PROTECTIONISM OR LEGITIMATE REGULATIONS: WHAT CAN TRADE PARTNERS EXPECT FROM THE NEW US FOOD SAFETY REGIME?

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Abstract

In January 2011, the US passed the Food Safety Modernization Act (FSMA) which represents a major legislative initiative to revise and strengthen the regulatory regime pertaining to foodborne illness and contamination. The tightening of the regulatory regime was justified on the basis of a number of high-profile foodborne disease incidents, which are claimed to have undermined public confidence in the US food safety system. While tightening food safety regulations inevitably increase barriers to trade, the central question is whether the trade inhibiting externality caused by the tightened of regulations is totally legitimate or whether it contains an element of pure economic protection. This paper seeks evidence of political influence in the governance of trade measures pertaining to food safety for fruit and vegetables in the US as manifested in import refusals. The results suggest that agricultural sector unemployment and antidumping (proxies for political influence) have had a significant positive effect on import refusals for Canada and Mexico. Evidence of politically motivated refusals was not found in the case of China.

Keywords**:** *Political influence, import refusals, US Food Safety Modernization Act*

1.0 Introduction

In January 2011, the United States passed the Food Safety Modernization Act (FSMA) which represents a major legislative initiative to revise and strengthen the regulatory regime pertaining to food borne illness and contamination. Given that there have been major technological improvements in the production, processing, storage and transportation of fruit and vegetables since the last major overhaul of the food safety regulatory regime in the US, far more of these products are consumed fresh and originate outside the US. As food safety regulations apply to both domestic producers and imports, they can act as trade barriers – sanitary and phytosanitary measures. It is in view of this that Ribera and Knutson (2011) concluded that the FSMA will place substantial cost on private actors in the supply chain and consequently raise food prices arising from compliance costs. Of course, tightened food safety regulations inevitably increase barriers to trade; the central question is whether the trade inhibiting externality caused by the tightened regulations is legitimate or whether it contains an element of pure economic protection.

The official impetus for the revision of US SPS measures against fruit and vegetables is a number of high-profile foodborne disease incidents, which are claimed to have undermined public confidence in the US food safety system (Carte Pate and Leavitt Partners 2010). Fruit and vegetables received particular attention because they are a favourable growth medium for foodborne pathogens and increasingly consumed in an untreated state.[1] Foodborne pathogens have also been reported as a major hazard for US food supply chains (Ackerman 2002) and several cases of *E. coli* and *Salmonella* in the US have been associated with the consumption of domestic and imported foods including fruit and vegetables (Carte Pate and Leavitt Partners 2010; CDC 2010; Kitzhaber 2011). The intent of the new legislation is, hence, to expand the regulatory mandate of the US Food and Drug Administration (FDA) in an attempt to increase the efficacy of the US food safety system. The FDA must verify and certify that imported foods comply with the regulations. Food certification may also be done by any FDA accredited third party auditor (US Food Safety Modernization Act 2011, Section 307). Other key provisions include allowing the FDA to grant expedited entry to importers that exhibit satisfactory compliance and, the mandate to embargo or mandatorily recall any food product it suspects may have adverse health implications (US Food Safety Modernization Act 2011, Nakuja et al 2011).

Notwithstanding the legitimate impacts, there are rising concerns that food safety regulations may be intended to provide illegitimate economic protection. The presence of avenues to protect coupled with increased competition from imports, provides US fruit and vegetable producers with an incentive to request economic protection from lawmakers and regulators under the new regulations. While Baylis *et al* (2011) and Grant and Anders (2011) suggest that new and more stringent regulation may result in trade diversion (especially when it leads to import refusals justified on SPS grounds) and trade deflections respectively; the ability to use sanitary and phytosanitary measures to provide pure economic protection has long been

[1] Fruit and vegetables were also a focus of the FSMA because other favourable growth medium for foodborne pathogens – meat, dairy and poultry – are regulated by the United States Department of Agriculture (USDA) under separate legislation (Nakuja et al, 2011).

recognized[2] and the Member States of the World Trade Organization (WTO) have attempted to address this problem through the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS). The major provisions of the SPS mandate that countries not structure or administer their regulatory regimes for food safety in ways that discriminate against (or among) foreign suppliers, that the measures have a scientific basis, be proportional to the risk, and applied in the least trade distorting manner that can achieve the measure's objectives (Isaac, 2007). The "scientific basis" provision, however, trumps the "non-discrimination provision" when a "food safety" problem may be present in some countries and not others (Isaac et al, 2002).[3] While the principles that underlie the commitments Member States make are clear, as with many aspects of trade agreements, the way commitments are operationalized can be contentious and open to differing interpretations.[4] Ultimately, the design and implementation of food safety regulation can be determined through understanding underlying motives; but because motives can seldom be directly observed, indirect evidence must be sought and interpreted.

Seeking evidence of political interference in trade measures is particularly important in the case of the FSMA because the regulatory regime mandated in the Act is very much a work in progress with the US Food and Drug Administration (FDA) charged with developing a host of new regulations covering everything from inspections of foreign facilities to the licensing of testing laboratories to acceptable agronomic practices for foreign producers (Nakuja et al, 2011). Given the diversity of tasks with which the FDA is charged, there is ample opportunity for protectionist aspects to be incorporated into regulatory design and procedures. Further, there is already some suggestion that aspects of the FSMA discriminate against foreign suppliers (Nakuja et al, 2011), contrary to WTO commitments.[5] As direct evidence of political interference in the current time period is difficult to obtain,[6] examining patterns of behaviour from the recent past may indicate whether or not trade partners should be particularly vigilant as the FDA rolls out its food safety regime for fruit and vegetables over the next few years. While political interference in food safety has been examined for other products (Baylis et al, 2009; Baylis et al, 2011; Busby and Roberts, 2011; Grant and Anders, 2011; Kerr et al, 1986), it has not been examined in the case of fruit and vegetables. Of course, any such evidence is only circumstantial and not proof that activities are continuing in the present time. This paper seeks evidence of political influence in the governance of trade measures pertaining to food safety for fruit and vegetables in the US.

[2] The official website of the World Organization for Animal Health states**:** The ratification of the 1924 Agreement creating the OIE reflects a desire clearly expressed by the Secretary General of the League of Nations that year. He invited various governments to designate veterinary experts "to examine the health guarantees that could be provided by cattle-exporting countries, the facilities that importing countries could accord on the basis of these guarantees and, in general, to determine the most effective means of enabling statutory veterinary measures to be applied, taking into account the economic interests of exporting countries and without prejudicing the interests of countries wishing to protect themselves against animal diseases"…."the Economic Committee of the League of Nations thus proposed to facilitate international trade in animals and animal products to try and reverse the *often highly overt tendency of numerous countries to use sanitary arguments purely for the purpose of economic protection*" (emphasis added) (OIE, nd.).

[3] For example, when a pest that thrives in a tropical climate cannot survive in a temperate climate.

[4] Of course, this is the reason for incorporating mechanisms for dealing with disputes in trade agreements.

[5] Until such time as there is a formal dispute brought to the WTO and a judgement brought against the FSMA, the apparently discriminatory aspects of the FSMA can remain in place.

[6] Direct evidence of current protectionism would require an admission that such motivations were at play in the design of the FSMA regulations – an unlikely but not impossible event.

It is asserted in this study that the FSMA will increase protection and step up import refusals by virtue of the FDA's 'unlimited powers' to recall products or deny market access based on its definition of satisfactory compliance, particularly if political influence can be brought to bear. Such actions could disproportionally increase costs for the Canadian fruit and vegetable industry as a result of its high degree of dependency on the US market. For example, approximately 85 percent (by value) of Canada's fruit and vegetable exports are destined for the US market and are worth approximately two billion dollars to farmers. The US fruit and vegetable market is therefore of considerable importance for Canadian producers and it is only prudent that foreign suppliers remain skeptical of the motives behind the FSMA.

2.0 Protectionist Political Interference

Lawley (2004) hypothesizes that political decisions are largely driven by the short-term pressure of the political cycle, therefore, suggesting that governments will be more responsive to measures advocated by political pressure groups in times of poor economic performance than will be the case in an era of prosperity. This is likely because protectionist vested interests may have more resonance with voters in a period of economic adversity (Viju and Kerr, 2011).

The state of the US economy as the regulations mandated by the FSMA are being developed by the FDA, and in particular the competitiveness of the fruit and vegetable sector where the share of imports has been rising takes place while the US is plagued by the worse economic recession since the 1930s (Viju and Kerr, 2011). The FSMA is anticipated to increase fruit and vegetable import refusals on sanitary and phytosanitary grounds as a result of it being perceived as having higher standards for foreign firms, and that the FSMA is open to political influence. The US fruit and vegetable industry is facing increasing foreign competition with net imports rising from US$2 billon to approximately US$11 billion over the period of 2001 to 2010 (Johnson 2012). The FSMA also comes at a time when unemployment is consistently high across almost all sectors of the US economy as a result of the 2008 financial crises, thereby raising expectations that politicians may be faced with considerable pressure to protect domestic industries. For example, the FSMA exempts small-scale producers in the US under its provisions, but does not allow them for similar foreign firms (US Food Safety Modernization Act 2011, Section 419(f)) although there is no evidence indicating that small firms in the US have been better at preventing foodborne diseases than large firms. However, notwithstanding evidence of political motivated standards increasing import refusals in other sectors (Baylis et al, 2009; Baylis et al, 2011; Busby and Roberts, 2011; Grant and Anders, 2011), the specific case of fruit and vegetables has not been investigated. Hence, the objective of this paper is to ascertain whether there appears to be a cause-and-effect relationship between fruit and vegetable import refusals and political influence in order to better inform the ongoing debate over whether the FSMA regulations will likely provide a degree of purely economic protection.

3.0 Modelling Political Influence

Non-compliance with food safety regulations constitute the scientific basis on which food of foreign origin can be rejected for import. Food adulteration violations accounting for refusals are categorised as chemical, pathogenic and 'others' (mainly filth and decomposed foods (Buzby and Roberts, 2011). The FDA, in accordance with its legislative mandate, verifies that all

imported fruit and vegetables are in compliance with US food regulations at the point of entry. Those shipments not in compliance are either refused entry, re-exported or destroyed (Humphrey 2003). Following the argument that the application of food safety regulations may be politically influenced, Baylis et al (2009) tested for political pressure in US seafood import refusals using monthly observations over the 1998 to 2004 period. Their implicit assumption is that governments can effectively provide protection to domestic producers by increasing import refusals. They thought this mode of protection was likely to be used because quantitative restrictions had been eliminated under WTO trade rules agreed upon in the Uruguay Round.

In this paper, political influence is defined as tacit manipulation of fruit and vegetable imports to protect the vested economic interests of the US fruit and vegetable industry. It is envisaged that pressure groups will tacitly lobby government officials to step up rejections from countries that compete with the US industry (especially when domestic market conditions are less favourable to the domestic industry (Kerr et al, 1986)). Such interests include protection from foreign competition and retention of employment in the industry. The refusals have to be tacit because refusals explicitly based on requests from domestic sector interests contravene commitments in international trade agreements.

3.1 Canada

The approach of Baylis et al (2009) is adapted in this paper to test the hypothesis of political influence being manifest in the case of Canadian fruit and vegetables refused entry into the US. While acknowledging that our examination of political influence in import refusals prior to the new regulatory regime is not a direct test for political influence in impending regulations (i.e. FSMA), it can provide some insights about how the pending regulations might operate. In particular, the test will establish whether there appears to have been political influence in fruit and vegetable import refusals in order to inform the debate as to whether the anticipated rise in refusals under FSMA may be, in part, motivated by a desire to provide economic protection.

In this paper the agricultural unemployment rate is used as an indicator of political influence. It is hypothesized that a rise in unemployment will be associated with an increase in import refusals. When unemployment rises in a given import substitution sector, government will move to protect domestic industries by increasing protection and invariably increasing refusals. Increasing refusals restricts imports and, hence, increases demand for domestic produce. Consequently, product prices increase and producers, in turn, increase their demand for labour in order to expand output to take advantage of the higher prices. In the end, import refusals will increase when unemployment increases. In the US fruit and vegetable industry, however, there are a large proportion of unskilled workers, often of foreign origin without secure residency status meaning they have little direct influence with politicians (Calvin and Martin, 2010). In this situation, unemployment is taken as an indication of the economic plight of firms with rising unemployment indicating declining firm level activity. It is in economic downturns that firms can be expected to lobby their political representatives for protection.

Although the fruit and vegetable industry constitutes approximately 15 percent of the US agricultural sector (US Census Bureau 2012), Calvin and Martin (2010) report that it is the most labour intensive agricultural industry with a sizable share of labour demand in the US

agricultural sector. The industry's labour demand is at a peak during harvesting followed by a substantial layoff afterwards. This makes the industry a considerable contributor to fluctuations in agricultural sector unemployment. Hence, the study uses US agricultural sector unemployment as a proxy for unemployment in the fruit and vegetable (UNEMP) industry due to lack of unemployment data reported specifically for the fruit and vegetable industry.

Antidumping actions are also used as a measure of political influence in our model. Domestic firms bring anti-dumping cases (ANTID) against foreign firms as a legal means of seeking protection. As such, it is expected that evidence of anti-dumping activity may act as a signal for regulatory institutions to increase protection.[7] Hence, an increase in antidumping actions is expected to have a positive effect on import refusals, where refusals are open to political influence. Similarly, lobbying expenditure is a proxy for protectionist motivation based on the premise that firms spend resources to lobby the government for protection. Hence, an increasing lobbying expenditure arising from the fruit and vegetable industry could be an indication of the desire for increased protection. Lobbying expenditure is, however, excluded from this analysis because of data limitations.

The value of fruit and vegetables imported from a specific country is introduced to control for the number of refusals. It is hypothesized that as imports rise, the number of products that will genuinely be rejected because they did not comply with US food safety laws may increase. As the volume of products destined for export to the US market increase, the time spent in screening to eliminate non-complying products is reduced as a result of the desire to dispatch highly perishable fruit and vegetable products to export markets. As a result, increased quantities of non-complying products may be carried along the supply chain only to be rejected at the point of entry. Hence, a positive relationship is expected between the import refusals from Canada (RCAN) and the value of imports from Canada (IMPCAN).

Further, food safety alerts and recalls in the US (ALERT) are included in the model to account for genuine concerns for safety. It is assumed that rising recalls and alerts pertaining to fruit and vegetables will increase scrutiny in inspection and possibly increase refusals. Hence, food safety alerts in the domestic market is expected to have a positive effect on import refusals.

A Vector Error Correction Model (VECM) is employed to estimate the effects of political influence on import refusals. The VECM is justified when: (1) the time series variables have regular and seasonal unit roots; and (2) the variables cointegrate – implying a long-run relationship between the variables exists. Since our model uses monthly data which is subject to seasonal influence, 12-monthly seasonal dummies are added to account for seasonality. The VECM estimates the long-run and short-run relationship between the variables, as well as the speed at which the short-run coefficients adjust to the long-run (Greene 2003; Madalla and Kim 2000). The condensed VECM can be written as:

$$\Delta y_t = \sum_{i-1}^{k-1} \Gamma_i \Delta y_{t-i} + \Pi y_{t-k} + \varepsilon_t \quad (1)$$

[7] Further, anti-dumping actions, or the prospects of an action may be a signal for exporters to "voluntarily" limit their exporting activities in the short run as a proactive defensive strategy.

Where: y_t is an n x 1 vector of endogenous variables; ε_t is an nx1 vector of stochastic disturbances; Π has a rank equivalent to the number of distinct cointegration equations and decomposed as $\Pi = \alpha\beta^{\tau}$; β is a n x r matrix of cointegration relationship parameters; and α is a n x r matrix of speed of adjustment coefficients (Greene 2003; Skrabic and Tomic-Plazibat 2009).

The full VECM specification for import refusals for Canada is shown by equation (2) below. The component of the equation in brackets is the long-run relation while the component outside the brackets is the short-run relation. The coefficient α_1 represents the speed at which the short-run component adjusts to the long-run.

$$\begin{aligned}\Delta RCAN_t = \alpha_1(RCAN_t - \theta_1 IMPCAN_t - \theta_2 UNEMP_t - \theta_3 ALERT_{t-1} - \theta_4 ANTID_{t-1} - \theta_0) \\ + \theta_5 \Delta RCAN_{t-1} + \theta_6 \Delta IMPCAN_{t-1} + \theta_7 \Delta UNEMP_{t-1} + \theta_8 \Delta ALERT_{t-1} \\ + \theta_9 \Delta ANTID_{t-1} + \theta_{10} \qquad (2)\end{aligned}$$

The hypothesis of political influence is tested by estimating and testing the significance of the regression coefficients generated for the unemployment and antidumping variables.

3.2 Data

The analysis uses monthly data from October 2001 to December 2011 because import refusals data is only available for this period. Import refusals were sourced from the FDA and measured as the number of refusals per month. Data on the value of fruit and vegetables (US$) imported from Canada into the US were sourced from US Department of Agriculture while unemployment data was obtained from US Bureau of Labor Statistics. The data on antidumping actions was sourced from the Global Antidumping Database of The World Bank and measured as the total number of antidumping activity/cases brought against fresh fruit and vegetable products by US farmers per month.

3.3 Descriptive Statistics

The descriptive statistics pertaining to the data are shown in Table A1[8]. The minimum, average and maximum refusals of fruit and vegetables reported per month for Canada are 8, 7 and 82 respectively. Further, the average monthly import value of fruit and vegetables from Canada is approximately US$77.5 million, while minimum and maximum import values are about US$12.3 million and US$186 million respectively. Moreover, while there are approximately five food safety alerts and recalls pertaining to fruit and vegetables on average per month across the US, the data further shows a minimum of zero (no alerts) and maximum of 45 alerts per month. With regards to unemployment, the average, minimum and maximum agricultural sector unemployment rates in the US are 10.3 percent, 2.4 percent and 21.3 percent respectively. Data shows approximately 0.37 antidumping cases against fresh fruit and vegetable

[8] Table or figure number preceded with the letter 'A' indicates they are in the Appendix.

products per month. The number of antidumping cases brought against fresh fruit and vegetables in the US ranges from zero (0) to a maximum of two antidumping actions per month. The majority of the data points show no antidumping and no alert cases. All variables were transformed into logarithms except antidumping and alerts[9] before estimating the model.

4.0 Results

The test for unit roots (Table A2) and cointegration (Table A3) supports the application of the VECM. The VECM included one lag as suggested by the Akaike Information Criterion (AIC), the Schwarz Information Criterion (SC), the Final Predictor Error (FPE) and the Hannan-Quinn information criterion (HQ) (Table A6)[10]. The results of the estimated VECM (Table A7) are explained in two parts: long-run and short-run effects.

4.1 Long-run Effects of Import Refusals From Canada

The long-run relationship between import refusals from Canada, value of fruit and vegetables imported from Canada, US agricultural sector unemployment, food safety alerts and antidumping is the estimated cointegration equation (Table 1). The results show that, in the long-run, US agricultural sector unemployment, value of fruit and vegetables imported from Canada and food safety alerts explain import refusals from Canada.

Table 1. Long-run Effects of Import Refusals From Canada

Variable	Coefficient	Standard error	t-statistic
$RCAN_{t-1}$	1.0000		
$IMPCAN_{t-1}$	1.633905	0.21239	7.69306***
$UNEMP_{t-1}$	1.282111	0.23797	5.38775***
$ALERT_{t-1}$	0.267799	0.08610	3.11036**
$ANTID_{t-1}$	0.103433	0.07233	1.43005
@TREND	0.007018		
θ_0	-13.00450		

****, ** and * are significance at 1 percent, 5 percent and 10 percent respectively*

The value of fruit and vegetables imported from Canada has a positive effect on import refusals from Canada in the long-run. The positive relationship between the value of fruit and vegetables imported from Canada and import refusals confirms the hypothesis that non-complying products rise with increasing imports. This is because, when imports rise, the time spent in screening products from the production site, before exporting, is reduced. This tends to increase the number of non-complying products which get rejected at the border. The results

[9] Since the logarithm of a zero is not defined, those values would have to be adjusted, if in logarithms, thereby decreasing the sample size substantially.
[10] Information criteria indicates the number of months the data must be lagged

show that a one percent rise in value of fruit and vegetables imported from Canada will increase import refusals from Canada by 1.63 percent in the long-run.

Food safety alerts have a significant positive effect on import refusals. The results show that a one percent increase in food safety alerts will increase import refusals from Canada by 0.27 percent. The safety of Canadian fruit and vegetables is of concern to US consumers as Canada is one of the largest sources of imports. Hence, it is likely that when alerts are issued, inspection of fruit and vegetables from Canada will be intensified to prevent any potential food safety hazards from getting into US.

Agricultural sector unemployment in the US (a proxy for political influence) has a positive effect on import refusals as expected. Agricultural sector unemployment is significant at 10 percent. Since fruit and vegetable production is a labour intensive activity with seasonal labour demand, changes in unemployment across the agricultural sector tends to track to a considerable degree that in the fruit and vegetable industry. As such, government's intervention to protect firms forced to shed labour could be anticipated as unemployment rises. In this regard, protection may be increased in the fruit and vegetable industry by increasing import refusals, which is reflected in the direct relationship between import refusals and agricultural sector unemployment. This confirms the findings of Baylis et al (2009)'s that declines in employment in a given import-substitution sector increases import refusals. The results suggest that a one percent increase in unemployment will increase Canadian import refusals by 1.28 percent in the long-run.

Antidumping, has no significant effect on import refusals in the long-run. Antidumping is probably not significant in the long-run because of the fairly small number of antidumping cases over the study period.

4.2 Short-run Effects of Import Refusals From Canada

Table 2 reports the short-run estimates of import refusals for Canada. In the short-run, import refusals from Canada are explained by the value of fruit and vegetables imported from Canada and food safety alerts. Past import refusals from Canada has an inverse relationship with current refusals, although it is not significant.

The value of fruit and vegetables imported from Canada has a positive effect on import refusals from Canada in the short-run and it is significant at ten percent. As in the long-run, the positive relationship between value of imports and refusals confirms the hypothesis that the number of non-complying products will rise whenever imports rise. The results show that a one percent rise in imports will increase import refusals by 0.63 percent.

Food safety alerts have a significant (10 percent significance) positive effect on import refusals from Canada in the short-run. The model predicts that a one percent rise in food safety alerts will increase import refusals from Canada about 0.15 percent in the short-run.

Agricultural sector unemployment in the US (measuring political influence) has no significant effect on import refusals from Canada in the short-run. This is partly because

unemployment usually rises gradually rather than showing a sudden increase. As such, officials may not be prompted until firms are shedding labour at a high rate, indicating they are in considerable economic difficulty and, hence, import refusals in response to unemployment may be muted in the short run. Antidumping actions, as in the long run results, have no significant effect on refusals.

Table 2. Short-run Effects of Import Refusals from Canada

Variable	Coefficient	Standard error	t-statistic
α_1	-0.769446	0.13377	-5.75217**
$\Delta RCAN_{t-1}$	-0.014259	0.10299	-0.13845
$\Delta IMPCAN_{t-1}$	0.629207	0.23799	2.64389*
$\Delta UNEMP_{t-1}$	0.122241	0.34953	0.34973
$\Delta ALERT_{t-1}$	0.14579	0.06150	2.3705*
$\Delta ANTID_{t-1}$	0.138696	0.14668	0.94557
@TREND	7.38E-05	0.00108	0.00430
θ_{10}	-0.000330	0.07679	-0.00868

****, ** and * are significance at 1 percent, 5 percent and 10 percent respectively*

The short-run adjustment coefficient in the model (-0.769446) is significant with a negative effect, as expected. This suggests that the model corrects about 76.9 percent of any increase in import refusals per month.

4.3 Results for Mexico and China

Similar quantitative models were estimated for Mexico and China and are presented in Table A8 and Table A9 respectively. While Mexico is the leading supplier of fresh fruits into the US market, imports from China have been increasing rapidly in recent times indicating the rising importance of Chinese products in the US market.

In the case of Mexico, agricultural sector unemployment has a significant positive effect on import refusals from Mexico (RMEX) in the long-run; antidumping, only exhibits a significant effect on import refusals in the short-run although it bears the expected positive effect in the long-run. Similarly, the value of fruit and vegetables imported from Mexico (IMPMEX) and alerts issued both have significant positive effects on import refusals in the short and long-run.

In the case of China, agricultural sector unemployment and antidumping do not have a significant effect on import refusals either in the short or long-run. However, food safety alerts are found to have a significant positive effect on import refusals from China (RCHI). Hence, while China has not been a significant threat to the US producers to the extent that refusals needed to be politically restrained (as in the case of Canada and Mexico), the US food regulatory system is worried about the safety of Chinese products. The value of fruit and vegetables from

China (IMPCHI) has a positive effect on import refusals in the short and long-run as in the case of Mexico and Canada.

5.0 Conclusions

The results indicate that import refusals from Canada are explained by agricultural unemployment in the US, the value of fruit and vegetables imported from Canada and the number of food safety alerts issued in the US. In the long-run, food safety alerts have a significant positive effect on import refusals. The results show that a one percent increase in food safety alerts will increase import refusals about 0.26 percent in the long-run. Further, a one percent rise in food safety alerts increases import refusals by 0.15 percent in the short-run. Rising fruit and vegetable import values from Canada leads to an increase in import refusals. This may be because, when import volumes increase, time spent on inspecting products before they are dispatched for export is reduced. As such, non-complying products associated with imports increase, which subsequently are rejected at the border.

Agricultural sector unemployment in the US has a significant positive effect on import refusals in the long-run. This is the case because fruit and vegetables contribute significantly to unemployment in agriculture as a result of seasonal labour demand. Hence, during the off season, labour is laid off and then re-hired during production. While there is a normal seasonal pattern to such labour demand, non-seasonal increases in unemployment provide an indication when firms are shedding labour, a sign that they are in economic difficulty. As a result, their lobbying for protection is likely to increase and, hence, may explain the direct relationship between import refusals and agricultural sector unemployment. The model predicts that a one percent increase in unemployment will increase import refusal by 1.28 percent in the long-run. Antidumping actions do not have an effect on import refusals in either the long-run or short-run. This may be due to the limited antidumping activity observed.

Similar models estimated for Mexico and China support some findings established in the case of Canada. While evidence that unemployment and antidumping activity in the US significantly increase import refusals in the case of Mexico, they have no effect on import refusals from China. As for Canada, food safety alerts and the value of imports each have a positive and significant effect on import refusals.

Direct evidence of political influence in import regimes is unlikely to be found as motivations cannot be directly observed. On the other hand, there is mounting indirect evidence of political influence in the US sanitary and phytosanitary import refusal system. This paper adds to that literature. The results suggest that exporters of fruit and vegetables to the US would be prudent to exercise vigilance as the FDA roles out its new regulatory regime as mandated by the FSMA. While not a fully effective means of offsetting protectionism, the US regulatory system is relatively transparent and open to comments by exporters (Kerr, 2004). As a result, the most egregious examples of regulations structured to provide pure economic protection may be identified and, hopefully, re-drafted.

References

Ackerman, J. 2002. Food: How Safe? http://ngm.nationalgeographic.com/ngm/0205/feature1 (accessed September 9, 2011).

Baylis, K., A. Martens and L. Nogueira. 2009. What Drives Food Import Refusal? http://works.bepress.com/kathy_baylis/26 (accessed July 28, 2011).

Baylis, K., L. Nogueira and P. Kathryn. 2011. Food Import Refusals: Evidence From the European Union. *American Journal of Agricultural Economics* 93(2):566–572.

Buzby, J.C. and D. Roberts. 2011**.** Food Trade and Food Safety Violations: What Can We Learn From Import Refusal Data? *American Journal of Agricultural Economics* 93(2):560–565.

Calvin, L. and P. Martin. 2010. Labor-Intensive U.S. Fruit and Vegetable Industry Competes in a Global Market. *Amber Waves* 8(4):24–31.

Carte Pate and Leavitt Partners. 2010. Responding to the Realities of Today's Global Food Supply Chain with Risk-Based Approach. http://www.pwc.com/us/en/point-of-view/assets/pwc-point-of-view-exporting-food-to-the-us.pdf (accessed June 10, 2011).

CDC. 2010. Vital Signs: Incidence and Trends of Infection with Pathogens Transmitted Commonly Through Food. US: Foodborne Diseases Active Surveillance Network. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6022a5.htm?s_cid=mm6022a5_w (accessed July 15, 2011).

Franses, P. H. 1991. Seasonality, Non-stationarity and the Forecasting of Monthly Time Series. *International Journal of Forecasting* 7:191-208.

Franses, P. H. and B. Hobijn.1997. Critical Values for Unit Root Test in Seasonal Time Series. *Journal of Applied Statistics* 24:25-47.

Grant, J. and S. Anders. 2011. Trade Deflection Arising From U.S. Import Refusals and Detention in Fishery and Seafood Trade. *American Journal of Agricultural Economics* 93(2):573-580.

Greene, H.W. 2003. *Econometric Analysis*. 5th Edition- International Edition. Upper Saddle River: Prentice Hall.

Humphrey, C.M. 2003. The Food and Drug Administration's Import Alerts Appear to Be Misbranded. *Food and Drug Law Journal* 58(4): 595-612

Isaac, G.E. 2007. Sanitary and Phytosanitary Issues. In W.A. Kerr and J.D. Gaisford (eds.) *Handbook on International Trade Policy*, Cheltenham: Edward Elgar, pp. 383-393.

Isaac, G.E., M. Phillipson, and W. A. Kerr. 2002. *International Regulation of Trade in the Products of Biotechnology*. Estey Centre Research Papers No. 2, Saskatoon: Estey Centre for Law and Economics in International Trade, 159pp.

Kerr, W.A. 2004. Homeland Security and the Rules of International Trade. *Journal of International Law and Trade Policy* 5(1):1-10.

Kerr, W.A., S.E. Cullen and M.F. Sommerville. 1986. *Trade Barriers and the Western Canadian Livestock Industry*. Working Paper 11/86, Marketing and Economics Branch, Ottawa: Agriculture Canada.

Johnson, R. 2012. US Trade Situation for Fruit and Vegetable Products. Report prepared for Members and Committees of US Congress. http://www.fas.org/sgp/crs/misc/RL34468.pdf (accessed June 12, 2012)

Kitzhaber, J.A. 2011. Fresh Strawberries from Washington County Farm Implicated in *E. coli* O157 Outbreak in NW Oregon. News Release. Salem: Oregon State Public Health Division. http://www.oregon.gov/OHA/news/2011/2011-0808.pdf?ga=t (accessed December 3, 2011).

Lawley, C. 2004. The Political Economy of Environmental Regulations in the U.S. Intensive Livestock Industry. M.Sc. Thesis. Saskatoon: University of Saskatchewan.

Leavitt Partners. 2011. Food Safety Modernization Act: What Does it Mean for Importers? http://www.ift.org/public-policy-and-regulations/~/media/Public%20Policy/PolicyDevelopment/FoodSafetyModernizationAct_Importers.pdf(accessed July 20, 2011).

Nakuja, T., M. Akhand, J.E. Hobbs and W.A. Kerr. 2011. The New Food Safety Regime in the US: How Will it Affect Canadian Competitiveness. CATPRN Trade Policy Brief 2011-01. http://www.uoguelph.ca/catprn/PDF-CP/CP2011-01-nakuja-akhand-hobbs-kerr.pdf (accessed September 20, 2012).

Office International Des Epizootics (OIE) nd. A Short History of the Office International des Epizootics. Paris (www.oie.int/eng/OIE/en_histoire.htmwww.oie.int/eng/OIE/en_histoire.htm).

Ribera, L. A. and R. D. Knutson. 2011. The FDA's Food Safety Modernization Act and Its Economic Implications. *Choices* 4th quarter 2011:26(4).

Schulze, P. M. 2009. Seasonal Unit Root Tests for the Monthly Container Transshipment of the Port of Hamburg. http://www.statoek.vwl.unimainz.de/Bilder_allgemein/AP_Nr._45_.pdf (accessed December 3, 2011).

Skrabic, B. and N. Tomic-Plazibat. 2009. Evidence of Long-run Equilibrium Between Money Demand Determinants in Croatia. *World Academy of Science, Engineering and Technology* 49:578-581.

United States Department of Agriculture (USDA) Database. http://www.fas.usda.gov/data.asp (accessed February 6, 2011).

US Census Bureau. 2012. The 2012 Statistical Abstract. http://www.census.gov/compendia/statab/cats/agriculture.html (accessed March 20, 2012).

US Food Safety Modernization Act 2011. http://www.fda.gov/Food/FoodSafety/FSMA/ucm247548.htm (accessed June 3, 2011).

Viju, C. and W. A. Kerr. 2011. Protectionism and Global Recession: Has the Link Been Broken? *Journal of World Trade* 45(3):605-628.

Appendix I

Table A1. Descriptive statistics

	REFMEX	REFCAN	REFCHI	IMPMEX	IMPCAN	IMPCHI	UNEMPL	ALERT	ANTID
Mean	46.16260	7.365854	22.85366	3.37E+08	77465854	7708171.	10.28195	4.878049	0.373984
Median	41.00000	5.000000	19.00000	3.00E+08	75000000	7608000.	9.800000	2.000000	0.000000
Maximum	187.0000	82.00000	100.0000	8.05E+08	1.86E+08	15187000	21.30000	45.00000	2.000000
Minimum	8.000000	0.000000	3.000000	63000000	12300000	1421000.	2.400000	0.000000	0.000000
Std. Dev.	27.51613	9.931956	16.09586	1.81E+08	37583066	3584273.	4.069882	7.010046	0.534059
Skewness	2.146707	4.795684	1.984688	0.569482	0.366270	0.051867	0.552354	3.124211	1.000982
Kurtosis	10.45330	32.11697	8.793544	2.479900	2.268703	1.952258	2.832864	14.68966	2.913379
Jarque-Bera	379.1738	4816.435	252.7706	8.034684	5.490968	5.681184	6.397618	900.4156	20.57875
Probability	0.000000	0.000000	0.000000	0.018001	0.064217	0.058391	0.040811	0.000000	0.000034
Sum	5678.000	906.0000	2811.000	4.15E+10	9.53E+09	9.48E+08	1264.680	600.0000	46.00000
Sum Sq. Dev.	92370.75	12034.54	31607.37	3.98E+18	1.72E+17	1.57E+15	2020.800	5995.171	34.79675
Observations	123	123	123	123	123	123	123	123	123

Table A2. HEGY Test for seasonal unit roots

Test	RCAN (L=10)	RMEX (L=10)	RCHI (L=10)	IMPMEX (L=8)	IMPCAN (L=8)	IMPCHI (L=6)	UNEMP (L=4)	ALERT (L=6)	ANTID (L=2)
$t(\pi_1)$	0.5064	0.1126	1.2391	1.3759	1.0225	1.1160	0.1126	0.9181	1.5005
$t(\pi_2)$	-0.6396	0.2714	1.2412	1.4218	1.1289	1.3102	-0.2714	1.4724	2.8838***
F34	0.6783	0.3270	1.5107	1.6470	1.2616	2.0800	0.3070	1.5910	4.2824***
F56	7.8759***	8.3253***	9.0227***	11.0238***	4.4859***	4.2045***	8.3253***	10.0559***	11.0451***
F78	2.9496***	6.3610***	5.8502***	7.5081***	3.7523***	3.6110**	6.3610***	7.9993***	5.1307***
F910	7.3821***	9.2316***	7.2682***	8.4432***	6.3491***	3.6057**	9.2316***	12.4790***	8.7349***
F1112	5.2661***	6.9208***	8.0226***	10.4511***	3.9740***	4.2364***	6.9208**	9.2902***	8.0680**
F1-12	6.1235***	4.625***	4.7958***	7.1235***	5.3763***	5.0660***	4.625***	7.0273***	11.4832***
F2-12	7.2378***	5.0150***	4.7717***	7.2926***	5.3424***	5.0109***	5.0150***	6.8568***	12.1370***

****, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. L is number of lags included*

Table A3. Cointegration test of import refusals from Canada

Included variables: RCAN, IMPCAN, UNEMP, ALERT, ANTID

	Intercept		***Intercept and trend***		**No intercept nor trend**	
Rank	Eigenvalue	Trace stat	Eigenvalue	Trace stat	Eigenvalue	Trace stat
0	68.44498**	173.9996***	70.44033***	205.2725*	70.740***	205.273***
1	39.55236	94.5546	43.90043	115.8321	43.900	115.832
2	21.12779	59.00228	35.94190	83.93171	35.942	83.931
3	17.18745	37.87449	19.51422	47.98981	19.514	47.981
4	12.47897	20.68704	17.18744	28.47559	17.187	28.476

****, **and * are significance at 1 %, 5% and 10% respectively, 1 – cointegration equation present*

Table A4. Cointegration test of import refusals equation for Mexico

Included variables: RMEX, IMPMEX, UNEMP, ALERT, ANTID

	Intercept		**Intercept and trend**		**No intercept nor trend**	
Rank	Eigenvalue	Trace stat.	Eigenvalue	Trace stat.	Eigenvalue	Trace stat.
0	50.13622**	122.3053***	86.32715***	217.9586***	86.327***	217.96***
1	36.51280	112.1691	43.92263	111.6314	43.922	111.631
2	26.69192	65.65628	30.34189	85.70877	30.341	85.708
3	23.19412	46.96436	23.25887	55.36688	23.258	55.367
4	13.16696	25.77024	16.64465	32.10801	16.646	32.108

****, **and * are significance at 1 %, 5% and 10% respectively, 1 – cointegration equation present*

Table A5. Cointegration test of import refusals equation for China

Included variables: RCHI, IMPCHI, UNEMP, ALERT, ANTID

	Intercept		Intercept and trend		No intercept nor trend	
Rank	Eigenvalue	Trace stat	Eigenvalue	Trace stat	Eigenvalue	Trace stat
0	69.17300**	176.5692**	89.77110***	212.7405***	30.856**	69.666**
1	41.01521	94.3962	42.11966	101.9694	23.984	39.813
2	24.64980	66.38102	29.67843	80.84976	10.215	18.885
3	20.85561	41.73122	22.31031	51.17133	6.900	8.669
4	10.95715	20.87561	14.53967	28.86102	1.769	1.769

****, **and * are significance at 1 %, 5% and 10% respectively, 1 – cointegration equation present*

Table A6. Lag order of import refusals equation for Canada

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-127.5832	NA	2.61e-08	2.403272	2.573178	2.472208
1	80.60443	386.6342	1.52e-09*	-0.439365*	0.919885*	0.112126*
2	121.9900	71.68579*	1.76e-09	-0.303394	2.245199	0.730652
3	154.5808	52.37796	2.42e-09	-0.010371	3.727565	1.506229
4	191.9446	55.37852	3.13e-09	0.197418	5.124697	2.196572
5	229.0410	50.34511	4.19e-09	0.409982	6.526605	2.891691
6	259.2040	37.16510	6.65e-09	0.746358	8.052323	3.710620
7	316.5816	63.52525	6.88e-09	0.596757	9.092066	4.043574
8	371.9987	54.42749	7.95e-09	0.482166	10.16682	4.411537
9	421.2395	42.20637	1.14e-08	0.477867	11.35186	4.889792
10	489.1345	49.70884	1.34e-08	0.140456	12.20379	5.034936
11	592.2785	62.62314	1.02e-08	-0.108260	12.42628	4.550633

* indicates lag order selected by the criterion
Included observations: 112

Table A7. Estimated VEC model of import refusals equation for Canada

Included observations: 121 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
REFCAN(-1)	1.000000
IMPCAN(-1)	-1.633905
	(0.21239)
	[-7.69306]
UNEMP(-1)	-1.282111
	(0.23797)
	[-5.38775]
ALERT(-1)	-0.267799
	(0.08610)
	[-3.11036]
ANTID(-1)	-0.103433
	(0.07233)
	[-1.43005]
@TREND	0.007018
C	13.00450

Error Correction:	D(REFCAN)	D(IMPCAN)	D(UNEMP)	D(ALERT)	D(ANTID)
CointEq1	-0.769446	0.224568	-0.030934	0.196677	-0.026242
	(0.13377)	(0.05318)	(0.03669)	(0.15198)	(0.07948)
	[-5.75217]	[4.22318]	[-0.84306]	[1.29409]	[-0.33017]
D(REFCAN(-1))	0.014259	-0.124264	0.047668	-0.009714	0.014743
	(0.10299)	(0.04094)	(0.02825)	(0.11702)	(0.06120)
	[0.13845]	[-3.03513]	[1.68731]	[-0.08301]	[0.24091]
D(IMPCAN(-1))	0.629207	0.023624	-0.276000	0.051781	0.044625
	(0.23799)	(0.09460)	(0.06528)	(0.27039)	(0.14140)
	[2.64389]	[0.24971]	[-4.22797]	[0.19150]	[0.31559]
D(UNEMP(-1))	0.122241	-0.281261	-0.097709	-0.473759	0.172134
	(0.34953)	(0.14012)	(0.09668)	(0.40047)	(0.20943)
	[0.34973]	[-2.00732]	[-1.01059]	[-1.18299]	[0.82191]
D(ALERT(-1))	0.14579	0.070457	0.022570	-0.431097	0.044742
	(0.06151)	(0.02922)	(0.02016)	(0.08351)	(0.04367)
	[2.3705]	[2.41150]	[1.11951]	[-5.16249]	[1.02453]
D(ANTID(-1))	0.138696	-0.029141	-0.015868	0.147570	0.000610
	(0.14668)	(0.05831)	(0.04023)	(0.16665)	(0.08715)
	[0.94557]	[-0.49978]	[-0.39440]	[0.88549]	[0.00700]
C	0.000330	-0.004797	-0.003187	0.001330	-0.014708
	(0.07679)	(0.03053)	(0.02106)	(0.08724)	(0.04563)
	[0.00430]	[-0.15715]	[-0.15132]	[0.01524]	[-0.32237]
@TREND	7.38E-05	0.000136	0.000102	-0.000123	9.89E-05
	(0.00108)	(0.00043)	(0.00030)	(0.00123)	(0.00064)
	[0.06838]	[0.31578]	[0.34503]	[-0.10057]	[0.15410]
R-squared	0.366273	0.232296	0.152923	0.253015	0.020917
F-statistic	9.330035	4.884591	2.914282	5.467818	0.344866

Table A8. Estimated VEC model of import refusals equation for Mexico

Sample (adjusted): 3 123
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1				
REFMEX(-1)	1.000000				
IMPMEX(-1)	-10.38601				
	(1.19799)				
	[-8.66955]				
UNEMP(-1)	- 3.352590				
	(1.146701)				
	[-2.92361]				
ALERT(-1)	-2.39345				
	(0.44291)				
	[-5.40351]				
ANTID(-1)	-0.634833				
	(0.58368)				
	[-1.08764]				
@TREND	0.033306				
C	82.21902				
Error Correction:	D(REFMEX)	D(IMPMEX)	D(UNEMP)	D(ALERT)	D(ANTID)
CointEq1	-0.024460	-0.039780	0.023097	0.001647	0.006795
	(0.01172)	(0.00553)	(0.00524)	(0.02264)	(0.01168)
	[2.08711]	[7.19057]	[4.40965]	[0.07277]	[0.58189]
D(REFMEX(-1))	-0.466034	-0.052782	0.053862	-0.057201	-0.004002
	(0.08522)	(0.04023)	(0.03808)	(0.16459)	(0.08490)
	[-5.46832]	[-1.31213]	[1.41428]	[-0.34753]	[-0.04714]
D(IMPMEX(-1))	0.455763	0.576323	0.247968	0.050022	0.143609
	(0.17163)	(0.08101)	(0.07670)	(0.33147)	(0.17099)
	[2.65546]	[7.11414]	[3.23303]	[0.15091]	[0.83988]
D(UNEMP(-1))	0.075515	-0.125015	-0.154833	-0.689634	0.096751
	(0.20569)	(0.09709)	(0.09192)	(0.39726)	(0.20492)
	[0.36712]	[-1.28764]	[-1.68443]	[-1.73600]	[0.47213]
D(ALERT(-1))	0.058808	0.039646	0.024184	-0.458379	0.053393
	(0.02189)	(0.02025)	(0.01917)	(0.08284)	(0.04273)
	[2.68652]	[1.95826]	[1.26172]	[-5.53340]	[1.24949]
D(ANTID(-1))	1.2074	0.016467	-0.038203	0.150128	-0.005766
	(0.21121)	(0.04175)	(0.03953)	(0.17084)	(0.08813)
	[5.7167]	[0.39439]	[-0.96644]	[0.87877]	[-0.06543]
C	0.001859	0.005998	-0.008486	0.000912	-0.018182
	(0.04585)	(0.02164)	(0.02049)	(0.08855)	(0.04568)
	[0.04055]	[0.27715]	[-0.41415]	[0.01030]	[-0.39803]
@TREND(1)	2.70E-05	-7.36E-05	0.000145	-0.000110	0.000147
	(0.00064)	(0.00030)	(0.00029)	(0.00124)	(0.00064)
	[0.04184]	[-0.24220]	[0.50462]	[-0.08815]	[0.22835]
R-squared	0.237168	0.427272	0.203635	0.235476	0.025017
F-statistic	5.018885	12.04306	4.127816	4.972049	0.414202

Table A9. Estimated VEC model of import refusals equation for China

Included observations: 121 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
REFCHI(-1)	1.000000
IMPCHI(-1)	-37.07205
	(5.82129)
	[-6.36836]
UNEMP(-1)	-0.264101
	(0.41284)
	[-1.56321]
ALERT(-1)	- 6.308861
	(2.27896)
	[-2.76831]
ANTID(-1)	- 0.056059
	(1.97333)
	[- 0.02841]
@TREND	-0.248285
C	260.4409

Error Correction:	D(REFCHI)	D(IMPCHI)	D(UNEMP)	D(ALERT)	D(ANTID)
CointEq1	-0.005008	0.009738	0.008111	-0.003590	-0.000729
	(0.00467)	(0.00175)	(0.00180)	(0.00766)	(0.00397)
	[-1.07261]	[5.56605]	[4.50425]	[-0.46839]	[-0.18386]
D(REFCHI(-1))	-0.494332	-0.002897	-0.059839	0.150659	0.024252
	(0.08278)	(0.03102)	(0.03193)	(0.13590)	(0.07033)
	[-5.97197]	[-0.09338]	[-1.87428]	[1.10864]	[0.34483]
D(IMPCHI(-1))	0.075918	0.060950	0.096267	-0.039184	0.200486
	(0.03280)	(0.08724)	(0.08979)	(0.38220)	(0.19780)
	[2.3145]	[0.69865]	[1.07212]	[-0.10252]	[1.01358]
D(UNEMP(-1))	0.327921	0.253845	0.141647	-0.772109	0.110186
	(0.23134)	(0.08669)	(0.08923)	(0.37980)	(0.19656)
	[1.41747]	[2.92806]	[1.58745]	[-2.03292]	[0.56057]
D(ALERT(-1))	0.082215	-0.020883	-0.025859	-0.422593	0.055514
	(0.02489)	(0.02057)	(0.02117)	(0.09012)	(0.04664)
	[3.3031]	[-1.01521]	[-1.22137]	[-4.68936]	[1.19030]
D(ANTID(-1))	0.134666	0.020515	-0.028907	0.162429	0.004412
	(0.10240)	(0.03837)	(0.03950)	(0.16812)	(0.08701)
	[1.31507]	[0.53459]	[-0.73189]	[0.96616]	[0.05071]
C	0.025301	0.014589	-0.001432	-0.002922	-0.019969
	(0.05369)	(0.02012)	(0.02071)	(0.08815)	(0.04562)
	[0.47121]	[0.72503]	[-0.06917]	[-0.03315]	[-0.43770]
@TREND	0.000161	-0.000152	4.76E-05	-6.44E-05	0.000159
	(0.00075)	(0.00028)	(0.00029)	(0.00124)	(0.00064)
	[0.21344]	[-0.53729]	[0.16390]	[-0.05206]	[0.24840]
R-squared	0.295251	0.246237	0.189046	0.244804	0.030599
F-statistic	6.762965	5.273509	3.763155	5.232869	0.509549