

August 25, 2017

Joe Yarbrough
President
Carpet and Rug Institute
100 S. Hamilton St.
Dalton, GA 30720

Re: CRI California Carpet Demand Study

Dear Joe:

At your request, we recently reviewed the August 18, 2017 comments offered by the CalRecycle staff to our June 29, 2017 report entitled “Impact of CCSP Assessment Fees on California Carpet Shipments.” We investigated the concerns raised by the staff and prepared specific responses, which are contained in the attached annotated document.

In short, based upon our investigation, we determined that the staff’s comments do not undermine our conclusions about the impact of the CCSP assessment fees on California carpet shipments. Most of the staff’s comments fall into one or more of the following categories:

- In many instances, the staff appear to misunderstand the purpose of our analysis. For example, the staff’s comments focus primarily on our estimate of the price elasticity of demand (PED) for carpet (incorrectly cited by the staff as -6.0 to -6.6). However, our PED estimate (-3.5 to -3.8) is a byproduct of our analysis of the impact of the assessment fees, not the main purpose. The staff further contend that we used an unorthodox methodology to estimate the PED. While we don’t agree with that characterization, the difference-in-differences (DID) methodology we used is the gold standard for evaluating the impact of natural experiments such as the changes in the assessment fee.
- The staff suggest other economic variables they assert should be included in our econometric model, including measures of commercial construction, carpet prices, personal income, and interest rates. However, in most instances, such data are not available on a state-by-state basis as would be required for our analysis. Moreover, none of these comments impact our fixed-effects regression specification where we use fixed effects to control for any potential confounding factors that do not trend differently in California compared to the rest of the United States.
- In some instances, the staff raise concerns that would actually increase our estimate of the impact of the assessment fee and PED. For example, the staff contend that our econometric model should also include measures of economic activity, such as personal income. As we explained in footnote

4 of our report, personal income is nearly perfectly collinear with population, such that the econometric model cannot reliably include both. However, substituting personal income for population increases our estimate of the impact of the assessment fees from approximately -6% to approximately -10%.

- Finally, the staff question whether our estimate of the price elasticity of demand is consistent with prior studies that have found lower demand elasticities, on the order of -0.90 to -0.95, for certain broad categories of floor covering products. Specifically, the prior studies cited by the staff appear to have estimated a PED for a broader set of floor covering products including carpets, linoleum, etc., as well as other textiles including drapes and linens. It is well understood in economics that broader product categories will have lower PED than specific products within those categories. The reason is that consumers have less ability to substitute away from broad product categories, such as floor coverings, than they do from a specific product, such as carpets. Thus, the results of the prior studies are actually consistent with our results (i.e., we find larger PED for carpets than the prior studies found for floor coverings).

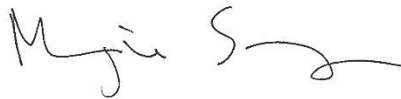
In the attached annotated responses, we provide more detailed explanations of these and other points. In addition, as we explained in our initial report, our estimate of the impact of the assessment fees is conservative because it does not include the impact of the initial \$0.05 assessment fee.

We hope that you find these responses helpful. Please let us know if you have any questions or would like to discuss any topic further.

Best regards,



Eric M. Gaier, PhD
Partner



Minjae Song, PhD
Principal

**CalRecycle Staff Review and Comments on
“Impact of CCSP Assessment Fees on California Carpet Shipments”**

The Impact of the CCSP Assessment Fees on California Carpet Shipments (Report) was prepared by Bates White Economic Consulting on behalf of the Carpet and Rug Institute (CRI). The Report is posted on the CalRecycle Carpet website at <http://www.calrecycle.ca.gov/Carpet/default.htm> and CalRecycle opened a comment period for stakeholder comments on the Report. No public comments were received. CalRecycle staff have reviewed the Report and offer the following comments.

- This is a study of the price elasticity of demand (PED) for carpet sales in California. The economic model is based on an unconventional approach because it is using two data points rather than data over a longer time period of 10 years which is the usual approach for other PED studies.
 - [BW comments] The primary purpose of the study was to estimate the historical impact of the CCSP assessment fees, not the PED. We used the gold standard approach (difference-in-differences (DID)) for estimating the impact of a natural experiment, such as the changes in the assessment fee. The PED that results is a by-product and is only used for the prediction of future carpet shipment reductions for further increases in the assessment fees.
 - [BW comments] In any case, using data over 10 years is not necessarily a better approach for estimating a PED. In particular, a longer period of data does not provide any advantage if price and quantity did not change materially over time or if the industry experienced significant structural changes. A methodology that exploits natural experiments, such as our DID approach, can provide more reliable estimates of the PED, even when the sample period is much shorter than ten years. Indeed, there are numerous peer-reviewed studies that estimate PEDs using relatively short time-period data.
- The final estimate was in the range of 6.0 – 6.6. That is, a one percent increase in price results in roughly a six percent decrease in carpet purchased.
 - [BW comments] The estimate of -6.0 to -6.6 is not an estimate of the PED, but an estimate of the change in carpet shipments due to the CCSP assessment fee. Our estimated PED ranges from -3.5 to -3.8.
- Assuming a common time trend for both CA and the rest of the US is probably not a valid assumption. Sales trends in different places can be quite different. Historical comparisons of percent change in sales of floor coverings over time differ significantly by state. (See Attachment 1.)
 - [BW comments] The purpose of our study was to estimate the impact of the assessment fees on California carpet shipments. It was not necessary to explain the variation in carpet shipments within other states. Instead, we aggregated the rest of the United States and used California and rest-of-the-nation measures of population, housing permits, and personal income.
 - [BW comments] In any case, we are unaware of any source of state-level carpet shipments other than for California. However, we are willing to consider it if a source can be identified.

- [BW comments] The state-level changes shown in Attachment 1 reflect “Sales in Floor Covering Stores.” It is our understanding that sales in floor covering stores would include a broader set of floor covering products than the carpet shipments we analyzed. In addition, the starting date range of the data comparison, 2007, is well before the start of the assessment fees.
- [BW comments] In any case, the sales trends across the states illustrated in Attachment 1 are generally explained by variations in state-level demand factors, such as those we analyzed for California (i.e., population, personal income, housing permits). Specifically, we regressed the changes in floor covering sales for each state from Attachment 1 on the corresponding state-level changes in housing permits and personal income. The adjusted R-square from that regression is 0.714 meaning that about 71% of the variation in sales is explained by the variation in housing permits and personal income.
- Data from other sources (see Attachment 2.) have significant variation in national sales and prices of floor coverings from 2007 to 2012. This should be addressed in the Report.
 - [BW comments] This comment is off base. The data in Attachment 2 imply different price levels for different types of floor covering (e.g., carpets, hardwood, ceramic, etc.). We have only studied carpet demand so the first row of each table is the only relevant row. In fact, the implied prices of carpet and area rugs from Attachment 2 show very little variation from year to year. The range of implied prices is \$8.39 per sq. yard in 2011 to \$8.81 in 2015. The average across all years is \$8.67 per sq. yard compared to the \$8.69 average price we used for calculating the PED. Hence, there is remarkable consistency in the carpet pricing data from different sources.
- CalRecycle requested additional data regarding both prices and sales of other types of floor coverings. Specifically, CalRecycle requested carpet and flooring annual reports prior to 2015, that CRI representatives stated were available. In addition, the California-specific data that was used in the Report is also requested.
 - [BW comments] We are willing to review additional data, although the relevance of data concerning other types of floor coverings is not apparent to us. Our focus was exclusively on carpets. In any case, we reiterate that we had sufficient data to conduct our analysis reliably and remain confident in our estimates of the impact of the assessment fees on California carpet shipments and corresponding PED.
- Independent variables that should be included in the model are:
 - Some measure of commercial demand should be included. This is a sizeable fraction of the carpet market (estimated at 30% in Europe).
 - [BW comments] We are unaware of any source of such information, but are willing to consider it if a source can be identified. This comment also does not apply to our fixed-effects regression specification (i.e., Specifications I and III in Figure 4 of our report).
 - Some measure of income (per capita?) should be included. This would help distinguish between the California and the rest of the U.S. consumers.
 - [BW comments] In footnote 4 of our report, we explained that personal income is nearly perfectly collinear with population and could not be included jointly with population. However, substituting personal income for population actually

increases our estimate of the impact of the assessment fees on CA carpet shipments from approximately -6% to approximately -10%. This comment also does not apply to our fixed-effects regression specification.

- The study should include some measure of economic activity as regressors like inflation-adjusted carpet prices, or interest rate.
 - [BW comments] It is not necessary to control for factors that do not trend differently in California and the rest of the United States. Interest rates would not trend differently, hence there is no reason to include them.
 - [BW comments] With respect to prices, we understand that manufacturers price carpet at a national level and do not vary carpet prices by state or region. Discounts may be provided based upon customer purchasing volumes, but there is no reason to believe that prices would trend differently in California compared to the rest of the United States. Nevertheless, we are willing to consider such pricing data if a source can be identified. This comment also does not apply to our fixed-effects regression specification.
- Construction indicators should be based on the square feet of housing and commercial space constructed, rather than the number of housing permits.
 - [BW comments] We are unaware of any source of such information, but are willing to consider it if a source can be identified. This comment also does not apply to our fixed-effects regression specification.
- The number of housing permits is a second-best means to estimate new housing, as actual housing construction was constricted during 2015-2016, due to the drought.
 - [BW comments] We are unaware of any source of such information, but are willing to consider it if a source can be identified. This comment also does not apply to our fixed-effects regression specification.
- The study should include lags in housing permits.
 - [BW comments] Based upon the staff's suggestion, we tested the inclusion of additional lags of housing permits in our regression. Adding two lags of housing permits (i.e., 6 months) slightly reduces our estimate of the impact of the assessment fees from -6.0% to -5.7%. Additional lags did not materially alter the estimated impact. This comment also does not apply to our fixed-effects specification.
- Is the average cost of carpet at \$8.69 per square yard reasonable? What is the average cost of low-end versus high-end carpet and what is the PED for each? (See Attachment 3.)
 - [BW comments] The average price only impacts the elasticity estimate and our predictions of potential future impacts of the assessment fee. The average price is not used to estimate the historical impact of the assessment fee.
- The Report shows no state data other than for California; can regional data on carpet shipments to California and other states (or other regions) be incorporated?
 - [BW comments] Our understanding is that such data is not available. We are willing to consider such data if a source can be identified.

Comparison with Other Studies

There are relevant studies that provide other estimates of this price-purchase relationship. Most of the European studies in price elasticity deal with trade aspects, usually from imports to Europe from developing countries. However, there is one study of price elasticities of trade within European countries that might be relevant. This study derives a PED for “Carpets, Linoleum, etc.” that is 0.9. The dates for underlying studies vary, and a further effort is required to determine the date of this study. The study appears as a chapter in a book titled Empirical Studies of Strategic Trade Policy, edited by Paul Krugman and Alasdair Smith (1994). The chapter is titled “*Trade Policy under Imperfect Competition: A Numerical Assessment*”, by Anthony J Venables (1994).

- [BW comments] As noted in the description above, Venables (1994) reports a PED for “Carpets, Linoleum, etc.” of 0.9 a broader category of floor coverings than carpets. This distinction is important because it is well known in economics that broader product categories will have lower PED than specific products within those categories. The reason is that consumers have less ability to substitute outside of broad product categories, such as floor coverings, than they do for a specific product, such as carpets. Hence, the PED result from Venables (1994) is consistent with our implied PED (i.e., we find a larger PED for carpets than the prior studies found for floor coverings).

Finally, a 2013 study by the Bureau of Labor Statistics, in estimating additional consumer purchases due to increased house values in the 2004-2009 bubble, provided a corollary estimate of the carpet price elasticity of demand to be 0.95. The study is titled “*Where did we indulge? Consumer spending during the asset boom*”, Michael L. Walden; Monthly Labor Review, April 2013; pgs. 24-40.

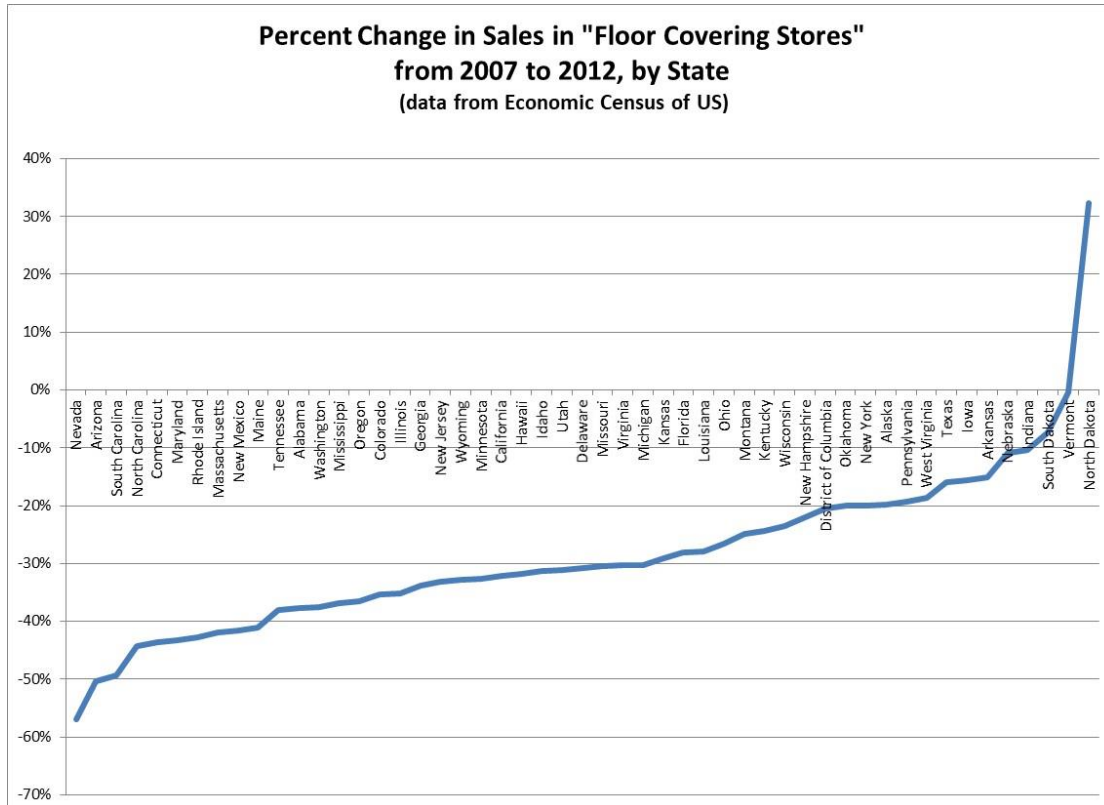
- [BW comments] The price elasticity estimate in the 2013 BLS study is not informative of carpet demand in California for at least two main reasons. First, the 2013 BLS study combines carpets with drapes and linens as one product category; this is a much broader product category than the BW study analyzes and would be expected to find a lower PED for the reasons explained above. Second, the BLS study uses data spanning 1946–2009 to estimate the price elasticity. This 50-year period is well outside of the time period relevant to our analysis of the impact of the assessment fees. Also, by using such a long time-period, the BLS study would be confounded by any structural changes in carpet demand or supply that would have occurred over 50 years, a reasonable assumption.

In conclusion, all of these alternative PED’s seem reasonable for a quasi-luxury item with significant market competition. The Report should contain a discussion of literature that presents alternative PED’s for carpet, and explain why this particular study has arrived at a number significantly different from those derived in other studies of similar consumer products.

Attachment 1.

The chart shows the Percent Change in Sales in "Floor Covering Stores", between the two U.S. Census reports of 2007 and 2012. Discarding the two outlier points, the sales by state vary between 0% and a 50% reduction. The median reduction in sales during this interval was 31%, and the mean reduction in sales was 29%. The respective value for California was a 32% reduction.

The economic recovery from the low of 2010 varied by state, and none of this data seems to have been incorporated into the Report.



Attachment 2.

The Floor Covering Weekly of July 25, 2016, contains an article on the Statistical Report 2015. The table below appears on page 10 of this magazine. This data provides average prices for flooring, and in particular for carpeting, that are significantly greater than has been discussed elsewhere. Furthermore, the prices and quantities appear to differ from other industry reports.

CalRecycle is interested in obtaining the relevant specific data set that underlies the Report. In addition, prior years of this Statistical Report would provide useful trend information regarding the carpet and flooring market shares.

TABLE 1

U.S. floor covering market sales value

(IN MILLIONS OF MANUFACTURERS' DOLLARS)

Product Sector	2011	2012	2013	2014	2015	Percent Change
Carpet & area rugs	\$9,533	\$10,041	\$10,491 ¹	\$10,754 ¹	\$10,743	-0.1%
Hardwood flooring	2,052	2,331	2,917 ¹	3,554 ¹	3,791	6.7%
Ceramic floor & wall tile	2,206	2,241	2,642 ¹	2,882 ¹	3,134	8.7%
Laminate flooring	894	908	922	932 ¹	912	-2.1%
Vinyl sheet & floor tile	1,938	2,195	2,390 ¹	2,593 ¹	2,947	13.7%
Other resilient flooring ¹	229	231	250	260 ¹	275	5.8%
Stone flooring ²	1,064	1,110	1,175	1,237	1,335	7.9%

R= Revised

Source: Catalina Research

¹ Other resilient includes cork, rubber, other plastics and linoleum.

² Natural stone. Excludes manufactured and engineered stone.

TABLE 2

U.S. floor covering market sales volume

(IN MILLIONS OF SQUARE FEET)

Product Sector	2011	2012	2013	2014	2015	Percent Change
Carpet & area rugs	10,219 ¹	10,459 ¹	10,865 ¹	10,990 ¹	10,973	-0.2%
Hardwood flooring	1,033 ¹	1,162 ¹	1,427 ¹	1,560 ¹	1,699	8.9%
Ceramic floor & wall tile	1,961 ¹	2,165 ¹	2,366	2,640 ¹	2,838	7.5%
Laminate flooring	950	964	993 ¹	1,002	950	-5.2%
Vinyl sheet & floor tile	2,580 ¹	2,731 ¹	3,033 ¹	3,318 ¹	3,527	6.3%
Other resilient flooring ¹	205	191 ¹	200 ¹	204 ¹	219	7.4%
Stone flooring ²	262	277 ¹	286	295	313	6.1%

R= Revised

Source: Catalina Research

¹ Other resilient includes cork, rubber, other plastics and linoleum.

² Natural stone. Excludes manufactured and engineered stone.

Attachment 3.

An alternative industry report contains a set of industry statistics, that has this disclaimer:

“FCNews does not include stone flooring in its aggregate total, nor does it include ceramic wall tile. In addition, rubber flooring numbers include sheet, tile, accessories and cove base.”

The annual total value in sales is nearly identical, but the total square footage sold varies by approximately 20%.

<http://www.fcnews.net/2016/06/scoring-flooring-industry-stats-for-2015/>

