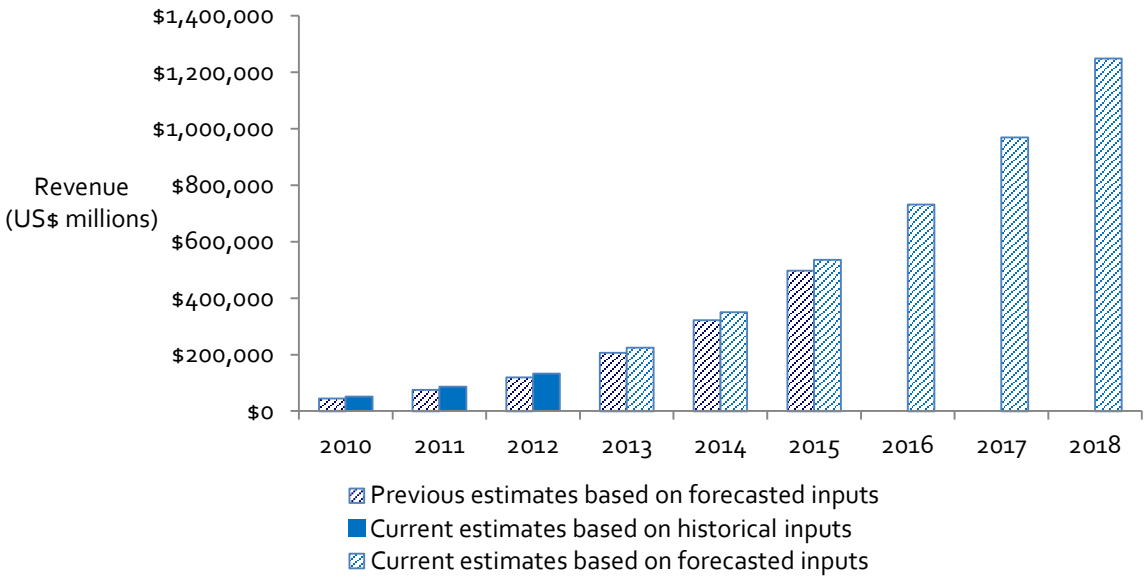


Fig. 15: Revenue from Nano-enabled Products by Region (in US$ Millions)

Geography	2010	2011	2012	2013	2014	…	2018
Europe	$111,919	$166,444	$234,721	$322,736	$435,187	…	$940,650
U.S.	$109,837	$169,971	$235,565	$318,135	$416,362	…	$903,460
Asia	$94,376	$144,458	$213,487	$308,941	$436,612	…	$1,135,466
Rest of World	$22,384	$33,289	$46,944	$64,547	$87,037	…	$188,130
Total	**$338,515**	**$514,162**	**$730,717**	**$1,014,359**	**$1,375,198-**	**…**	**$3,167,706**

- **Nano-intermediates rise while nanomaterials also come in lower than previous forecast.** While our estimates for nano-enabled products revenues decreased since our last update, nano-intermediate revenues increased slightly over our 2009 projections in each year of our forecast (see Figures 16 and 18). We previously estimated 2012 revenues for intermediates would be $120 billion; we now estimate they were $134 billion in 2012, and will grow to $1.2 trillion by 2018. In the next five years, we expect slowing growth and eventually a decline in intermediate revenues in Europe and the U.S., as the manufacturing of these inputs shifts to Asia. We also downgraded our nanomaterials value estimates. In 2012, nanomaterials were worth $1.3 billion (see Figures 17 and 18), compared to our 2009 projection of $1.7 billion.

Fig. 16: Nano-intermediate Revenue Estimates Change Only Slightly*



* Previous estimates were based on projected global output for each year, as well as our estimates of nanotechnology penetration rates for products. Current estimates were based on historical output data for 2010-2012, and projected output from 2013-2018, along with our estimates of nanotech penetration rates.

Fig. 17: Downgrade in Nanomaterial Value Estimates

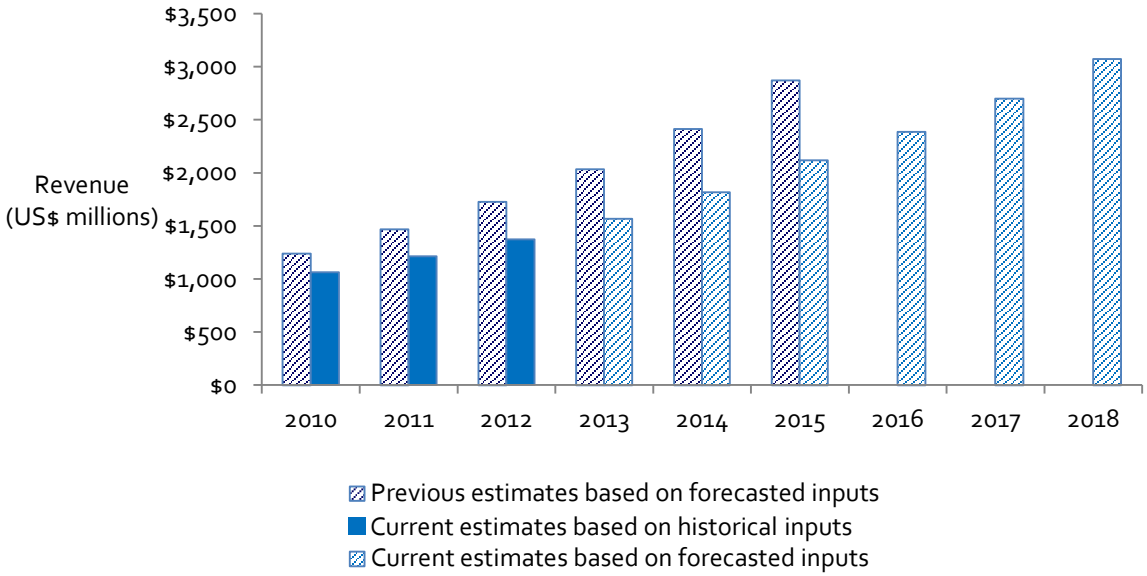


Fig. 18: Global Revenue from Nano-intermediates and Value of Nanomaterials (in US$ Millions)

Value chain stage	2010	2011	2012	2013	2014	…	2018
Nano-intermediates	$51,583	$85,953	$133,284	$225,822	$350,385	…	$1,248,487
Nanomaterials	$1,065	$1,213	$1,373	$1,567	$1,818	…	$3,071

Conclusions

From our review of nanotechnology funding from governments, corporations, and private investors, we conclude:

- Government support for nanotechnology is becoming increasingly difficult to estimate, as many governments around the world have stopped tracking funding to nanotechnology R&D, or have ceased funding nanotechnology as its own technology area. Nevertheless, based on our discussions with relevant agencies in numerous countries, and reviews of specific funding programs and projects, we have concluded that government funding for nanotechnology continues to decline from a peak in 2009 of $8.3 billion. While some countries are still dedicated to maintaining programs for nanotechnology support, many have wrapped it into other science and technology funding programs.
- Total VC investment in nanotechnology companies was up in 2011, only to fall in 2012, and remains well below its 2008 peak. Much of the 2012 investments were in later-stage companies (indicated by the predominance of Series D and later funding rounds) and were based in the U.S. Average deal size has fallen each year from 2010, reaching slightly less than $12 million in 2012.
- While venture capital and government funding of nanotechnology is declining, corporate nanotechnology R&D funding continues to increase in line with rising GDPs around the world.

From our analysis of the revenues made possible by nanotechnology, we find:

- Revenues from products that contain emerging nanotechnology reached their highest level at $731 billion in 2012. By 2018, revenues will reach $3.2 trillion.
- Materials and manufacturing sectors have achieved the highest level of revenue from nano-enabled products.
- Regionally, there are only modest differences among Asia, the Americas, and Europe in revenues generated by nano-enabled products.
- Nano-intermediates and nanomaterials also continue to increase the value brought to suppliers.

Endnotes

[1] Specific key terms used in the research includes: nanotechnology (and terms such as nanotubes, nanowires, nanoparticles, and others), metamaterials, plasmonic, spintronics, graphene, MRAM, zeolites, and quantum dots.

[2] https://www.innovateuk.org/documents/1524978/2138994/Concept+to+Commercialisation+-+A+Strategy+for+Business+Innovation+2011-2015/f9debf80-dd43-4284-be56-a11a3dda25a8

[3] http://www8.cao.go.jp/cstp/english/doc/comprehensive_sti_strategy_shortsummary.pdf

[4] Several countries did not have information available indicating a nanotechnology company received a round of funding in each year. In 2010, these included Australia, Germany, Belgium, Netherlands, Japan, and Spain. In 2011, they included China and Korea. In 2012, they included Sweden, Finland, China, Belgium, and the Netherlands.

[5] Series A through D represent rounds of funding for venture capital that come after angel investors but before IPOs. Series A is an early funding round, whereas Series D is later.