Appendix 1: Methodology – Non-Technical Summary

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The standard tool to analyze trade agreements is a computable general equilibrium (CGE) model. We employ a dynamic version of the widely used Global Trade Analysis Project (GTAP) model modified to directly represent foreign-owned firms in each service sector of the economy to capture services trade conducted through foreign affiliates. For a technical description of the GTAP model used here, see Hertel (1997); for a discussion of the degree of confidence in CGE estimates, see Hertel et al. (2003). A detailed description of the technical modifications is provided in Ciuriak and Xiao (2014, forthcoming).

To bring out the relative contribution of the quantifiable elements of the CKFTA, the agreement is simulated on a sequential basis, introducing in turn:

- Tariff liberalization;
- Tariff liberalization with preference under-utilization and utilization costs taken into account;
- Reduction of non-tariff barriers (NTBs) on goods;
- Reduction of NTBs on cross-border services;
- Liberalization of foreign direct investment (FDI) in services and thus of Mode 3 trade.

The model generates impacts for the following indicators:

- Economic welfare, which is a lump sum payment to households that equals the benefit of the agreement ("equivalent variation");
- National accounts aggregates (GDP, consumption, investment, government expenditure, etc.);
- Industry output and prices for 57 goods and services sectors;
- Production inputs, including capital stock and rates of return, and skilled and unskilled labour inputs and wages; and
- Trade and foreign direct investment (FDI) flows, and foreign affiliate sales in services sectors.

The model incorporates measures of effective tariff protection and allows the impact of non-tariff measures to be taken into account as cost reductions for doing business across borders. The trade impacts from these simulations capture the linkages across sectors through national input-output tables (i.e., an increase in demand for automobiles drives fixed production requirements of steel, which in turn are met by a combination of domestic and imported steel).

To simulate the CKFTA, we establish a baseline projection to 2035 drawing on available long-term projections for guidance. The main research task is then to formulate the "shock" scenario – i.e., the assumptions concerning tariff cuts and their phase-in schedules. Rules changes that affect NTBs are assumed to be implemented in the 2015, which is our assumed date for entry into force of the CKFTA.

For the impact of rules changes on goods sector NTBs and FDI restrictions, we calculate reductions on the basis of a convergence towards the standard set by Singapore: Korea, which is further than Canada from Singapore's standards of transparency and border costs, thus makes greater changes than Canada. This is consistent with the qualitative assessment of the relative movement by Canada and Korea on trade-related rules.

Details of the translation of the negotiated tariff reduction schedules into GTAP sectoral liberalization shocks are provided in a publicly available working paper, Ciuriak and Xiao (2014a).

For services NTBs, we map the negotiated measures in the CKFTA into changes in changes to Canada's and Korea's Services Trade Restrictiveness Indexes (STRIs) for bilateral trade. The STRI assigns weights to specific measures that are common in international trade. Negotiated text that does not result in a change in the STRI value – e.g., reaffirmations of WTO commitments – is thus deemed to have no quantitative trade liberalizing value. Changes in the STRIs can be linked to changes in trade through econometric techniques; accordingly, this approach provides a much sharper evaluation of the impact of a trade agreement on services trade than is possible under alternative methods of guesstimating the liberalizing impact of a trade agreement that have been used to date. Details of the construction of the STRI-coded CKFTA services trade policy shocks are provided in a working paper, Ciuriak, Dadkhah, and Xiao (2014).

For policy shocks, the model is simulated forward in a dynamic process whereby changes in the rate of return on capital induce investment and changes in wage rates induce increased labour force participation. The results reported are changes relative to the baseline at 2015, 2025, and 2035. The reported gains in 2035 may be interpreted as the permanent change in the level of output of the economy, once full equilibrium has been restored following the policy shocks, including the reallocation of capital and labour across sectors in response to the changed opportunities in the liberalized economy.

A key issue in simulations concerns the choice of so-called "closure" rules. In particular, the balance of payments must be rebalanced following the CKFTA policy shock. The changes in tariffs and NTBs will result in changes in each country's current account. In our modelling framework, these current account changes are accommodated by offsetting flows of foreign investment, including FDI. A frequently used alternative closure restores the initial current account balance for each country through an implicit exchange rate change. The resulting trade flows under this latter closure thus reflect a combination of reduction of trade protection and exchange rate changes. The choice of macroeconomic closure can have significant implications for the measured impacts of a trade deal for particular economies. By the same token, there can be important differences in results across studies that employ different closures.

Appendix 2: Sectoral Impacts of the CKFTA

The CKFTA impacts on a pattern of protection that is very uneven across sectors in both economies. Accordingly, the impacts vary sharply by sector. Overall, the deal reinforces existing patterns of comparative advantage in both economies.

For Canada, the CKFTA expands agricultural output, especially beef and pork production, and boosts non-traded services through income effects. The deal slows the expansion of Canada's heavy industry and manufacturing sectors. The automotive sector impact is much smaller in terms of output declines (about C$114 million or -0.0 percent) compared to the $1.2 billion expansion of Korean auto imports. The main impact of this is on third party imports into Canada; the impact on Canada's automotive sector is further softened by the income gains from the deal. This is consistent with Ciuriak (2012) findings for impacts on Canada's auto sector from bilateral trade liberalization with Japan.

For Korea, the deal expands the auto sector and transportation equipment exports in particular, followed by machinery and equipment, and chemicals. In terms of production gains, the biggest gainers after autos are non-traded services. Business services also make a substantial gain, although this is primarily induced by domestic income gains. In terms of declining sectors, the beef sector and food products more generally experience relatively modest declines compared to the inroads in the Korean market made by Canada, as these inroads come in good measure at the expense of third parties.

Table A2-1: Canadian Sectoral Impacts

	Bilateral Exports		Bilateral Imports		Total Exports		Total Imports		Total Output	
GTAP Sector	C$ mn	percent change	C$ mn	percent change	C$ mn	percent change	C$ mn	percent change	C$ mn	percent change
Positively Impacted Sectors										
20 Meat Products	927.6	464.5	0.1	27.4	871.6	25.7	73.5	3.2	1,253.0	7.7
56 Public Admin and Defense	7.9	4.4	0.7	4	-10.5	-0.2	20.7	0.2	842.0	0
46 Construction	0.9	9.7	0.1	3.1	-0.6	-0.1	1.6	0.2	759.1	0.1
47 Trade	-0.2	-0.2	0.7	3.7	-12.7	-0.3	17.9	0.2	676.7	0.1
54 Business Services	-0.6	-0.2	17.9	6.7	-66.0	-0.3	55.9	0.2	414.3	0
25 Food Products	235.5	143.4	12.3	25.5	203.9	1.3	52.2	0.3	349.2	0.4
19 Meat, Cattle, etc.	198.8	1067.5	0.0	5.5	162.2	4.6	14.4	1.1	294.9	0.9
57 Dwellings	0.0	4.2	0.0	3.5	0.0	0	0.0	0	212.8	0
10 Animal Products	15.2	13	0.0	3.5	3.7	-0.2	10.6	2	211.0	1.9
52 Financial Services	3.5	11.6	5.7	5.9	-6.5	-0.2	24.1	0.2	200.3	0
Negatively Impacted Sector										
40 Electronic Equip.	23.1	11.3	32.6	3.4	-23.8	-0.2	44.5	0.1	-36.2	-0.1
39 Transport Equip.	12.8	10.6	519.6	274.9	43.9	0.1	56.7	0.3	-37.1	-0.1
33 Chemicals	91.0	15.2	97.1	12.1	-38.2	-0.1	99.0	0.1	-50.5	-0.1
38 Motor Vehicles	17.6	42.2	1,202.7	27.1	59.2	0.1	341.8	0.3	-113.7	0

Source: Calculations by the authors.

Table A2-2: Korean Sectoral Impacts

	Bilateral Exports		Bilateral Imports		Total Exports		Total Imports		Total Output	
GTAP Sector	C$ mn	percent change	C$ mn	percent change	C$ mn	percent change	C$ mn	percent change	C$ mn	percent change
Positively Impacted Sectors										
38 Motor Vehicles	1,202.7	27.1	17.6	42.2	1,075.8	0.9	97.0	0.4	1,672.3	0.5
46 Construction	0.1	3.1	0.9	9.7	-11.1	-0.1	11.6	0.1	820.1	0.1
56 Public Admin & Defense	0.7	4	7.9	4.4	-4.1	-0.1	21.3	0.1	603.9	0
54 Business Services	17.9	6.7	-0.6	-0.2	-1.2	0	39.3	0.1	391.5	0.1
39 Transport Equip.	519.6	274.9	12.8	10.6	335.2	0.5	35.2	0.2	360.7	0.4
47 Trade	0.7	3.7	-0.2	-0.2	2.4	0.1	19.8	0	256.5	0.1
33 Chemicals	97.1	12.1	91.0	15.2	44.8	0	109.5	0.1	225.3	0.1
35 Ferrous Metals	17.1	1.9	5.4	7	-8.0	0	80.1	0.1	174.8	0.1
55 Recreation, etc.	0.5	0.4	27.6	6.6	-0.1	0	17.4	0.1	155.6	0.1
52 Financial Services	5.7	5.9	3.5	11.6	-0.6	0	6.3	0.1	152.5	0
Negatively Impacted Sector										
19 Meat, Cattle, etc.	0.0	5.5	198.8	1067.5	0.2	2.1	82.7	3.2	-90.7	-0.7
9 Cattle, Sheep, etc.	0.0	2.8	8.7	173	0.0	1.6	1.3	2.5	-129.2	-1.5
10 Animal Products	0.0	3.5	15.2	13	0.6	0.8	1.2	0.1	-173.9	-1.3
25 Food Products	12.3	25.5	235.5	143.4	17.6	0.6	114.4	0.8	-201.1	-0.2
20 Meat Products	0.1	27.4	927.6	464.5	1.0	2.3	445.7	14.2	-447.3	-2.4

Source: Calculations by the authors.