

**Policy Brief**

**Economic impacts to consumers from extended producer responsibility (EPR) regulation in the  
consumer packaged goods sector**

**by**

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### Executive Summary

We construct a triangulation of the upper bound of expected consumer price impact resulting from the introduction of EPR fees in the consumer packaged goods sector. We review the estimate of the packaging cost component of US expenditure on food (a subset of the consumer packaged goods sector), as computed by the USDA based on economic input-output analysis. We use this estimate as a foundation, combined with food price elasticities and the analysis of expected burden-sharing between suppliers and consumers of the increase in packaging costs due to EPR requirements. We construct an orders-of-magnitude estimate of the maximum increase in grocery bills that an average US consumer should expect as a result of a nationwide adoption of EPR regulation. Even if EPR compliance costs were to lead to a doubling of packaging costs throughout the value chain, the computed upper bound is approximately 0.69% of grocery spending. This estimate corresponds to a maximum increase in monthly grocery bills of \$4 per household. In the context of a 9.5% increase in the CPI in the latest 12 months, it would be difficult to discern such a small impact on prices. Previous research indicates that most US food, drugstore, and mass merchandise chains charge nearly uniform prices across stores even though they could increase their profits by exploiting the wide variation in demand elasticities and income levels across stores. In addition, a basic insight of economic analysis is that so long as there is some elasticity to consumer demand, then suppliers will not be able to pass on 100% of cost increases to customers. Other studies suggest that there is no discernible impact on consumer prices from the introduction of EPR requirements. These considerations are likely to dampen the response of local prices to increases in costs resulting from state-level EPR regulation.

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The opinions expressed herein are those of the author and do not necessarily reflect the views of Columbia University or The Recycling Partnership.

## Introduction

Following the 2017 Chinese ban on imported recyclable waste, a number of American local governments faced increases in recycling program costs due to significant drops in prices received for recyclable waste. Municipalities were forced to offset the higher cost of recycling through reductions in other services or increases in local taxes. A few local governments were compelled to end their recycling programs due to the higher cost. The higher financial cost of recycling for local governments must be balanced against the financial and environmental benefits of diverting solid waste from landfills. In order to address the challenges created by excessive packaging waste and reduce the financial cost of recycling borne by taxpayers, many governments are considering the possibility of assigning the responsibility for packaging recycling costs during the post-consumer phase to producers. Extended Producer Responsibility (EPR) is a policy approach under which producers are required to either arrange for or pay for recycling of post-consumer waste. Producers<sup>1</sup> of packaging may be required to fulfil their EPR obligations either individually or collectively. In individual producer responsibility (IPR) systems, producers take responsibility for their own products, whereas in collective producer responsibility systems (EPR) producers of the same product type collaborate and pay a fee to a Producer Responsibility Organization (PRO). EPR is a mechanism to shift the financial cost of end-of-life management of discarded packaging materials from local taxpayers to packaged goods producers.

The generation of packaging waste is a by-product of normal economic activity in advanced societies. The quantity and types of waste generated are the result of a range of factors:

1. Product & Process Design Choices: Do manufacturers and distributors choose to privilege reduced packaging over other factors such as product protection, the possibility of shrinkage or marketing considerations? Is there any effort to incorporate the disposal and recycling costs of different types of packaging (cardboard, glass, plastics, aluminum etc.) into the packaging design process? In the absence of EPR, producers face few incentives to design products and packaging to minimize their adverse environmental impact (referred to as design for environment or DfE).
2. Consumption Choices: do consumers choose refillable or bulk purchases that have lower packaging materials per unit of consumable over the convenience of individually-wrapped portions? Are consumers who seek to reduce their environmental footprint able to make informed choices which then influence manufacturers to incorporate disposal costs into their product offering?
3. Matching of Incentives and Decisions: Does the system of packaging choices incorporate incentives that reward and discourage the appropriate decision-makers or is there scope for significant free-loading? For example, does it cost less for the consumer to buy food with less packaging or are the savings from conscious consumption enjoyed only by the producer or distributor? Similarly, does the system reward the producer for its foresight and socially

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<sup>1</sup> Producers are typically defined as companies who use the packaging to sell their own or imported branded products. Most consumer goods manufacturers and importers selling products in the jurisdiction would be considered a producer.

responsible behavior if it invests in reduced packaging in order to minimize downstream disposal costs?

The concept of EPR is designed to institutionalize responsibility for the downstream impact of packaging choices on manufacturers and distributors, shifting the burden of disposal and recycling costs from taxpayers to packaging producers. Producers have significant agency in choosing the menu of product offerings to consumers. In order for producer decision-making to reflect the costs of end-of-life management, it is important for policy makers to construct a signaling process that rewards systemically beneficial investments and discourages free riding. Prices are the primary source of signals used to direct investment and economic activity in a capitalist economy. In effect, an EPR mandate imposes a price on packaging choices and business processes that generate excessive waste. It does so by forcing consideration of the impact on compliance costs of packaging choices: efforts to minimize packaging or to increase recovery and recyclability are rewarded by reduced EPR fees. Taxpayers, who have limited ability to substitute highly-packaged household essentials with low footprint systemic alternatives, should not bear the primary financial burden of packaging decisions. The rationale for EPR is premised on the superior technical and managerial capacity of producers to change products and disposal costs by incorporating DfE principles. This does not mean that all producers will attempt to minimize packaging waste—for some producers, the value of convenience or aesthetics or other considerations will override the rewards of reduced packaging. The point is that producers, in aiming to serve the market need, are best placed to negotiate the trade-offs involved between footprint reduction and other important customer and business goals. EPR is simply a mechanism to encourage those who produce packaged goods to balance strategic business decisions with the true cost of packaging choices.

EPR mandates are likely to shift some of the costs of recycling from governments to producers. In the long run, such burden shifting ought to lead to reduced municipal tax burdens. A key research question that awaits a robust and rigorous answer is to what extent the costs of EPR mandates might increase prices for consumers relative to the overall benefits of reduced packaging waste resulting from internalization of an externality. EPR mandates will increase compliance costs for producers or first importers of covered consumer goods. A system-wide analysis would be needed to determine if such costs exceed the costs of disposal and recycling already incurred by public and private stakeholders in the recycling ecosystem, including municipalities, waste management companies, businesses, commercial and residential building managers, taxpayers and consumers. In addition, a model of pricing choices affected by market structure and demand elasticity considerations is required to determine the extent to which, if any, the incidence of compliance costs will fall on consumers rather than producers. As waste management activity often has implications for environmental justice and equity, it is important to construct solutions that are sensitive to the concerns of local and disadvantaged communities. A *laissez-faire* approach to the waste problem is likely to burden disadvantaged and low-income communities for whom waste management costs represent a larger than average share of income.

This policy brief outlines the salient points that must be addressed in any quantitative study on the economic impact of EPR compliance costs on consumers. We describe the attributes of market

structure, consumer demand elasticity, DfE potential and support policies for low-income communities which are likely to limit the impact on consumer prices:

- a. The market power of incumbent producers (or the level of competition) and an evaluation of their ability to pass on cost increases. The higher the level of competition in the production of packaged consumer goods, the lower is the ability of producers to pass on compliance costs to consumers in the form of higher prices.
- b. The range of elasticities for the most important packaged consumer staples. The price elasticity of demand for packaged consumer staples in the food and beverage category ranges from 0.27 for eggs to 0.79 for soft drinks (Andreyeva, Long, & Brownell, 2010)<sup>2</sup>. The higher the price elasticity, the lower is the ability of producers to pass on compliance costs because of a tendency of consumers to switch to alternatives.
- c. The potential for subsidizing recycling costs in low-income communities to widen access to recycling programs.
- d. The possibility of combining EPR fees with other policy interventions such as consumer awareness campaigns which over time can reduce demand for packaging materials and future compliance costs.
- e. The possibility of domestic investments in processing recycled materials. Increased capacity to handle recycled materials in the production of packaging facilitates reductions in EPR fees over time.
- f. The opportunities for expanded deployment of reuse and refill systems which lower packaging costs per use.
- g. The longer term impact on waste minimization and circular economy considerations at the design and manufacturing phase of packaged consumer staples.

This brief outlines a triangulation of the upper bound of expected consumer price impact of the imposition of EPR mandate fees in the consumer packaged goods sector. We review the estimate of the packaging cost component of US expenditure on food, (a significant subset of the consumer packaged goods sector) as computed by the USDA based on economic input-output analysis. We use this estimate as a foundation, combined with food price elasticities and the analysis of expected burden-sharing between suppliers and consumers of the increase in packaging costs due to EPR mandates. We construct an orders-of-magnitude estimate of the maximum increase in grocery bills that an average US consumer should expect as a result of a nationwide implementation of EPR mandates. Even if EPR compliance costs were to lead to a doubling of packaging costs throughout the value chain, the computed upper bound is approximately 0.69% of grocery spending. This estimate corresponds to a maximum increase in monthly grocery bills of \$4 per household<sup>3</sup>. In the context of a 9.5% increase in the CPI in the latest 12

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<sup>2</sup> A price elasticity of demand of 0.27 for eggs implies that a 1% increase in the price of eggs will lead to a 0.27% reduction in the quantity of eggs demanded.

<sup>3</sup> Price elasticities of food items are generally lower than those of non-food items, indicating a greater degree of substitutability for non-food items. While greater substitutability suggests a lower consumer price impact, additional analysis would be necessary to incorporate the impact of EPR on spending on non-food consumables.

months, it would be difficult to discern such a small impact on prices. This amount is comparable to the household willingness to pay additional taxes for better recycling<sup>4</sup>.

This triangulation is a prelude to the development of a quantitative pricing model that would more precisely calibrate the impact of EPR levies on consumer prices by examining the material amounts of different types of consumer staples packaging used and the likely fees associated with such packaging. The pricing model would attempt to account for variation in the level of cost recovery, competition, demand elasticity of a range of food and beverage categories and other quantifiable factors to analyze the consumer price impact of a range of EPR scenarios. This type of study would be different from an economic impact analysis, which is focused on changes in revenue or gross domestic product, or jobs. The aim of our pricing model would be focused on determining a more precise range of price impacts faced by consumers as a result of EPR mandates.

### **Price Impact on Consumers**

In order for EPR compliance costs to lead to price increases for consumers, packaging producers, consumer staples manufacturers, wholesalers and retailers must be able to pass on compliance costs to the final consumer, rather than choose to reduce profit margins. Whether this is feasible depends on a two factors: market pricing power and relative elasticities of supply and demand. When costs of production rise, leading to an upward shift of the supply curve, the resultant increase in price is almost always lower than the cost increase. It is extremely unlikely that 100% of EPR compliance costs could be passed on to consumers given the limited pricing power of food retailers and the relatively elastic demand for consumer staples with significant packaging costs.

The consumer packaged goods retailing sector can be proxied by the revenue of food and beverage and health and personal care stores listed in Table 1. The gross output (primarily revenue) of this sector amounted to \$384 billion in 2020.

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<sup>4</sup> A 2019 Recycling Partnership survey suggests that the median respondent is willing to pay \$40-\$50 per year in additional taxes for better recycling. See Figure 29b of (The Recycling Partnership, 2020).

Table 1

**Gross Output in Consumer Packaged Good Sector**

in billions of \$

	<b>2020</b>
Food and beverage stores	\$ 281
Health and personal care stores	\$ 103
<b>TOTAL</b>	<b>\$ 384</b>

Source: Bureau of Economic Analysis

Ideally, we would compute the portion of this \$384 billion in revenue that is spent on EPR compliance costs to derive some parameters of the range of potential price impact. For the food and beverage sub-industry, we have an estimate of the costs that arise from the manufacturing and distribution of packaging in the value chain. For this sector, the USDA estimates that packaging costs represent 2.3% of the overall retail value of the sector in 2019. This figure has dropped from 4.2% in 1993.<sup>5</sup>

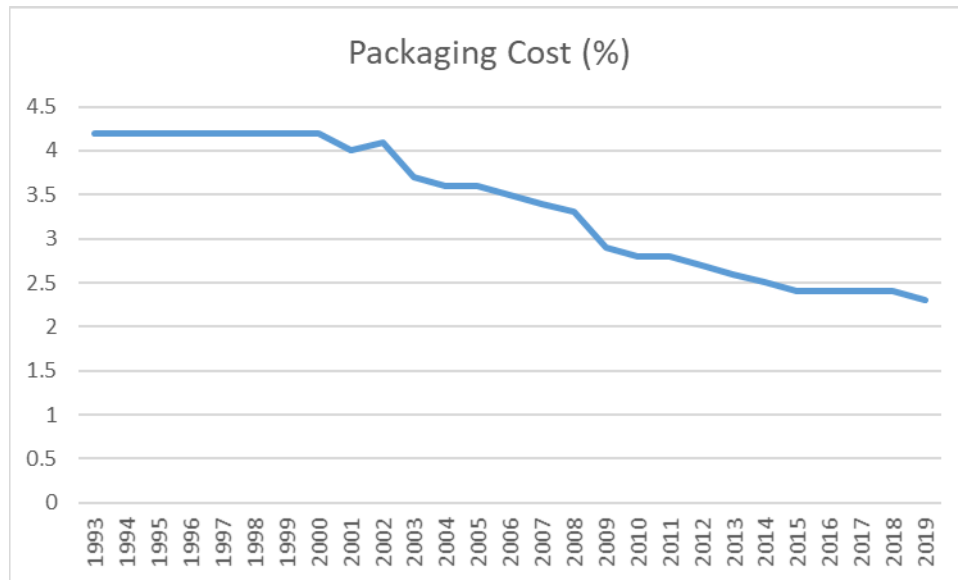


Figure 1 Source: USDA Food Dollar Series

<sup>5</sup> Using BEA input-output tables, the USDA constructs a food dollar series which estimates the portion of spending on food (and sub-components) that covers the costs of farm production, food processing, packaging, transportation etc. Details of the methodology are available at <https://www.ers.usda.gov/data-products/food-dollar-series/>

It is unlikely that EPR compliance costs would represent a 100% increase on packaging costs for the entire retail value chain<sup>6</sup>. If, against all odds, the advent of EPR compliance costs were to lead to a 100% increase on packaging costs, that would constitute a doubling of packaging cost proportions to a level higher than that recorded in 1993, which is the highest level in the time series in Figure 1. Any reasonable observer would agree that such a scenario is highly unlikely. We can therefore conservatively estimate that the upper bound on EPR compliance costs cannot exceed 2.3% of the retail prices faced by consumers. Hence, 2.3% would be the maximum increase in consumer prices, even in the unlikely event that retailers were able to pass on all of these EPR compliance costs to consumers. For reasons described below, any consumer price impact is likely to be much lower than 2.3%<sup>7</sup>.

### **Level of Competition**

Market power is the ability of suppliers to dictate prices rather than being forced to match competitors' prices. In general, the consumer staples sector is viewed as relatively competitive, with individual producers, processors and retailers having low market power. This is evidenced by the low profit margins in the sector. The operating profit margin of the consumer staples component of the S&P 500 index is 7.4% compared to 12.6% for the index as a whole<sup>8</sup>. Low operating margins are an indication that the sector does not have pricing power, and therefore cannot easily pass on cost increases to its customers. For example, a recent J.P.Morgan equity research report estimates that most household & personal care listed companies would face significant drops in gross margin as a result of supply chain pricing pressure (Teixeira, 2022). The report estimates drops in gross margin ranging from 6.54 percentage points to 10.34 percentage points for Kimberly Clark, Clorox and Reynolds due to their exposure to higher raw materials prices in the pulp, aluminum & resin input markets. If these companies were able to pass on their higher raw materials costs, then one would not expect such drops in gross margin.

In addition, most US food, drugstore, and mass merchandise chains charge nearly-uniform prices across stores even though they could increase their profits by exploiting the wide variation in demand elasticities and income levels across stores (DellaVigna & Gentzkow, 2019). This phenomenon is likely to dampen the response of prices to local increases in costs such as those that would result from state-level EPR regulation.

### **Elasticity Considerations**

Increased compliance fees that are related to the scale and type of packaging would increase the cost of goods sold by producers, in much the same way as raw materials costs would. A basic insight of economic demand & supply analysis is that the burden of increased raw materials costs is usually shared between suppliers and consumers in the marketplace. So long as demand is not perfectly inelastic, then

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<sup>6</sup> The USDA methodology aggregates, using input-output analysis, all packaging costs incurred by the entire retail value chain. Excluding hazardous materials, there are few, if any, products which cost more to dispose of than to produce. Hence, 100% of production costs represents a conservative upper bound on disposal costs.

<sup>7</sup> This analysis is for food and beverage stores. Additional analysis would be necessary to extend this methodology to health and personal care stores.

<sup>8</sup> See Figure 9 of (Yardeni & Abbott, 2022).



suppliers will not be able to pass on 100% of cost increases to customers. The more inelastic the demand, the greater is the ability to pass on price increases. Nevertheless, unless elasticity is zero, suppliers cannot pass on 100% of cost increases to buyers. The incidence of cost increases (the relative burdens borne by suppliers and consumers) depends on the relative elasticities of supply and demand. There is generally low elasticity of supply by food producers and processors resulting from a number of structural attributes of the modern food value chain. These include perishability of food crops, fixed capacity of processing facilities, long term contracts, and fixed access to retail shelf space (Crespi, Saitone, & Sexton, 2012).

In the food & beverage category, Table 2 lists selected demand price elasticity estimates. A product with low elasticity, such as eggs, is likely to see significant pass-through of the cost increases resulting from EPR mandates. On the other hand, in the case of soft drinks or food away from home, which have higher elasticity, it is likely that only a portion of the cost increase can be passed on to consumers.

*Table 2*

**US Price Elasticity Estimates**

Food away from home	0.81
Soft drinks	0.79
Beef	0.75
Fruit	0.70
Cereals	0.60
Vegetables	0.58
Fish	0.50
Cheese	0.44
Sweets/sugars	0.34
Eggs	0.27

Source: Andreyeva et al. (2010)



A key benchmark is provided by the study on the imposition of taxes on sugar-sweetened beverages (SSBs) in Berkeley, California. In early 2015, Berkeley became the first U.S. city to impose an excise tax of 1 cent per ounce on non-diet SSBs<sup>9</sup>. Sugar-sweetened beverages have a similar elasticity to soft drinks, which is close to the highest among the food categories listed above. Using a difference-in-difference analysis comparing Berkeley’s experience with San Francisco as the control (where no tax was instituted), the authors found that approximately 43% (95% confidence interval: 28%-58%) of the tax increase was passed on to consumers (Cawley & Frisvold, 2015). Hence, as a rough estimate, we might expect that for the higher elasticity food & beverages, approximately 43% of the costs of an EPR

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<sup>9</sup> The amount of the Berkeley SSB tax as a proportion of retail price would be somewhat higher the 2.3% posited as an upper bound on EPR compliance costs. A 20 ounce bottle of Coca-cola which retails for approximately \$2.00 would include a 20 cent tax, amounting to 10% of retail price. Arguably, manufacturers would be under more pressure to pass on such a tax increase than they would in the case of much lower EPR compliance fees.

mandate might be passed on to consumers. This is quite different from 100%. Since many food & beverage categories have lower elasticities, the weighted average incidence is likely to be much lower than 43%. Assuming an overall incidence to consumers of 30%, which is within the confidence interval of incidence for sweetened beverages, and recognizing that packaging costs comprise 2.3% of the retail food dollar, a very conservative upper bound on the price impact of EPR mandates on consumers even if compliance costs led to a doubling of packaging costs would be 30% of 100% of 2.3% = 0.69%. This potential increase in prices will be offset by diminished pressure to raise local taxes or reduce municipal services.

Table 3

<b>Estimated Maximum Price Increase in an Illustrative Scenario</b>		
<p>Packaging costs double for producers:</p> <ul style="list-style-type: none"> <li>• Since packaging costs constitute 2.3% of overall food expenditure (final demand), producer costs increase by 2.3% of final expenditure in a cost-doubling scenario.</li> </ul>		<p>Producers try to pass on some of the increased cost to consumers:</p> <ul style="list-style-type: none"> <li>• Given estimated elasticity of demand, producers are only able to pass on an estimated 30% of the cost increase.</li> </ul>
		<p>Consumers face higher prices that incorporate a fraction of the cost increases of producers:</p> <ul style="list-style-type: none"> <li>• In the food sector, the estimated maximum price increase would likely be 0.69% (= 30% x 2.3%).</li> <li>• Consumers, who are also taxpayers, face reduced local tax burdens</li> </ul>

An additional benchmark is provided by a study of the consumer price impact of the Food Safety Modernization Act in 2011. This regulation was expected to cost on average approximately 1.1% of revenue for covered farms producing raw and minimally processed fruits and vegetables in the United States. A study of the price impact of the cost of compliance using estimates of demand and supply elasticities for 18 fruit and 20 vegetable commodities indicates that consumer prices of fruits and vegetables were expected to rise by 0.55% and 0.15% respectively (Ferrier, Zhen, & Bovay, 2022). In this case also, only part of the compliance costs were expected to be passed through: just 14%-50% of cost increase was passed on to final consumers. The Ferrier et al. study covers a broad regulation that impacts a wide range of substitutable food categories. The Cawley & Frisvold study of the Berkeley tax, conversely, covers a tax on a limited category of beverages with correspondingly lower substitutability. The greater cross-product substitutability of fruits and vegetables suggests that the conclusions of the

Ferrier et al. study are likely to be more comparable to the impact of EPR mandates. Hence, this study provides additional support for the expectation that less than half of the cost of compliance might be expected to be passed through to consumers.

### **Existing Deposit Programs**

Some states already have programs that increase resource recovery rates and effectively reduce the cost of recycling borne by municipalities. Specifically, 10 states have container deposit return laws that add a small deposit to the price of selected beverages (Bragg, 2016). The USDA estimated existing expenditure on packaging costs throughout the value chain includes the impact of such existing programs on consumer prices. In general, EPR mandates would exclude such programs and thus their costs would not be part of any increased EPR costs.

### **Pricing Power in Low-Income Communities**

In certain local markets, small food retailers are able to exercise market pricing power. The Berkeley study cited above notes that another study that was skewed towards low income neighbourhoods with a high percentage of minority residents estimated a somewhat higher incidence rate of 46%-49% (Falbe, Rojas, Grummon, & Madsen, 2015). It is known that in local markets where large supermarkets are not available (known as 'food deserts'), often associated with low income communities, small food retailers are able to exercise market power and pass on a greater proportion of cost increases (Ma, Saitone, Volpe, Sexton, & Saksena, 2019). This is especially true for the categories of beverages and tobacco. For example, out of 42 sectors studied, beverage and tobacco is the only packaged consumer goods category to demonstrate positive price asymmetry<sup>10</sup> that is both economically and statistically significant (Gwin, 2009).

It is possible that the incidence of EPR costs on consumer pricing, while low, is likely to be somewhat higher for low income localities due to their lower access to competitive food options. While small retailers would not themselves pay the EPR compliance fees since such fees would be paid by food manufacturers, they would likely face some increase in the wholesale prices faced. Given their local pricing power, they may be able to pass on a greater portion of the increased wholesale prices than the chains. Further analysis needs to be performed to evaluate this possible increased incidence. The possibility of combining EPR levies with other policy interventions such as enhanced recycling subsidy support targeted to low-income communities is likely to avoid exacerbating inequities.

### **Other Studies**

There are just three other estimates of the price impact of EPR mandates. One study of the potential impact of the EPR mandate in New York state estimates that New York households would pay an additional 4.01% to 6.35% in grocery bills (Lakhan, 2021). This is significantly higher than our estimate of

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<sup>10</sup> Positive price asymmetry is a phenomenon where retailers with market power pass on cost increases in the form of higher prices but do not pass on cost decreases.

0.69%, with the midpoint of the Lakhan estimates amounting to 7.5x our 0.69% expectation. While our analysis is a calibrated estimate from food price elasticities, the Lakhan study attempts to compute recycling costs based on EPR fees imposed in the state of Ontario and actual recycled material volume in New York State. There are at least three key differences in approach between our estimate and the Lakhan study. Firstly, the Lakhan study assumes that all cost increases would be fully passed on to consumers. We have shown that according to a basic rule of economics, the burden of cost increases in the context of non-zero demand elasticities must be shared between producers and consumers, rendering the Lakhan assumption inappropriate. Secondly, our study effectively incorporates the impact of substitution behavior by suppliers and consumers, whereas the Lakhan study assumes that there is no attempt to minimize the incidence of EPR costs. Thirdly, our study is effectively based on an input-output analysis model of the US food and beverage sector as utilized by the USDA, whereas the Lakhan study is based on a regionalized input-output analysis for New York. It is possible that these differences are contributing to the significant divergence in estimates. Nevertheless, additional detailed analysis is required to arrive at a more robust reconciliation.

Secondly, at the request of the Oregon Department of Environmental Quality, RRS, a sustainability and recycling consulting firm conducted a study comparing prices of common consumer products purchased in EPR and non-EPR jurisdictions in Canada using an online virtual shopping exercise in 2020 (Hesterman, Dimino, Ricchi, Bell, & Dobrot, 2021). The items in the shopping list included a basket of consumer goods that varied in the range of packaging material, brands and EPR fee rates. RRS attempted to match EPR and non-EPR jurisdictions so that other community attributes were relatively similar. The study found no correlation between the existence of EPR mandates and consumer product prices, indicating that EPR fees had no discernible impact on consumer prices. This study supports a credible lower bound on price impact of essentially zero. We note that this study used prices from national and regional chains rather than local retailers. As noted earlier, previous research indicates that chains charge nearly uniform prices even when local costs vary. This phenomenon may have caused the RRS study to find no differences in prices across EPR and non-EPR jurisdictions. Our study and the RRS study would suggest that the price impact is likely to be bracketed between 0 and 0.69%.

Finally, an industry consultant estimates that households in the United Kingdom would pay an additional £100 (or \$137) per annum by 2024 due to EPR mandates (Valpak Ltd., 2021). The comparable figure for our estimate of 0.69% is \$47 per household per annum, or approximately \$4 per month<sup>11</sup>. The consultant study does not list its methodology, so it is impossible to reconcile differences. This estimate is 2.9x our estimate, being significantly closer in magnitude than the Lakhan study.

### **Possibility of Investment in Recycling Infrastructure**

While in the long term, EPR mandates are expected to lead to design changes in packaging and the recycling ecosystem, there is significant evidence that the US recycling sector has already been making investments in processing infrastructure in order to absorb the high volume of low value recyclable

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<sup>11</sup> This estimate is 0.69% of the average nominal expenditure per household in 2020 of \$6,818 (see USDA ERS table available at <https://www.ers.usda.gov/data-products/food-expenditure-series/>) This is an over-estimate because it shows only price impact, but not quantity impact.

material available since the Chinese import ban. An industry group estimates that since 2018, recycling processing capacity has increased by more than 5 million tons per year of corrugated cardboard and 1 million tons per year of recycled pulp (Northeast Recycling Council, 2021). Such increases in US recyclables processing capacity will reduce the cost of recycling, so that over time the cost of EPR mandates will moderate for consumer good suppliers.

## **Conclusion**

We have presented a calibrated triangulation of the upper bound of expected consumer price impact due to EPR mandates that utilizes previous research on food price elasticities and input-output analysis of the packaging component of food spending. We review the estimate of the packaging cost component of US expenditure on food as computed by the USDA based on economic input-output analysis. We use this estimate as a foundation, combined with food price elasticities and the analysis of expected burden-sharing between suppliers and consumers of the increase in packaging costs due to EPR mandates. We construct an orders-of-magnitude estimate of the maximum increase in grocery bills that an average US consumer should expect as a result of a nationwide implementation of EPR mandates. Even if EPR compliance costs were to lead to a doubling of packaging costs throughout the value chain, the computed upper bound is approximately 0.69% of grocery spending.

Previous research indicates that most US food, drugstore, and mass merchandise chains charge nearly uniform prices across stores even though they could increase their profits by exploiting the wide variation in demand elasticities and income levels across stores. In addition, a basic insight of economic analysis is that so long as there is some elasticity to consumer demand, then suppliers will not be able to pass on 100% of cost increases to customers. Other studies suggest that there is no discernible impact on consumer prices from the imposition of EPR mandates. These considerations are likely to dampen the response of local prices to increases in costs resulting from state-level EPR mandates.

The triangulation presented in this brief is a prelude to the development of a quantitative pricing model that would more precisely calibrate the impact of EPR levies on consumer prices by examining the material amounts of different types of consumer staples packaging used and the likely fees associated with such packaging. The pricing model would attempt to account for variation in the level of cost recovery, competition, demand elasticity and other quantifiable factors to analyze the consumer price impact of a range of EPR scenarios.

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