

Specialty CFL Shelf Survey Analysis

*Prepared by Matthew Taylor for Energy Trust of Oregon
July 2010*

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Executive Summary

Key Findings

This report, conducted for Energy Trust of Oregon, uses data from the NEEA retail lighting shelf surveys to analyze the availability, diversity, prices, and market share of specialty CFL bulbs in Oregon. The key findings of the analysis are:

- Approximately 49% of lighting shelving in Oregon is dedicated to specialty bulbs. An estimated one quarter of this 49% is dedicated to CFL technology, indicating that CFL technology for specialty lighting is less available and less readily shelved by Oregon retailers than for non-specialty lighting applications.
- On average, Oregon Big Box stores allocate a larger percentage of specialty lighting shelf space to CFL bulbs than do Oregon Grocery/Drug/Hardware stores. Stores within metropolitan areas similarly allocate a larger share of specialty lighting to CFL technology than do stores outside of metropolitan areas.
- Both the stores outside of metropolitan areas and the Grocery/Drug/Hardware stores exhibit different CFL shelving practices between specialty and non-specialty CFLs, allocating statistically larger shares of non-specialty shelving to CFLs than for specialty shelving.
- CFL technology has an estimated 32-36% market share of specialty lighting in Oregon, slightly lower than CFL market share of non-specialty lighting. There are a number of specialty lighting applications for which there are currently no CFL alternatives, some of which will never conceivably develop CFL alternatives due to the nature of the application. While the available data does not differentiate between the applications of non-CFL specialty lighting, taking a more narrowed view of the market in which specialty CFLs are competing would increase estimated CFL market share.
- Approximately 89% of Oregon lighting retailers that carry specialty bulbs also carry at least one model of specialty CFLs.
- Since 2008, Oregon lighting retailers have increased the availability and diversity of screw-based specialty CFLs and reduced the availability of Pin-based and Circline bulbs as well as the diversity of those offerings. Similarly, retailers have moved towards increasing the availability of the more traditional incandescent looking specialty lighting and away from tubular specialty lighting, screw-based or otherwise.

- Prices for CFL bulbs vary significantly with several differentiating characteristics. Analysis of the determinants of the price of CFL bulbs revealed a significantly positive correlation between bulb wattage and price per bulb. Significantly negative correlations between price per bulb and being sold in a Big Box store, having dimming capabilities, and the quantity of bulbs per package were identified. Preliminary regression results indicate that overall, after controlling for the above mentioned characteristics, prices of CFL bulbs in Oregon have seen a statistically significant decrease over the last two years. However, when individual bulb styles are analyzed separately the decline in bulb price over time is no longer significant, indicating that the overall decline in price is due to the changing mix of bulbs sold and not due to reductions in the cost of technology or any increasing economies of scale. While not statistically significant, the negative coefficients are still indicative of a downward trend in most specialty CFL bulb types.

Recommendations to Energy Trust and Future Shelving Studies

1. That 45-49% of lighting shelving is dedicated to specialty bulbs indicates that this is a large segment of the lighting market and a segment worth pursuing. NEEA, Energy Trust, and similar organizations in the Pacific Northwest should continue to be active in this market, promoting CFL alternatives where they exist and supporting further development of CFL and LED alternatives for applications in which they are currently none.
2. The practice of shelving specialty CFLs has been adopted least by rural Grocery/Drug/Hardware stores. Any thoughts towards expanding existing programs to increase CFL market penetration in these areas should take into consideration (1) their limited role as a channel for residential CFL sales and (2) the relatively small impact that such efforts would have on CFL share of the specialty bulb market in Oregon.
3. Energy Trust should continue to pursue coordination with their home products program management contractor on any future shelving surveys, specifically on survey methodology, consistency in data collection, and a compatible survey sample. Such coordination will help reduce redundancy of survey efforts and ensure that the data collected expands and enriches the understanding of the residential lighting market in Oregon.
4. Energy Trust should pursue building upon their existing partnerships with participating lighting retailers in an effort to move towards more comprehensive data collection. Ideally, data on CFL sales outside of the Energy Trust program as well as incandescent bulb sales could be available to Energy Trust. Such information would enhance understanding of the CFL market in Oregon

and allow for a more accurate determination of CFL market share in Energy Trust service territory. Potential benefits for partnering retailers might include store level analysis and feedback on lighting sales and analysis of the state of the residential lighting market.

5. Future NEEA surveys should include an expanded sample that includes stratification such that each state's sample is representative, allowing for comparisons between states. Such comparisons would allow for analysis of the effects that the various regional energy efficiency programs and initiatives are having on the residential lighting market, providing useful feedback to program staff and policy makers.
6. Future NEEA surveys should continue to record lumens per bulb. As residential energy efficiency lighting moves towards incorporating more LED technology this will become an increasingly important element of any future analysis of the residential lighting market.
7. In light of the observed shift from alternative based bulbs towards screw-based lamps and the coinciding shift away from tubular CFLs, NEEA should expand the other components of their research in the residential lighting market - the market actor interviews and residential consumer surveys - to include questions concerning the main drivers of these trends. This additional questioning would help clarify the source of this shift - changing consumer demand or changes in production and supply - as well as identify the root causes. These insights will prove valuable to both bulb manufacturers and energy efficiency programs as they move forward in developing new energy efficient lighting products and expand the market.

Introduction

This analysis focuses on the availability, prices, and market share of specialty CFL bulbs in Oregon. The study was conducted for Energy Trust of Oregon as a compliment to the *2009-2010 Residential Lighting Market Research Study* conducted for the Northwest Energy Efficiency Alliance (NEEA). The market research, conducted by KEMA for the sixth year since 2005, includes consumer surveys, market actor interviews, and retail shelving surveys. Such research provides valuable information to Energy Trust concerning the state of the CFL market in the Pacific Northwest. However, given their relatively limited activity in the Northwest residential CFL market, Energy Trust required a more focused analysis of specialty CFLs in Oregon to provide more applicable information for program planning and decision making.

In 2010 the retail shelving study was expanded, as requested by Energy Trust, to include a larger sample of Oregon lighting retailers that was fully representative of the whole state. The survey was further expanded by adding new sections to the survey instrument, including spaces to record linear feet of specialty bulb shelving and specialty CFL shelving, as well as the available models and shelf space of LED and Cold Cathode lighting. The expansion of the sample and data collected allowed for a more accurate analysis of the specialty CFL market in which Energy Trust participates.

Throughout the analysis, definitions of demographic areas, store types, and bulb types are consistent with the definitions used in NEEA's region wide studies. Stores are demographically categorized as being either metropolitan or rural, based upon their being located within or without a Metropolitan Statistical Area¹. They are further classified as being either a Big Box store type (Mass Merchandise, Do-It-Yourself, or Club/Warehouse) or a Grocery/Drug/Hardware store type. Big Box stores have a strong positive correlation with being a national chain, a relationship that is more pronounced for Oregon stores than for the region overall².

The Sample

The 2010 retail shelving survey included 78 stores in the Pacific Northwest, 38 of which were Oregon stores that carry specialty bulbs. The sample was stratified such that the Oregon sample and the overall sample were both representative of their respective geographies, yet the Idaho, Montana, and Washington stores were not meant to be representative of those states. As such, comparisons between states are largely inappropriate. Similarly, being the first survey to collect detailed shelf space data for specialty bulbs, trends in specialty lighting shelving practices cannot be observed in the way that it can for CFLs in general. Such analysis should be considered as part of future shelving studies.

¹ As defined by the US Census Bureau.

² See Appendix C for correlation coefficients

Specialty CFL Shelf Space

Specialty Bulb Shelf Space in Oregon

The following tables show the sample sizes, the percentage of total lighting shelving dedicated to specialty bulbs, and the percentage of total CFL shelving dedicated to specialty CFLs for each store type. Table 2 indicates that 49% of Oregon lighting shelving is dedicated to specialty bulbs, a proportion quite similar to the region overall. However, rural retailers in Oregon appear to dedicate a higher portion of their lighting shelving to specialty bulbs than do rural stores in the greater Northwest.

Table 1. Sample Size, by Store Type and Geography

	Metro Big Box	Rural Big Box	Metro Grocery/Drug/Hardware	Rural Grocery/Drug/Hardware	Total
Oregon	10	6	12	10	36
Region-wide*	13	11	21	17	62

* Includes Oregon, and does not include stores with incomplete information on specialty bulb shelving

Table 2. Percentage of Lighting Shelf Space Dedicated to Specialty Bulbs by Store Type

	Metro Big Box	Rural Big Box	Metro Grocery/Drug/Hardware	Rural Grocery/Drug/Hardware	Total
Oregon	41%	59%	45%	62%	49%
Region-wide*	39%	46%	46%	52%	45%

* Includes Oregon, and does not include stores with incomplete information on specialty bulb shelving

Comparing Table 3 and Table 4 indicates that specialty CFLs have penetrated Big Box stores more so than the smaller Grocery/Drug/Hardware stores. In Big Box stores the share of CFL shelving dedicated to specialty bulbs is on par, if not greater, than the share of non-CFL shelving dedicated to specialty bulbs, whereas in Grocery/Drug/Hardware stores the share of CFL shelving dedicated to specialty bulbs is consistently and notably less than specialty bulbs' share of non-CFL shelving.

Table 3. Percentage of CFL Shelving Dedicated to Specialty Bulbs by Store Type

	Metro Big Box	Rural Big Box	Metro Grocery/Drug/Hardware	Rural Grocery/Drug/Hardware	Total
Oregon	52%	55%	26%	40%	47%
Region-wide*	46%	48%	28%	37%	41%

* Includes Oregon, and does not include stores with incomplete information on specialty bulb shelving

Table 4. Percentage of non-CFL Shelving Dedicated to Specialty Bulbs by Store Type

	Metro Big Box	Rural Big Box	Metro Grocery/Drug/Hardware	Rural Grocery/Drug/Hardware	Total
Oregon	35%	60%	50%	68%	50%
Region-wide*	35%	45%	52%	56%	47%

** Includes Oregon, and does not include stores with incomplete information on specialty bulb shelving*

The 45-49% of lighting shelving dedicated to specialty bulbs suggests that specialty lighting makes up a similar portion of lighting sales and is a significant market. NEEA, Energy Trust, and similar organizations in the Pacific Northwest should continue to be active in this area of the lighting market, promoting CFL alternatives where they exist and further developing CFL and LED alternatives for applications in which there are currently none.

Interestingly, Big Box stores have a significantly larger amount of specialty bulb shelving than their non-Oregon counterparts, having median values of 143 linear feet and 5 linear feet, respectively. Some of this difference can be attributed to the fact that unlike Oregon Big Box retailers several of the non-Oregon Big Box stores are independently owned. Although such a difference was not observed in the other store types, similar differences in Big Box shelving of all light bulbs were present in previous surveys, indicating that the difference was neither due to bias in the 2010 sample nor the way in which the 2010 survey was implemented. There is no clear reason for this continually observed difference, yet its existence further supports the notion that comparing Oregon retailers and other Northwest stores in the sample is inappropriate. See Appendix A for more detail on this difference in lighting shelving.

CFL Share of Specialty Shelf Space

Overall, an estimated 25% of specialty lighting shelf space in Oregon is allocated to CFL bulbs. This estimate is an average of a series of estimates that ranged from 19-32%, resulting from two different measurements of the CFL share of specialty bulbs of each store type and then applying three different sets of weights. CFL share of all retail lighting shelving was similarly estimated to be 28%, an average of estimates ranging from 24-32%. Please see Appendix B for more detail on the structure of the weights.

Table 5 displays the ranges of estimates of each of the four major store types, revealing the previously discussed differences between Rural and Metro establishments and between Big Box and Grocery/Drug/Hardware store types. Regardless of geography, the proportion of specialty shelving allocated to CFL bulbs in Big Box stores is approximately twice that of the proportion in their smaller counterparts. The higher estimates of CFL share of all lighting in Grocery/Drug/Hardware stores further indicates that their shelving practices of specialty CFLs are behind their shelving practices of twister CFLs as well as behind the practices of Big Box stores.

Table 5. CFL Shelf Space as Percentage of Specialty Lighting Shelf Space

	Metro Big Box	Rural Big Box	Metro Grocery/Drug/Hardware	Rural Grocery/Drug/Hardware	Overall
Specialty Bulbs	41-43%	29-37%	13-26%	10-15%	25%
All bulbs	34-37%	31-37%	23-28%	18-23%	28%

Market Share

Share of retail shelf space does not directly translate into actual market share, as the percentage of shelf space does not reflect variations in the velocity of inventory turnover. This study's estimates of CFL market share are 38-39% for specialty bulbs and 32-36% for all Medium Screw Based Lamp (MSBL) bulbs. These estimates are consistent with the region wide MSBL market share estimates of 35-48% found in NEEA's 2008-2009 CFL Tracking Study³.

Estimating market share involved applying weights to the CFL share of shelf space in each store type in each demographic area (Metro or Rural). These estimates were based upon each store type's proportion of actual sales data from the 2009 calendar year⁴. The sales data used to determine the weights is limited in that it only includes bulbs sold through Energy Trust participating retailers, and only those bulbs that Energy Trust incented. Due to this potential bias, alternative weights were constructed based upon the region-wide distribution of CFL sales found in the consumer survey that was conducted as part of NEEA's *2009-2010 Residential Lighting Market Research Study*. The distributions are displayed below in Table 6; the alternative weights resulted in marginal downward adjustments in the estimates of CFL market share to 36-37% and 32-35% of specialty and all lighting bulbs, respectively.

Table 6. Distribution of Bulb Sales by Store Type

	Distribution from Energy Trust Sales Data	Distribution based upon NEEA's 2010 Consumer Survey
Metro Big Box	80%	66%
Rural Big Box	7%	17%
Metro Grocery/Drug/Hardware	9%	13%
Rural Grocery/Drug/Hardware	4%	3%

³ These estimates are based on a top-down estimation method that uses MSBL shipment data. In contrast, the estimation in this analysis takes a bottom-up approach, basing the estimates on observed shelving practices and sales data.

⁴ Based upon sales of Energy Trust incented specialty bulbs between January, 2009 and March, 2010.

There are a number of specialty lighting applications for which there are currently no CFL alternatives, many of which will not conceivably develop CFL alternatives due to the nature of the application. While the available data does not differentiate between the applications of non-CFL specialty lighting, taking a more narrowed view of the market in which specialty CFLs are actually competing would increase the estimated CFL market share.

Ideally, data on CFL sales outside of the Energy Trust program as well as incandescent bulbs would be available for analysis, allowing Energy Trust to more accurately determine market share of energy efficient lighting within their service territory. If possible, such data collection partnerships should be pursued with retail establishments. Potential benefits for partnering retailers might include store level analysis and feedback on lighting sales.

Shelf Space by Store Type

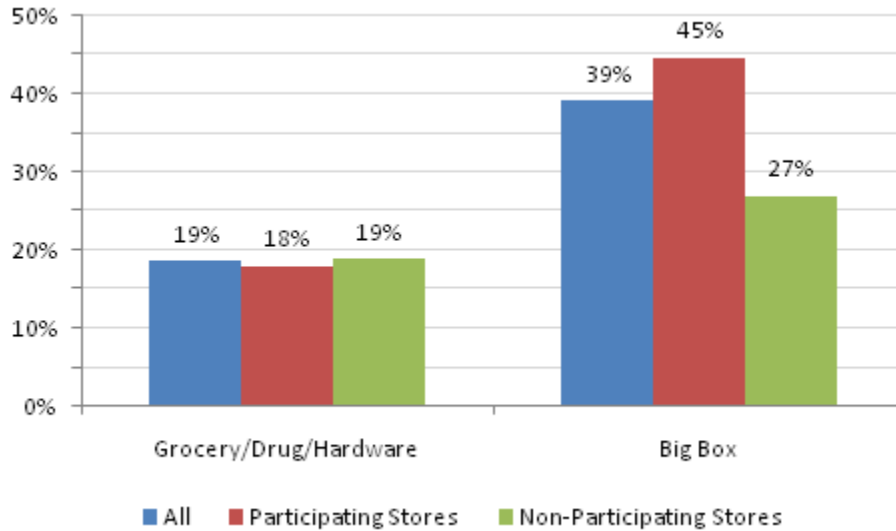
While CFL technology accounts for approximately 25% of specialty bulb retail shelf space in Oregon, there are significant differences between store type and whether or not the store participated with Energy Trust (approximately 45% of the stores surveyed were working with Energy Trust during the survey took place).

Table 7. Number of Participating Stores Surveyed, by Store Type

	Big Box	Grocery/Drug/Hardware	Total
Participating Store	11	6	17
Non-Participating Store	5	16	21
Total	16	22	38

Figure 1 below shows the average (mean) percentage of specialty bulb shelving dedicated to CFLs by store type and by whether or not they participated with Energy Trust. The mean values are presented primarily to be compared with the measurements presented in the NEEA tracking studies.

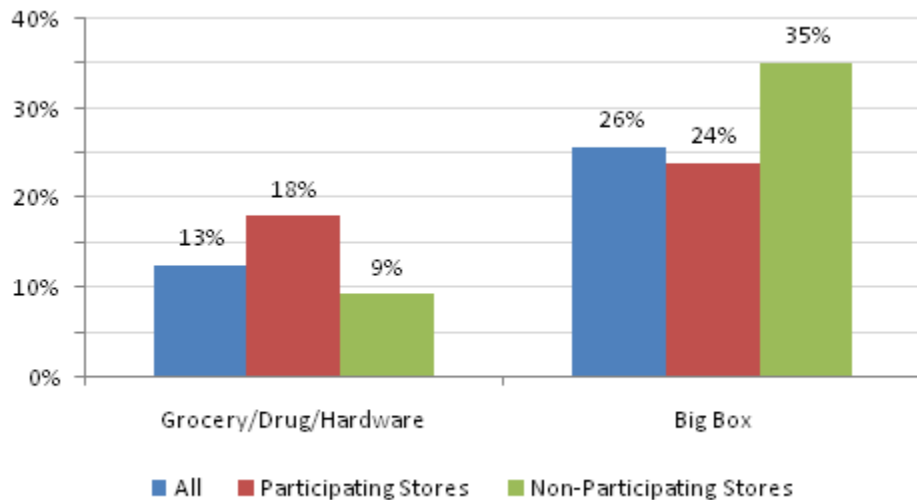
Figure 1. Average Percentage of Specialty Bulb Shelving Dedicated to CFLs, by Store Type



With such small and varying sample sizes and the presence of extreme values – Club/Warehouse stores that carry CFL lighting only and some smaller lighting retailers carrying no CFLs - the mean is not a good measure of central tendency. Figure 2 displays the median values of the percentage of specialty bulb shelving dedicated to CFLs, values that are quite close to a recalculated mean after the extreme values (100% or 0%) are removed. A further advantage of comparing medians is that the appropriate test for statistical significance, the Mann-Whitney U test (MW), is closely related to the notion of median values.

The percentage of specialty bulb shelving dedicated to CFLs in all Big Box and Grocery/Drug/Hardware stores is statistically different⁵. That typical non-participating Big Box stores seem to allocate a higher percentage of specialty shelf space to CFLs is a surprising result considering that many of the same chains appeared in both groups and that we would expect the additional incentives to increase specialty CFL shelving in participating stores.

Figure 2. Median Percentage of Specialty Bulb Shelving Dedicated to CFLs, by Store Type



The picture provided by the mean values is significantly altered when compared to that of the medians; not only are the averages notably reduced, but the larger portion of specialty bulb shelving devoted to CFLs in Grocery/Drug/Hardware stores participating with Energy Trust than in non-participating stores is statistically significant. This difference is likely attributable to the participating Grocery/Drug/Hardware stores almost all being regional and national chains. These stores do not fully reflect the nature of this category of store type which has a large share of independently owned small drug and hardware stores, rendering any comparison between participating and non-participating Grocery/Drug/Hardware stores inappropriate. While the participating stores may be more closely identified with smaller drug and hardware stores than Big Box stores, it is certainly not fair to directly compare them with smaller retailers within their store type.

Overall, across all store types, participating stores do have a statistically significant higher portion of specialty bulb space dedicated to CFLs than do non-participants. It is not clear that this difference is attributable to participation with Energy Trust and not selection bias underlying the determination of

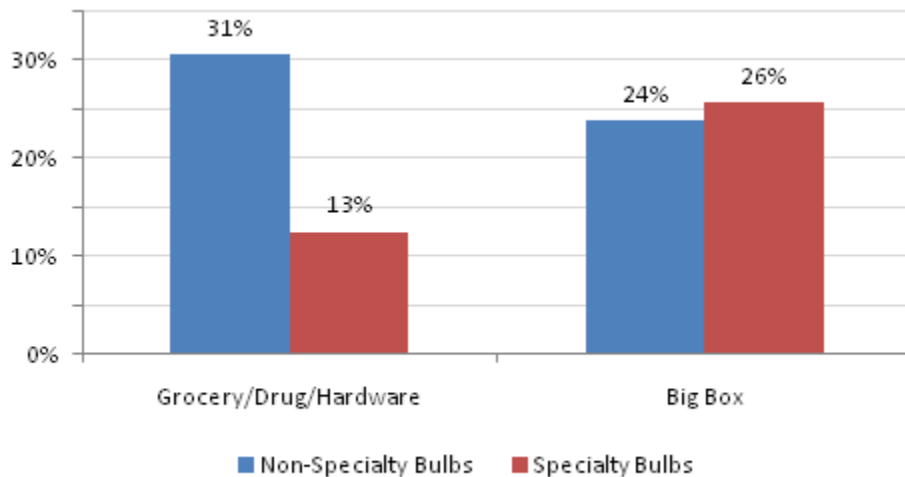
⁵ Throughout the report, statistical significance refers to significance at the 5% level unless otherwise noted.

participation. The lack of independently owned establishments and hardware and grocery stores participating with Energy Trust are indications that such bias exists.

What can be said is that as a group, the smaller Grocery/Drug/Hardware stores have a statistically smaller percentage of specialty lighting shelf space dedicated to CFLs than do their Big Box counterparts. These Grocery/Drug/Hardware stores represent between 58-71% of lighting retailers and approximately 38% of retail lighting shelf space in the state, yet are a channel for just 14-16% of retail CFL sales. Unless equity of access to CFL specialty bulbs across regions or among participating stores are important factors, efforts to increase the prevalence of CFL specialty bulbs in these stores is likely not an efficient home product priority for Energy Trust.

Comparing the way store types shelve CFL technology for specialty and non-specialty MSBL bulbs reveals a statistically significant difference (at the 10% level) in the shelving practices of Grocery/Drug/Hardware stores. An average Grocery/Drug/Hardware store dedicates a larger proportion of their non-specialty MSBL shelving to CFL technology than they do where specialty bulbs are concerned. In contrast, Big Box stores are relatively consistent in the proportion of shelf space they allocate to CFL technology.

Figure 3. Median Percentage of Bulb Shelving Dedicated to CFLs, by Bulb Type



Shelf Space by Geography

Analysis of the specialty CFL share of shelf space showed similar patterns in both the means and medians of rural and metropolitan stores. While the differences were notable, they were not statistically significant. However, as with store type, when we test for a systematic difference in the CFL shelving practices of specialty and non-specialty bulbs, we see that rural stores stock CFL specialty bulbs significantly less than they stock non-specialty CFL bulbs. Again, when comparing the mean and median share among store types we clearly see the mean being positively affected by outliers.

Figure 4. Median Percentage of Specialty Bulb Shelving Dedicated to CFLs, by Geography Type

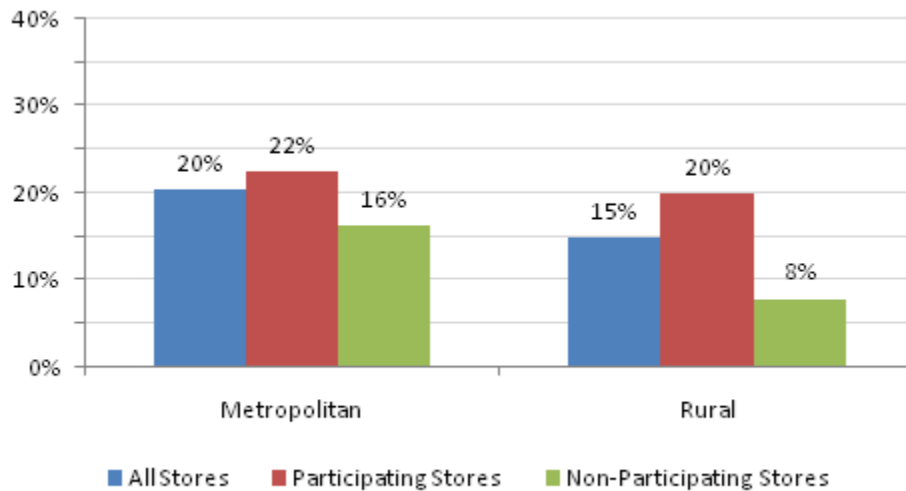


Figure 5. Mean Percentage of Specialty Bulb Shelving Dedicated to CFLs, by Geography Type

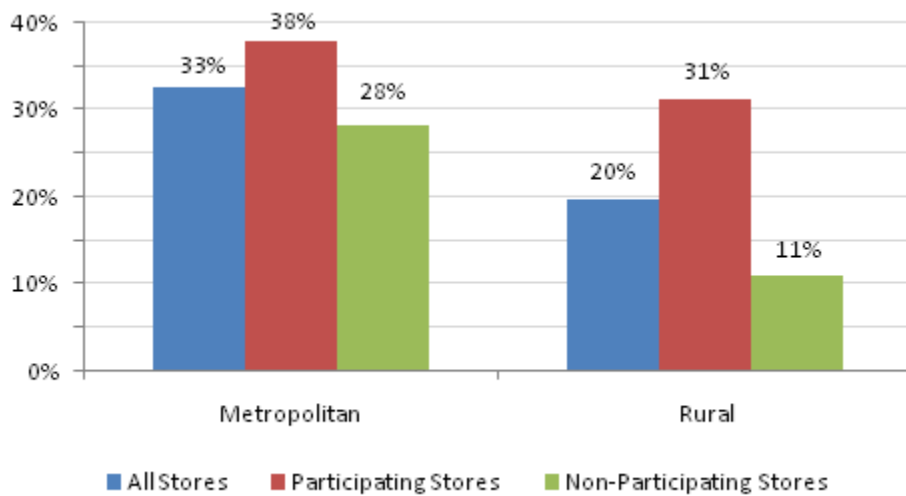
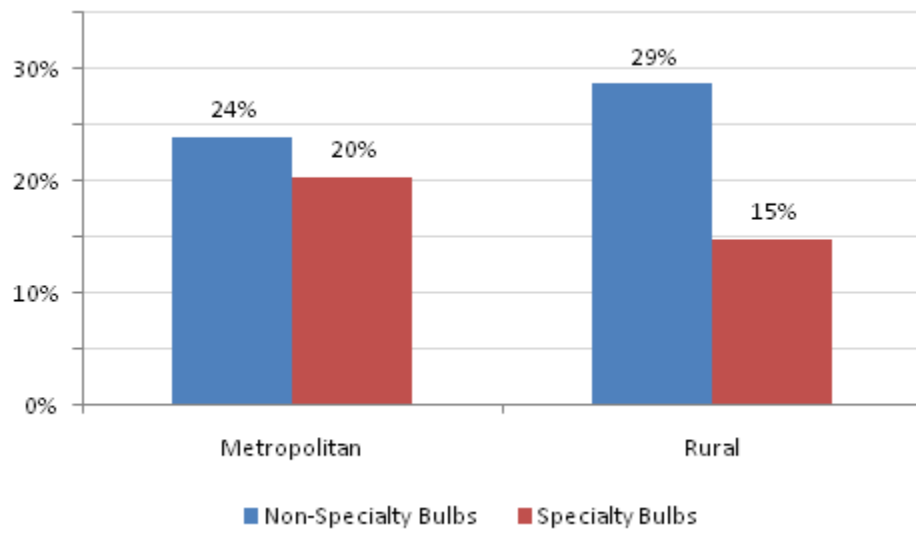


Figure 6. Median Percentage of Bulb Shelving Dedicated to CFLs, by Bulb Type



Availability & Diversity of Specialty CFLs

Availability of Bulb Types

A second way to measure the availability of specialty CFLs is to analyze availability of specific types of specialty bulbs and the diversity of models being offered. In this context, two bulbs are considered different models if they are of different brands, watts, lumens, aesthetic features, or packaging even if they are of the same type of bulb. This type of analysis allows for insight into which specialty applications CFL technology is becoming more or less prevalent and which CFL technologies are only sparsely available.

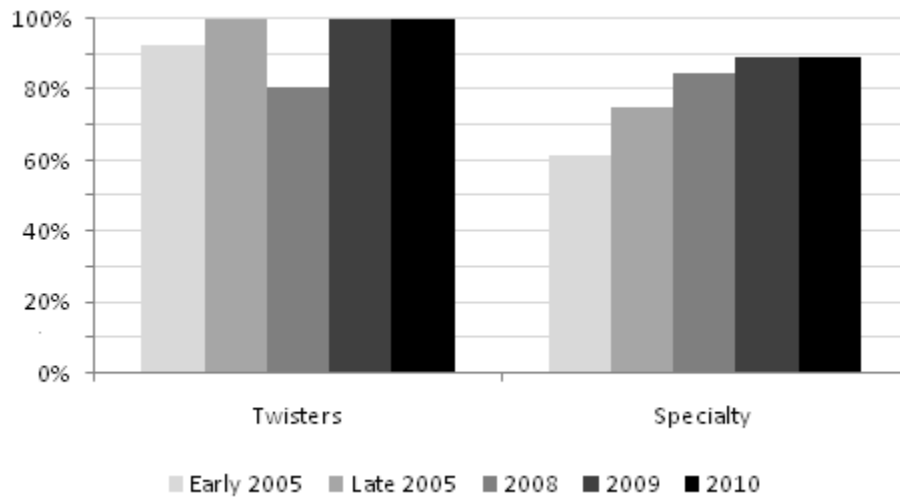
Detailed bulb level data has been consistently recorded since NEEA's first retail lighting shelf survey in 2005, providing five observations for some data points. Table 8 displays the main weakness of looking at this data over time, which is the fact that before the 2010 survey the sample was not designed to be representative of Oregon as a whole. This issue is most pressing in the first two studies, during which no rural establishments in Oregon were surveyed.

Table 8. Breakdown of Sample Sizes for the Series of Shelf Surveys

Year of Survey	Metro Big Box	Rural Big Box	Metro Grocery/Drug/Hardware	Rural Grocery/Drug/Hardware	Total
Early 2005	3	0	10	0	13
Late 2005	3	0	9	0	12
2008	6	3	7	10	26
2009	5	4	5	4	18
2010	8	7	12	10	37

Nevertheless, analyzing this data over time reveals trends in the specialty CFL shelving practices of Oregon retailers. Figure 7 below shows the percentage of Oregon stores in the shelf surveys that carry each of the varying styles of CFL bulbs over time. Overall, while the standard twister CFLs are available at virtually all lighting retailers in Oregon, specialty CFLs are somewhat less available despite their continued increase year after year. Interestingly, in the 2009 survey there were no observed models of Replacement Pin or Globe bulbs available for purchase.

Figure 7. Percentage of Stores Carrying Twister and Specialty CFL Bulbs over Time



Trends in Availability and Diversity

Depending on the application, there is considerable variation in the availability of specialty CFLs; the A-Lamp bulbs that imitate traditional incandescent bulbs and the CFL Reflector bulbs are relatively more available compared to the Two-tube, Four-tube, and Pin-based styles of bulbs, despite their advantages in some fixtures. Similarly, there appears to be a trend towards screw-based lamps away from the alternative ballasts; whereas screw-based CFLs- such as Reflector, A-lamp, and Globe bulbs- appear to have become more available, availability of the Pin-based and Circline bulbs has declined.

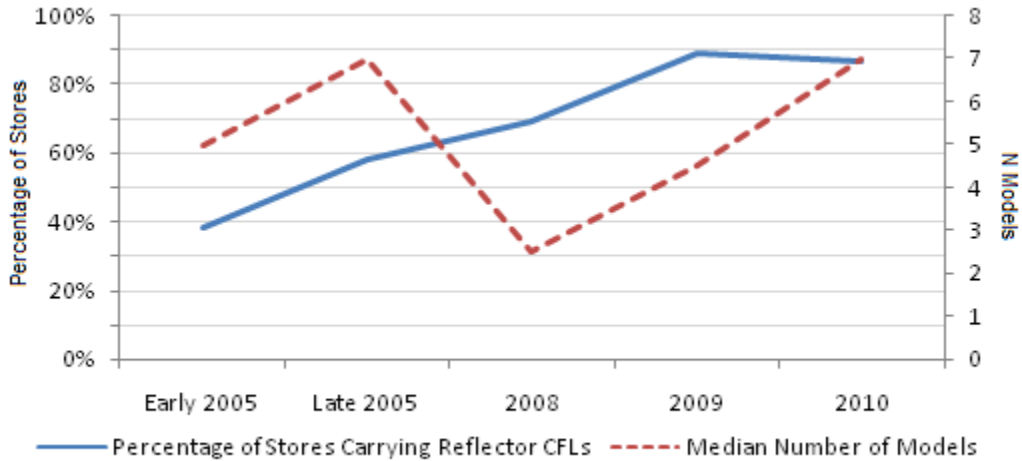
There is also considerable variation in diversity between store types. Depending on store type, between 80% and 100% of Oregon lighting retailers carry specialty CFLs. Metro area stores are more likely to carry specialty CFLs than are Rural stores just as Big Box stores are more likely to carry specialty bulbs than are Grocery/Drug/Hardware stores. See Appendix D for additional detail on differences between store types.

Figure 8 below shows the percentage of stores that specifically carry Reflector CFL Bulbs. A larger percentage of Metro stores and Big Box stores stock Reflector CFLs relative to their respective counterparts. The slight decrease in the portion of Oregon stores offering Reflector CFLs in 2010 is driven by decreased availability in Grocery/Drug/Hardware stores.

Although the slight reduction in the overall availability of Reflector CFLs over the past year is not statistically significant, when we take a longer view and compare 2010 availability with 2008 availability, the earliest year in which we have a relatively robust sample, the increase in availability is statistically

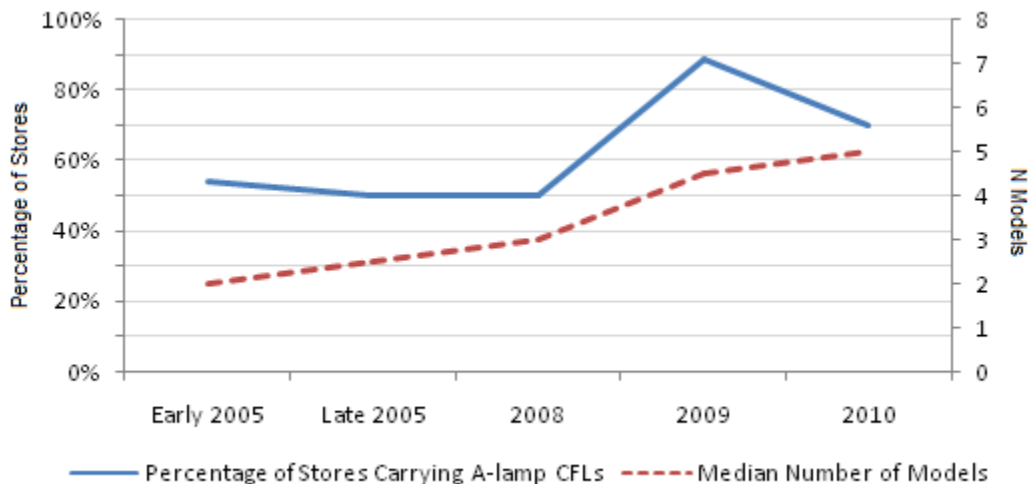
significant. This trend of increasing availability is mirrored by a statistically significant increase in diversity of models offered over the same time period.

Figure 8. Percentage of Stores Carrying Reflector CFL Bulbs and Median Number of Models Available over Time



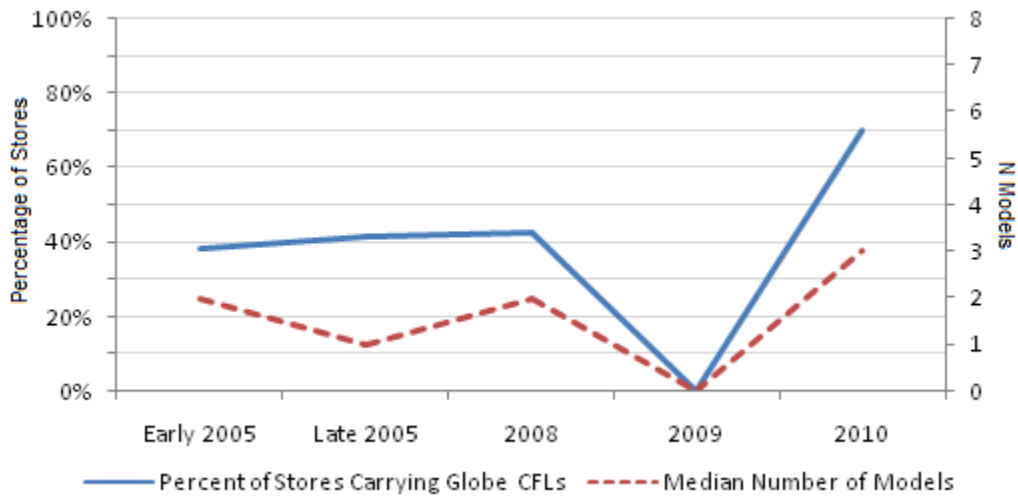
The availability of A-lamp CFLs has increased from 50% to 70% of stores since 2008, accompanied by steadily declining variation in availability between store types. This increased availability has been most notable among Grocery/Drug/Hardware stores; 60-75% of these stores observed in the 2010 survey were carrying A-lamp CFLs compared to just 30-43% of stores surveyed in 2008. As with reflector bulbs, the increased availability and diversity of A-lamp CFL models available between 2008 and 2010 is statistically significant, shown in Figure 9.

Figure 9. Percentage of Stores Carrying A-lamp CFL Bulbs and Median Number of Models Available over Time



Oddly, the 2009 survey recorded no observations of Globe CFLs being stocked in Oregon. This would seem unlikely, as over 40% of retailers carried an average of 2 models of Globe CFLs in 2008 and 70% or retailers surveyed in 2010 stocked an average of 3 models. Regardless of the lack of observations in 2009, it is clear that Globe CFLs have seen trends in increasing availability and diversity similar to those of Reflector and A-lamp CFLs, as shown in Figure 10 below.

Figure 10. Percentage of Stores Carrying Globe CFL Bulbs and Median Number of Models Available over Time



Trends in availability and diversity of the last two types of screw-based specialty bulbs, Two-tube and Four-tube CFLs (it is assumed that these are screw-based, and distinct from the tube lamps using pin-based ballasts), are less easily interpreted. Although the differences are not statistically significant, it appears that availability of Two-tube CFLs has trended upwards since 2008, driven largely by increased availability in Big Box stores. In contrast, the availability of Four-tube CFLs has trended downward driven largely by reduced availability in Metro stores, to where Four-tube CFLs are now most prevalent in rural Grocery/Drug/Hardware stores, where approximately 40% of stores carry them.

Interestingly, those stores that do stock Four-tube CFLs appear to have converged in their stocking practices so that the average store carrying such bulbs has just one model available. This finding points towards the stocking of Four-tube CFLs as being a token gesture towards the lamp type, indicating that they are not priorities for retailers.

Figure 11. Percentage of Stores Carrying Two-tube CFL Bulbs and Median Number of Models Available over Time

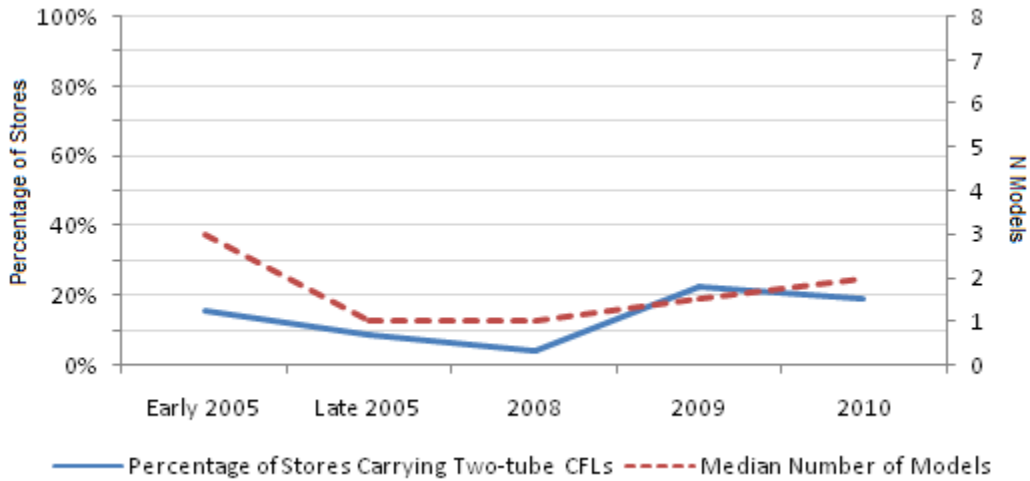
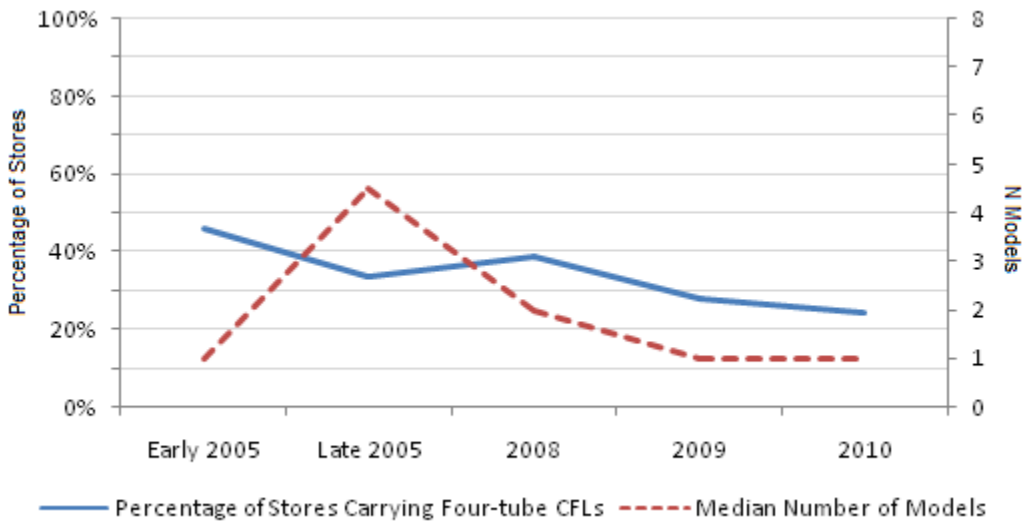


Figure 12. Percentage of Stores Carrying Four-tube CFL Bulbs and Median Number of Models Available over Time

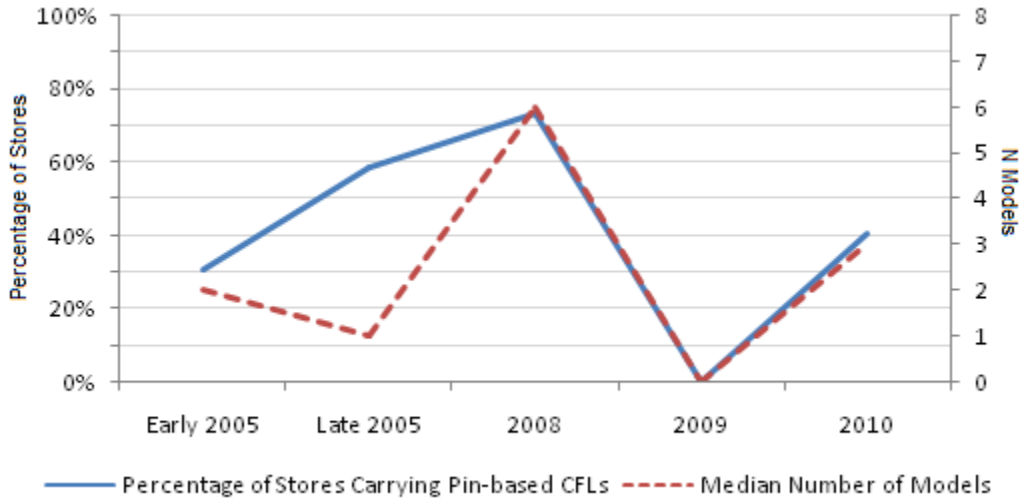


The following figures show the availability and diversity of models of Pin-based CFL bulbs in Oregon stores. As with Globe CFLs, the 2009 survey recorded no instances of Pin-based CFL bulbs being available in Oregon. This observation is in line with the sharp drop in availability for the Northwest region overall⁶. Given the relative prevalence of such bulbs both one year before and after the 2009 study, it is likely that the '0' observations are not fully reflective of the market overall (likely due to some sampling or

⁶ See the NEEA 2008-2009 CFL Tracking Study

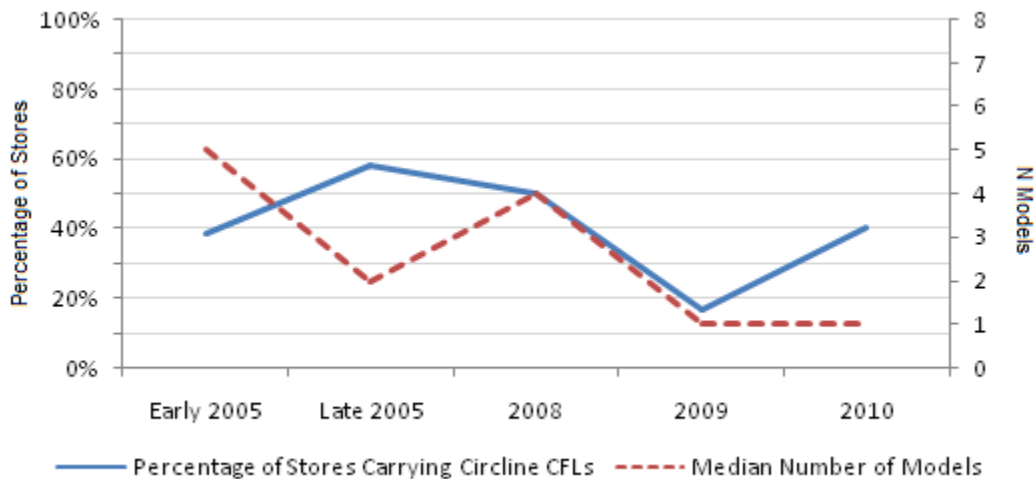
data collection error), yet Oregon’s trend in declining availability of Pin-based CFLs is similar to that being experienced by the Pacific Northwest as a whole. This decline is further reflected in the statistically significant drop in number of models per store from 6.7 in 2008 to 4.2 in 2010.

Figure 13. Percentage of Stores Carrying Pin-based CFL Bulbs and Median Number of Models Available over Time



There is considerable variation in the availability of Circline CFLs; while such bulbs were stocked more prevalently in rural stores in 2010 than in years past, none of the metropolitan Big Box stores surveyed in 2010 carried Circline bulbs, leading to decreased availability of such bulbs over time. This change in availability between 2008 and 2010 was statistically insignificant, yet the overall decline in number of models stocked per store, from 4.0 in 2008 to 1.0 in 2010, was significant and can be seen in Figure 14.

Figure 14. Percentage of Stores Carrying Circline CFL Bulbs and Median Number of Models Available over Time



Observed Shifts in Specialty Bulb Shelving

The changes in shelving practices over time indicate that screw-based specialty bulbs have grown to dominate the Oregon retail market over competing Pin-based and Circline CFL technology. Similarly, the selection of the alternative ballast CFLs is diminishing in the stores that do still carry these bulbs.

As part of this shift away from alternative based fixtures there is an observed trend away from tubular bulbs – Two-tube and Four-tube screw based bulbs as well as Pin-based and Circline bulbs, which tend to have similar tube structure – towards the A-lamp, Globe, and Reflector CFLs more reminiscent of older incandescent lighting.

The decline in lighting shelving of many bulb types observed in the 2009 survey is puzzling. One explanation for this downward fluctuation is the overall economic condition and the general state of CFL technology. It is possible that the reduced availabilities of the less prevalent CFL technologies in 2008 and 2009 were a result of the deep recession dominating the Oregon and United States economic climate during the time of the surveys; reduced availability and diversity may reflect the drawing down of inventories in the face of weak consumer demand for more exotic lighting options. Uncertainty about the direction of the residential lighting market and the fate of CFL technology would exacerbate any such trends in retailer's management of inventory, creating hesitation in investment in the inventory of less common CFL types, as they are potentially obsolete technologies. If this were the case, the increased availability and more diverse selection may reflect consumers and retailers expectations of a near recovery and a resulting restocking by retailers.

Regardless of the reasons for the odd observations in the 2009 survey, the stocking practices of Big Box stores in MSAs appears to have diverged from the practices of other stores during the years preceding the 2010 survey. With a focus on mass merchandise, a tendency to be larger national chains, and a higher turnover of their inventory, Big Box retailers are more flexible and responsive to consumer demand, apt to change what products they carry. Their movement away from shelving Pin-based and Circline technologies is likely the best indicator of direction of the specialty CFL market and that the future will be dominated by screw-based lamps. One can expect the smaller Grocery/Drug/Hardware stores to continue to carry alternative ballast CFL technologies as they fill the niche of supplying any remaining Circline and Pin-Based CFL demand.

Price per CFL

The average price per CFL bulb was calculated using weighted averages based upon the Energy Trust sales data. Weighting by sales data makes the average prices more reflective of the actual price paid per customer and less reflective of the average price observed in stores.

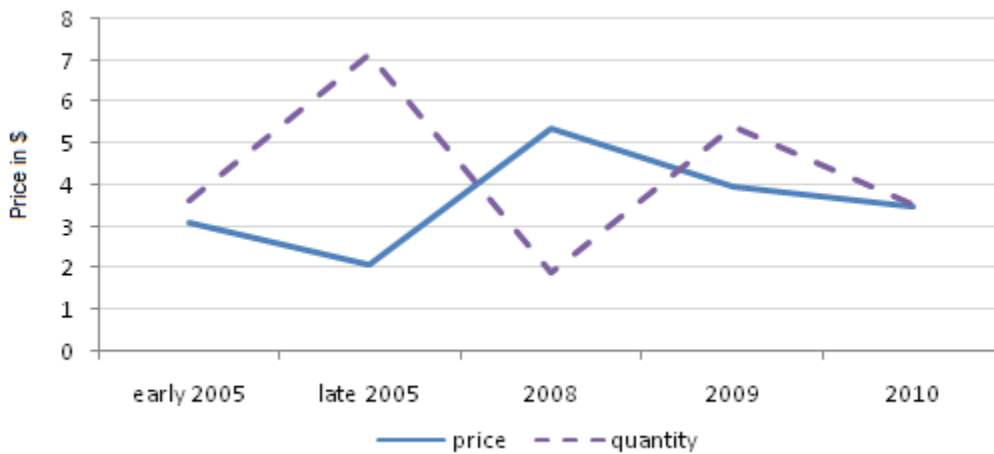
Table 9. Sample Sizes of Bulb Types, by Survey Year

Survey Year	Twister	Reflector	A-lamp	Pin-based	Circline	Globe	Two-tube	Four-tube
Early 2005	74	24	12	7	27	10	6	13
Late 2005	98	38	16	12	20	6	1	16
2008	195	77	36	142	64	23	1	24
2009	284	84	98	0	3	0	4	8
2010	842	259	152	68	32	82	13	8

In the following figures, the weighted average of price per bulb is graphed alongside the quantity of bulbs per package to provide context for the fluctuations in price. There is a clear inverse relationship between the quantity of bulbs per package and price per bulb as well as a likely positive relationship between bulb wattage and bulb price. See Appendix E for average wattage and after rebate price per bulb.

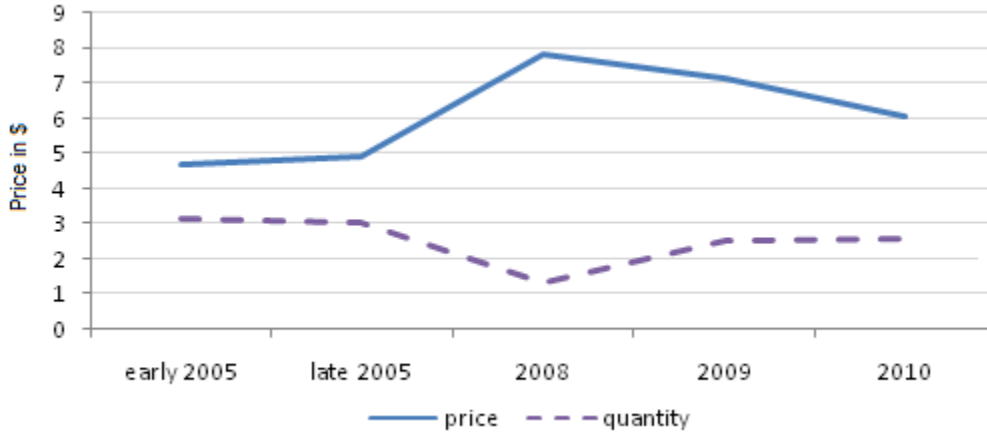
Figure 15 below displays the trends in average price paid per twister CFL. The left axis is the scale for both price and quantity, price measured in dollars and quantity in number of bulbs per package. The reduction in price, from \$3.97 in 2009 to \$3.51 in 2010 is similar to what NEEA's *2009-2010 Residential Lighting Market Research Study* found for the region overall.

Figure 15. Average Price Paid per Twister CFL Bulb in Oregon, over Time



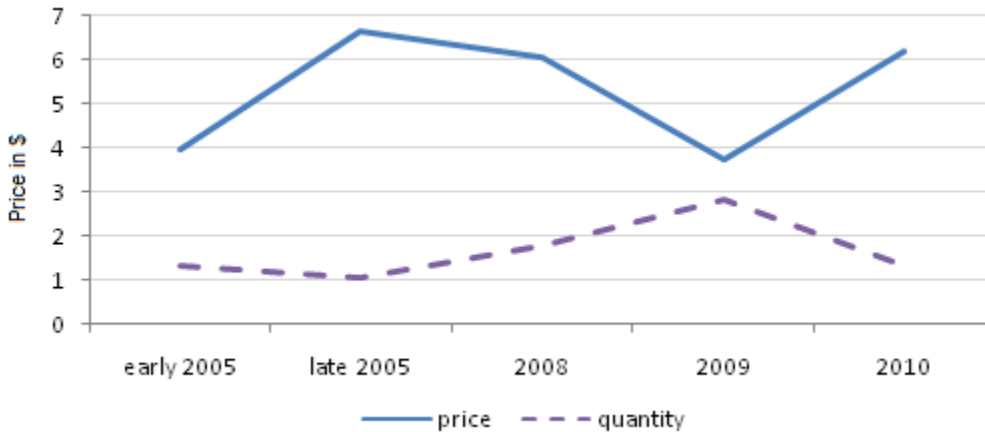
Price paid per Reflector CFL decreased from \$7.12 in 2009 to \$6.04 in 2010, while the after rebate price dropped less sharply from \$6.13 to \$5.55. On average, reflector CFLs are bought in 2-3 bulb packages.

Figure 16. Average Price Paid per Reflector CFL Bulb in Oregon, over Time



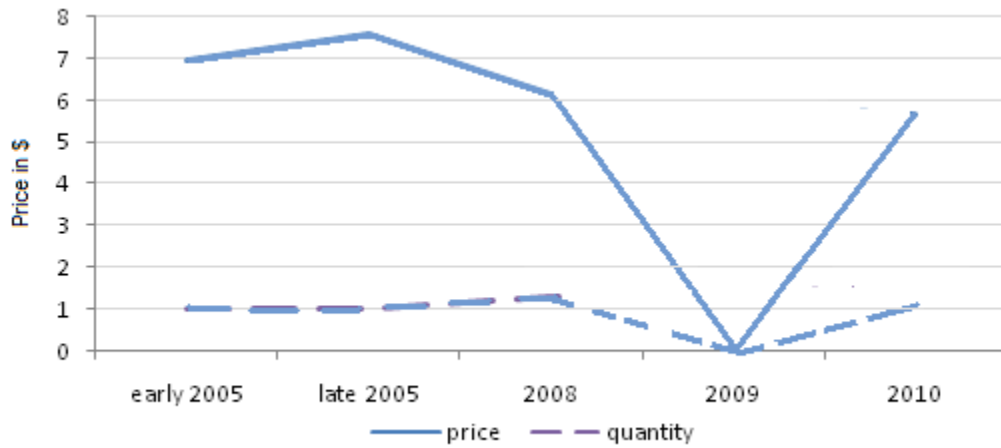
Price paid per A-lamp bulb increased in the year to 2010, from \$3.72 to \$6.17, with a similar rise in the after rebate price. These increases are likely due to the corresponding increased wattage per bulb and reduced quantity of bulbs per package observed over the time period.

Figure 17. Average Price Paid per A-lamp CFL Bulb in Oregon, over Time



Although there were no observed Globe CFLs in 2009, the average price paid per bulb in 2010 is approximately \$5.67, down from \$6.13 in 2008. The after rebate price dropped even further to \$4.88 per bulb, as there were no observed rebates for Globe CFLs in prior surveys.

Figure 20. Average Price Paid per Globe CFL Bulb in Oregon, over Time

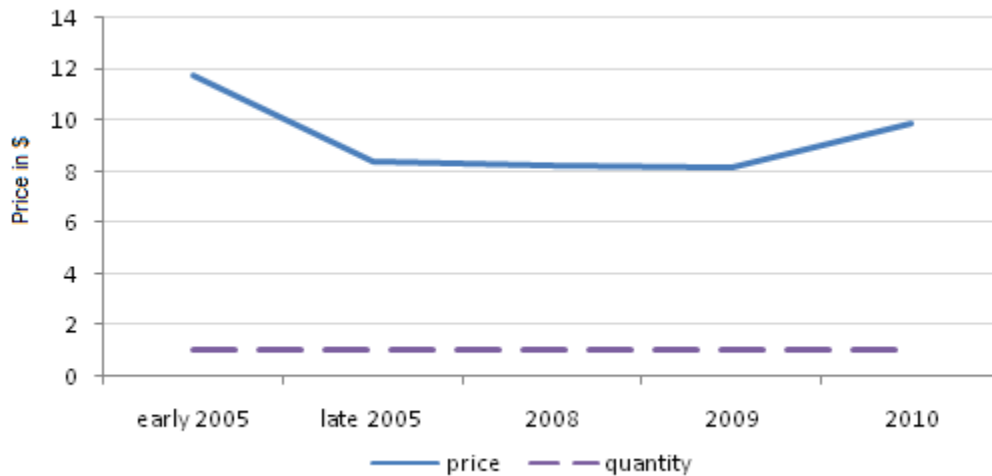


The following two figures show that for Pin-based and Circline CFLs the price per bulb has increased slightly since 2008 and 2009, during which there were no rebates offered. Packaging for both bulb types has remained constant over the survey period at 1 bulb per package.

Figure 18. Average Price Paid per Pin-based CFL Bulb in Oregon, over Time



Figure 19. Average Price Paid per Circline CFL Bulb in Oregon, over Time



Regression Analysis of CFL Bulb Price

The above graphs clearly indicated that the diversity in bulb characteristics obscured any observations of trends in the prices of specialty lighting. These differentiating bulb characteristics were controlled for using simple regression analysis, allowing for a somewhat clearer picture of how bulb prices are changing over time.

Independent variables used in the regression analysis were bulb specific characteristics such as wattage, having Energy Star certification, being dimmable, being a three-way bulb, and quantity of bulbs per package, and the store characteristics of being located in a metropolitan area, being a Big Box location, and being located in Oregon. Two variables, one for being part of the 2009 and one for the 2010 survey were included, using bulbs from 2008 as a baseline to estimate trends in bulb pricing.

Preliminary regression results using log transformations of bulb price and bulb wattage indicate that overall, prices of CFL bulbs have seen a statistically significant decrease over the last two years. However, when individual bulb styles are analyzed separately, the decline in bulb price over time is no longer significant, indicating that the overall decline in price is due to the changing mix of bulbs sold and not to reductions in the cost of technology. Despite the lack of statistical significance, for the majority of the bulb types the results indicated a downward direction in bulb prices over time.

Concluding Remarks and Recommendations

Recommendations to Energy Trust and Future Shelving Studies

1. That 45-49% of lighting shelving is dedicated to specialty bulbs indicates that this is a large segment of the lighting market and a segment worth pursuing. NEEA, Energy Trust, and similar organizations in the Pacific Northwest should continue to be active in this market, promoting CFL alternatives where they exist and supporting further development of CFL and LED alternatives for applications in which they are currently none.
2. The practice of shelving specialty CFLs has been adopted least by rural Grocery/Drug/Hardware stores. Any thoughts towards expanding existing programs to increase CFL market penetration in these areas should take into consideration (1) their limited role as a channel for residential CFL sales and (2) the relatively small impact that such efforts would have on CFL share of the specialty bulb market in Oregon.
3. Energy Trust should continue to pursue coordination with their home products program management contractor on any future shelving surveys, specifically on survey methodology, consistency in data collection, and a compatible survey sample. Such coordination will help reduce redundancy of survey efforts and ensure that the data collected expands and enriches the understanding of the residential lighting market in Oregon.
4. Energy Trust should pursue building upon their existing partnerships with participating lighting retailers in an effort to move towards more comprehensive data collection. Ideally, data on CFL sales outside of the Energy Trust program as well as incandescent bulb sales could be available to Energy Trust. Such information would enhance understanding of the CFL market in Oregon and allow for a more accurate determination of CFL market share in Energy Trust service territory. Potential benefits for partnering retailers might include store level analysis and feedback on lighting sales and analysis of the state of the residential lighting market.
5. Future NEEA surveys should include an expanded sample that includes stratification such that each state's sample is representative, allowing for comparisons between states. Such comparisons would allow for analysis of the effects that the various regional energy efficiency programs and initiatives are having on the residential lighting market, providing useful feedback to program staff and policy makers.

6. Future NEEA surveys should continue to record lumens per bulb. As residential energy efficiency lighting moves towards incorporating more LED technology this will become an increasingly important element of any future analysis of the residential lighting market.
7. In light of the observed shift from alternative based bulbs towards screw-based lamps and the coinciding shift away from tubular CFLs, NEEA should expand the other components of their research in the residential lighting market - the market actor interviews and residential consumer surveys - to include questions concerning the main drivers of these trends. This additional questioning would help clarify the source of this shift - changing consumer demand or changes in production and supply - as well as identify the root causes. These insights will prove valuable to both bulb manufacturers and energy efficiency programs as they move forward in developing new energy efficient lighting products and expand the market.

Appendix A. Store Sample

The stores surveyed for NEEA are stratified to represent the Northwest region of the United States, covering the states of Idaho, Montana, Oregon, and Washington⁷. Due to Energy Trust's specific interest in CFLs in the specialty bulb market, the Oregon sample was expanded to provide a more robust sample for analysis of the state's retailers.

The following table shows the geographic distribution of surveyed stores. Stores surveyed in Montana more heavily represent rural regions, whereas the sample of Washington stores is more heavily weighted towards metropolitan areas. The following table displays the distribution of the 2010 shelving study sample.

Table AA.1. Sample Distribution

Region	MSA East	MSA West	Non MSA	% Metro	% Rural
<i>All</i>	16	31	31	60%	40%
<i>Oregon</i>	0	23	17	58%	42%
<i>Idaho</i>	12	0	7	63%	37%
<i>Montana</i>	2	0	5	29%	71%
<i>Washington</i>	2	8	2	83%	17%
<i>I-M-W</i>	16	8	14	63%	37%

Roughly 43%, 17 of the 40 stores, surveyed in Oregon were participants with Energy Trust (defined by my having sales data on them from PECL).

Comparisons between OR and IMW are further complicated by consistent differences in the total shelving space that was recorded between the two samples. This difference is largest when considering Big Box stores, observable in Grocery/Drug/Hardware stores to a lesser degree. In both OR and IMW samples slightly over 50% of Big Box stores were in a Metropolitan setting.

Table AA.2. Linear feet of specialty bulb shelving in Big Box Stores

	OR*	IMW
<i>N</i>	14	11
<i>Min</i>	0	0
<i>Median</i>	143	5
<i>Max</i>	292	52
<i>Mean</i>	153	12
<i>Standard Deviation</i>	85	18

* Excludes Club/Warehouse stores

⁷ Stratification is based upon a lighting retailers database obtained by KEMA from PECL.

Table AA.3 Linear feet of all bulb shelving in Big Box Stores

	OR*	IMW
<i>N</i>	14	11
<i>Min</i>	2	3
<i>Median</i>	392	56
<i>Max</i>	644	516
<i>Mean</i>	331	149
<i>Standard Deviation</i>	168	188

* Excludes Club/Warehouse stores

Unless there is a fundamental difference between OR and IMW stores, this observation provides reason to question the consistency of the data collection processes and is a potential shortcoming of the data. With this in mind, the primary interest here is the share of shelf space dedicated to CFL technology, and while the total linear feet estimates may be inconsistently recorded the relative shares should prove to be consistent and of use.

If values for the linear feet of shelf space were recorded inconsistently any comparison of overall market share will be biased as the share of specialty bulb shelving will be heavily weighted towards Grocery/Drug/Hardware stores in the IMW region. However, if these values were recorded consistently this difference indicates that Oregon is distinct from its Northwest counterparts in the provision of specialty bulbs.

Table AA.4 Distribution of Specialty Bulb Shelf Space in OR and IMW

	Metro Big Box	Rural Big Box	Metro Grocery/Drug/Hardware	Rural Grocery/Drug/Hardware	Total
OR	27.69%	29.19%	22.49%	20.63%	100.00%
IMW	3.97%	8.12%	38.31%	49.60%	100.00%

* Excludes Club/Warehouse stores

Appendix B. Weighting Schemes for Retail Shelving Based Market Share of CFLs

The following document provides documentation for the weighting scheme used to estimate CFL share of retail lighting space, MS , using the following formula:

$$MS = \sum_{i=1}^n p_i \cdot w_i$$

Where i is a given store type, p_i is the fraction of lighting space dedicated to CFL technology for store type i , and w_i is the fraction of total Oregon retail lighting space represented by store type i and $\sum_{i=1}^n w_i = 1$.

In using the above formula to estimate CFL share of retail shelving space, \mathbf{p} and \mathbf{w} must be accurately estimated. The following approaches to calculating \mathbf{p} were used:

- 1) Based upon the average % of lighting space dedicated to CFLs in each store type, we use the following formula:

$$p_i = \frac{\sum_{j=1}^m \frac{CFL_j}{LIGHT_j}}{m}$$

- 2) Based upon the total % of lighting space dedicated to CFLs in each store type, we use the following formula:

$$p_i = \frac{\sum_{j=1}^m CFL_j}{\sum_{j=1}^m LIGHT_j}$$

Where m is the number of stores of type i and j is a given store, CFL_j is the total linear feet of CFL technology shelf space in store j and $LIGHT_j$ is the total linear feet of all lighting shelf space in store j .

The vector of weights, \mathbf{w} , is necessary to adjust the sample to ensure it accurately represents Oregon's lighting retailers. Ideally, such weights could be constructed using the PECL database of lighting retailers using the following formula:

$$w_i = \frac{LS_i}{TLS}$$

Where $TLS = \sum_{i=1}^n LS_i$, and LS_i is an estimate of lighting shelving of all stores of type i , estimated by multiplying the number of stores of type i in the database by the average linear feet of lighting in a store of type i , as observed in the retail shelving survey.

Without access to the database of lighting retailers, it was assumed that the sample was stratified to represent the population of Oregon lighting retailers. Resting on this assumption, store type was defined in two ways: (1) strictly by store type (Club/Warehouse, Mass Merchandise, DIY, Small Hardware, Drug & Grocery) and (2) by a combination of geography and store classifications (Metro Big Box, Rural Big Box, Metro Grocery/Drug/Hardware and Rural Grocery/Drug/Hardware).

The primary advantage of using the first definition is that the distribution of each store type in Oregon (as found in the PECL database of lighting retailers) was taken directly from NEEA's 2007 *ENERGY STAR Consumer Products Program Market Progress Evaluation Report*. The primary disadvantage is that such a definition does not take into account differences between metropolitan and rural stores.

Two other sets of weights were constructed using the second definition, one weighting scheme based upon the percentage of total Oregon lighting retailers represented by each type and the other based upon the percentage of total Oregon retail lighting shelving space represented by each store type. While using actual shelving space is theoretically a more appropriate weight, this weighting scheme will be most affected if the sample is not fully representative of Oregon retailers overall or not an accurate representation of a particular store type (see Appendix B for a discussion of the sample's representation).

Appendix C. Pearson Correlation Coefficients

AC.1 Correlation Coefficients for Whole 2010 Survey Sample

	Metro	Big Box	Independent	National Chain
Metro	1.000	-0.015	-0.286	0.123
Big Box	--	1.000	-0.207	0.567

AC.2 Correlation Coefficients for Oregon 2010 Survey Sample

	Energy Trust Participant	Metro	Big Box	Independent	National Chain
Energy Trust Participant	1.000	0.023	0.386	-0.463	0.354
Metro	--	1.000	0.023	-0.263	0.152
Big Box	--	--	1.000	-0.463	0.759

Appendix D. Additional Availability and Diversity Charts

Figure AD1. Percentage of Stores Carrying CFLs, by Bulb Style Over Time

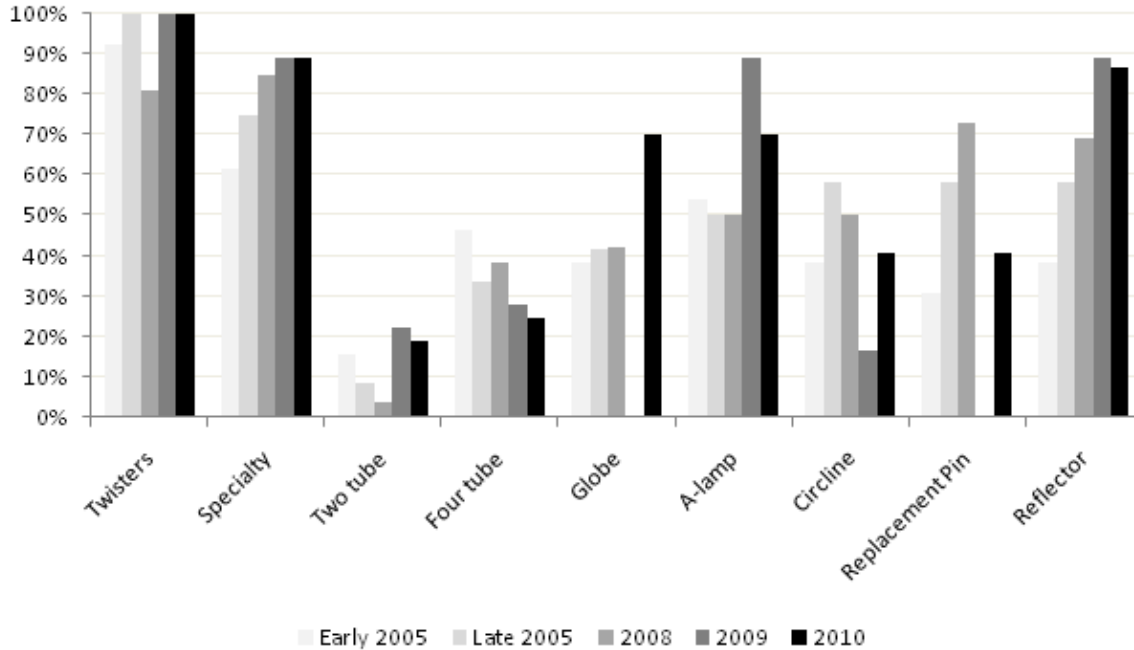


Figure AD2. Percentage of Stores Carrying Specialty CFL Bulbs, by Store Type Over Time

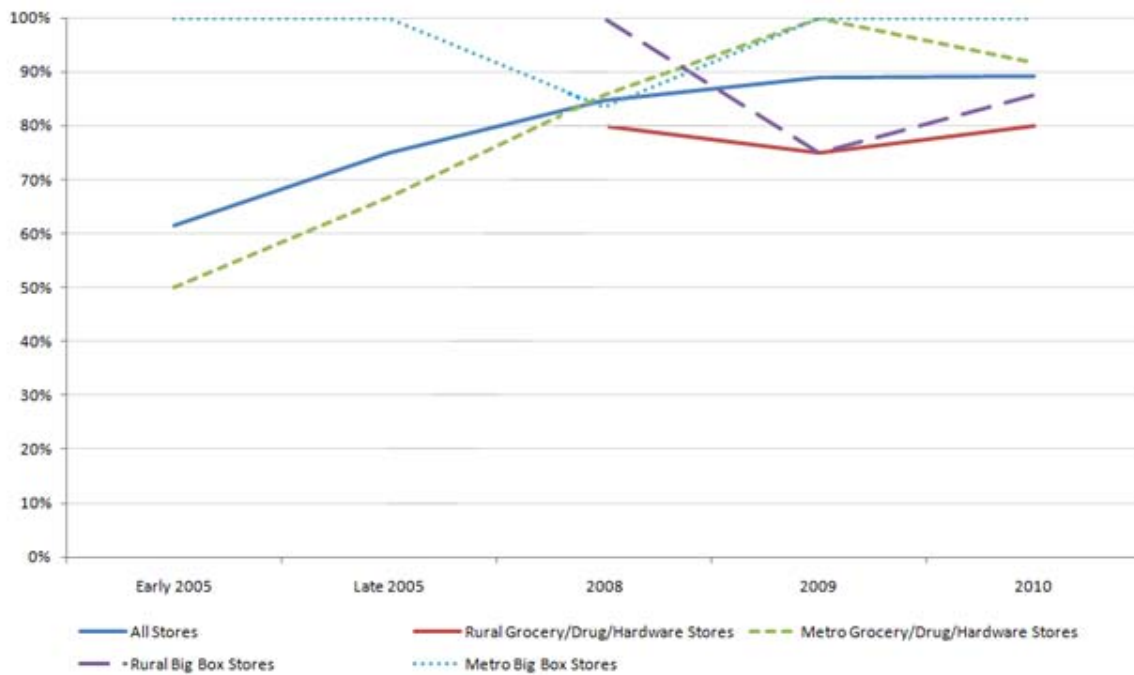


Figure AD3. Percentage of Stores Carrying CFL Reflector Bulbs, by Store Type, over Time

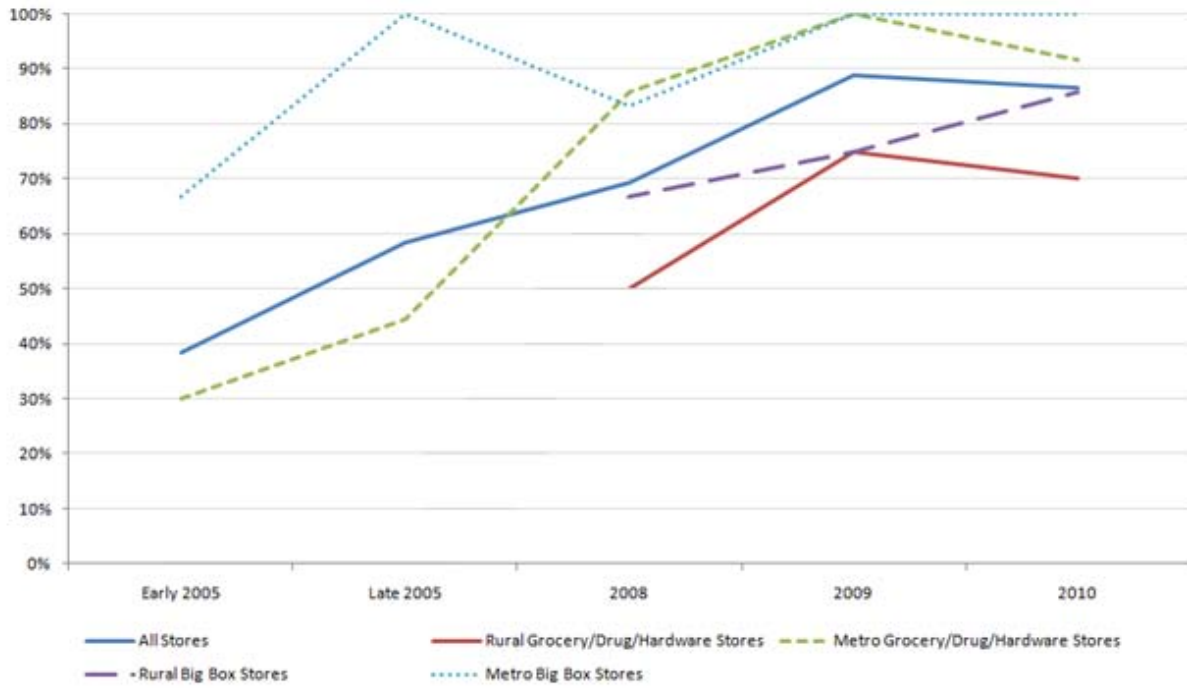


Figure AD4. Median Number of Different Reflector CFL Models, by Store Type, over Time

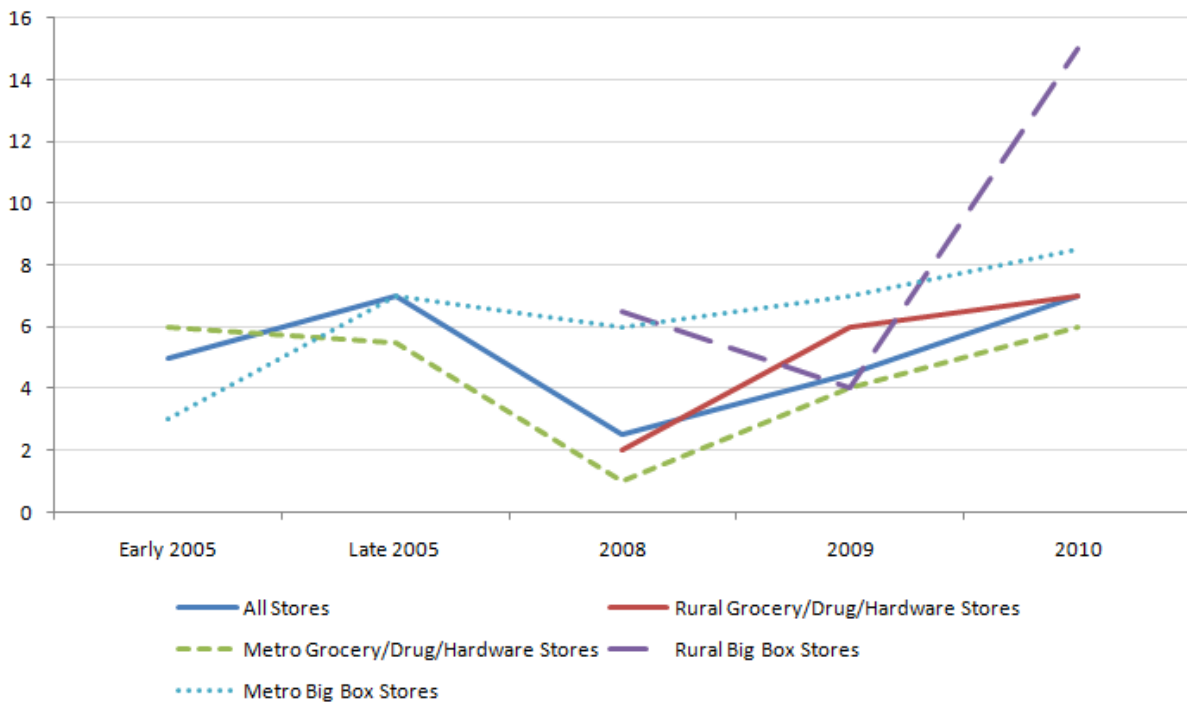


Figure AD5. Percentage of Stores Carrying CFL A-lamp Bulbs, by Store Type Over Time

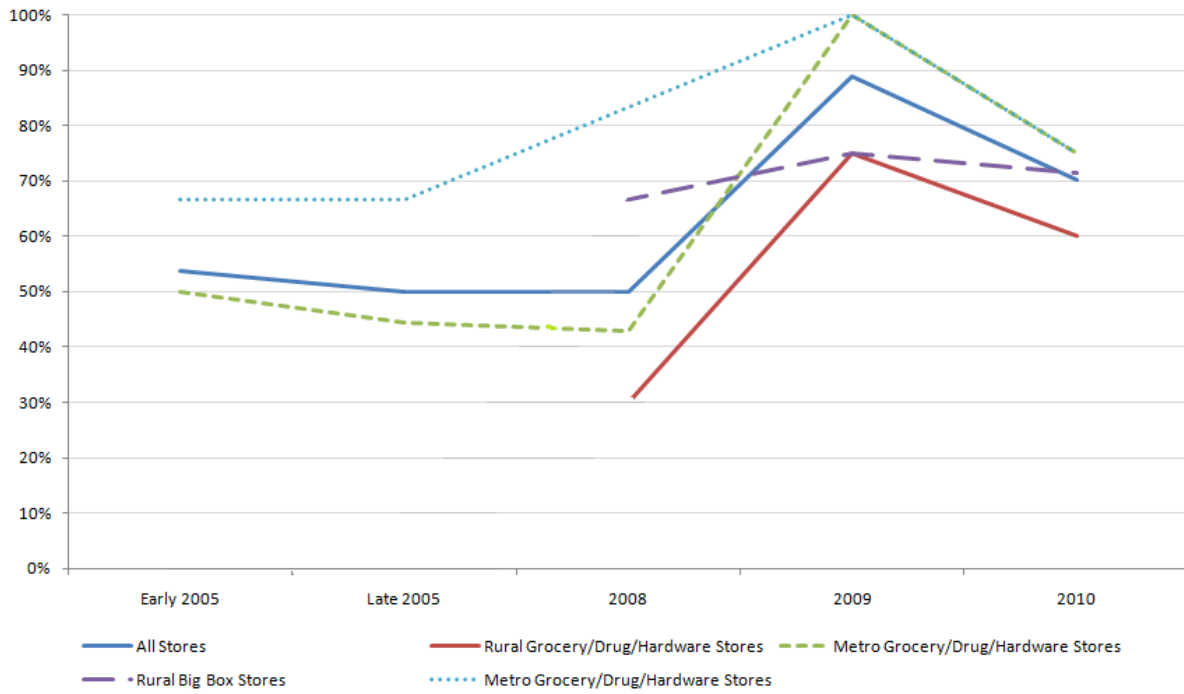


Figure AD6. Median Number of Different A-lamp CFL Models, by Store Type, over Time

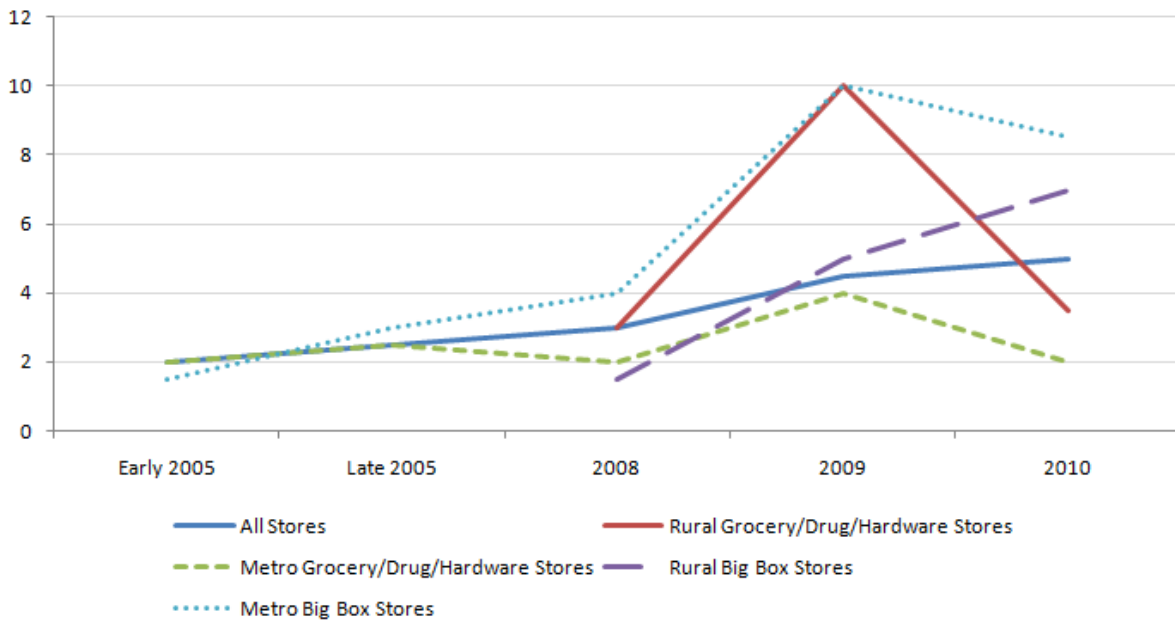


Figure AD7. Percentage of Stores Carrying Globe CFL Bulbs, by Store Type, over Time

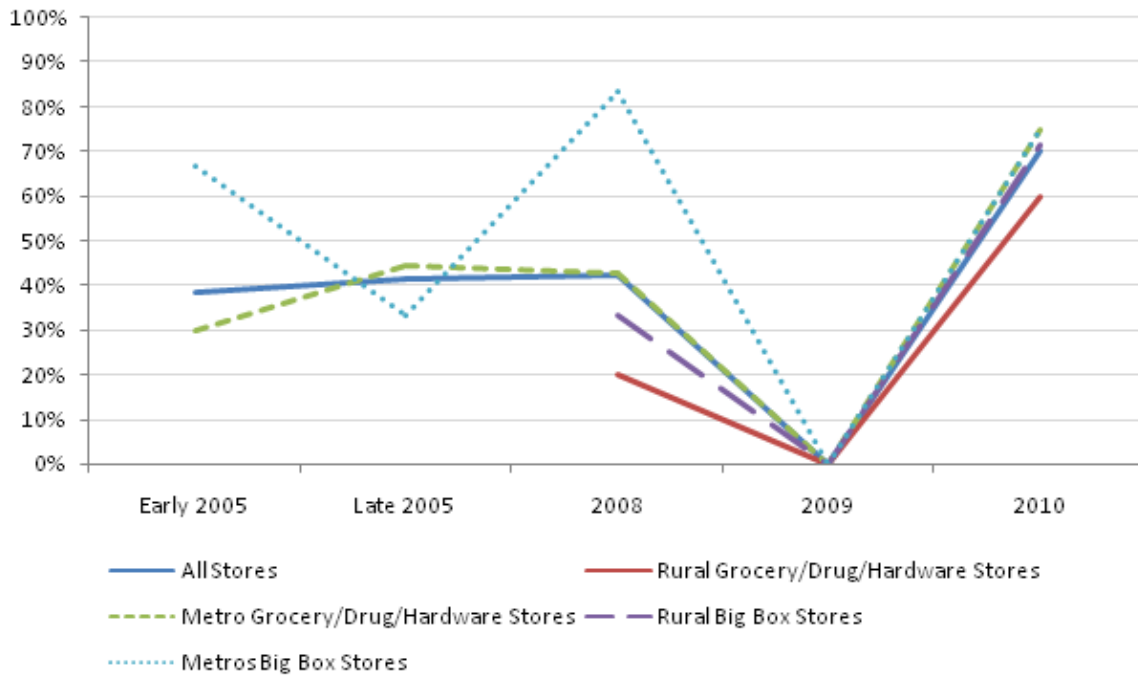


Figure AD8. Percentage of Stores Carrying CFL Two-tube Bulbs, by Store Type, over Time

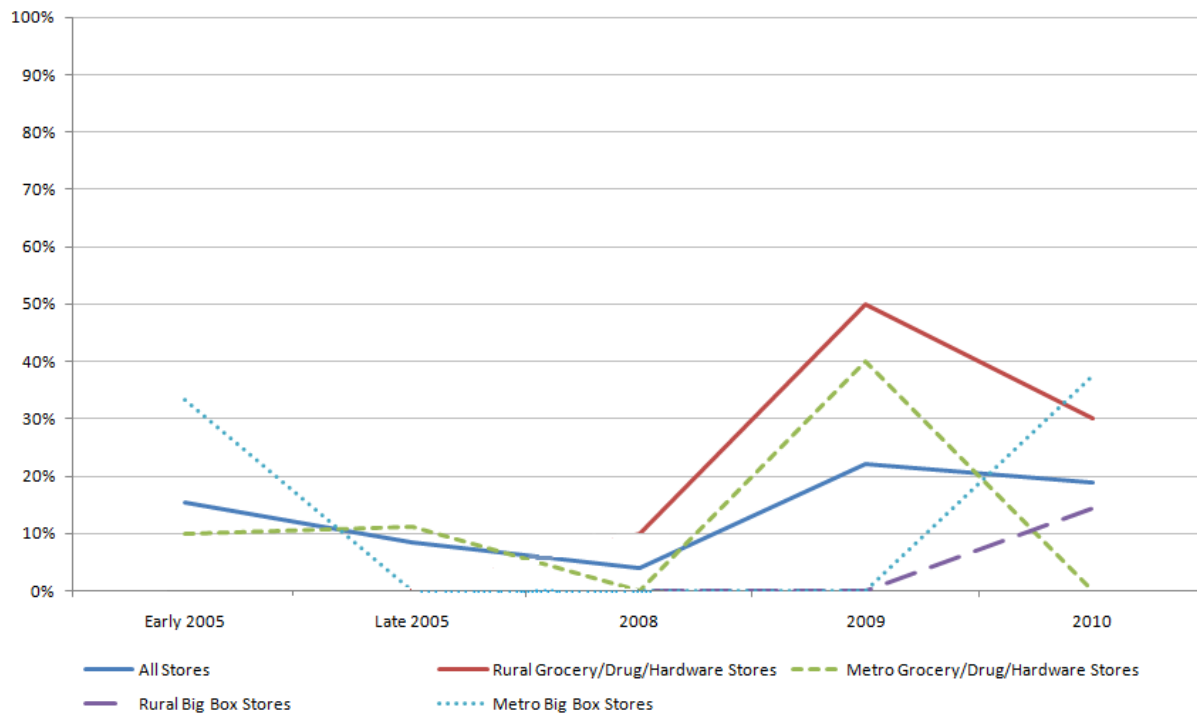


Figure AD9. Percentage of Stores Carrying CFL Four-tube Bulbs, by Store Type, over Time

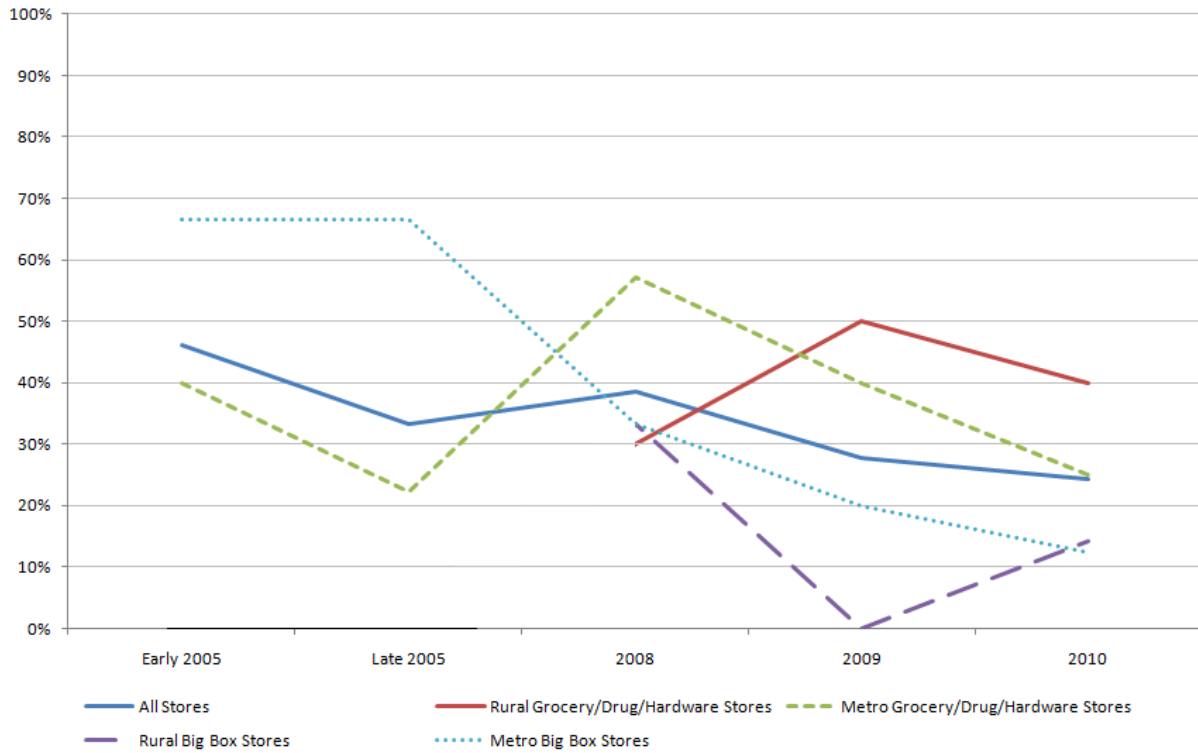


Figure AD10. Median Number of Different Four-tube CFL Models, by Store Type, over Time

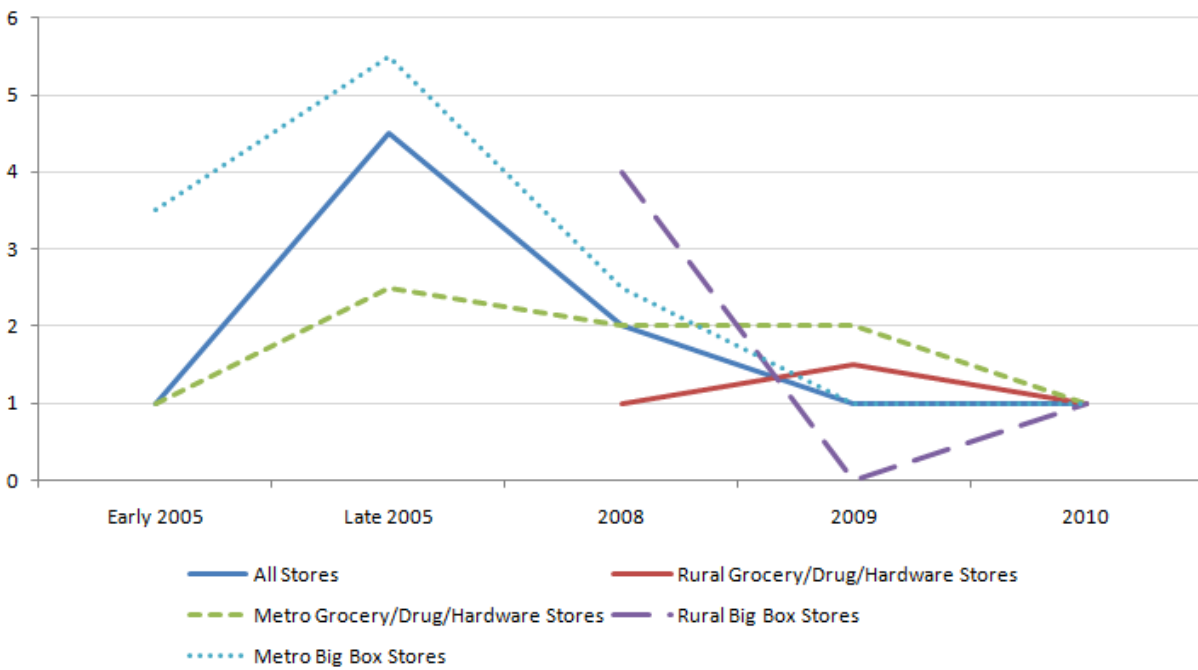


Figure AD11. Percentage of Stores Carrying Pin-based CFL Bulbs, by Store Type, over Time

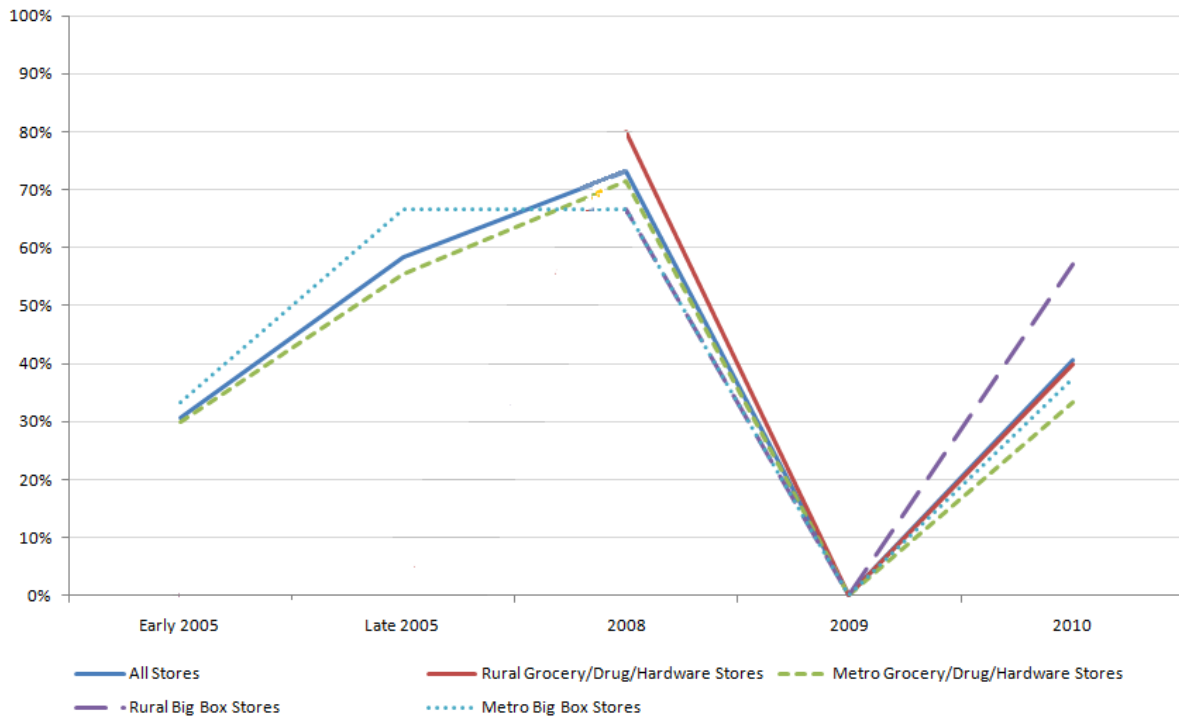


Figure AD12. Median Number of Different Pin-based CFL Models, by Store Type, over Time

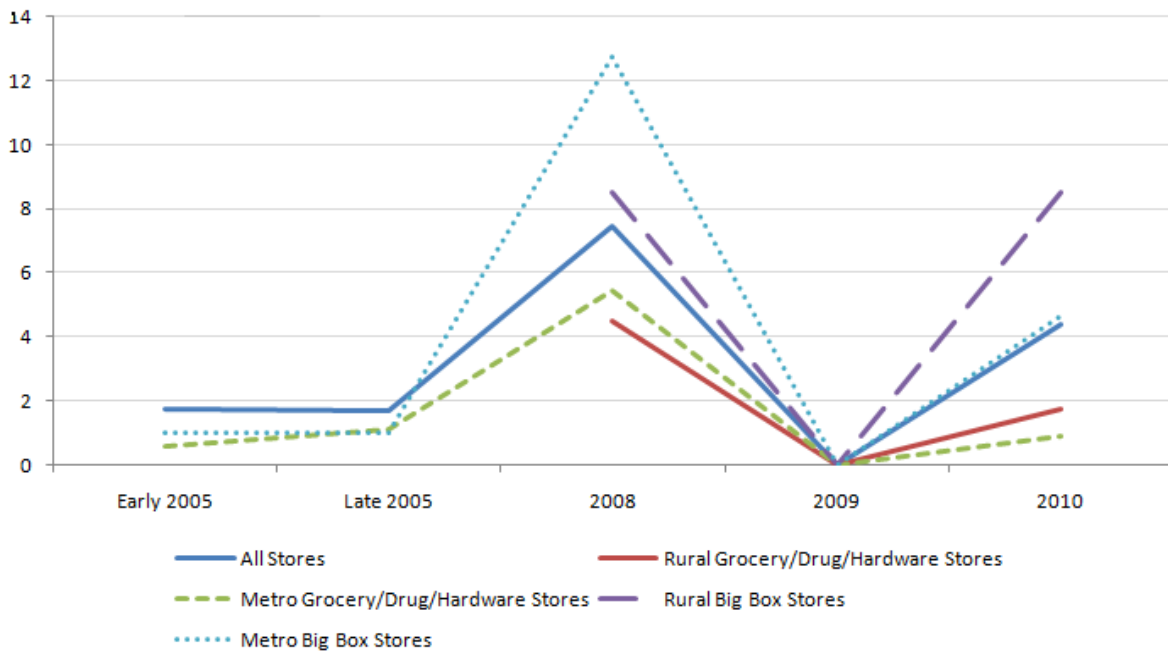


Figure AD13. Percentage of Stores Carrying CFL Circline Bulbs, by Store Type Over Time

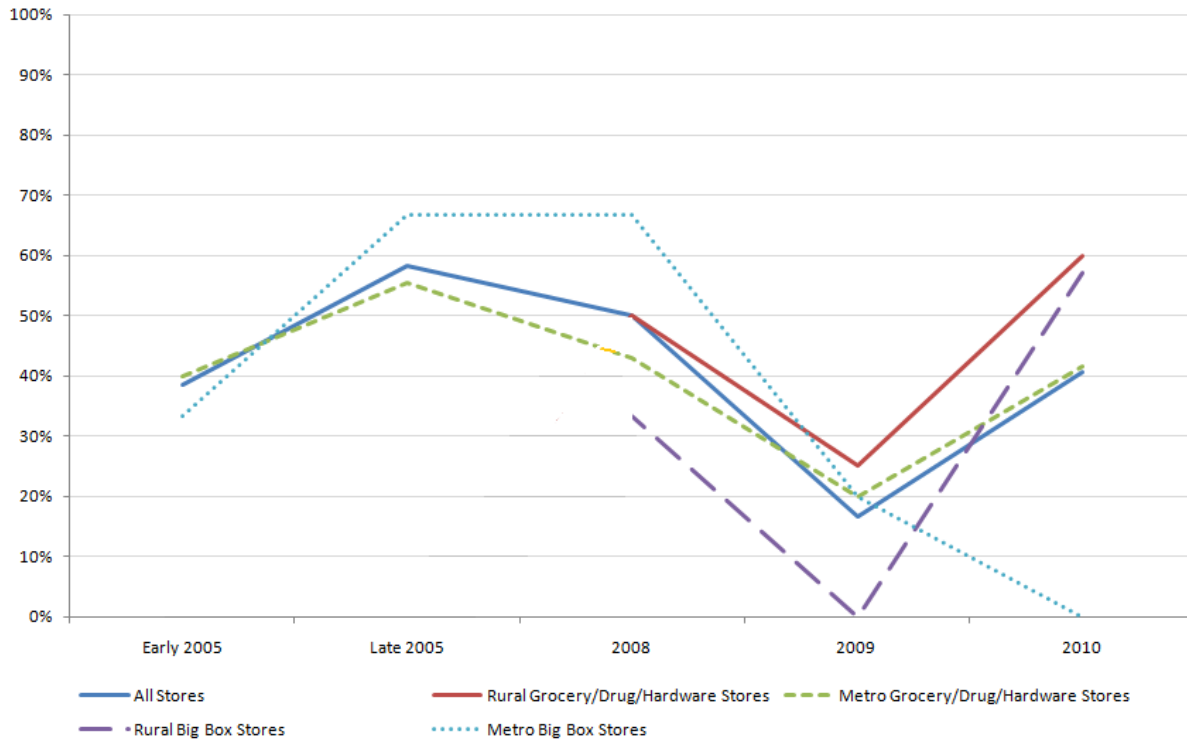
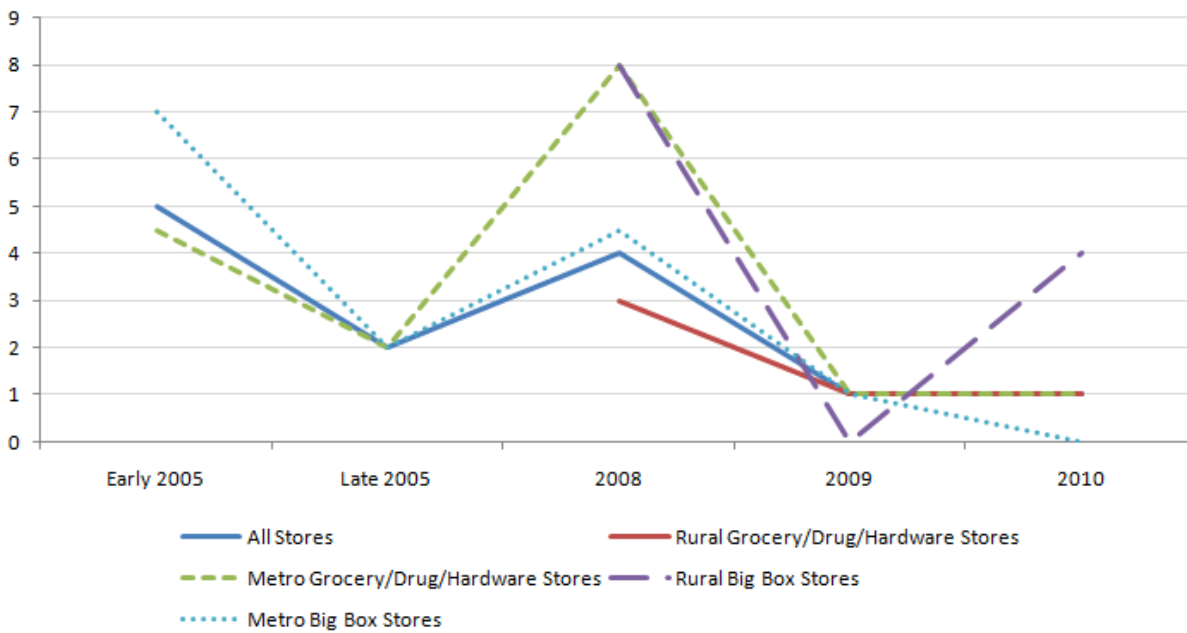


Figure AD14. Median Number of Different Circline CFL Models, by Store Type, over Time



Appendix E. Additional Price of CFLs Time Series Charts

For the following figures, the right hand axis is wattage per bulb, whereas the left hand axis is for both quantity (number of bulbs per package) and price (\$).

Figure AE.1 Average Price Paid per Twister CFL Bulb in Oregon, over Time

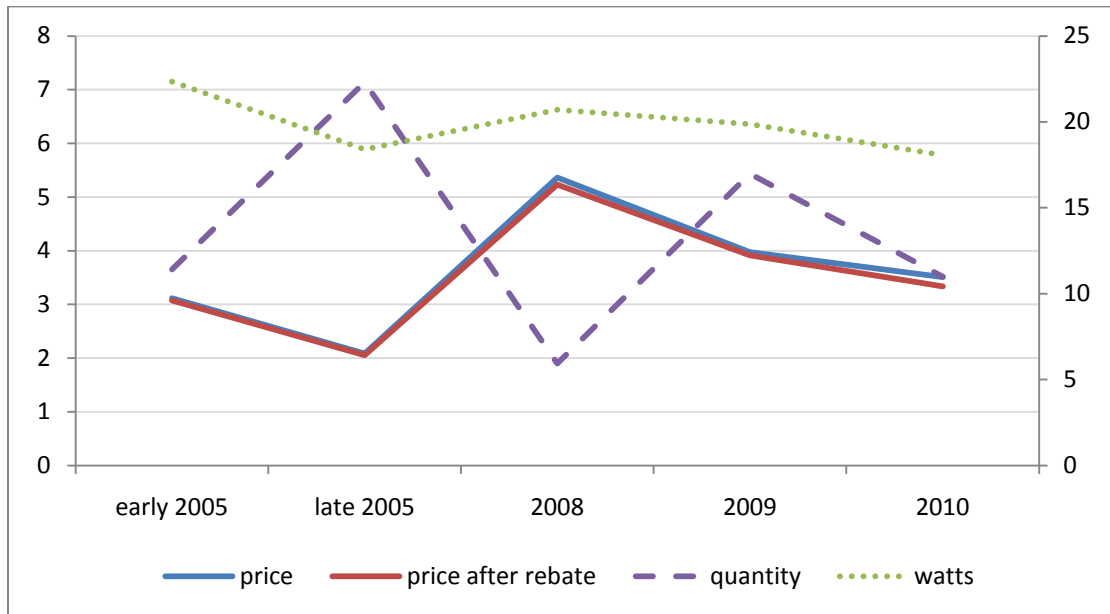


Figure AE.2 Average Price Paid per Reflector CFL Bulb in Oregon, over Time

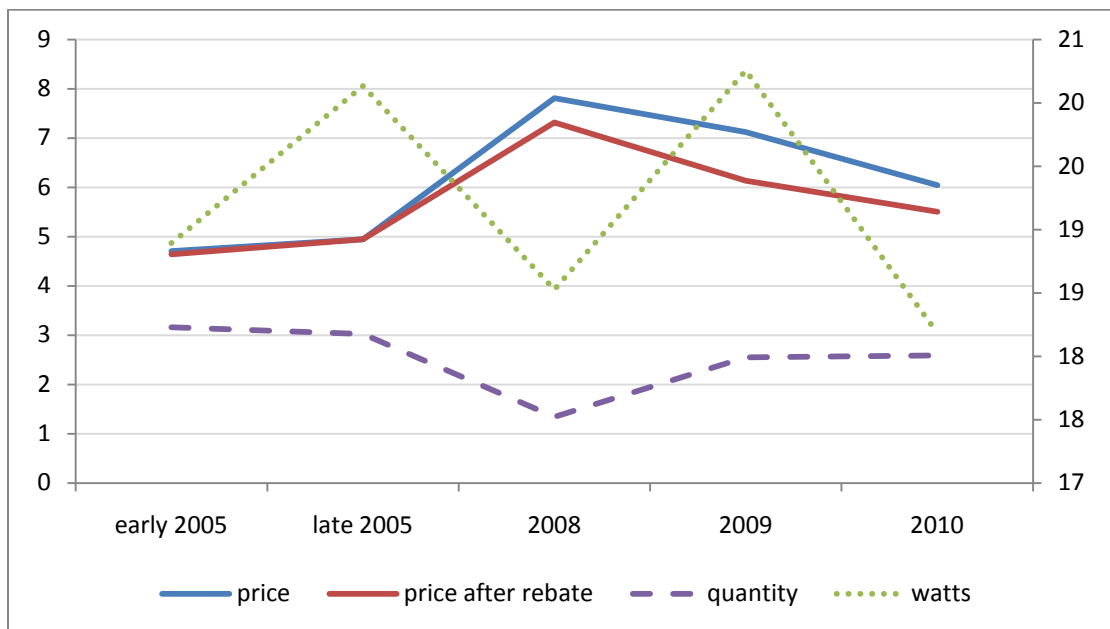


Figure AE.3 Average Price Paid per A-lamp CFL Bulb in Oregon, over Time

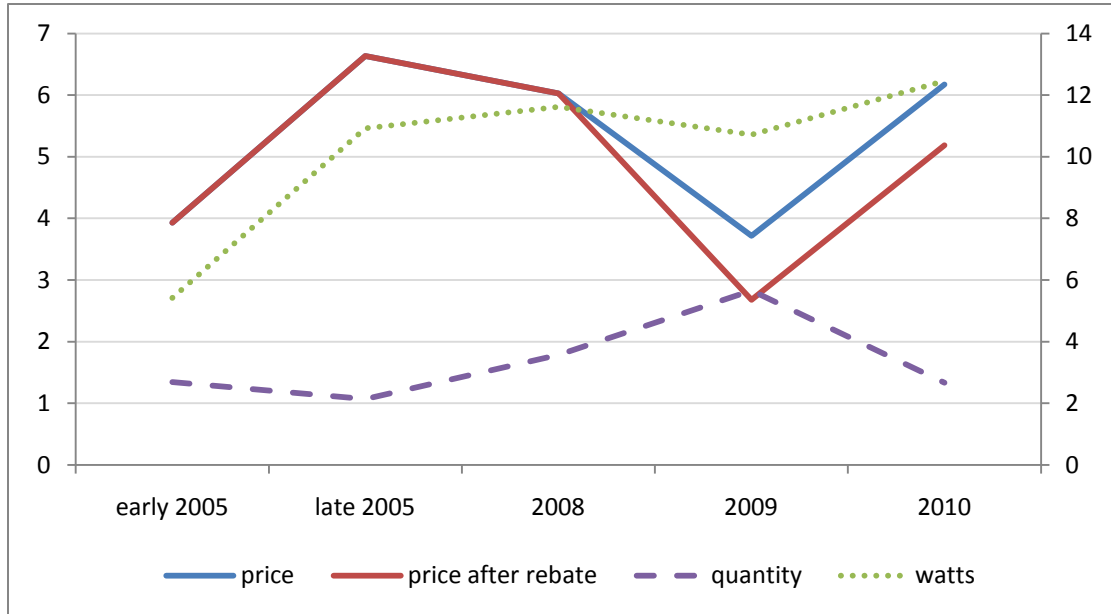


Figure AE.4 Average Price Paid per Pin-based CFL Bulb in Oregon, over Time



Figure AE.5 Average Price Paid per Circline CFL Bulb in Oregon, over Time

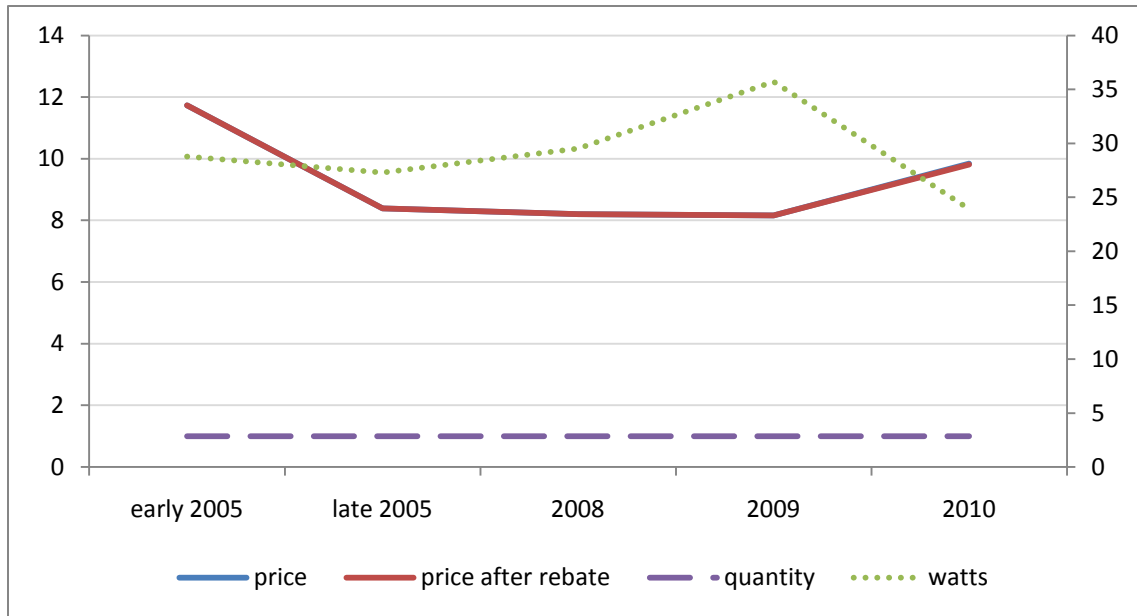


Figure AE.6 Average Price Paid per Globe CFL Bulb in Oregon, over Time

