

Vol. XV, No. 9

December 17, 2015

## *Season's Greetings!*

*On behalf of the CPBIS management team and the entire body of CPBIS faculty, staff and students, I extend best wishes for this holiday season to all of our newsletter readers. We value your continued interest in the Center's work as we strive to help meet the industry's research, education, and outreach needs. During this joyous season we hope that your travels are safe and your holidays relaxing.*

*With warm regards,  
Pat McCarthy, Director*

## **What does City Size Have to do with Production Capacity?**

*By Patrick McCarthy*

CPBIS's Mills OnLine database identifies and provides information on nearly 800 stand-alone and integrated pulp and paper mills and 125 company headquarters in the U.S. The most recent report lists 345 mills as operating, 19 mills as idled or closed, and 429 as delisted from or not yet listed in the annual national mill directories. The dataset is rich in information on company ownership, product category, capacity, spatial information and, most recently, employment, pulping capacity, product SIC and NAICS codes, and energy information, as reported in the 2013 Lockwood Directory.

When we think about pulp and paper mills, we often think about the largest and most visible companies such as International Paper, Georgia Pacific, WestRock and Kimberly Clark. But mills have varying

capacities as do the parent companies and the states where companies locate. In that total production capacity is a measure of size, can we say anything about the amount of productive capacity that we observe at the mill, company, or state level? To answer this question, we can appeal to the long and rich body of work that studies the size distribution of cities. In general, there are a small number of cities with very large populations (e.g. Beijing, Chicago, New York) and a much larger number of cities with smaller populations. Such distributions are said to be 'skewed to the right' and researchers often use a Pareto distribution to describe the size distribution of cities. The Pareto distribution for city sizes is simply  $R(p) = A p^{-\alpha}$ , where  $R$  is the rank of a city with a population of at least  $p$ ,  $A$  and  $\alpha$  are Pareto parameters to be estimated. One last bit of information: Suppose that  $\alpha = 1$ . Then our Pareto distribution is simply  $R(p) = A(1/p)$  which implies that  $p R(p) = A$ . Thus, if a city's rank is 1 (i.e. it is the largest city), then  $R = 1$  and  $A$  is the population of the largest city. And if city rank is 2, then the Pareto distribution predicts that a city's population will be (1/2) that of the largest city (i.e.  $p^2 = A$  which implies that  $p = A/2$ ). And the third largest city is 1/3 the size of the largest city, and so forth. This special relationship when  $\alpha = 1$  is referred to as the 'rank-size' rule. Using real world data on city populations,  $\alpha$  is generally estimated to be around .9 rather than 1, indicating that cities further down the distribution have smaller populations than predicted by the rank-size rule.

And this brings us back to pulp and paper production capacity. Do we observe similar relationships in U.S. pulp and paper capacity? That is, do we observe a small number of mills (or companies or states) with very large production pulp and paper capacity and a much larger number of mills (or companies or states) with small pulp and paper capacities.

Figure 1 depicts the size distribution of total capacity in the states. Only states (40 in total) that have some

production capacity are included in the graph. Similarly, Figure 2 depicts the size distribution of total production capacity by company (142 companies in all). Figure 1 seems to be reasonably consistent with the rank-size rule except for those states at the end of the distribution (e.g. Maryland, New Hampshire, and further down). This suggests that the Pareto parameter  $\alpha$  will be smaller than 1. We see a similar but much steeper pattern in Figure 2 for the size distribution of company capacity (company labels are suppressed). The distribution of capacity at the mill level (345 mills, not depicted) reflects a similar pattern to that in Figure 2.

Estimated values for the Pareto parameter  $\alpha$  are -0.50, -0.50, and -0.57 for statewide, company, and mill total capacity and each of these coefficients is measured with statistical precision. What do they tell us? First, that the estimated values are much less than one indicates that the distribution of production capacity – whether ranked by state, company, or mill – does not satisfy the rank-size rule. Rather, at lower ends of the distribution, production capacities are much less than

predicted by the rank-size rule. Second, variations in production capacity explain 69%, 68%, and 86% of the variation in ranks. Particularly at the company level, the results indicate that the Pareto distribution does a good job of describing the size distribution of company productive capacity.

A take-away from these results is that the Pareto distribution can be used to get some insights on the size distribution of productive capacity in the pulp and paper industry. Of interest, however, are the many unanswered questions that a focus on size distributions raises. What are the drivers of such distributions? Are the Pareto parameters ‘relatively constant’ or do they exhibit (wide) variations over time? And how do industry actions (e.g. mergers, consolidations) and regulatory affect the distribution? Does industry restructuring (e.g. closures) affect the entire distribution or only parts of the distribution? And are there differences in the size distribution by product category or by measures of size different from productive capacity (e.g. employment)?

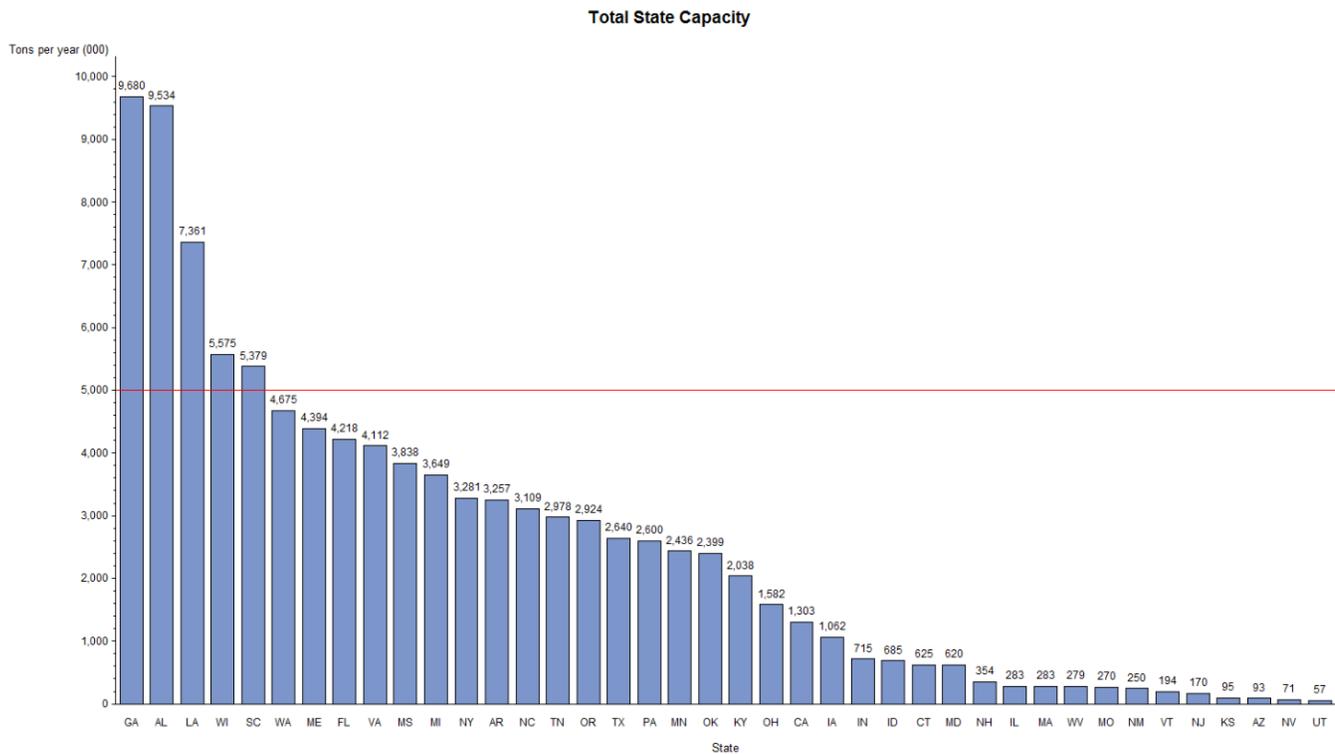


Figure 1. Size Distribution of Statewide Total Capacity

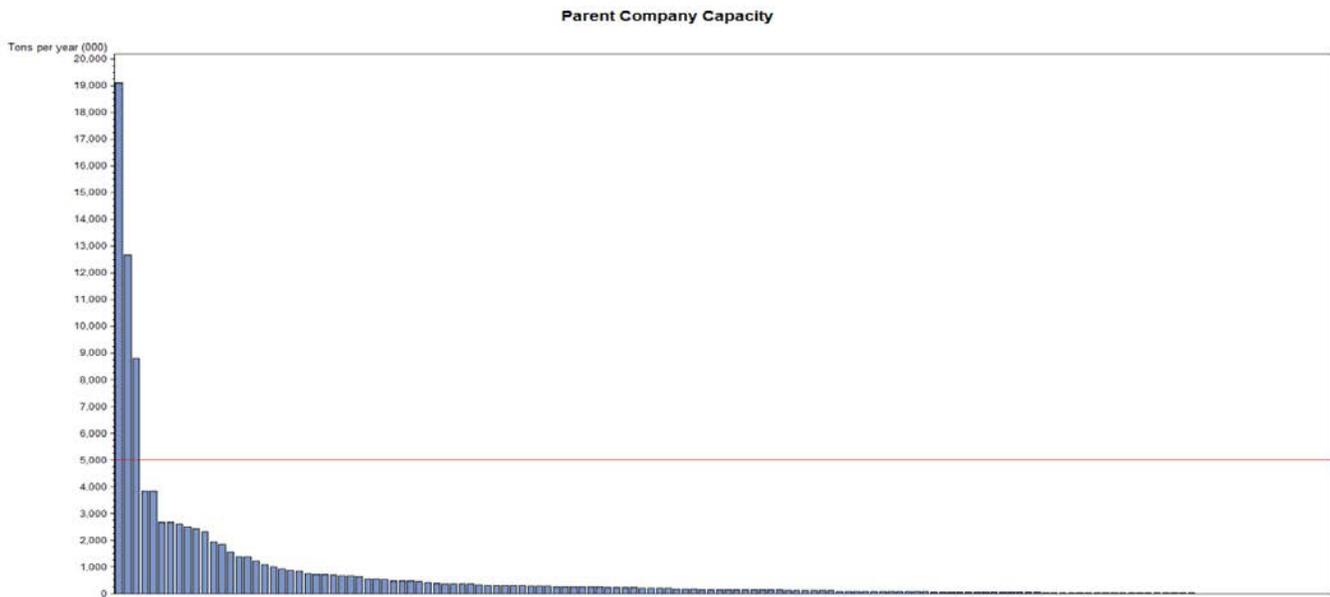


Figure 2. Size Distribution of Company Total Capacity

### **Chemical Giants to Merge**

In what the Washington Post calls a “jaw-dropping megadeal,” chemical giants Dow Chemical and DuPont will merge into a \$130 billion leviathan. Both companies are suppliers to the pulp and paper and forest products industries. They have long and distinguished histories, having been founded in the 19<sup>th</sup> century. Both have distinguished records of innovation and discovery.

The resulting company, DowDuPont, will eventually split into three independent companies focused on agriculture (seeds, pesticides, etc.), materials (coatings, plastics and chemicals) and specialty products (chemicals).

### **Trend Indicators from Industry Intelligence Inc.**

Industry Intelligence Inc. has provided market intelligence to more than 600 companies worldwide since it began as Forestweb in 1999. Industry Intelligence delivers a daily report featuring news of the paper and forest products industries. For your subscription visit: <http://www.industryintel.com>

Below is a sampling of recent Industry Intelligence headlines, chosen to mirror significant trends and other

interesting developments in and around the paper and forest products industries.

***Glatfelter, Dreamweaver International complete production scale-up of Dreamweaver Titanium nanofiber-based separator materials for supercapacitors, noting it is the only facility of its type outside Asia; plan is to further expand in 2016***

*Ed.: Perhaps this is an example of the much-anticipated boom in nanocellulose commercialization.*

***Linköping Univ.'s Laboratory of Organic Electronics in Sweden develops paper with ability to store energy; the paper consists of nanocellulose and conductive polymer, has set world record in simultaneous conductivity for ions and electrons***

One sheet, 15 cm in diameter and a few tenths of a mm thick can store as much as supercapacitors currently on the market.

***Orient Paper to suspend production of corrugating medium, offset printing paper and digital photo paper at its mill in North China, Dec. 14-31, due to mandate issued by Baoding City authority, reflecting Chinese government's anti-smog efforts***

The mandate reflects the Chinese government's stepped-up anti-smog efforts following Beijing's first red alert for smog last week.

***Southeast Asian tissue market, where production is 1 million tonnes/year and demand is growing 6.5% on average, threatened by slowdown in China; overcapacity could spill out of China, but country's economic transition might be beneficial long-term: report***

Although the specter of the Chinese slowdown hangs over Southeast Asian tissue markets, these markets are booming. In the view of consulting company Pöyry they represent a growth region: with current tissue production at 1 million tonnes per annum, growth in demand at 6.5% on average and the potential for accelerating consumption levels, the fundamentals for continued expansion are in place.

***Excavation work begins for converting Kotkamills' PM No. 2 at Kotka, Finland, mill to folding boxboard and barrier board production; sections of foundation have disappeared to make room for new winder, but PM No. 2 is still producing publication paper***

The project includes a new wrapping line, new core cutting, new building for pulp and core handling, new crane, new hall ventilation and a lot of supporting equipment.

***Many towns in Maine hit hard by workforce cuts as paper industry slashes capacity; mills have shut down in Millinocket and East Millinocket, Lincoln mill running with fraction of its workers, mills in Rumford and Jay downsized, Old Town mill set to close***

Many towns in northern Maine have been hard-hit by recent changes in the paper industry. Mills in Millinocket and East Millinocket have closed their doors, leaving hundreds of workers without jobs and undermining the economy of the entire region. In Lincoln, the mill is running with a fraction of its former workforce. The industry is in decline in other areas of the state as well. Paper mills in Rumford and Jay have downsized significantly, and the mill in Bucksport closed abruptly last year, putting 570 local workers out of a job.

***Office machine instantly turns wastepaper into new paper***

Seiko Epson Corp. has introduced a machine that takes wastepaper and churns out new paper within minutes, according to a company release on Dec. 1. Dubbed "PaperLab," the prototype is small enough to fit in a typical office setting and can produce new paper from shredded wastepaper through a dry process that doesn't require water. It can produce 14 sheets of

paper per minute and 6,720 sheets in an eight-hour day.

***North American pulp, paper and forest products outlook for 2016 stable, driven mostly by growth rate of Chinese demand, recovery of US and European markets, effects of M&A, while strong US dollar continues to lift price competition for US producers: Fitch***

The full report 'Outlook 2016: North American Pulp, Paper and Forest Products' is available at '[www.fitchratings.com](http://www.fitchratings.com)'.

***Packaging made from tree and plant fibers could overtake the petrochemical variety within a decade, says Stora Enso CEO, following recent company announcement of new innovation center in Helsinki and upcoming inauguration of research facility in Stockholm***

Stora Enso's researchers will be looking at a wide range of products that could potentially be made from tree-based materials including stronger, lighter packaging from nanocellulose and glues and carbon fiber from lignin.

## ***AF&PA Statistics***

Since our last reporting of American Forest and Paper Association statistics releases, the Association has issued its October Printing and Writing Paper Report. According to the report, shipments decreased 8 percent in October compared to October 2014. Total printing-writing paper inventory levels decreased 3 percent from September. Uncoated free sheet (UFS) paper shipments decreased 4 percent relative to shipments in October 2014, the fourth decrease in the past six months. Imports of UFS decreased 34 percent year-over-year in September. Coated free sheet (CFS) paper shipments decreased 7 percent compared to October 2014. Imports of CFS papers decreased 8 percent in September, the second year-over-year decrease in the past three months. Uncoated mechanical (UM) paper shipments decreased 3 percent when compared with October 2014. Imports of UM papers were down 12 percent in September, the fifteenth consecutive monthly decline. Coated mechanical (CM) shipments in October decreased 21 percent relative to October 2014. Imports of CM increased in September by 27 percent compared to the same period last year.

Purchase the full report by contacting Caroline Nealon, [Statistics\\_Publications@afandpa.org](mailto:Statistics_Publications@afandpa.org) or 202-463-2448.

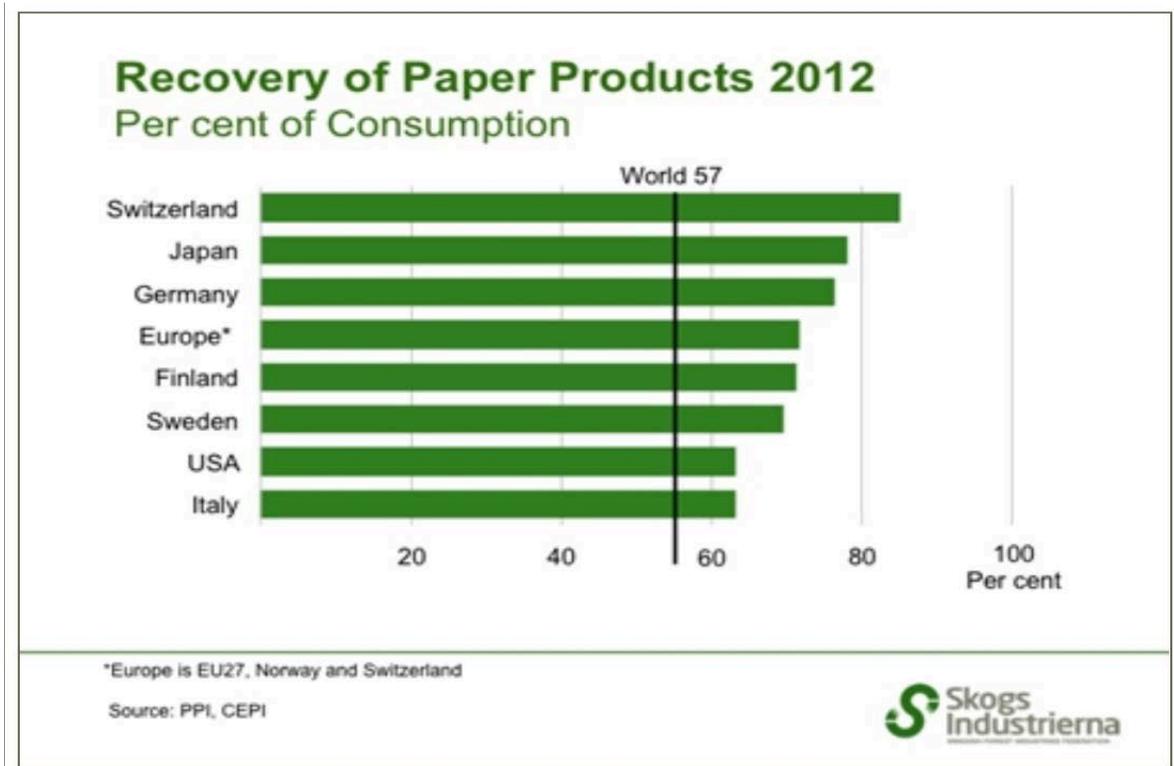
## Paper Quotes

“Anything that you do with fossil-based materials, you’ll be able to do out of a tree.” – Stora Enso Chief Executive Officer Karl-Henrik Sundstroem, during an interview with Bloomberg, after announcing the company’s two new research Centers.

“If someone wants to buy my paper assets for what they’re worth, I’m selling. Unfortunately there are not a lot of buyers.” Stora Enso’s CEO Sundstroem, during the same interview.

## Statistics Corner: Paper Recovery by Country

The figure below shows the extent to which various countries recycled the paper products they consumed in 2012. According to the figure, 57% of the paper consumed worldwide is recovered for recycling, with Switzerland outpacing other countries. Not represented in the figure is Canada, which, according to the Forest Products Association of Canada, “recycles almost 70% of its paper and cardboard.”■



**Figure 3. Recovery of Paper Products** (Source: Swedish Forest Industries Federation)