UBC Social Ecological Economic Development Studies (SEEDS) Sustainability Program

Student Research Report

Buying Local for UBC Food Services

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Executive Summary

UBC Food Services (UBCFS) purchases approximately $2 million in produce annually from FreshPoint, a Sysco subsidiary. As part of its Food Vision and Values, UBCFS has a stated commitment to minimize environmental impacts and support sustainable farming practices. While already sourcing a significant portion of their produce locally, UBCFS is considering growing its partnership with Vancouver Farmers' Market Direct (VFMD) from $32,000 in 2018 to $500,000 by 2022. The purpose of this report is to assess the effect of UBCFS pursuing more locally-sourced produce on social welfare. While there are potential benefits in the form of reduced carbon emissions, much of the literature stresses that local production doesn't necessarily reduce carbon emissions. The social implications of this potential policy change thus depend on the consumption value placed on local produce by UBC consumers and the change in procurement costs to UBCFS. We find that in the month of October, there are potential cost savings of 11%. We also find a small reduction in the social cost of pollution, with 0.56 tonnes of reduced carbon emissions per month. This is valued at a social benefit of $240 annually. From the perspective of consumers, the economic literature shows that consumers tend to place significantly more value on local food than conventional food. However, due to project limitations, it was not possible to calculate a measure of consumption value specifically for UBC consumers. We thus assume that UBC consumers are the same as the consumers in the Grebitus et al. (2013) study, and place 30-40% more value on local produce.

The results of our analysis show that UBC Food Services would be able to switch some of its procurement to VFMD with minimal cost impacts, and potentially with cost savings. We calculated the cost of sourcing produce from VFMD using October 2017 data. We then analyzed the total cost impacts for various cost increase thresholds by individual goods. If the individual good's percentage change in price was less than this threshold value, then we would switch from Freshpoint to VFMD. Based on the findings of the literature review, we use a threshold of 30%. If UBCFS was to only purchase VFMD goods with a 30% increase in cost or less (in comparison to FreshPoint), the overall monthly savings would be $5,602. This analysis assumes that UBCFS is able to purchase any available produce from VFMD, without capacity constraints. Based upon this assumption, we find that UBCFS could switch a major proportion of their produce spending to VFMD, while generating increased consumer benefits, as well as cost savings and small environmental benefits.

1 Introduction

1.1 Background

The client, UBC Food Services (UBCFS), is requesting an analysis related to their Food Vision and Values initiative. From the perspective of UBCFS, the initiative emphasizes a desire to procure food in a socially-responsible manner. This paper serves to analyze the potential effects of a policy change which would shift a large proportion of UBCFS fresh produce spending to local farms.

Currently, UBCFS spends approximately $2 million annually on produce, which primarily comes from their corporate supplier, FreshPoint (a Sysco subsidiary). UBCFS also has a small purchase relationship with Vancouver Farmers' Market Direct (VFMD). In 2017 UBCFS purchased about $32,000 worth of produce from VFMD. It is important to note that the mandate of UBCFS is to provide a for-profit service to the university and its consumers. Accordingly, the effect of this policy change on UBCFS customers should have equal consideration as the effects on the environment and UBCFS.

1.2 Project objectives

This project has 3 distinct objectives. The first is to understand the change in UBCFS' costs if they were to replace some of their conventional produce purchases with local alternatives. Secondly, to estimate the environmental impact of purchasing more food from VFMD in lieu of FreshPoint. Finally, this project seeks to analyze the impacts of this policy change to UBCFS end consumers. By analyzing these three effects, UBCFS can make a more informed decision about their purchasing practices. Ultimately, we will use these objectives to answer the question: should UBCFS shift up to $500k in produce spending to VFMD?

1.3 Scope

The scope of this project is to complete the following:

1. Conduct a switching cost analysis of like-for-like (i.e. "apples to apples") produce items between FreshPoint and VFMD.
2. Estimate the change in transport-related carbon emissions of buying more produce from VFMD and less from FreshPoint.
3. Provide an estimate of the additional value consumers place on local produce in comparison to conventional produce. Cross-reference this estimate with the potential cost impact to determine whether consumers would be better off (or worse off) with the policy change.

2 Framework

This analysis applies a cost benefit analysis (CBA) framework to evaluate the societal impact of shifting procurement from FreshPoint to VFMD. Notably, the CBA framework considers all of the costs and benefits to society as a whole, and so we evaluate the impact of this procurement shift not only for our client UBCFS but also to UBCFS customers, as well as to the environment. As such, we recommend that UBCFS go through with the procurement shift if its benefits outweigh its costs for these constituents and for the environment.

In particular, Vancouver Farmers' Market Direct (VFMD) is not recognized as a stakeholder in this project, though they stand to accrue benefits from the increased purchase scale and upfront commitment from UBCFS. This is because consideration for the British Columbia and Vancouver economies is not within the scope of UBC Food Services' mandate; the company's responsibility is primarily to provide a service to its customers and the university.

We determine the net benefits of this project relative to the current state (net benefits equal benefits minus costs) (Boardman et al. 2011). We break the overall social impact of this project into the sum of the impacts to UBC Food Services, UBC customers, and the environment as follows:

Net Social Benefit = Net Benefit to UBC Food Services + Net Benefit to UBC Consumers + Environmental Impact

We then evaluate each of these components (net benefits to UBCFS, its customers, and the environmental impact) to determine whether each these components will have a net benefit. If each component is determined to have a net benefit, then the overall net social benefit would also be positive. In this case, we would recommend that UBCFS go through with the procurement shift, as it implies that in aggregate, the benefits of this procurement shift outweigh its costs, having taken the impacts of all stakeholders into account.

However, if each of these components has a negative impact, then this project would have an overall negative impact and we would not recommend the procurement shift. Meanwhile, if some of the components are net benefits, but some are net costs, then the net social impact of this project would depend on the relative size of the 3 net effects. For example, this project could be a net benefit for UBCFS and have a positive environmental impact, but these benefits could come at an net cost to UBCFS customers if the costs they would incur outweigh the benefits they would receive. In this case, we would further investigate whether the positive impacts outweigh the negative ones, and make our recommendation accordingly.

2.1 Net Benefits to UBCFS Customers

For UBCFS customers, the shift towards local procurement represents a tradeoff between higher prices (VFMD may cost more than FreshPoint) and the perceived benefits of buying local produce. Regardless of whether or not it is empirically beneficial to the local economy, there is a growing consumer trend in purchasing local produce due to the perception that it supports local economies (Marginal Revolution University 2015). This perception may increase customer satisfaction and therefore value from buying local as opposed to conventional produce. To determine whether the procurement shift will generate a net benefit for this group, it needs to be established that the additional value that customers place on local produce (relative to FreshPoint conventional produce, the status quo) exceeds any increase in cost that they could incur.

We estimate this change in net benefits by determining the current demand (from customers) for UBCFS produce. This demand is a mathematical representation of how much of a specified item would be sold at a given price. We then apply an estimate of 30% additional willingness-to-pay for local produce that was determined by Grebitus et al. (2013). This means that for any given quantity of produce, the customer is willing to pay 30% more if that produce is locally sourced than if it is conventionally sourced.

The CBA framework predicates that the customer net benefits would be equal to their additional willingness to pay for the local produce. For example, a UBCFS customer buying local apples will not pay more for the local apple than they believe it's worth. Likewise, if there is much value placed on locally produced apples, the customer will continue to purchase them until their benefits no longer outweigh the cost of the apples. Given that customers will not pay more or less for a produce item than the benefit they obtain, we can determine their net benefit by estimating the value of the additional produce they would buy if they were buying local apples instead of the conventional ones.

2.2 Net Benefit to UBC Food Services

UBCFS has expressed a desire to remain profitable while providing sustainably sourced options for their customers. As such, UBCFS would generate a net benefit from the procurement shift if there is no profit change or if there is a profit increase. Profit changes would be determined by how much more UBCFS can charge its customers for locally sourced produce without incurring losses from decreased demand.

Taking the Grebitus et al. (2013) estimate into account, customers are willing to pay 30% more for locally sourced produce, so UBCFS could (hypothetically) charge up to 30% more for locally sourced produce without suffering a loss of revenue. As such, we evaluate the cost of this procurement shift by comparing like for like substitutes of current FreshPoint purchases with VFMD's offerings, and determining which produce items represent a 30% or less cost differential. We assume that these are the produce items that UBCFS can shift towards sourcing from VFMD without losing customers. However, it is critical to note that while the 30% estimate from the literature review is our best possible estimate, it is derived

from a study that examines the preferences of a random sample of German consumers. The very different socioeconomic and demographic background of typical UBCFS customers (young students on tight budgets) relative to the subjects of the Grebitus et al. (2013) study make the 30% estimate a very rough approximation. As such, using this 30% marginal willingness to pay for local produce to estimate UBCFS customers' demand is one of the key assumptions in this analysis. Moreover, the Grebitus et al. (2013) involved an auction experiment as well as a survey portion, making the estimates found less accurate; we would expect consumers to behave differently in more realistic situations.

The largest cost that UBCFS would incur as a result of this procurement shift is that FreshPoint would increase prices on the comparatively lower produce amount that UBCFS would then be sourcing from them. FreshPoint offers bulk buy discounts based on annual purchasing amount, so a decrease in this amount would result in a decrease in the degree of bulk buy discounts that UBCFS qualifies for, ultimately increasing the overall procurement cost for FreshPoint produce. . However, this cost increase is not included in this analysis, given that the revised prices associated with the decreased bulk buy discount would be subject to negotiation between UBCFS and FreshPoint.

We also believe that UBCFS would incur some logistical and time costs, as there would be additional labour costs associated with managing a procurement relationship with an additional supplier, and with renegotiating the FreshPoint contract.

2.3 Environmental Impact

The main environmental impact examined in this analysis is the change in carbon emissions that would occur as a result of the procurement shift. These changes were evaluated by determining the the change in carbon dioxide emission levels that would occur due to changes in shipping distance (e.g. produce from BC, Mexico, or California) and shipping medium (e.g. by truck, ship, and/or plane). This change in emissions is monetized by applying the social cost of carbon emissions from the scholarly literature.

3 Producer Surplus & Cost Analysis

3.1 Methodology & Assumptions

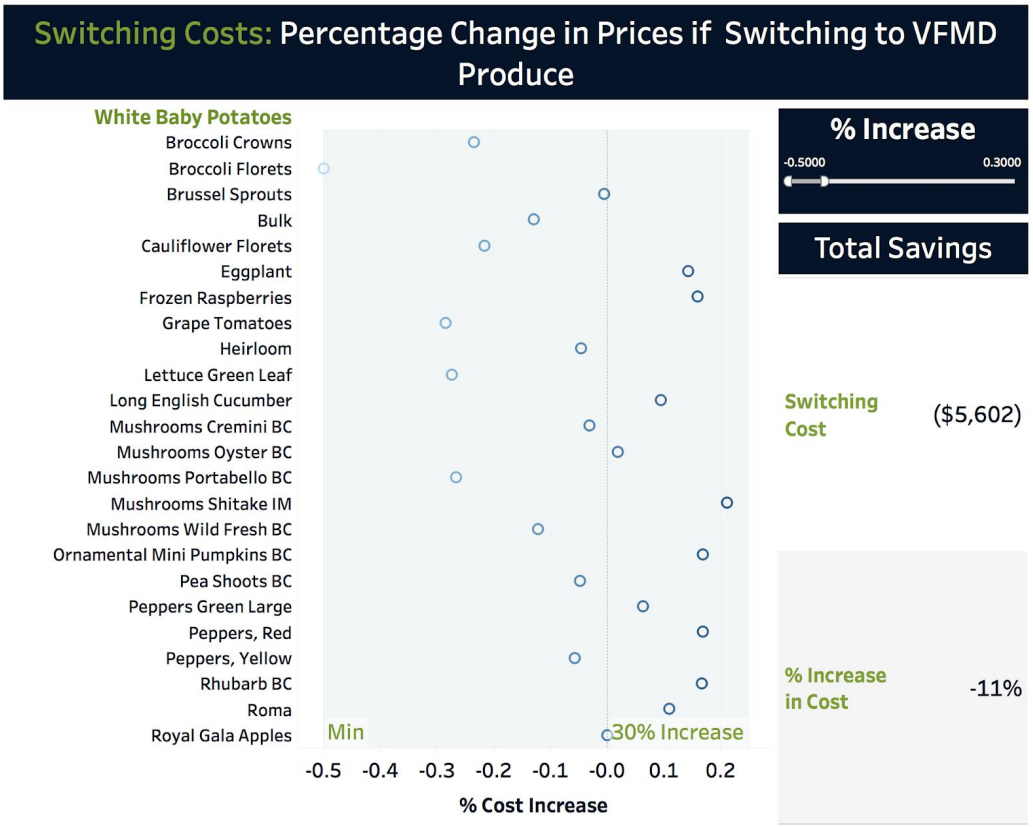
We calculate the change in UBCFS' surplus as the percentage change in costs that UBCFS would incur if it switched to sourcing produce locally from VFMD. To carry out this cost analysis, we use UBCFS' velocities and the prices of goods sourced from FreshPoint in October 2017, along with VFMD's product offerings and current prices. We use October prices and quantities as a proxy for the prices and quantities available during the rest of the academic year, and we assume that the prices offered by FreshPoint remain unchanged after a decrease in overall purchase quantity.

In order to be able to directly compare product prices across suppliers, we first standardize all the produce measurements and then match the existing FreshPoint orders with an exact

substitute from VFMD (e.g match FreshPoint broccoli crowns with VFMD broccoli crowns). For both suppliers, if there are multiple items under the same category (e.g. different packaging SKUs of the same product), we choose a standard measurement unit. We then use weighted averages to estimate a representative price, based on the velocities or available quantities for each product. Once the prices have been adjusted, we estimate the change in costs of sourcing produce from VFMD. Based on growth projections provided by VFMD, we assume that there are no capacity constraints in VFMD farms.

3.2 Results & Analysis

Results indicate that while some goods, like grape tomatoes, may be cheaper to source locally, a complete switch to VFMD would entail a significant cost increase. The cost of sourcing all available products from VFMD is estimated at $31,293 for the month of October, representing a 48% increase in total produce costs. We propose that, by avoiding procurement from the “worst offenders”, UBC FS would be able to shift some procurement to VMFD with minimal price impacts. We define worst offenders as products whose price exceeds the price offered by FreshPoint by an amount greater than the customers’ additional willingness to pay for local products. Based on our literature review, we assume a positive impact on consumer surplus from buying local produce. Grebitus et al. (2013) show that typical consumers are willing to pay 30-40% more for locally produced food items, depending on the magnitude of transport distance. Therefore, in order to maximize net welfare gains, local goods should only be procured when the percentage cost increase is less than the increase in the typical customer’s willingness to pay for local goods.



As illustrated in the figure above, we have created a dynamic tool that can be used to test for different willingness to pay as well as to estimate the associated percentage increase in costs. After removing the worst offenders using the willingness to pay for local products of 30%, we find that, in the month of October, there is a potential to save $5,602 (an 11% decrease in total produce costs) by sourcing produce locally. This price differential demonstrates that the worst offenders (e.g. VFMD peeled garlic costs over 600% more) are costly to produce by small scale farms and are likely to be more efficiently produced by a large-scale supplier.

3.3 Limitations

Limited access to year-round pricing data stands as a limitation to our results; given the pricing data available, we only use October prices and quantities to conduct our cost analysis. Considering the volatile nature of food prices and the availability constraints associated with the local growing season, we foresee significant price and availability variation throughout the academic year. Specifically, we expect that the overall price differential calculated in this analysis is an underestimate of the true switching cost. As a harvest month for BC farming, October would have more competitive local produce prices than the rest of the academic year. We have also not accounted for the additional logistical costs that would arise, such as additional staffing costs, and the higher prices that FreshPoint would charge on other goods after switching to a different supplier.

4 Environmental Effects

4.1 Carbon Emissions From Shipping

4.1.1 Methodology & Assumptions

To estimate the reduction in carbon emissions due to shipping associated with sourcing produce locally, we used the goods matched dataset used in the cost analysis as it also contained the point of origin of the produce for both suppliers. We then estimated the distance between the point of origin and UBC. This distance is split into the distance by land and distance by sea. The following formula is then used to calculate carbon dioxide emissions as a result of shipping.

$$tonnes\ of\ CO_2 = 0.000062 * \sum(W_i * D_{li}) + 0.000016 * \sum(W_i * D_{si})$$

Where W_i is the weight of the produce, D_{li} is the overland distance and D_{si} is the distance by sea. This formula tells us that the carbon emissions of shipping are equal to the distance shipped by land multiplied by the weight of the produce multiplied by the tonnes of CO2 produced per kilometre per tonne by road, a coefficient from the ECTA report, plus the weight of the produce multiplied by the distance travelled by sea multiplied by the tonnes of CO2 produced per kilometre per tonne by sea. To calculate the net change in carbon emissions we use the above formula for both Fresh Point and VFMD produce and subtract the VFMD emissions from the Fresh Point emissions to calculate our net carbon savings. To

calculate its dollar value we multiply this by the value of carbon emissions from the IMF paper by Parry et al.

For our analysis of the change in shipping-related carbon emissions it is necessary to make several assumptions. First, we assume that produce is shipped efficiently from its origin to UBC; if it is more efficient to ship it by sea then that is the course of action, and that VFMD and Fresh Point ship with the same efficiency. Second, we assume that the mean distance of Fresh Point's British Columbian farms is the same as the weighted mean distance of VFMD's farms, i.e. produce from Fresh Point grown in British Columbia has the same carbon footprint from shipping as VFMD produce. Third, we assume that produce sourced from Fresh Point had a common point of origin by country: for Mexico we assume this point was Mexico City, while for US produce we assume this point was Fresno, California. We chose Fresno as California is the most productive agricultural state in the USA, with Fresno county being the most productive county by value of produce (California Agricultural Resource Directory, 2009). We chose Mexico City as the single point of origin for Mexican produce as not only is it a commercial hub for Mexico, it is also geographically central. This is important for the assumption as food is produced in southern and northern Mexico, varying by season and type of produce.

4.1.2 Results & Analysis

The results of this calculation indicate that there would be a net carbon savings of 0.62 tonnes per month if all produce procurement were switched from FreshPoint to VFMD. This figure is reduced further to 0.56 tonnes of reduced carbon dioxide emissions from transportation when we limit our procurement substitution to those goods deemed cost efficient in the cost analysis section of our report. With a carbon price of $35 per tonne (Parry, Veung & Heine, 2014), the reduction in carbon emissions due to local sourcing is valued at $19 in October. Scaled to the proposed contract value of $500,000 6.3 tonnes of carbon would be saved, at a value of $219. From this, we can determine that while there is an environmental benefit to switching procurement to VFMD, it is not a significant impact. This is likely because the produce with the largest carbon footprint from transportation, like kiwis from New Zealand, are impossible to replace with local production due to differences in the climate.

4.1.3 Limitations

First, as we do not know with certainty the method by which these goods are transported nor the efficiency with which the vehicles are being packed we cannot be certain that these carbon dioxide emissions figures are entirely accurate, but instead ought to be treated as a best estimate. This is compounded by an estimation of the point of origin being a best estimate given the produce and the most common agricultural areas in the US and Mexico. It is likely that the average point of origin is different from our estimate.

4.2 Farm Production & Efficiency

In addition to transport-related emissions, the CO2 emissions from production are also important to consider. We cannot simply assume that local production results in less carbon emissions since there is less mileage to ship the produce, because this omits the production process. Hence, we have turned to the academic literature to assess this impact. We find that it is simply not feasible to provide an accurate estimate for the production-related carbon emissions due to the lack of available production information of the producers in question. While it could be a subject of future research to determine carbon emissions of VFMD farms, it would be extremely difficult to obtain a similar, comparable number for FreshPoint. Hence, we focus our analysis on the transport-related carbon emissions and use this as an estimate of the environmental benefits. However, it is important to consider the omitted effect of production-related carbon emissions.

Much like the challenge in estimating carbon efficiency in production, it is difficult to estimate the economic efficiency of producing food in smaller farms. In other words, if there are economies of scale (less labour, land and capital required to produce the same amount of food) for large, commercial farms, it may be wasteful for society to produce food on smaller farms since this would require more inputs for the same amount of output. This is the conclusion of Born & Purcell (2006) as well as Winfree & Watson (2017). However, there is also research which suggests that local farming can have a positive effect on personal incomes (Brown et al., 2013) and result in net social benefits (Hughes et al., 2008). Due to this ambiguity in the literature and the small scale of this policy change, we assume a negligible change in economic efficiency.

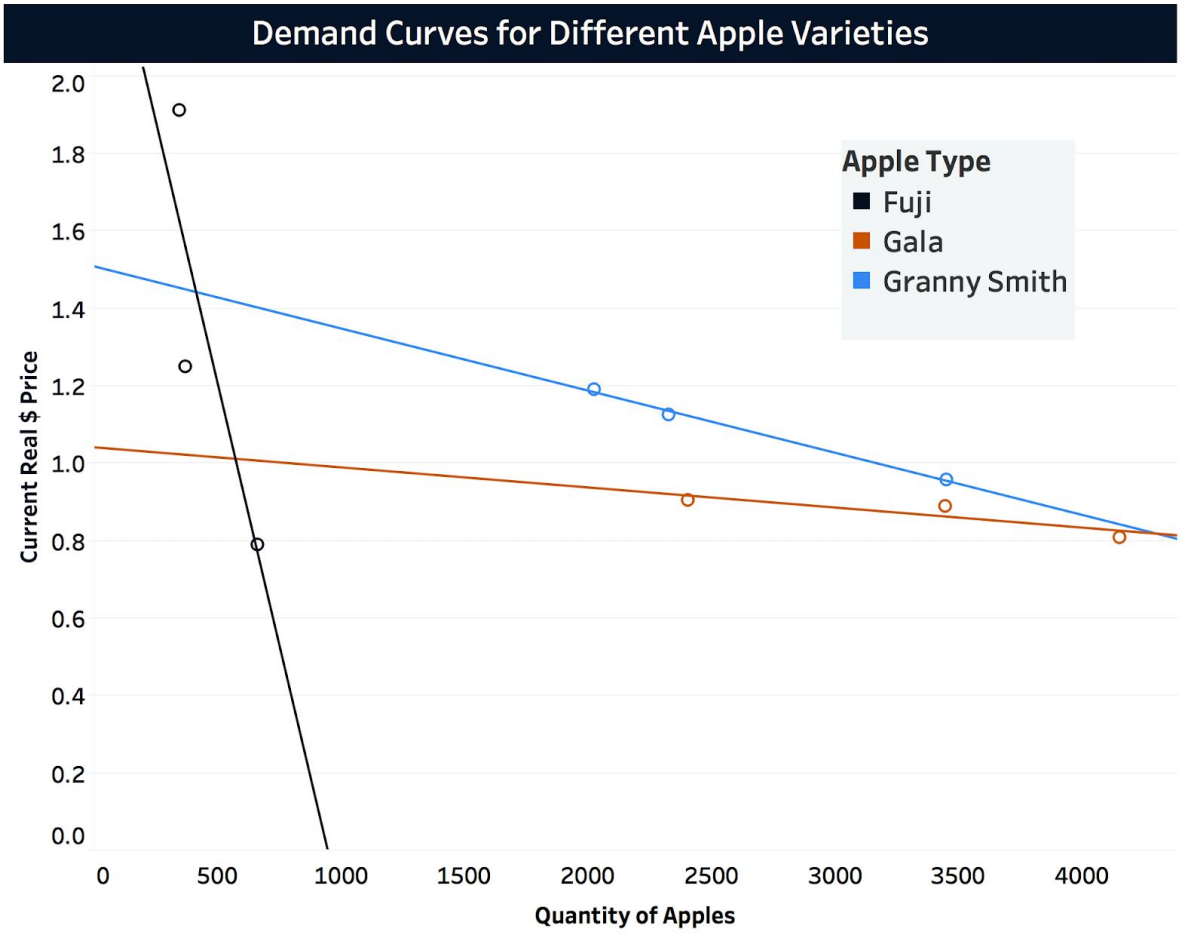
5 Consumer Surplus

5.1 Methodology & Assumptions

To calculate the value created for UBCFS' customers, we used the apples sales data available from August 2016 to October 2018. This dataset was divided by month and by location, including the Open Kitchen along with Place Vanier and Totem Park cafeteria. It contained the quantity of each apple type sold, the apple type and the price of the apples sold for each year. The first step was to eliminate changes in demand due to seasonal variation and location, so we compiled the quantities sold from each location from August to October in 2016, 2017 and 2018 and then adjusted the pricing data for inflation. The prices and quantities were then plotted and lines of best fit were included so we could derive a demand curve (see Glossary) in order to estimate the change in the value to UBC consumers if they value the produce 30% more.

The key assumptions to these calculations is that the cafeterias offer to sell the apples regardless of their price, i.e. that if an apple is more expensive then they do not substitute it for a cheaper apple offering. Additionally this calculation assumes that there are no other changes to demand other than the change in price, e.g. that the number of students served by a cafeteria has remained constant over time.

5.2 Results & Analysis



Analyzing the chart above, there are two key takeaways. The first is that it is immediately apparent that there are very different changes in quantity bought among varieties when the price of the apples changes. Indeed, it would appear that Fuji apples are 10x more sensitive to changes in price than gala apples. This is for goods which we would initially consider to be very similar products as they are both apples. This poses a significant difficulty in estimating the total value placed by the consumer on the produce from VFMD instead of Fresh Point. Therefore, any net welfare calculation of consumer benefit from the change is likely to be biased and extremely limited in its applicability.

The second key takeaway from the chart is that UBC consumers are very price sensitive, a price increase of a nickel for granny smith apples results in 250 fewer granny smiths purchased by UBCFS customers. This high price sensitivity of consumers brings into question the validity of the 30-40% additional value of local produce that has been cited in

our report as it indicates that UBCFS customers desire low prices, and are willing to change what they buy to minimise their food costs.

However, this does not preclude consumer surplus from being included in our analysis. We would expect there to be a positive gain to customer value as studies indicate that consumers value local produce more than non-local produce. If prices to customers remain unchanged, due to the cost of ingredients falling as indicated in our cost analysis, there is a positive welfare gain to consumers. Under these circumstances, we would expect that if the decision is made to switch procurement to VFMD from Fresh Point that the quantity of food sold would increase, provided the prices remain constant, if there is a greater value attached to local produce. Therefore we would recommend that should the procurement be switched that there is indeed an increase in demand to confirm that there has been an increase in the value customers place on the food.

5.3 Limitations

We are concerned in this study over the possibility of selection bias, where UBCFS chooses not to offer more expensive apples for sale to customers and instead offer a more affordable apple when prices are higher. Additionally, the dataset is relatively small which decreases the strength of our estimates. Given the variability in the provided data, we primarily use the Grebitus et al. (2013) study to estimate the benefit to customers. However, using this assumption implies that UBC consumers are representative of general consumers. This may be inaccurate, since UBC students may have different preferences towards local produce as indicated by their very high price sensitivity.

6 Conclusion & Recommendations

Our key recommendation to UBCFS is to engage in strategic procurement when sourcing from VFMD. As such, UBCFS should evaluate VFMD prices and quantity offered on a month to month basis, and determine which produce items should be sourced locally for that month based on its price relative to FreshPoint. Undertaking this procurement strategy implies that UBCFS may need to negotiate a more flexible contract with FreshPoint due to the VFMD's exposure to seasonal variability.

Despite the increased logistical costs of this strategy, we recommend overall that UBCFS shift procurement to VFMD. We assume that customers are willing to pay 30-40% more for local produce due to the additional value they place on supporting their local communities and on the environment. Moreover, UBCFS may benefit from a net reduction in produce procurement cost. There are also small but positive environmental impacts which could occur as a result of this project. Given that there are net benefits for each impact that we considered in our framework (impact to UBCFS, impact to UBCFS customers, and environmental impact), we determine that there is an overall net positive benefit, and therefore recommend that UBCFS undertake this project.

In terms of feasibility, the director of VFMD has provided qualitative estimates of how much produce they would be able to provide UBC with in the coming years. This is a concern for UBC Food Services as if they were to shift procurement, VFMD would need to be able to scale up its production in order to adequately serve UBCFS' needs. VFMD estimates that they can provide $100 000 worth of produce to UBC for the 2019-2020 year, and be able to provide the total $500 000 amount by the 2022-2023 academic year, provided that UBCFS enters into an upfront commitment with VFMD.

6.2 Future Considerations

We would recommend that further research be conducted to examine aspects of this project which are beyond the scope of this analysis.

Firstly, further research could examine the additional value placed specifically by UBC Food Services customers on local produce. An estimate from the scholarly literature has been used throughout this analysis, and as aforementioned, may not be representative of the UBC customer.

Secondly, it is important to investigate how customers attribute additional value to dishes that are made with local produce. Customers could only place additional value on a dish if the entirety of its ingredients are sourced locally, or it could be that customers place additional value in proportion to the fraction of local produce used in that dish. This issue warrants further research especially given that most of UBC Food Services sales are from prepared meals as opposed to the single unit produce items like the apples that were considered in this analysis.

Lastly, this analysis could be extended by determining how the procurement strategy should change over the course of the school year. VFMD produce offerings and prices vary due to seasonality, and therefore would not be the same as the analysis conducted here for October. Individual produce items would have varying cost differentials when compared with FreshPoint, which would affect which produce items (if any) should be sourced from VFMD in a given month. On a related note, it is very likely that FreshPoint's pricing may change as a result and any resulting increase in prices must be considered as it would impact UBCFS's total costs.

Appendices

Glossary

Cost-Benefit Analysis: a form of economic analysis which incorporates both discrete and indiscrete costs & benefits to place a social value on a policy change. For example, a robust cost-benefit analysis for an infrastructure project would include opportunity costs and time costs.

Consumption Value: how much value someone derives from consuming a product. Economic theory purports that people will only buy something if their consumption value is greater than the price.

Demand Curve: a function which graphs the quantity demanded of a good as a function of price.

Marginal Willingness to Pay: How much more someone would be willing to pay for a different product in comparison to the current state.

Social Welfare: The total well-being of society at large.

Literature Review

Avoiding the Local Trap
Born & Purcell, 2006.

Born and Purcell (2006) use the term "the local trap" to argue against the assumption that eating local food is desirable and better for the environment and for achieving positive social outcomes. Instead, this article argues that the scale of production never determines how sustainable and socially desirable a production system is. In other words, for advocates of sustainability and social justice, localization should be perceived as a means to the ends and not as the ends itself. Born and Purcell (2006) recommends that community planners conduct extensive research before determining whether local production is desirable. Some of the questions recommended for pre-assessment include: "Who will benefit from localization (or nationalization, etc.)? What is their agenda? What outcomes are most likely to result from a given scalar strategy?"

Economies of Size in Production Agriculture
Duffy, 2009.

Economies of size are defined as the ability of a farm to lower the costs of production by increasing production, given that the average cost per unit may decrease as the number of units increases. Overall, it's found that agricultural production has an L-shaped average cost curve, meaning that there are initial gains from economies of size (farmers are able to spread out more production over a fixed level of expenses) but these gains are maximized at a certain point and flatline. For the soybeans and corn crops in this study, such gains were maximized at the $100 000 mark. Huge leaps over the past century have given rise to today's current dual agricultural model of many small farms and relatively few large farms; technology increases the level of agricultural productivity, causing a substitution of capital for labour, which in turn demands a higher output to justify the high costs of capital.

Effect Of Distance Of Transportation On Willingness To Pay For Food
Grebitus et al., 2013.

This study from the journal, Ecological Economics, estimates the consumers' consumption value of local produce to be 30-40% higher than conventional produce, depending on how far the produce has traveled (WTP declines in distance transported). Grebitus et al. ran a non-hypothetical second-price auction in Bonn, Germany to assess this additional willingness to pay. Interestingly, the authors find a different WTP curve for different categories of goods. WTP for typically homogeneous goods like apples or lettuce strictly decline in distance, but certain goods, such as wine, gain an exotic element in distance. For example, Canadian consumers would be willing to pay relatively much more for French wine rather than French lettuce.

Evaluating the Economic Impact of Farmers' Markets Using an Opportunity Cost Framework.
Hughes, Brown, Miller, and McConnell, 2008.
Hughes et al. (2008) estimates positive net impacts from farmers' markets on West Virginia's economy. First, this study uses an IMPAN-based input-output model to estimate the gross gains in output and employment. Second, Hughes et al. (2008) incorporates the concept of opportunity cost to account for direct revenue and employment losses. The data used in this study was derived from a survey in which respondents indicated the range value of their sales at farmers' markets in the area. This study finds that while some sectors of the economy are negatively impacted, there are overall net benefits resulting from farmers markets.

The Impacts of Local Markets: A Review of Research on Farmers Markets and Community Supported Agriculture (CSA).
Brown and Miller, 2008.
Brown and Miller (2008) provides a broad review of the existing literature on the economic and social impacts of farmers markets. Existing literature on this topic supports the idea that farmers markets can have positive impacts on the income and human capital of vendors and can help promote a sense of community. While it is possible that local markets have negative impacts and food and beverage stores, truck businesses and wholesale traders, Hughes et al. (2008) argues that these effects are more than offset by the "gains to vegetable and melon farming, fruit farming, greenhouse and nursery, and animal and egg production."

Linkages Between Community Focused Agriculture, Farm Sales, and Regional Growth.
Brown, Goetz, Ahearn, and Liang, 2013.
Brown et al. (2013) uses US county-level census of agriculture data to examine whether community-focused agriculture resulted in positive regional growth outcomes- estimated using real personal income change (2002-2007). Overall, this study finds that community focused agriculture in the US did not result in statistically significant increases in regional economic growth (between 2002 and 2007). However, the estimated impact of community focused on economic growth varied across different regions. The study also estimated the impact of farm sales on personal income: " The coefficient on Δfarm sales shows that a $1 increase in farm sales over the 2002 to 2007 period led to a $0.22 increase in county personal income over the same period. On an annualized basis, this represents about a $0.04 increase in personal income for every additional dollar in farm sales" (Brown et al. 2013). Nevertheless, this study does not address the long-run effects of community-based farming on regional economic growth.

The Welfare Economics of "Buy Local"
Winfree & Watson, 2017.
Winfree and Watson lay out a theoretical model to the welfare economics of buying local produce. This model predicts that buying local produce when there are not significant externalities, and when there is a comparative advantage in production, creates a deadweight loss by artificially shifting the demand or supply of local produce. However, the

authors do lay out that if there are felt to be significant positive externalities in production, along with the presence of market power, that this could outweigh the deadweight loss. This is a possible scenario for UBC Food Services, given its market power and the potential for there to be positive externalities of local produce, or at least a reduction in negative externalities such as air pollution. Additionally, there is the potential for a net welfare gain if consumers genuinely feel there are benefits to local production.

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