Modeling impact on consumer packaged goods pricing resulting from the adoption of Extended Producer Responsibility in New York State

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Executive Summary

This study models the economic impacts of implementing extended producer responsibility legislation for packaging waste in New York State, as outlined in Bill S1185B. New York State is one of several jurisdictions across the United States looking to adopt producer responsibility legislation, which would obligate producers to pay for the recycling costs of more than 30 individual materials commonly used in printed paper and packaging.

Increasingly, a diverse range of stakeholders, including local governments, packaging producers and waste service providers are recognizing the role that producer responsibility can play in promoting recycling and a sustainable waste management system.

Few studies to date have attempted to quantify what the adoption of EPR legislation will ultimately cost producers, and how, if at all, the price of consumer packaged goods changes in response to producer responsibility. Previous investigations into the topic were conducted in Canadian jurisdictions, with no clear consensus regarding whether EPR legislation has a positive or negative impact on cost of living for consumers.

Using best available data, this study combines data from both New York State, as well as data from Canadian jurisdictions to model both the direct, indirect, and induced effects of EPR legislation on the New York State economy.

Modeling for this study is separated into two phases – 1) quantifying the direct producer obligation given estimated quantities of recyclable materials generated/recovered in New York State, 2) Quantify the indirect/induced effects resulting from an increase in the producer obligation, and how that ultimately impacts the price of consumer packaged goods for households in the State.

Based on estimated quantities of printed paper and packaging generated/diverted in New York State, the direct impacts of EPR legislation are estimated to be $803.2 million dollars annually. This figure includes costs associated with administrative expenses, promotion and education and ongoing data expenses, but do not include any additional investments in recycling infrastructure that may be required or baseline data collection.

Using an economic input/output model that has been regionalized for New York State, this study modeled the indirect and induced economic impacts of EPR legislation resulting from an increase in the producer obligation ($803.2 million). Our modeling assumes that producers will not internalize any of these costs, and that they will pass this cost onto the consumer, or other stakeholders within the supply chain. Our modeling also assumes that the price of packaged goods (including the price elasticity of packaged goods) is a function of locality.

Given that the overall price of a packaged good varies depending on how sensitive the price is to changes in the cost of inputs, this study modeled more than 660 different types of packaging

most commonly consumed by households from 30 different sectors. Using a log-linear regression model, we attempted to model how cost of living for households in New York State would change in response to the adoption of EPR legislation. It should be noted that the price of consumer packaged goods are particularly sensitive to changes in the price of inputs. Differences in price elasticity were observed across material categories.

Based on the modeling of indirect and induced effects attributable to EPR legislation, we arrive at a final impact multiplier that ranges from 3.6x to 5.4x. The multiplier is intended to capture both the direct, indirect and induced impacts of adopting EPR legislation in New York State. Using these multipliers, an $803.2 million-dollar direct cost to producers (resulting from EPR legislation) results in a $2.9 billion to $4.17 billion dollar impact on the economy of New York State.

The total impact on "basket of good" pricing (packaged goods) ranges from 4.01% on the low end, to 6.35% on the high end. Stated alternatively, this translates into an additional $36 to $57 per month in grocery costs for the average family of four in New York State. This study found that the decision to adopt producer responsibility legislation for packaging waste has an unintended effect that disproportionately affects low income families.

1.0 Introduction

Momentum behind extended producer responsibility for packaging waste has increased markedly in the past year, with many jurisdictions viewing Extended Producer Responsibility (EPR) legislation as an inevitability – the issue is seen as not a matter of if, but when. In the past several months, packaging stakeholder groups such as AMERIPEN announced a new policy position which expresses support for state level producer responsibility legislation, a marked shift from what the organization has historically advocated for, which was to oppose EPR programs.

New York State was one of several jurisdictions to announce proposed EPR legislation for printed paper and packaging waste in 2021, which would obligate producers to pay for the recycling costs of more than 30 individual materials – the proposed list of materials includes everything from the conventional (newsprint, magazines, corrugated cardboard, aluminum cans) to the obscure (Multi-layered and flexible packaging made out multi resin products such as Linear low-density polyethylene (LLDPE), Polyvinyl chloride (PCV) and polystyrene (PS), and even materials that are known not to be recyclable (Bisphenol, Compostable Plastics, Polycarbonate and Lexan).* (as per materials listed in bill S1185B)

Increasingly, a diverse range of stakeholders including local governments, packaging producers, waste service providers etc. are recognizing the role that producer responsibility can play in promoting recycling and a sustainable waste management system. Given the conceptual premise of EPR, ensuring that producers who make a product, ultimately bear the financial and/or physical responsibility for managing it at end of life, it is easy to see why EPR is being championed.

However, the adoption of EPR is not without its challenges. While there is a groundswell of support in favor of EPR legislation with many jurisdictions looking to fast track its adoption, it is imperative that we press pause and take the time to understand the pre-requisites that must be established for effective EPR implementation.

The purpose of EPR is to shift the physical and financial responsibility of end-of-life waste management onto the producers (or first importers), of a particular good. Conceptually, it is difficult to find fault with the premise – generally speaking, people who make a product, should ultimately be responsible for how it gets managed post consumption.

However, in practice, what producers are financially obligated for is of critical importance when addressing what is literally a billion dollar question. At present, EPR for printed paper and packaging waste has focused on recycling – producers are obliged to pay for the costs associated with recycling post-consumer packaging waste. Where this becomes potentially problematic, is that recycling costs (which includes the cost to collect, transport, sort and bail materials, net any revenue received from the sale of recyclables), particularly for composite and light-weight materials, are going up exponentially – recycling system costs for Ontario, British Columbia and other jurisdictions with EPR are increasing by double digits year over year (Lakhan, 2020). In the case of Ontario, recycling system costs have more than doubled in the past 15 years, while recycling rates have actually decreased *(Historical review of Stewardship Ontario, Pay In Model (2004-2021)).*

While advocates of EPR say that producers should be paying these costs irrespective of what they might be, the reality is that these costs are passed along to and absorbed by the consumer, in the form of increases in the cost of consumer packaged goods.

This study seeks to better understand the relationship between producer responsibility fees and the price of consumer packaged goods. Using best available data, this study models a scenario intended to reflect the proposed increase in the steward obligation resulting from New York State's proposed EPR legislation (S1185B), and the corresponding impact on the price of consumer packaged goods.

2.0 Methodology

This section describes the data used in this study and the modeling steps used to quantify the impact of EPR legislation on packaged goods pricing in New York State.

Please note the following:

- *This modeling relies on data proxies/surrogates from other jurisdictions due the absence of New York specific data. This is a significant limitation of this study, which highlights*

the necessity that baseline data needs to be collected prior to the adoption of any recycling legislation in New York State.

- *For the purposes of modeling, we have converted short tons into metric tonnes, and express all costs in $USD.*

2.1 Data used in this study includes:

1) Data modeled by the Consumer Brands Association which estimates total quantities of printed paper and packaging generated/recycled in New York State, based on US EPA data.

2) Data modeled by the Consumer Brands Association regarding estimated data collection costs for New York State.

3) All data pertaining to material specific recycling costs were obtained from the Stewardship Ontario Pay in Model (PIM) (https://stewardshipontario.ca/stewards-bluebox/fees-and-payments/fee-setting-flow-chart/the-pay-in-model/). The PIM is used in Ontario to calculate the overall producer obligation, as well as material specific fee rates for obligated packaged goods. It should be noted that costs taken from the PIM model may not apply to the cost of recycling in other jurisdictions. However, in the absence of state specific data, it is the only publicly available source that provides insights into the costs to manage individual materials within the recycling system.

4) An adapted version of the Economic Modeling LLC input-output model that has been regionalized for New York State (using best available data where possible). Input-output models are used to describe the interconnectedness of the industries, households, and government entities that occupy a given geographic area. The term "input/output" demonstrates how the output of one industry will appear as an input in another industry with the intent of tracking the "flow" of money through a given system. For our purposes, we are using an Input-Output model as a predictive tool to quantify the indirect and induced effects of adopting EPR legislation in New York State.

5) "Basket of Goods" costs based on locality (Large Urban, Urban Regional, Small Urban, Rural Regional). It should be noted that basket of goods costs for these regions were derived using Ontario specific data that were subsequently adapted to reflect different localities in New York State. This involved calculating the differences in cost of living between Ontario and New York State as a whole, standardizing what constitutes a "basket of goods", and converting all values from $CAD to $USD based on the current spot rate. The use of Ontario data in lieu of New York specific data is a limitation of this study – it is recommended that

analysis moving forward should use data collected from New York State, which was unavailable at the time of conducting this study.

6) Waste audits sampled from 9 communities in New York State between the periods of 2018-2020. Waste audits were used to calculate the composition of the types of packaged goods being generated and recycled in the state. The distribution of waste audits include:

    - 5 samples taken from New York City (4 single family, 1 multi-residential),
    - 2 samples from Buffalo (2 single family)
    - 2 from Rochester (2 single family).

    It should be noted that the number of waste audits used to estimate waste compositions is not statistically representative of the state as a whole. Unfortunately, there is very little publicly available data regarding waste audits in most jurisdictions, and it is highly unlikely that any area will have conducted enough waste audits to meet the threshold of statistically significant.

Modeling the impact of proposed EPR legislation on the price of consumer packaged goods is done in two phases.

Phase 1 involves calculating recycling system costs in New York State under the proposed EPR system for printed paper and packaging.

Phase 2 involves modeling indirect and induced impacts attributable to the adoption of EPR legislation using the adapted ESRI Input-Output model

2.2 Methodology Phase 1 Modeling

To calculate direct economic impacts of EPR legislation, we need to know the following inputs:

1) What is the quantity of printed paper and packaging materials generated and recycled in New York State?
2) What is the composition of printed paper and packaging being collected and recycled in New York State?
3) What are the costs associated with collecting and recycling these materials?
4) What are the administrative, data collection and promotion and education costs attributable to operating a residential recycling program for printed paper and packaging?

As noted in a description of the data used in this study, data surrogates/proxies from other jurisdictions are used in lieu of New York specific data. This is particularly true of data pertaining to material management costs.

2.21 How much material is being recycled?

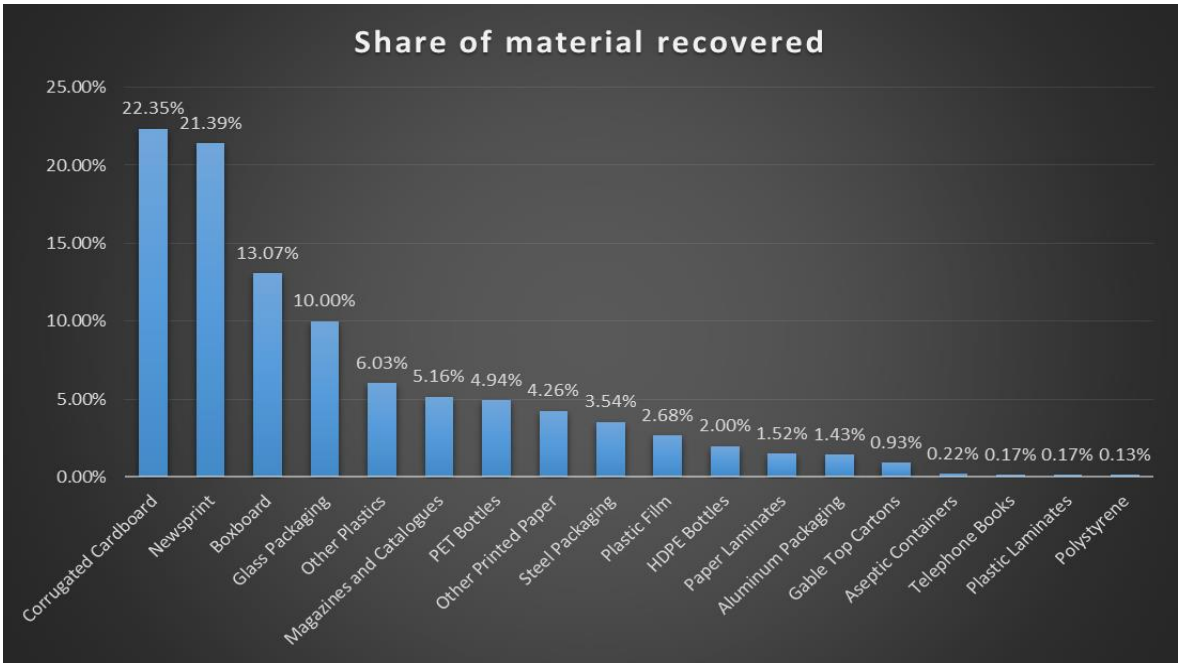
According to data provided by the Consumer Brands Association, it is estimated that there are 4,306,260 short tons of material recycled in New York State, of which 56% is obligated printed paper and packaging. This amounts to approximately 2,187,681 metric tonnes of obligated recyclables recovered annually.

2.22 What is the composition of obligated recyclables recovered?

Using the collection of waste audits sampled from various localities in New York State, we are able to estimate the relative composition of printed paper and packaging presently found in the residential recycling stream. The results shown in Figure 1 represent a weighted average based on the number of localities sampled. It should be noted that there is a statistically significant difference in the composition of waste when comparing localities (i.e. single family homes in New York City generate a different composition of waste relative to single family homes in Buffalo). It is the recommendation of this study that additional waste audits be conducted (across the state) to better understand the types and quantities of waste generated/recovered by locality.

As shown in Figure 1, a significant percentage of the recycling stream is made up of paper-based fibers such as corrugated cardboard, boxboard and newsprint. While a time series analysis of how quantities of waste generated/recovered over time was not possible given the relatively small number of audit samples, we do know that the proliferation of light weight and composite plastics is increasing over time, corrugated cardboard and boxboard are increasing (as a result of e-commerce) while quantities of newsprint and other printed paper are declining.

Figure 1: Composition of residential recycling stream for printed paper and packaging



2.23 How much does it cost to recycle?

Note: Net costs per tonne includes the costs of collecting, sorting and baling a recyclable material, net of the revenue generated from its sale.

To calculate recycling system costs, we multiply the total quantity of printed paper and packaging recycled in New York State (2,187,681 metric tonnes) and multiply it by the relative composition of the residential recycling stream calculated from our waste audits. This provides a breakdown of total quantities of material recycled by material type (expressed in metric tonnes).

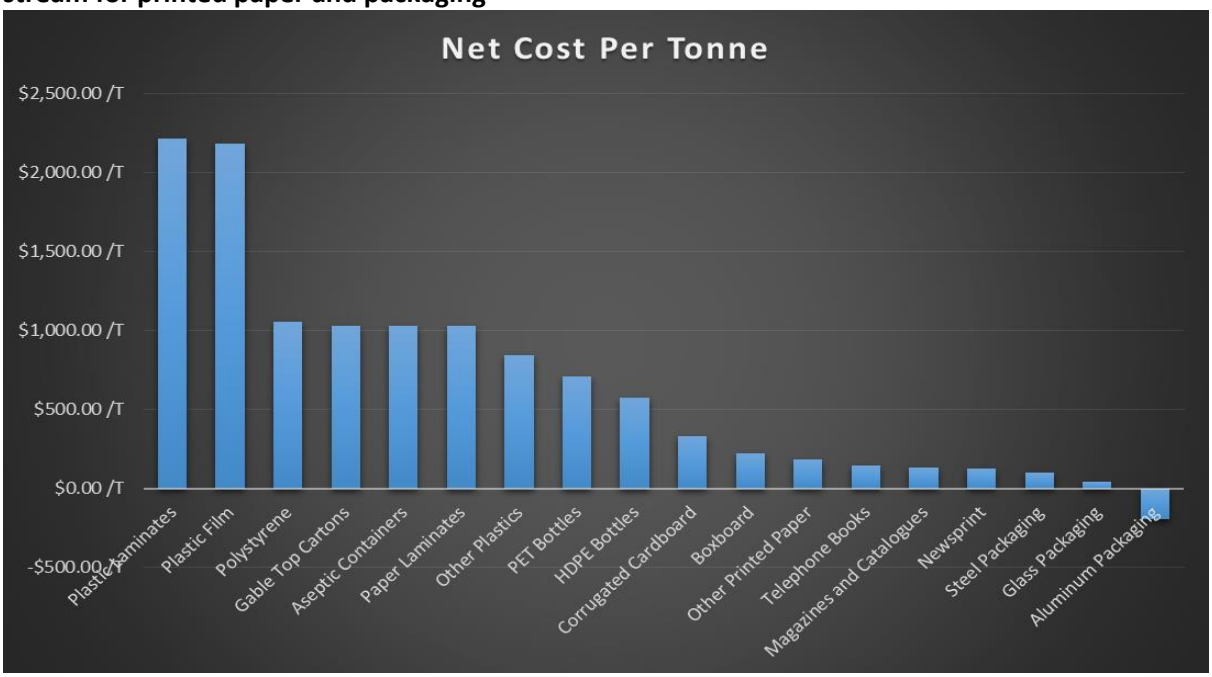
Using material specific recycling costs obtained from the Stewardship Ontario Pay in Model, we multiply a material's recycling net cost per tonne by the quantity of material generated (i.e., the net cost per tonne to recycle newsprint is $123.20 USD, and there are an estimated 533.5 thousand tonnes recycled in New York State annually – as such, the total cost to recycle all newsprint is $123.20 multiplied by 533,500T).

Based on our data assumptions, the total net recycling system cost for all printed paper and packaging is $757,936,661 USD. This excludes costs related to program administration, data collection and promotion and education. It should be noted that while these estimates imply a level of precision (specific down to a decimal point), these are very much "best guesses using best available data" and are primarily intended to be directionally accurate.

Figure 2 below provides a breakdown of the net cost per tonne by material type ($USD). Note the variability in recycling system costs depending on the type of material being recycled (ranging from -$197/tonne for aluminum to $2212.52/tonne for plastic laminates). This emphasizes the

point that not all recycling is created equal - while plastic film makes up only 2.68% of all material recycled, it accounts for almost 11% of all recycling system costs.

Figure 2: Net cost per tonne for recycling individual material types found in the residential recycling stream for printed paper and packaging



In order to calculate administrative, data collection and promotion and education costs, we use Ontario assumptions as a proxy for New York State.

In Ontario, we estimate that optimal promotion and education costs are $1 per household, per year. In New York State, there are 7,343,234 households, which means that annual promotion and education expenses are roughly $7.3 million dollars.

Administrative expenses are estimated to be 5% of total net system costs annually. If net system costs are modeled to be approximately $758 million dollars $USD, annual administrative expenses would be $37.9 million dollars. While administrative expenses are intended to capture annual data collection costs, it does not include the costs of baseline data collection (which can potentially be quite significant depending on how much data a particular jurisdiction has collected or has access to).

Based on our modeling, the estimated annual producer obligation under New York State's proposed EPR legislation are:

- Cost of material management: $758 million
- Administrative expenses: $37.9 million

- Promotion and education expenses: $7.3 million
- Total (annual) Recycling System Costs: $803.2 million USD

Stated alternatively, the direct economic impacts to producers attributable to proposed producer responsibility legislation are $803.2 million dollars annually.

2.3 Methodology Phase 2 Modeling (Indirect and Induced Impacts)

Most conventional analysis would stop at the point of measuring direct economic impacts and assume that this is the "bill" that producers will end up paying. However, this is an incomplete interpretation of how producer responsibility actually affects the economy of a particular jurisdiction. This is because the true economic impact of a particular policy or decision results in direct, indirect and induced effects. Direct effects are the result of initial spending (or in this case, cuts) and the corresponding impact (increased or decreased economic activity) in the local economy. Indirect effects are the results of business-to-business transactions indirectly caused by the direct effects. Induced effects are the results of the change in household income (or purchasing power) caused by both direct and indirect effects.

To estimate indirect and induced impacts attributable to an increase in recycling system costs, we use an input-output model, which in general terms, provides a detailed picture of the flow of products and resources within a given economic system and between that economy and actors outside of the system. Input-Output models are commonly used to estimate economic multipliers for specific industries and sectors, which in turn, form the basis for economic impact analysis that attempts to quantify the contribution/impact of specific industries to a local economy (or the effects of a given policy, event, or investment, expressed in terms of employment or investment).

Given that we have already modeled the direct impacts on packaged good pricing resulting from the proposed legislative changes in New York State (a direct increase of $803.2 million dollars per year), we perform the following steps to model indirect and induced impacts using our input-output model.

2.31 Step 1: Quantify the potential reduction in the municipal tax base resulting from the transfer of recycling and landfilling costs onto producers

One of the common claims made by advocates of producer responsibility is that it results in a reduction in the municipal tax base. When Ontario officially announced its transition to EPR, many proponents falsely claimed that the adoption of producer responsibility would save tax payers hundreds of millions of dollars each year. However, the actual impact on the municipal tax base is much more muted. Municipalities (particularly in a post COVID world), grapple with significant budgetary shortfalls and are likely going to take the funds "saved" from transitioning

the Blue Box program and re- allocating those funds to other programs and services. Using British Columbia and Ontario as a proxy, there is no data to suggest the transition to 100% EPR has resulted in a tax savings for households.

There is an argument to be made that the reallocation of funds to support other municipal programs and services does benefits household, but the benefits that are accrued are indirect and do not directly offset the increase in packaging costs that are attributable to EPR.

In the absence of having any examples to provide context for the analysis, this model assumes that households will experience a 15% reduction in the taxes/levies that they were previously paying under existing legislation.

2.32 Step 2: Determine how producers respond to the increased obligation

While there is no clear indication how producers in New York State will choose to respond to the added costs associated with EPR legislation, experiences from other jurisdictions suggest that they are likely not going to internalize the $803.2 million dollars in annual recycling system costs. Responses will manifest themselves in one of two ways:

a. costs are transferred to consumers and other participants in the supply chain (i.e., increased pricing for packaged goods), or
b. contraction of the company resulting in job losses etc. (a less likely scenario, but one that does have a precedent).

For the purposes of simplicity, our modeling assumes that increased costs will be passed onto consumers. This is a potential limitation of this study, as producers may have limited ability to increase the price of certain items due to demand elasticity. The most likely response by producers is a combination of cost externalization and reduced operational footprint.

Cost increases are modeled as a change in the price of manufacturing inputs (expressed in dollars) for the following Consumer Goods Packaging Groups as classified by NAICS. For the purposes of simplicity, only four level CPG manufacturing NAICS codes are shown:

NAICS CODE	NAICS Title
	Consumer Products/Packaged Goods
3111	Animal Food Manufacturing
3112	Grain and Oilseed Milling
3113	Sugar and Confectionery Product Manufacturing
3114	Fruit and Vegetable Preserving and Specialty Food Manufacturing
3115	Dairy Product Manufacturing
3116	Animal Slaughtering and Processing
3117	Seafood Product Preparation and Packaging
3118	Bakeries and Tortilla Manufacturing

3119	Other Food Manufacturing
3121	Beverage Manufacturing
3122	Tobacco Manufacturing
3133	Textile and Fabric Finishing and Fabric Coating Mills
3141	Textile Furnishings Mills
3149	Other Textile Product Mills
3151	Apparel Knitting Mills
3152	Cut and Sew Apparel Manufacturing
3159	Apparel Accessories and Other Apparel Manufacturing
3161	Leather and Hide Tanning and Finishing
3162	Footwear Manufacturing
3169	Other Leather and Allied Product Manufacturing
316991	Luggage Manufacturing
3211	Sawmills and Wood Preservation
3231	Printing and Related Support Activities
3256	Soap, Cleaning Compound, and Toilet Preparation Manufacturing
3272	Glass and Glass Product Manufacturing
3322	Cutlery and Handtool Manufacturing
3352	Household Appliance Manufacturing
3371	Household and Institutional Furniture and Kitchen Cabinet Manufacturing
3399	Other Miscellaneous Manufacturing
4251	Wholesale Electronic Markets and Agents and Brokers
4532	Office Supplies, Stationery, and Gift Stores
4539	Other Miscellaneous Store Retailers

It should be noted that not all CPG manufacturing sectors are affected equally by a potential increase in the producer obligation resulting from EPR. By definition, materials with higher net recycling costs will be more adversely affected as a result of the proposed legislation. Certain packaging sectors and package material types are also more likely to experience a change in cost should they represent an inordinate share of all material generated and sold into New York State (relative to their proportional share of net system costs)

This study sought to capture these differences, looking at which packaging sectors (and subsequently) consumer packaged goods products, are likely to experience the greatest changes in price.

2.33 Step 3: Examine how "basket of goods" costs varies across localities

Basket of goods costs vary significantly depending on locality, population density, proximity to markets etc. This analysis is used to determine the relative price elasticity of the consumer good basket across communities from different parts of New York State, in response to changes in the price of manufacturing inputs. Price elasticity is an often neglected consideration, but our

analysis in Canadian jurisdictions has shown that packaged good prices are very much a function of locality. Price elasticity in rural and northern communities is sometimes 200% greater than in urban communities, as an example increasing the input costs of a 4L bag of milk by $1 will result in $2 increase in the final purchase price of milk in Moosonee when compared to a $0.17 change in Ottawa. Due to relative price elasticities, our modeling shows that the increase in the price of a basket of consumer goods resulting from an increase in manufacturing inputs resulting from EPR is more acute in certain communities within New York State. These results are shown in Table 1.

Table 1: Variation in basket of goods costs across localities

County	Relative % Change in Basket of Good Pricing in response to increases in CPG manufacturing costs
Cayuga County	127%
Hamilton County	121%
Lewis County	117%
Allegany County	115%
Franklin County	111%
New York County	102%
Nassau County	102%
Westchester County	101%

It is critical that the readers interpret these values with caution, as the underlying intuition (and the strength of the relationship between locality and cost of living) is based on data taken from Ontario and British Columbia. The sensitivity of the change in the price of consumer packaged goods in response to an increase in manufacturing costs varies based on a number of factors, some of which are not accounted for in this modeling. Our modeling assumes that households in rural areas do not have the ability to travel to other cheaper jurisdictions (as is the case in some remote areas of Ontario and British Columbia). This may not be a reasonable assumption for New York State, but in the absence of state specific data, we are forced to use data analogs from other jurisdictions.

2.34 Step 4: Use our adapted Input/Output model to estimate indirect and induced economic impacts of EPR legislation

Using a combination of a logit-loglinear regression model and our regionalized input-output table, we attempt to determine both the total economic impact resulting from EPR legislation, as well as how prices of consumer packaged goods change. A log-linear analysis is necessary to isolate what percentage of the producer obligation ($803.2 million) specifically manifests itself as price changes in the consumer basket of goods, by sector, and by material type. Our modeling

assumes that an increase in the price of the producer obligation is analogous to increasing the cost of manufacturing inputs for a particular packaging type. It is important to note that the producer obligation is not distributed equally across packaging types and sectors – what a particular company (or group of companies/industry associations) is obligated to remit in EPR fees is a function of the types of packaging products that they generate into a market, and what the share of net recycling system costs they represent. Our modeling attempts to capture which particular sector and what types of products are most affected by the adoption of New York State EPR legislation.

While a full elaboration of this exercise is outside the scope of this report, it is best explained using the following example "If a bottled water producer faces an additional $10 million dollars in direct costs in response to EPR legislation, how much (if at all) will it increase the unit price of bottled water that they sell?".

Log-linear analysis allows us to control for all of the factors that can potentially impact the price of a product (e.g., bottled water), and specifically isolate how changing the cost of a product input (e.g. plastic bottle packaging), affects the total price that consumers will end up paying. Given that the overall price of a good varies depending on how sensitive the price is to changes in the cost of inputs, our study modeled more than 32 different sectors and 660 different types of packaging most commonly consumed by households. As best we could, the intent was to model how cost of living for households in New York State would change in response to the adoption of EPR legislation. It should be noted that the price of consumer packaged goods are particularly sensitive to changes in the price of manufacturing inputs. Differences in price elasticity were observed across material categories, i.e., plastic packaging is more sensitive to changes in the cost of manufacturing inputs, when compared to paper based packaging.

Table 3 shows an input/output multiplier for the range of manufacturing packaged goods sectors included in this study. For the purposes of simplicity, manufacturing categories have been aggregated to represent an "umbrella" categories that represent manufacturers of most commonly used consumer packaged goods types. Guidance regarding how categories should be aggregated was based on NAICS industry code classifications (i.e. 322220 Paper Bag and Coated and Treated Paper Manufacturing and 326112 Plastics Packaging Film and Sheet (including Laminated) Manufacturing, would be classified under Paper/Paperboard/Fiberboard and HDPE/PET Rigid/Flexible respectively).

Please note that we are only interested in the production of consumer packaged goods (including primary, secondary and tertiary packaging) made up of printed paper and packaging found in the residential recycling stream. The multipliers shown in Table 3 represent a weighted average of all indirect/induced impacts included within each parent material category

Table 3:

Parent Packaging Sector	Indirect	Induced	Multiplier
Paper/Paperboard/Fiberboard	2.48 X	2.54 X	5.02 X

HDPE/PET/Rigid Packaging	3.09 X	2.88 X	5.97 X
LDP/LLDPE/Flexible Packaging	4.51 X	4.16 X	8.67 X
Aluminum Packaging (including food and beverage)	1.16 X	1.05 X	2.21 X
Steel Packaging (including food and beverage)	1.79 X	1.11 X	2.90 X
Glass Packaging	1.12 X	1.69 X	2.81 X

As an example, for every $1 dollar increase in direct manufacturing costs for certain types of Rigid Flexible packaging, the direct, indirect and induced effects on the economy would be $5.97. But how does this economic impact actually manifest itself as changes in the price of packaged goods and services that households have to pay? This is discussed in Section 3 below.

2.35 Step 5: Back out savings resulting from a decrease in the municipal tax base

Once we have determined the potential change in the price of consumer basket, we then back out savings resulting from a potential decrease in the municipal tax base to arrive at our final estimates.

3.0 Results

Based on the modeling indirect and induced effects attributable to EPR legislation, we arrive at a final impact multiplier that ranges from 3.6x to 5.4x for all potentially obligated printed paper and packaging materials. As noted in Section 2.34, the multiplier is intended to capture both the direct, indirect and induced impacts of adopting EPR legislation in New York State. Using these multipliers, an $803.2 million-dollar direct cost to producers (resulting from EPR legislation) results in a $2.9 billion to $4.17 billion dollar impact on the economy of New York State.

Note: We express impact multipliers as a range to reflect a conservative (low end) and high end estimates with respect to price elasticities of various packaged goods. The change in price of a particular packaged good in response to EPR legislation falls within a range (based on a number of factors, such as the product in question and what materials it is made of, locality, population density, regionalized cost of living, household income levels, density of packaged goods retailers, proximity of packaging manufacturers to end markets etc.) and is not one specific data point.

As noted earlier, the impact on packaged good prices is largely dependent on how producers intend to internalize these costs. Option 1 is to externalize costs to consumers and other actors within the supply chain, Option 2 is to cut jobs/decrease economic activity, and Option 3 is some combination thereof. This report only models Option 1 due to a lack of information regarding how producers will respond to increased financial obligations resulting from producer responsibility. How a producer chooses to respond is likely dependent on site and situation specific factors – this analysis should be re-run should data specific to New York State become available.

Table 4 below summarizes the modeled increase in the price of packaged food items reflecting a range of common consumer goods (that are part of the proposed EPR legislation). This includes:

- Paper Food Tray (500g)
- Parchment Paper (50m)
- Glass Pasta Sauce Jar (500ml)
- Aluminum Pop Can (355ml)
- Aseptic Juice Carton (500ml)
- Molded Boxboard Egg Carton (12 Count)
- PET Water Bottle (500ml)
- HDPE Detergent Bottle (1L)
- LDPE Film Sandwich Bags (100 Count)
- Cling Wrap Film (300m)
- Polystyrene Clamshell Rigid Container (1 Litre)
- Laminated Pouch (200ml)
- Cardboard Cereal Box (434g total weight)
- Cardboard Frozen Dinner Box (600g total weight)
- Steel Can Preserved Vegetables (500ml)

Table 4: % Price Change Post EPR Legislation

Material Category	% Change Low	% Change High	% Change Average
Paper Food Tray (500g)	1.82%	3.11%	2.93%
Parchment Paper (50m)	2.21%	3.88%	2.79%
Glass Pasta Sauce Jar (500ml)	2.06%	3.44%	2.84%
Aluminum Pop Can (355ml)	0.42%	0.91%	0.55%
Aseptic Juice Carton (500ml)	4.41%	7.91%	5.89%
Molded Boxboard Egg Carton (12 Count)	5.17%	6.64%	5.77%
PET Water Bottle (500ml)	4.06%	6.21%	5.89%
HDPE Detergent Bottle (1L)	3.97%	5.14%	4.35%
LDPE Film Sandwich Bags (100 Count)	13.89%	21.56%	17.71%
Cling Wrap Film (300m)	14.03%	22.54%	18.21%
Polystyrene Clamshell Rigid Container (1 Litre)	15.50%	17.91%	16.77%
Laminated Pouch (200ml)	18.84%	27.06%	21.65%
Cardboard Cereal Box (434g total weight)	4.05%	5.19%	4.66%
Cardboard Frozen Dinner Box (600g total weight)	4.64%	5.97%	5.41%
Steel Can Preserved Vegetables (500ml)	2.88%	3.64%	3.37%

Please note that the items evaluated in this study do not refer to a specific brand type. Baseline prices were established by examining the price of multiple products within the same material category – this average serves as our point of comparison.

As shown in Table 4, the impact of EPR legislation on the price of commonly used consumer packaged goods items is quite significant, and varies significantly depending on the material in question. Packaging materials that have relatively high costs to recycle (plastic laminates, plastic film etc.) experience the greatest increase in overall price, increasing by more than 20% in some instances. On aggregate, based on the 600+ packaged goods included in our modeling, the total impact on "basket of good" pricing (all packaged goods) ranges from 4.01% on the low end, to 6.35% on the high end. Stated alternatively, this translates into an additional $36 to $57 per month in grocery costs for the average family of four in New York State.

These increases are independent of inflation and are the increase in packaged goods costs attributed exclusively to the adoption of EPR policy. As noted by Dalhousie University, disruptions to food supply chains, combined with inflationary pressures resulting from COVID stimulus funding has resulted in the largest year over year increase in the price of groceries in more than a generation. Any increase in the price of consumer packaged goods resulting from the adoption of producer responsibility is likely to exacerbate issues surrounding food affordability and access.

While the modeling steps may seem complicated, in many ways the, results can be interpreted as though we are increasing input costs when manufacturing packaged goods. As noted above, our modeling assumes that producers will attempt to minimize the impact of their EPR obligation by passing price increases onto to consumers and other actors (upstream suppliers and downstream customers) within the supply chain. These increases in costs have a "cascading" effect on the economy – an increase in the price of packaged goods means that consumers have less to spend on other items, which in turn, results in decreased economic output resulting from decreases in consumer spending. The "Input/Output Multiplier" that we calculate is intended to capture the full magnitude of these impacts , but the results should be interpreted with caution.

Understanding and modeling the complex interrelationships between an increase in costs borne by producers and the corresponding impact on the costs of goods and services is an inexact process that relies heavily on assumptions that reflect a very specific scenario. It is important that readers recognize not only the technical limitations of input/output modeling, but understand that the experiences of one particular jurisdiction cannot be transposed to another. As a better practice, analysis surrounding the potential impact of producer responsibility legislation on the local economy and price of consumer packaged goods needs to use data specific to the jurisdiction in question.

4.0 Combating the Critics

Advocates of EPR legislation often contend that there is no appreciable impact in the cost of living attributable to the transition to full producer responsibility. In a recent Newsday article discussing the potential adoption of EPR for packaging in New York State, Senator Todd Kaminsky (NY) was quoted as saying the effect of EPR on raising consumer prices was ""infinitesimal, not anything anyone would notice."

While it is unclear where this assertion originates, proponents of EPR often cite a report by RRS that found that the price of packaged goods in jurisdictions with EPR, were not materially different than package good prices in provinces without EPR (https://www.oregon.gov/deq/recycling/Documents/rscRRSconsumer.pdf) . This ultimately led to the conclusion that the adoption of EPR had a negligible impact on product pricing – a finding that has been parroted repeatedly in conversations surrounding the adoption of EPR legislation for packaging.

However, in a review of the RRS methodology conducted by York University, it was found that the manner in which the study was conducted was methodologically flawed and could not be used to provide any insights into whether EPR affects the price of packaged goods (either positively or negatively). Given the way the study was designed, it is not possible for RRS to make any statements regarding the effect of EPR policy on packaging prices. Comparing costs across jurisdictions (even for like products and retailers) is not likely to yield any meaningful inferences with respect to the impact of EPR policies.

There are literally hundreds of variables that affect the price of goods across localities (even for the same product and retailer). Demographics, infrastructure, relative purchasing power, proximity to markets, density of competing retailers etc. all effect price. In order for RRS to make the statements they did, they would have to control for all of these factors using statistical techniques such as multivariate regression to specifically isolate the effects of EPR on packaging prices. Given that many of these explanatory variables are collinear, they would also need establish controls for interdependency among explanatory variables.

While the above description may be technical, the best way to look at it is that we are trying to compare identical systems, where the only variable being changed is the presence or absence of EPR programs. All other variables that can potentially impact a product's price need to be controlled for in an analysis. RRS made no attempts to control for interdependent variables and arrived at a conclusion that cannot be substantiated empirically. The only observation that can be made is that product prices differ from province to province but provides no insight as to why they differ.

When faced with this critique, RRS acknowledged the limitation of the study and stated that controlling for exogenous variables that affect product pricing was outside of the study scope. Unfortunately, in failing to control for the litany of variables that can affect prices, particularly

across localities, then no conclusions can be drawn regarding the relationship between EPR and package pricing.

5.0 An issue of equity

While the intent of producer responsibility legislation is to encourage superior environmental outcomes and keep recyclable materials out of landfill, there are broader social implications that are rarely considered and poorly understood.

While a 4-6.5% increase in our grocery bills may seem like an inconvenience to some, it can have catastrophic consequences to lower income and marginalized families in New York State. In the summer of 2019, York University conducted focus groups with more than 1,800 consumers in the Greater Toronto Area over the course of four months. More than 80% of respondents indicated that price was the primary determinant for making a purchase. If possible, respondents indicated that they would like to make more sustainable purchases, but budgetary constraints largely discouraged them from doing so.

During focus group sessions, families expressed concern that they were unable to keep up with the rising cost of food and would have to "go without" should prices continue to increase.

What makes this issue particularly insidious is that households characterized as “low income” (household income less than $40,000 per year) consume almost 20% more pre-packaged goods (namely grains, produce and frozen meats), when compared to families whose household income exceed $100,000 a year. There is an inverse, statistically significant correlation between household income and percentage of prepackaged products of overall weekly purchases. Given that lower income groups are the greatest consumers of packaged goods (both in absolute terms, and as a relative percent of the overall purchasing basket), any upwards pressure in the cost of food stuff could have potentially adverse impacts.

Ultimately, the decision to adopt producer responsibility legislation for packaging waste has an unintended effect that disproportionately affects are most vulnerable and marginalized families.