International Banking and Cross-Border Effects of Regulation: Lessons from Canada*

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We study how changes in prudential requirements affect cross-border lending of Canadian banks by utilizing an index that aggregates adjustments in key regulatory instruments across jurisdictions. We show that when a destination country tightens local prudential measures, Canadian banks increase the growth rate of lending to that jurisdiction, and the effect is particularly significant when capital requirements are tightened and weaker if banks lend mainly via affiliates. Our evidence also suggests that Canadian banks adjust foreign lending in response to domestic regulatory changes. The results confirm the presence of heterogeneous spillover effects of foreign prudential requirements.

JEL Codes: F34, G01, G21.

1. Introduction

How do regulatory changes in prudential requirements affect cross-border banking activities? Does the effect depend on the regulatory instrument being adjusted, or on bank characteristics? And does it depend on the country of origin or the type of lending the bank is engaged with? In this project we take advantage of a unique database, as part of the International Banking Research Network (IBRN)

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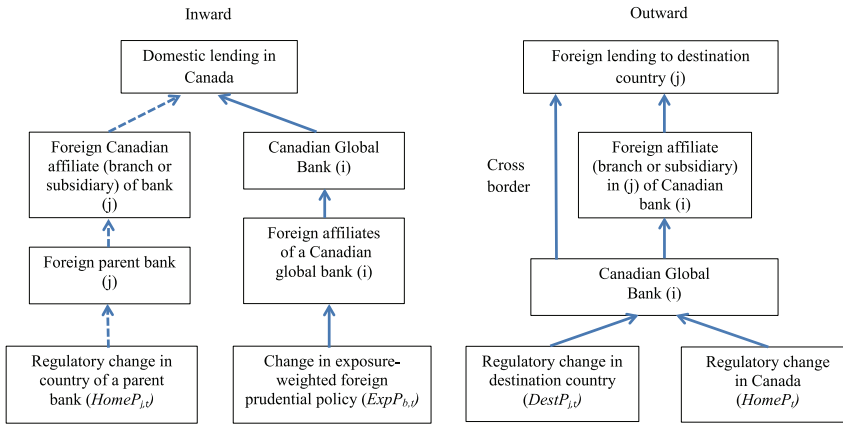
Figure 1. Transmission Channels of Regulatory Policy Changes (relevant channels for Canada shown by the solid lines)



initiative, to investigate these questions using a sample of globally active Canadian banks, and study how they adjust the growth rate of lending when faced with prudential changes, either at home or abroad.

Canadian banks represent an interesting case to study the international spillover effects of prudential regulations, since they are relatively globally active. Furthermore, the banks traditionally operate with capital buffers above the minimum prescribed Basel requirements, which could play a role in their reaction to prudential policy changes in other countries.

The focus of the analysis is on the outward transmission channel, which is the most relevant for Canadian banks. The outward channel captures how Canadian lending to a specific destination country reacts to policy changes at that destination. This can take two forms: either via the Canadian banks' foreign affiliates lending or via the Canadian banks' headquarters (cross-border lending). We also study an extension of the outward channel, one that captures how changes to Canadian regulatory requirements affect foreign lending. Figure 1 provides a graphical representation of these respective channels. After examining the outward channel in detail, we extend the analysis by investigating the inward transmission channel, or

the effect of foreign regulatory changes on domestic lending (i.e., in Canada). This exercise investigates the degree to which domestic activities of Canadian banks are exposed to foreign regulations through their global operations.[1]

We find that when a destination country tightens requirements, Canadian banks react by increasing the lending growth rate to that jurisdiction, and this effect is strongest when capital, loan-to-value (LTV), or reserve requirements change. The economic magnitudes of tighter capital requirements can be significant: the average amount of new lending associated with a tightening is around Can$600 million (or approximately 10 percent of the average foreign lending in a given quarter). However, since such changes occur infrequently during the sample period, their overall impact is modest.[2]

We note that such an outcome is not necessarily undesirable if the Canadian banks that increase lending have more capital than their local competitors. Under this scenario, lending would have shifted toward better-capitalized institutions and increased overall resilience of the banking sector (which may have been the policy's intention in the first place). Although our data do not allow us to compare Canadian banks' capital ratios with those of their competitors in each destination country, two pieces of information may be indicative of this outcome. First, for most of our sample period, Canadian banks operated with capital requirements that exceeded Basel minimum requirements, so it is possible that their capital ratios exceeded those of their competitors, at least in some foreign jurisdictions. Second, we find that some bank characteristics, such as tier 1 capital, interact positively with the impact of regulatory changes in Canadian banks' foreign lending. Other important bank factors that support foreign lending are the size of the bank's international activities and its internal capital market, indicating that a developed intragroup

[1] A different inward channel that could potentially exist is through foreign affiliates operating in Canada. However, the economic magnitude of this channel is likely to be limited, since foreign affiliates have traditionally accounted for a very small share of domestic lending. Over the sample period, the average annual share of domestic lending by foreign subsidiaries and branches is only about 4.5 percent and 1.5 percent, respectively. As such, the inward analysis focuses only on the home global banks.

[2] For the prudential index, the magnitude is about Can$190 million of extra lending per tightening. If aggregated over thirteen years across all banks and actions, this translates into an increase in lending of about Can$40 billion.

market or presence across multiple jurisdictions is a key determinant of a bank's ability to redirect lending as prudential standards change at the destination.

Next we study how regulatory adjustments interact with global banks' business models. If in a certain destination a Canadian bank lends mainly via an affiliate, then the bank's ability to adjust lending, perhaps by substituting to cross-border loans, might be more limited. We show that under tighter LTV limits, the lending growth rate in such a destination country decreases if it is done mainly via affiliates. A similar slowdown in affiliate lending is observed for non-bank private loans when capital requirements are tightened.

As an extension to the outward transmission analysis, we also investigate how changes to domestic (i.e., Canadian) regulatory requirements affect foreign lending. We show that, in general, tighter home requirements push Canadian banks to lend abroad, but the effect differs across banks. For example, when domestic capital standards are tightened, we observe a reduction in foreign lending growth rates for banks that are more retail oriented (i.e., with higher levels of illiquid assets) and/or for banks that are more internationally active, but an increase in lending growth rates for banks that rely on core deposits. Finally, we complement the analysis by investigating the consequences of foreign regulatory changes on domestic Canadian lending, i.e., the inward channel. We find that the tightenings of foreign prudential policies are associated with a slowdown in the growth rate of domestic credit by global Canadian banks. Assuming a global bank has a fixed pool of funds, this finding is expected given the positive effects for the outward channel. It indicates that global banks optimize lending across jurisdictions (reducing in one, increasing in another).

2. Data and Stylized Facts for Canada

2.1 Bank-Level Data

Our data are obtained from the confidential regulatory returns filed by all federally chartered financial institutions in Canada.[3]

[3]Please see Chen et al. (2012) and Chapman and Damar (2015) for more details on our data sources. The actual forms and their filing instructions can be found at http://www.osfi-bsif.gc.ca/Eng/fi-if/rtn-rlv/fr-rf/dti-id/Pages/default.aspx.

Bank-time level data is globally consolidated at the parent level and is obtained from two forms: the quarterly "Basel Capital Adequacy Return" (for tier 1 capital ratio) and the monthly "Balance Sheet" return (for all other bank-level data).

In order to construct the foreign lending of globally active Canadian banks, we use data from two sources. The form "Geographic Assets and Liabilities Booked in Canada" contains information on the cross-border activities (claims and liabilities) at the bank-country-time level, while the "Geographic Assets and Liabilities Booked Outside of Canada" form provides claims and liabilities booked by foreign affiliates of Canadian banks. For the purposes of this study, we combine information from the two forms to create an aggregate "foreign lending" variable, without differentiating between cross-border loans and lending being done through affiliates. As part of the robustness tests, we extend the analysis by treating these two lending types separately (see section 3.3).

We perform a number of adjustments to the data. Given our primary focus on the outward transmission of regulatory policy changes, we first exclude all foreign banks and foreign bank branches from our sample. In addition, we exclude all domestic banks with assets less than Can$1 billion (in 2013:Q4 dollars) at any point during our sample period. To eliminate the possibility that the results are driven by banks with limited foreign lending activity, we drop any observations where the outstanding foreign lending by bank i in country j in time t is less than Can$100 million. We then limit our sample to series of bank-country-time observations with at least eight consecutive non-missing quarterly observations. This yields a final estimation sample of 2,885 observations.

There are six domestically owned Canadian banks in our sample, which are the "Big Six" banks that have traditionally dominated the federally chartered banking sector.[4] These six banks lend

[4]These banks are the Bank of Montreal, Bank of Nova Scotia, Canadian Imperial Bank of Commerce, National Bank of Canada, Royal Bank of Canada, and the Toronto Dominion Bank group. Among the federally chartered commercial banks (domestic and foreign subsidiaries), trust and loan companies, and foreign bank branches, these six banks hold approximately 90 percent of all assets. There are also a number of provincially chartered credit unions and cooperative credit institutions in Canada; however, we exclude such institutions from this study, as they do not file uniformly designed regulatory returns and have almost no foreign activities.

in thirty-five different foreign countries.[5] However, looking across individual banks, there is substantial variation in the scope of foreign lending. The number of countries that banks lend to varies between 3 and 29 (with an average of 16.8). Furthermore, there are only three countries where all six banks have substantial lending activities (China, the United Kingdom, and the United States). Meanwhile, our sample includes nine countries in which only one Canadian bank is active throughout the entire sample period (Belgium, Denmark, Finland, Greece, Malaysia, New Zealand, Peru, the Slovak Republic, and Thailand).

For the baseline empirical analysis, our dependent variable is defined as

$$\Delta Y_{b,j,t} = \text{Change in log loans by bank } b \text{ to counterparties in country } j \text{ at time } t.$$

We also use a narrower definition of lending as an extension of the baseline specification:

$$\Delta P_{b,j,t} = \text{Change in log private non-bank lending by bank } b \text{ in country } j \text{ at time } t.$$

This allows us to investigate if some regulatory policies affect certain types of lending but not others. Ideally, we would like a finer subcategorization of loans (mortgages versus unsecured consumer lending versus commercial loans, etc.). However, the regulatory forms only allow for the (relatively coarse) sub-categorization of "loans to banks," "loans to non-bank public entities," and "loans to non-bank private entities." We use the latter category in defining $\Delta P_{b,j,t}$.

Table 8 in the appendix reports the different control variables. These are the log of total assets ($LogTotalAssets_{b,t-1}$), the percentage of a bank's portfolio of assets that is illiquid ($IlliquidAsset-Ratio_{b,t-1}$),[6] the percentage of the bank's balance sheet financed

[5]These are countries for which prudential policy, business cycle, and financial cycle data are available. There are a few other countries (mainly in the Caribbean and South America) that would have otherwise met our sample inclusion criteria. Therefore, the real number of countries with substantial lending by Canadian banks is around forty.

[6]We limit illiquid assets only to loans due to data availability issues. Ideally, we would like to include other assets, such as held-to-maturity structured financial products, in our definition of illiquid assets. However, Canadian regulatory

with core deposits ($CoreDeposits_{b,t-1}$),[7] and the bank's regulatory tier 1 capital ratio ($Tier1Ratio_{b,t-1}$). We also include two variables related to the international aspects of Canadian banks' balance sheets. The first is the percentage of the bank's foreign assets plus foreign liabilities relative to total assets plus total liabilities ($InternationalRatio_{b,t-1}$). The second variable measures the size of the bank's "internal capital markets," capturing the bank's net claims on its foreign affiliates. Specifically, we include the percentage of the bank's net due to head office—net due from head office relative total liabilities ($NetIntragroupFunding_{b,t-1}$).

Since we would like to capture the exposure of globally active Canadian banks to changes in prudential measures, we construct two "prudential policy change" instruments according to their geographical specifications. Our first measure is "destination-country regulation" ($DestP_{j,t}$), which captures tightening or loosening of prudential measures in destination (or "host") country j and time t. This variable takes one of three possible values: +1 for a tightening, –1 for a loosening, and 0 for no change. In some of the empirical specifications, we use the contemporaneous value of this variable along with its first two lags ($DestP_{j,t-l}$, where $l = 0, 1, 2$). For the second measure, we use the "home-country regulation" ($Home_t$) in certain extensions of our empirical analysis. This allows us to investigate whether prudential policy changes in Canada affect Canadian banks' foreign lending. This variable is defined in a manner similar to $DestP_{j,t}$.

2.2 Stylized Facts

Summary statistics on the banks' characteristics are presented in table 1. While the banks are fairly similar in terms of size (given the small standard deviation for that variable), they exhibit greater diversity with regards to the level of capital, the share of international activity, and the reliance on parent funding (i.e., net intragroup funding) and on core deposits. Summary statistics

returns do not feature such a breakdown of banks' securities holdings during our sample period.

[7] Core deposits are defined as demand, notice, and time deposits owned by individuals.

Table 1. Summary Statistics on Foreign Lending and Bank Characteristics

Variable	Observations	All Banks (N = 6)		
		Mean	Median	SD
Dependent Variables:				
Δ Foreign Loans	2,885	0.086	0.099	25.750
Δ Foreign Private Non-bank Loans	2,589	−0.636	−0.267	26.968
Independent Variables:				
Log Total Assets	324	19.729	19.758	0.555
Tier 1 Ratio (%)	324	9.793	9.224	2.159
Illiquid Assets Ratio (%)	324	54.470	54.860	5.537
International Activity (%)	324	21.799	23.259	7.909
Net Intragroup Funding/Liabilities (%)	324	0.221	−0.025	1.125
Core Deposits Ratio (%)	324	26.886	25.661	5.041

Notes: This table provides summary statistics for bank balance sheet and lending data. Data are observed quarterly from 2000:Q1 to 2013:Q4. Banking dada come from the globally consolidated balance sheet and capital reporting forms and are reported at the parent level. Net intragroup funding measures from the perspective of a bank's head office total net internal lending (or borrowing) vis-à-vis all its related domestic and international offices. Given the globally consolidated nature of the independent variables, summary statistics are reported at the bank-quarter level. Meanwhile, the dependent variables are measured at the bank-country-time level and the summary statistics are reported accordingly.

on the outward transmission of destination-country policy changes ($DestP_{j,t}$) are reported in table 2. For the prudential index, there are a total of 223 changes reported by countries in which Canadian banks operate, and 73 percent of those are associated with tightening of prudential requirements. Considering the individual components of the index, we observe that 8 percent of the overall changes are to local reserve requirements, 4 percent are to the LTV limits, 3.6 percent are to foreign reserve requirements, and about 3 percent are capital related. Since interbank exposure limits and concentration ratios rarely change, we do not report regression results for these instruments.

There are a few characteristics unique to the Canadian system that makes it ideal to study the consequences of foreign regulatory spillover effects. First, globally active Canadian banks are relatively more internationally oriented than their peers and as such are exposed to changes in foreign regulation. For example, for Canadian

Table 2. Summary Statistics on Changes in Prudential Instruments

Outward Transmission of Policy to Destination Country					
	Policy Changes in Destination Country				
Instrument	**No. of Country-Time Changes**	**No. of Country-Time Changes (Tightening)**	**No. of Country-Time Changes (Loosening)**	**No. of Bank-Country-Time Changes**	**Proportion Base-MPP Non-zero**
Prudential Index	223	164	59	426	0.165
General Capital Requirements	39	39	0	86	0.029
Sector-Specific Capital Buffer	33	26	7	53	0.024
Loan-to-Value Ratio Limits	54	43	11	122	0.040
Reserve Requirements: Foreign	48	31	17	75	0.036
Reserve Requirements: Local	112	61	51	203	0.083
Interbank Exposure Limit	10	10	0	22	0.007
Concentration Ratios	12	12	0	20	0.009

Notes: This table shows summary statistics on changes in prudential instruments for banks located in Canada over the period 2000–13. Data on the instruments come from the IBRN Prudential Instruments Database described by Cerutti et al. (2017) and are quarterly. The number of changes in prudential instruments is reported on several dimensions, i.e., on the country-time level and on the bank-time level. The last column shows the share of prudential changes to total observations (i.e., the share of non-zero observations). The reported data are based on the regression sample.

banks the median *InternationalRatio* is about 20 percent, substantially larger than the one for U.S. or German banks, approximately at 5 percent and 3 percent, respectively (see Berrospide et al. 2017 and Ohls, Pramor, and Tonzer 2017). Furthermore, Canada has a history of federally regulated institutions operating with higher capital requirements. Between 1999 and 2013, the Office of the Superintendent of Financial Institutions (OSFI) required institutions to hold minimum tier 1 and total capital ratios of 7 percent and 10 percent, while the Basel II requirements were 4 percent and 8 percent. Effectively, Canadian banks maintained a time-invariant capital buffer of 3 percent for tier 1 capital and 2 percent for total capital. Finally, in recent years Canadian regulators have used loan-to-value (LTV) limits extensively (see table 9 in the appendix).[8] During the sample period domestic authorities also adjusted capital requirements.[9] Thus we limit the $Home_t$ indicator to capture only these two policies.

3. Empirical Method and Regression Results

3.1 Baseline Analysis of Outward Transmission of Prudential Policies

The analysis explores the effect of changes in regulation on banks' growth rate in outstanding foreign loans, following the approach described in Buch and Goldberg (2017). We begin with the following regression specification, which controls for the outward transmission of destination-country macroprudential policy:

$$\Delta Y_{b,j,t} = \alpha_0 + (\alpha_1 DestP_{j,t} + \alpha_2 DestP_{j,t-1} + \alpha_3 DestP_{j,t-2}) + \alpha_4 X_{b,t-1} + \alpha_5 Z_{j,t} + f_j + f_t + f_b + \varepsilon_{b,j,t}, \quad (1)$$

[8]In Canada, federally regulated lenders and most provincially regulated lenders are required by law to purchase insurance for mortgages that exceed 80 percent of the value of the residential property. Since the insurance is guaranteed by the government, it sets minimum qualifying standards for borrowers, and key among those is the LTV limit.

[9]Capital changes included the full adoption of Basel II in 2007:Q4, the implementation of Basel II.5 in 2012:Q1, and the Basel III implementation in 2013:Q1.

where $\Delta Y_{b,j,t}$ is the log change in destination-country j lending by a global Canadian bank b at time t. $DestP_{j,t}$ captures that country's prudential policy changes. $X_{b,t-1}$ is a vector of bank balance sheet control variables and $Z_{j,t}$ represents the financial and business cycle variables for country j (as defined by Drehmann, Borio, and Tsatsaronis 2011 and the Bank for International Settlements 2014). Finally, f_j, f_t, and f_b respectively represent country, time, and bank fixed effects.

We report results from this specification in table 3. First we note that Canadian banks' lending at the destination country is procyclical, as evident by the positive and significant business cycle coefficient. More importantly for our study, the positive and significant (at 5 percent) coefficient on the prudential index suggests that when a destination country tightens requirements, Canadian banks increase the lending growth rate in that jurisdiction. The coefficient of $DestP_{j,t}$ implies that for the average Canadian bank, a tightening of the prudential policy index is associated with roughly Can$190 million of new lending.[10]

Results from the individual components of the prudential index show that the effect is strongest for changes in capital requirements. The average amount of new lending associated with a tightening in capital requirements is around Can$600 million. The healthy balance sheets of Canadian banks during our sample period, and especially after the crisis (Chapman and Damar 2015), may have better positioned banks to increase lending under tighter requirements. Furthermore, until the implementation of Basel III toward the end of the sample period, Canadian banks were required to maintain capital ratios above the Basel minimum. According to Ratnovski and Huang (2009), such requirements lower Canadian banks' incentives for foreign expansion, "except in cases where they can have a distinct competitive advantage." Tighter capital requirements in

[10]Given that our dependent variable is the log change in foreign lending (multiplied by 100), a coefficient of 3.254 implies that on average (*foreign lending at time t/foreign lending at time* $t-1$) $= e^{(3.254/100)}$, which equals 1.033 if the prudential index is tightened by one unit at time t. Using the average value of foreign lending in our sample (Can$5.7 billion), we are able obtain an average increase of Can$188 million (5.7 billion * 0.033). Given that there were 204 net tightenings throughout our sample period (317 tightenings – 113 loosenings), a simple estimate of the cumulative effect is Can$40 billion.

Table 3. Outward Transmission of Policy to Destination Country

	DestP = Prudential IndexC	**DestP = Capital Requirements:**	**DestP = Sector-Specific Capital Buffer**	**DestP = LTV Ratio**	**DestP = Reserve Requirements: Foreign**	**DestP = Reserve Requirements: Local**
Destination-Country Regulation DestP_{t}	3.755**	9.985**	−0.279	1.834	−1.065	2.517*
	(1.463)	(4.333)	(1.550)	(3.517)	(1.010)	(1.415)
Destination-Country Regulation DestP_{t-1}	1.233	5.194	0.183	−1.535	1.714	1.882
	(1.521)	(3.868)	(1.412)	(1.677)	(2.228)	(2.279)
Destination-Country Regulation DestP_{t-2}	1.089	2.488	2.415	3.395**	0.763	1.036
	(1.340)	(4.799)	(2.458)	(1.600)	(1.436)	(1.347)
Log Total Assets_{t-1}	−8.228	−9.698	−8.544	−8.048	−8.548	−8.748
	(5.845)	(5.850)	(5.734)	(6.051)	(5.797)	(5.831)
Tier 1 Ratio_{t-1}	−0.600	−0.647	−0.589	−0.580	−0.593	−0.653
	(1.015)	(0.984)	(1.011)	(1.014)	(1.009)	(1.008)
Illiquid Assets Ratio_{t-1}	−0.135	−0.161	−0.162	−0.151	−0.150	−0.135
	(0.271)	(0.257)	(0.264)	(0.264)	(0.261)	(0.272)
International Activity_{t-1}	0.083	0.072	0.052	0.053	0.051	0.069
	(0.163)	(0.164)	(0.163)	(0.163)	(0.164)	(0.165)
Net Intragroup Funding_{t-1}	0.226	0.239	0.221	0.218	0.220	0.213
	(0.135)	(0.148)	(0.140)	(0.140)	(0.142)	(0.136)

(*continued*)

Table 3. (Continued)

	DestP = Prudential IndexC	DestP = Capital Requirement	DestP = Sector-Specific Capital Buffer	DestP = LTV Ratio	DestP = Reserve Requirements: Foreign	DestP = Reserve Requirements: Local
Core Deposits Ratio$_{t-1}$	0.071	0.066	0.069	0.070	0.061	0.070
	(0.352)	(0.354)	(0.358)	(0.352)	(0.356)	(0.355)
BIS Financial Cycle	0.017	0.018	0.018	0.015	0.019	0.019
(Destination Country)	(0.034)	(0.036)	(0.033)	(0.032)	(0.033)	(0.033)
BIS Business Cycle	0.551*	0.706**	0.710**	0.681**	0.705**	0.726**
(Destination Country)	(0.324)	(0.315)	(0.321)	(0.328)	(0.333)	(0.332)
Cumulative Effect DestP	6.076**	17.667*	2.319	3.694	1.412	5.435**
	(2.601)	(9.702)	(2.828)	(4.044)	(2.407)	(2.603)
Observations	2,885	2,885	2,885	2,885	2,885	2,885
Adjusted R^2	0.025	0.025	0.022	0.022	0.022	0.023
No. of Destination Countries	35	35	35	35	35	35
No. of Banks	6	6	6	6	6	6

Notes: This table reports the effects of changes in destination-country regulation and firm characteristics on log changes in total loans by destination country. The data are quarterly from 2000:Q1 to 2013:Q4 for a panel of bank holding companies and are globally consolidated at the parent level. DestP refers to the changes in regulation in the destination country of the loan. For more details on the variables, see table 8 in the appendix. Each column gives the result for the regulatory measure specified in the column headline. All specifications include bank, country, and time fixed effects. Standard errors (in parentheses) are clustered by country. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent level, respectively.

certain foreign jurisdictions may have provided such competitive advantages; while domestic banks are adjusting to the new capital requirements by curbing credit growth, Canadian banks (that already operate under relatively strict capital levels) could have more easily adjusted lending and increased market share.

Our findings also indicate that the lending growth rate in a destination country increases under tighter local reserve requirements (cumulative effect) and stricter LTV limits (second lag of the policy). Surprisingly, this suggests that LTV limits, a product-level regulation that often targets borrower demand, may also affect credit supply. There could be two possibilities for this positive outcome. Recall that our data do not distinguish lending by entity type. This might be important in cases where the limits apply to a specific group of institutions, which does not include the Canadian affiliates. That would allow them to maintain (or increase) lending. Alternatively, it is possible that Canadian banks increase other types of lending that are not targeted by the LTV limits. Akinci and Olmsted-Rumsey (2015) and Cerutti, Classens, and Laeven (2016) provide some cross-country evidence of LTV limits having an impact on overall credit growth. Therefore, if a limit tightening is associated with a broader slowdown, then foreign banks can take advantage of this and increase lending more broadly.[11]

3.2 Outward Transmission and Bank Characteristics

Our next specification explores more directly the role of bank characteristics by interacting them with $DestP_{j,t}$ such that

$$\begin{aligned}\Delta Y_{b,j,t} = \alpha_0 &+ (\alpha_1 DestP_{j,t} + \alpha_2 DestP_{j,t-1} + \alpha_3 DestP_{j,t-2}) \\ &+ \alpha_4 X_{b,t-1} + \alpha_5 Z_{j,t} + (\beta_1 DestP_{j,t} \cdot X_{b,t-1} \\ &+ \beta_2 DestP_{j,t-1} \cdot X_{b,t-1} + \beta_3 DestP_{j,t-2} \cdot X_{b,t-1}) \\ &+ f_j + f_t + f_b + \varepsilon_{b,j,t}, \end{aligned} \tag{2}$$

[11] We also ran a baseline specification that includes all prudential measures (and their lags) simultaneously, while excluding the aggregated *PruC* measure. We also excluded the interbank exposure limits and concentration ratios from this specification, since these measures lack sufficient variation in our sample. The results of this specification (not presented for brevity) are almost identical to our findings in table 3, with positive and significant cumulative effects for capital requirements and local reserve requirements.

where all variable definitions are the same as in equation (1), but the balance sheet characteristics are now interacted with the destination-country prudential policy changes and its lags. Among the findings reported in table 4 for this specification, we focus on the cumulative effect (i.e., over the three periods) of the prudential measure and its interactions ($(\alpha_1 + \alpha_2 + \alpha_3)$ and $(\beta_1 + \beta_2 + \beta_3)$). Exploring the prudential index first, we show that better-capitalized Canadian banks increase their lending growth rates under tighter conditions, given the positive interaction term with the tier 1 ratio. The prudential index results also point to the fact that banks that are more internationally active increase lending under such conditions (results are similar when regressions include country-time fixed effects instead of separate country and time fixed effects).

According to table 4, the effect of some of the prudential measures depends on their interaction with the banks' characteristics. For instance, sector-specific capital requirements (SSCBs) are effective at slowing down the growth rate of credit for banks that rely on core deposits. Since SSCBs tend to target retail lending activity (such as mortgage credit, auto loans, or credit cards), it is not surprising to observe that the retail-oriented banks (which rely on deposits) are most affected.[12] The effect is opposite for banks that rely on intragroup funding, suggesting that head-office funding attenuates the negative effect of SSCB on foreign credit extension. Table 4 also indicates a positive relation between LTV tightening and foreign lending growth rates, given the statistical significance of the cumulative policy effect. While the effect depends on bank characteristics (size, liquidity, and foreign activity), it broadly confirms the baseline results.

3.3 Extension: The Effect of Prudential Requirement on Foreign Lending via Affiliates

If a global Canadian bank follows a diverse business model, one that supports both cross-border and affiliate lending, then such a bank may be better positioned to manage regulatory changes in a given jurisdiction, compared with a bank that lends to that jurisdiction

[12] One should interpret the SSCB findings cautiously, since SSCB changes are infrequent over the sample period.

Table 4. Outward Transmission of Policy (bank character interactions)

	DestP = Prudential IndexC	**DestP = Capital Requirements**	**DestP = Sector-Specific Capital Buffer**	**DestP = LTV Ratio**	**DestP = Reserve Requirements: Foreign**	**DestP = Reserve Requirements: Local**
Destination-Country Regulation DestP_{t}	−135.632	−417.905	122.622	310.584***	−461.511**	−139.083*
	(108.377)	(278.540)	(171.578)	(96.801)	(216.681)	(81.663)
Destination-Country Regulation DestP_{t-1}	77.496	529.251	−37.275	−24.686	169.189	−48.745
	(103.963)	(329.417)	(164.511)	(90.363)	(259.695)	(88.057)
Destination-Country Regulation DestP_{t-2}	24.499	143.010	−359.363*	101.997	376.308**	176.612
	(89.743)	(266.809)	(204.726)	(130.919)	(142.100)	(116.807)
Log Total Assets_{t-1}	−9.145	−11.604*	−9.277	−6.570	−8.506	−9.735
	(6.107)	(6.213)	(5.910)	(6.163)	(5.999)	(5.874)
Tier 1 Ratio_{t-1}	−0.735	−0.483	−0.515	−0.557	−0.640	−0.635
	(1.025)	(0.983)	(1.046)	(1.073)	(1.009)	(1.024)
Illiquid Assets Ratio_{t-1}	−0.129	−0.031	−0.139	−0.100	−0.138	−0.119
	(0.263)	(0.305)	(0.259)	(0.274)	(0.265)	(0.267)
International Activity_{t-1}	0.027	0.039	0.072	−0.027	0.059	0.075
	(0.175)	(0.181)	(0.162)	(0.173)	(0.169)	(0.168)
Net Intragroup Funding_{t-1}	0.242*	0.267*	0.218	0.216	0.229	0.219
	(0.138)	(0.149)	(0.136)	(0.143)	(0.140)	(0.130)
Core Deposits Ratio_{t-1}	0.064	−0.047	0.041	0.030	0.054	0.042
	(0.344)	(0.366)	(0.346)	(0.374)	(0.362)	(0.368)
BIS Financial Cycle (Destination Country)	0.010	0.018	0.013	0.011	0.020	0.018
	(0.036)	(0.037)	(0.036)	(0.034)	(0.033)	(0.033)
BIS Business Cycle (Destination Country)	0.541	0.709**	0.720**	0.678*	0.612*	0.542
	(0.338)	(0.310)	(0.314)	(0.335)	(0.360)	(0.322)

(*continued*)

Table 4. (Continued)

	DestP = Prudential IndexC	DestP = Capital Require-ments	DestP = Sector-Specific Capital Buffer	DestP = LTV Ratio	DestP = Reserve Requirements: Foreign	DestP = Reserve Require-ments: Local
Log Total Assets*DestP	−0.842	0.232	20.243	−24.760***	−4.588	−3.385
	(5.699)	(30.395)	(15.314)	(7.278)	(6.578)	(7.054)
Tier 1 Ratio*DestP	1.791**	−10.809	−0.762	1.164	2.852***	1.878**
	(0.838)	(6.452)	(2.205)	(1.203)	(0.833)	(0.817)
Illiquid Assets Ratio*DestP	0.403	−1.818	−1.214	1.247***	−0.355	0.851**
	(0.372)	(2.317)	(0.845)	(0.204)	(0.457)	(0.365)
International Activity*DestP	0.751**	0.0746	−1.371*	2.019***	−0.495	0.444
	(0.351)	(1.392)	(0.682)	(0.574)	(0.583)	(0.575)
Net Intragroup Funding*DestP	0.488	−0.778	30.842***	−5.836	−5.933	−10.537
	(2.179)	(3.608)	(8.008)	(19.266)	(4.690)	(8.388)
Core Deposits Ratio*DestP	−0.169	−0.096	−0.785***	−0.709	0.693	0.267
	(0.314)	(1.210)	(0.283)	(0.491)	(0.711)	(0.228)
Cumulative Effect DestP	−33.637	254.355	−274.016	387.895***	83.985	−11.217
	(93.386)	(524.41)	(272.45)	(134.101)	(149.908)	(111.375)
Observations	2,885	2,885	2,885	2,885	2,885	2,885
Adjusted R^2	0.23	0.26	0.19	0.22	0.19	0.23
No. of Destination Countries	35	35	35	35	35	35
No. of Banks	6	6	6	6	6	6

Notes: This table reports the effects of changes in destination-country regulation and firm characteristics, business and financial cycles, and their interactions on log changes in total loans by destination country. The data are quarterly from 2000:Q1 to 2013:Q4 for a panel of bank holding companies and are globally consolidated at the parent level. DestP refers to the cumulative changes in regulation in the destination country of the loan. For more details on the variables, see table 8 in the appendix. Each column gives the result for the regulatory measure specified in the column headline. All specifications include bank, country, and time fixed effects. Standard errors (in parentheses) are clustered by country. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent level, respectively.

only via an affiliate. The reason is that the affiliate is more likely to be directly exposed to regulatory changes. Since our lending variable captures both cross-border lending (booked by the headquarters in Canada) and credit extension by foreign affiliates (of the Canadian banks via branches or subsidiaries), we can investigate more precisely the benefits of this flexibility by considering the portion of lending conducted via affiliates.

We differentiate between the two types of lending by considering the relative importance of affiliate lending for a given bank in a particular country.[13] Specifically, we define a new indicator variable $Affiliate_{b,j,t}$, which equals one if more than 95 percent of bank b's lending in country j at time t is done via an affiliate.[14] We then interact $Affiliate_{b,j,t}$ with policy changes in the destination country ($DestP_{j,t}$) where all variable definitions are the same as in equation (2). In addition, we experiment with using the change in "total lending" and "total non-bank private lending" as different dependent variables. The empirical specification is

$$\begin{aligned}\Delta Y_{b,j,t} = \alpha_0 &+ (\alpha_1 DestP_{j,t} + \alpha_2 DestP_{j,t-1} + \alpha_3 DestP_{j,t-2}) \\ &+ (\alpha_4 DestP_{j,t} \cdot Affiliate_{b,j,t} + \alpha_5 DestP_{j,t-1} \cdot Affiliate_{b,j,t-1} \\ &+ \alpha_6 DestP_{j,t-2} \cdot Affiliate_{b,j,t-2} + \alpha_7 X_{b,t-1} + f_j + f_t \\ &+ f_b + \varepsilon_{b,j,t}. \qquad (3)\end{aligned}$$

Table 5 reports the results from this specification.[15] For brevity, we only discuss the cumulative effects related to $DestP_{j,t}$ and its interaction with $Affiliate_{b,j,t}$. From panel A we observe that a tightening of the overall prudential index, and especially the LTV requirement, increases the growth of foreign lending, but not if it is through the affiliate ($DestP$ is positive but the interaction of $DestP$ *$Affiliate$ is negative). The stand-alone positive effect of the policy could be

[13]This is especially an issue for cross-border lending, since some Canadian banks only engage in affiliate lending in certain countries.

[14]We have also considered 90 percent and 100 percent as a cut-off for *Affiliate*. Our results are robust to these changes.

[15]We do not interact the bank characteristics with $DestP_{j,t}$ or $Affiliate_{b,j,t}$ in order to keep the specification as simple as possible. However, our main conclusions regarding $DestP_{j,t}$ and its interactions with $Affiliate_{b,j,t}$ are robust to including such interactions in the analysis.

Table 5. Outward Transmission of Policy with Alternate Dependent Variable Definitions

	DestP = Prudential IndexC	DestP = Capital Requirements	DestP = Sector-Specific Capital Buffer	DestP = LTV Ratio	DestP = Reserve Requirements: Foreign	DestP = Reserve Requirements: Local
A. Total Lending						
Destination-Country Regulation $DestP_t$	5.545***	11.981**	−2.309	5.300	−2.549	3.350*
	(1.871)	(5.285)	(3.151)	(5.026)	(1.555)	(1.853)
Destination-Country Regulation $DestP_{t-1}$	1.768	5.786	−3.407	−0.930	1.887	1.598
	(1.827)	(5.148)	(2.673)	(2.819)	(3.417)	(3.106)
Destination-Country Regulation $DestP_{t-2}$	1.164	1.519	3.315	6.105**	−1.140	0.480
	(1.911)	(6.062)	(3.052)	(2.687)	(1.939)	(1.253)
Cumulative Effect DestP	8.477***	19.286	−2.401	10.475***	−1.802	5.428
	(2.784)	(11.806)	(3.151)	(2.993)	(4.161)	(3.331)
$DestP_t$*$Affi_t$	−3.791*	−4.267	3.014	−5.333	4.382***	−1.873
	(2.141)	(5.660)	(3.536)	(3.618)	(1.097)	(2.077)
$DestP_{t-1}$*$Affi_{t-1}$	−1.355	−1.376	5.489*	−0.832	0.621	0.790
	(2.117)	(7.185)	(3.068)	(3.748)	(3.035)	(2.718)
$DestP_{t-2}$*$Affi_{t-2}$	−0.308	1.836	−1.319	−4.384	4.171**	1.136
	(2.187)	(5.895)	(4.212)	(3.674)	(1.938)	(1.686)
Cumulative Effect DestP*Affi	−5.454*	−3.806	7.184	−10.551***	9.174***	0.054
	(2.953)	(9.668)	(4.615)	(3.375)	(3.144)	(3.187)
Observations	2,885	2,885	2,885	2,885	2,885	2,885
Observations with Affi = 1	1,721	1,721	1,721	1,721	1,721	1,721
Adjusted R^2	0.025	0.024	0.021	0.022	0.021	0.022

(*continued*)

Table 5. (Continued)

	DestP = Prudential IndexC	DestP = Capital Requirements	DestP = Sector-Specific Capital Buffer	DestP = LTV Ratio	DestP = Reserve Requirements: Foreign	DestP = Reserve Requirements: Local
B. Non-bank Private Lending						
Destination-Country Regulation $DestP_t$	2.833	11.982**	−0.436	2.956	0.363	−13.368**
	(3.437)	(5.310)	(6.989)	(15.129)	(2.313)	(5.137)
Destination-Country Regulation $DestP_{t-1}$	2.608	8.138	−11.959	−5.739	6.671*	15.030*
	(5.235)	(6.244)	(9.329)	(11.679)	(3.625)	(8.725)
Destination-Country Regulation $DestP_{t-2}$	−6.518	8.855**	11.163	−1.829	−11.761**	−15.778***
	(4.000)	(3.989)	(7.070)	(6.242)	(5.111)	(5.181)
Cumulative Effect DestP	−1.078	28.975***	−1.231	−4.612	−4.727	−14.116***
	(5.714)	(9.371)	(10.934)	(27.861)	(4.034)	(4.568)
$DestP_t$*$Affi_t$	−1.627	−11.047	1.697	−6.105	−1.605	14.504**
	(3.893)	(7.077)	(6.664)	(15.796)	(2.283)	(5.471)
$DestP_{t-1}$*$Affi_{t-1}$	−3.978	−2.426	12.445	7.066	−8.610	−17.626*
	(5.586)	(9.103)	(10.799)	(12.180)	(5.278)	(8.772)
$DestP_{t-2}$*$Affi_{t-2}$	6.367*	−10.771	−13.653*	4.158	13.137***	17.473***
	(3.652)	(7.479)	(6.803)	(6.350)	(3.844)	(5.036)
Cumulative Effect DestP*Affi	0.762	−24.244*	−0.743	5.118	2.921	14.352***
	(5.198)	(13.390)	(2.372)	(28.362)	(5.152)	(4.395)
Observations	2,589	2,589	2,589	2,589	2,589	2,589
Observations with Affi = 1	2,354	2,354	2,354	2,354	2,354	2,354
Adjusted R^2	0.042	0.043	0.041	0.041	0.041	0.047
No. of Destination Countries	35	35	35	35	35	35
No. of Banks	6	6	6	6	6	6

Notes: This table reports the effects of changes in destination-country regulation on log changes in total loans and log changes in "non-bank private loans" by destination country, while accounting for affiliate vs. cross-border lending. The variable *Affiliate* is set at one if more than 95 percent of the lending of a bank in a given country is done through an affiliate. The definition of *Affiliate* is based on the type of loan being considered in the dependent variable. The number of bank-country-time observations where *Affiliate = 1* is provided. The data are quarterly from 2000:Q1 to 2013:Q4 for a panel of bank holding companies. DestP refers to the cumulative changes in regulation in the destination country of the loan. For more details on the variables, see table 8 in the appendix. Each column gives the result for the regulatory measure. All specifications include bank characteristics, but those coefficients are not presented for brevity. All specifications also include bank, country, and time fixed effects. Standard errors (in parentheses) are clustered by country. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent level, respectively.

driven by cross-border lending.[16] However, the LTV effect disappears once the dependent variable is defined as the change in non-bank private lending (panel B). This remains a surprise: if Canadian banks circumvent LTV rules in foreign jurisdictions, perhaps via cross-border lending, then one should expect this to show up more strongly for non-bank private loans (which includes the types of loans most likely to be covered under LTV limits, such as mortgages).[17] Finally, we note that tighter capital requirements slow down the growth of non-bank private lending if it is mainly extended by Canadian banks' foreign affiliates (panel B). However, tighter local reserve requirements are less effective (positive and significant interaction term), suggesting that foreign retail and corporate credit do not necessarily depend on locally sourced deposits.

3.4 Extension: Impact of Home-Country Policy Changes

It is possible that regulatory policy changes in Canada also influence Canadian banks' lending abroad. Therefore, we investigate how changes in the home-country prudential instruments (*HomeP*) affect destination-country lending. Since only capital requirements and LTV limits changed in Canada over our sample period, we conduct the analysis on these two instruments. The regression specification is

$$\begin{aligned}\Delta Y_{b,j,t} = \alpha_0 &+ (\alpha_1 DestP_{j,t} + \alpha_2 DestP_{j,t-1} + \alpha_3 DestP_{j,t-2}) \\ &+ \alpha_4 X_{b,t-1} + \alpha_5 Z_{j,t} + (\beta_1 HomeP_{j,t} \cdot X_{b,t-1} \\ &+ \beta_2 HomeP_{j,t-1} \cdot X_{b,t-1} + \beta_3 HomeP_{j,t-2} \cdot X_{b,t-1}) \\ &+ f_j + f_t + f_b + \varepsilon_{b,j,t}. \qquad (4)\end{aligned}$$

In equation (4), the main coefficients of interest are β_1, β_2, and β_3 (since *HomeP* is bank invariant at a given time period, it is captured by the time fixed effect). We focus on the cumulative coefficients ($\beta_1 + \beta_2 + \beta_3$) for ease of comparison. The results from table 6

[16] Of course, the fact that cross-border lending is a relatively small component of Canadian banks' foreign lending (and the fact that some Canadian banks do not engage in cross-border lending to certain jurisdictions at all) makes it difficult to fully establish this conclusion.

[17] Measurement and/or sample-size issues could also be a potential explanation for this observation.

Table 6. Outward Transmission of Policy Changes in the Home Country

	Home/DestP = Prudential Index	Home/DestP = Capital Requirements	Home/DestP = Loan-to-Value Ratio
Destination-Country Regulation $DestP_t$	3.629**	9.884**	1.933
	(1.467)	(4.224)	(3.581)
Destination-Country Regulation $DestP_{t-1}$	1.214	4.997	−1.378
	(1.489)	(3.792)	(1.659)
Destination-Country Regulation $DestP_{t-2}$	0.957	2.413	3.634**
	(1.335)	(4.522)	(1.608)
Log Total $Assets_{t-1}$	−11.990	−13.492*	−11.808*
	(7.570)	(7.464)	(6.319)
Tier 1 $Ratio_{t-1}$	−0.917	−0.775	−0.970
	(1.024)	(1.033)	(1.120)
Illiquid Assets $Ratio_{t-1}$	−0.301	−0.362	−0.159
	(0.302)	(0.340)	(0.232)
International $Activity_{t-1}$	0.266	0.199	0.129
	(0.214)	(0.191)	(0.181)
Net Intragroup $Funding_{t-1}$	0.144	0.226	0.154
	(0.108)	(0.157)	(0.115)
Core Deposits $Ratio_{t-1}$	0.350	0.252	0.179
	(0.356)	(0.389)	(0.332)
BIS Financial Cycle (Destination Country)	0.016	0.021	0.014
	(0.034)	(0.034)	(0.031)
BIS Business Cycle (Destination Country)	0.572*	0.698**	0.669**
	(0.329)	(0.315)	(0.327)
Log Total Assets*HomeP	23.666**	28.817	31.276**
	(10.740)	(20.182)	(14.161)
Tier 1 Ratio*HomeP	−0.279	−16.616	2.289
	(4.272)	(14.137)	(3.597)
Illiquid Assets Ratio* HomeP	−0.682	−2.786*	−0.803
	(0.771)	(1.591)	(0.842)
International Activity* HomeP	−1.044	−3.312**	−0.883
	(0.679)	(1.477)	(0.659)
Net Intragroup Funding* HomeP	0.265	−0.493	0.171
	(0.527)	(1.722)	(0.724)
Core Deposits Ratio* HomeP	−0.042	1.743*	−0.149
	(0.462)	(0.933)	(0.424)
Cumulative Effect DestP	5.801**	17.294*	4.188
	(2.701)	(9.458)	(4.219)

(*continued*)

Table 6. (Continued)

	Home/DestP = Prudential Index	**Home/DestP = Capital Requirements**	**Home/DestP = Loan-to-Value Ratio**
Observations	2,885	2,885	2,885
Adjusted R^2	0.027	0.028	0.021
No. of Destination Countries	35	35	35
No. of Banks	6	6	6

Notes: This table reports the effects of changes in both destination- and home-country regulation, along with firm characteristics on log changes in total loans by destination country. The data are quarterly from 2000:Q1 to 2013:Q4 for a panel of bank holding companies and are globally consolidated at the parent level. DestP refers to the changes in regulation in the destination country of the loan, while HomeP captures changes in Canadian regulations. For more details on the variables, see table 8 in the appendix. Each column gives the result for the regulatory measure specified in the column headline. All specifications include bank, country, and time fixed effects. Standard errors (in parentheses) are clustered by country. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent level, respectively.

indicate that tighter prudential home requirements push certain types of banks to lend abroad, as observed via the interaction terms between the bank characteristics and *HomeP*. The effect comes from both higher Canadian capital requirements and LTV limits. However, the mechanism through which the requirements affect lending might differ.

Considering capital changes first, more internationally oriented and less liquid banks decrease foreign lending growth rates when capital requirements in Canada are tightened. It could be that these banks engage in foreign lending activities with higher risk weights, and under higher capital requirements these banks shift away from such activities. However, Canadian banks that are more retail deposit funded increase foreign lending growth rates under tighter domestic capital requirements. This might be driven by that fact that the Canadian capital requirement changes in our sample (2012:Q1 and 2013:Q1) coincided with periods in which Canadian banks were engaged in foreign acquisitions. As discussed in Chapman and Damar (2015), since the 2008 crisis, Canadian banks took advantage of their relatively healthy balance sheets (and the official Canadian liquidity facilities) to engage in foreign acquisitions

that boosted their foreign loan book. Hence, the link between capital requirement tightenings in Canada and foreign lending by Canadian banks might be a product of both the timing and contents of the policy change.

Regarding LTV requirements, table 6 indicates that larger Canadian banks increase their foreign lending growth rates when LTV requirements are tightened at home. Specifically, the coefficient of *LogTotalAssets*HomeP* implies that a tightening of Canadian LTV requirements *and* a bank moving from the median asset size to the 75th percentile will be associated with Can$780 million of total new foreign lending.[18] This increase is likely driven by a desire to compensate for slower mortgage credit growth at home. We note that the LTV limits in Canada apply at the borrower level and are only for domestic mortgage lending, and as such are unrelated to the banks' activities abroad. Therefore, the impact of home-country macroprudential policy actions on foreign lending is likely to be dependent on the nature and scope of the policy tool being used, and the timing of the policy change with regard to global (or at least regional) conditions.

3.5 Extension: Inward Transmission of Foreign Policies

Finally, we briefly investigate the transmission of foreign policy changes into Canada via globally active Canadian banks ("inward transmission"). As discussed above, there could potentially exist another inward channel, via foreign subsidiaries and bank branches that operate in Canada. However, the economic magnitudes of this channel are likely small. For instance, over the sample period, the average annual share of domestic lending by foreign subsidiaries and branches is about 4.5 percent and 1.5 percent, respectively. Given the limited role played by these institutions in the Canadian financial system, we limit our inward transmission exercise to large, globally active Canadian banks. We estimate the following model:

[18]The difference between the median and 75th percentile of *LogTotalAssets* is 0.41 (20.16 – 19.75). Multiplying this by the coefficient of *LogTotalAssets*HomeP* yields 12.823, implying $(\textit{foreign lending at time } t/\textit{foreign lending at time } t-1) = e^{(12.823/100)} = 1.136$. Using the average value of foreign lending then results in 780 million.

$$\begin{aligned}\Delta Y_{b,t} = \alpha_0 &+ (\alpha_1 ExpP_{b,t} + \alpha_2 ExpP_{b,t-1} + \alpha_3 ExpP_{b,t-2}) \\ &+ \alpha_4 X_{b,t-1} + (\beta_1 ExpP_{b,t} \cdot X_{b,t-1} + \beta_2 ExpP_{b,t-1} \cdot X_{b,t-1} \\ &+ \beta_3 ExpP_{b,t-2} \cdot X_{b,t-1}) + f_t + f_b + \varepsilon_{b,j,t}, \end{aligned} \tag{5}$$

where $Y_{b,t}$ is domestic (i.e., Canadian) lending of bank b at time t and $ExpP_{b,t}$ is "foreign-exposure-weighted regulation" faced by bank b at time t. $ExpP_{b,t}$ is an average of all foreign regulation indexes at time t, weighted by the total assets and liabilities of bank b in each country. We use the same bank characteristics as in previous specifications. All regressions include time and bank fixed effects. We present the results in table 7. According to the inward channel, tighter foreign capital and LTV requirements are associated with a slowdown in the growth rate of domestic lending by the six largest Canadian global banks (cumulative effect of each policy is negative). These results are in line with the outward analysis from the previous tables, indicating that as foreign regulatory requirements become stricter, Canadian banks increase the foreign lending growth rate to those destination countries and also reduce the growth of domestic credit.

4. Concluding Remarks

We study how regulatory changes in prudential requirements affect the cross-border activities of Canadian banks. Our results show that the effect depends on the regulatory instrument being adjusted, and that bank characteristics determine the extent to which the institutions can maintain or increase lending under stricter conditions.

We find that when a destination country tightens requirements, Canadian banks react by increasing the lending growth rate to that jurisdiction, and the effect is particularly strong for changes in capital requirements. Our results suggest that banks with higher tier 1 ratios increase lending at the destination country, even under tighter prudential requirements. We also show that the effect of prudential policies depends on a global bank's business model. While stricter LTV limits are associated with an increase in foreign lending, the growth of credit slows in destination countries where Canadian banks mainly operate via affiliates. We extend the analysis

Table 7. Inward Transmission of Foreign Policy (bank character interactions)

	DestP = Prudential IndexC	**DestP = Capital Requirements**	**DestP = Sector-Specific Capital Buffer**	**DestP = LTV Ratio**	**DestP = Reserve Requirements: Foreign**	**DestP = Reserve Requirements: Local**
Foreign-Exposure-Weighted Regulation $ExpP_t$	−464.492**	−1268.882	640.904	−6703.659**	−988.182	−377.556
	(152.098)	(783.469)	(4916.893)	(1833.235)	(5085.386)	(777.615)
Foreign-Exposure-Weighted Regulation $ExpP_{t-1}$	−163.995	−184.589	−1282.058	−4037.766	322.496	−371.962
	(84.317)	(1077.507)	(3128.073)	(2320.005)	(843.897)	(224.971)
Foreign-Exposure-Weighted Regulation $ExpP_{t-2}$	60.322	−2981.396***	1216.430	1561.088	1876.443	−1392.669
	(197.240)	(243.664)	(1646.000)	(1739.008)	(3378.243)	(859.248)
Log Total $Assets_{t-1}$	−3.627	−4.635	−2.721	−6.283	−4.674	−1.473
	(4.431)	(5.572)	(4.958)	(4.684)	(4.548)	(3.370)
Tier 1 $Ratio_{t-1}$	−0.533	−0.627	−0.519	−0.314	−0.484	−0.566
	(0.336)	(0.435)	(0.406)	(0.409)	(0.447)	(0.423)
Illiquid Assets $Ratio_{t-1}$	−0.575**	−0.551**	−0.512**	−0.503**	−0.549**	−0.512**
	(0.181)	(0.147)	(0.146)	(0.128)	(0.191)	(0.143)
International $Activity_{t-1}$	0.034	0.049	0.003	0.040	0.036	0.005
	(0.107)	(0.092)	(0.090)	(0.094)	(0.091)	(0.085)
Net Intragroup $Funding_{t-1}$	−0.093	−0.092	−0.172	−0.302	−0.155	−0.109
	(0.334)	(0.302)	(0.316)	(0.356)	(0.303)	(0.275)
Core Deposits $Ratio_{t-1}$	0.584**	0.575**	0.522**	0.495**	0.542**	0.561**
	(0.185)	(0.154)	(0.135)	(0.176)	(0.201)	(0.156)
Log Total Assets*ExpP	33.131	203.307***	−100.054	483.811**	−44.859	114.363
	(13.499)	(13.751)	(76.951)	(87.442)	(181.494)	(46.803)

(*continued*)

Table 7. (Continued)

	DestP = Prudential IndexC	DestP = Capital Requirements	DestP = Sector-Specific Capital Buffer	DestP = LTV Ratio	DestP = Reserve Requirements: Foreign	DestP = Reserve Requirements: Local
Tier 1 Ratio*ExpP	−2.439	−2.138	44.149	−18.581	−14.197	−14.079
	(5.521)	(34.525)	(172.377)	(78.943)	(337.161)	(16.341)
Illiquid Assets Ratio*ExpP	−0.838	5.604**	10.425	−7.037	11.821	−3.634*
	(0.965)	(1.071)	(14.455)	(5.004)	(28.121)	(5.952)
International Activity*ExpP	−1.012	1.869*	6.852	−4.308	−22.734**	0.979
	(1.623)	(2.111)	(4.339)	(3.729)	(7.331)	(2.379)
Net Intragroup Funding*ExpP	−10.106	−156.952***	−3.654	−150.727	126.798	−54.585
	(13.221)	(32.607)	(296.656)	(131.868)	(529.361)	(42.742)
Core Deposits Ratio*ExpP	−0.272	−1.617*	7.228	7.047	−10.813	8.294
	(4.416)	(7.472)	(38.137)	(21.472)	(14.461)	(11.155)
Cumulative Effect ExpP	−568.164	−4434.867***	575.276	−9180.335**	1210.756	−2142.186
	(288.026)	(582.313)	(4940.084)	(3297.954)	(3863.114)	(1512.602)
Observations	324	324	324	324	324	324
Adjusted R^2	0.244	0.232	0.234	0.268	0.233	0.271
No. of Banks	6	6	6	6	6	6

Notes: This table reports the effects of changes in regulation and firm characteristics and their interactions on log changes in total loans. The data are quarterly from 2000:Q1 to 2013:Q4 for a panel of domestic bank holding companies. Foreign-exposure-weighted regulation ExpP is calculated as the weighted average of changes in foreign regulation where the weights are total assets and liabilities of the bank in the respective foreign country. For ExpP and its interaction effects, the reported coefficient is the sum of the contemporaneous term and two lags. For more details on the variables, see table 8 in the appendix. Each column gives the result for the regulatory measure specified in the column headline. All specifications include fixed effects as specified in the lower part of the table. Standard errors (in parentheses) are clustered by bank. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent level, respectively.

to show that home policies push Canadian banks to lend more abroad, and confirm the existence of a limited inward transmission channel.

The spillovers identified in our study do not necessarily represent a negative outcome. If the regulatory policies' original intention was to shift lending away from risky entities, then one could interpret our results as a beneficial outcome, since better-capitalized Canadian banks may have ended up increasing foreign lending. However, if the original intention was to slow down the growth of credit (i.e., lean against the cycle), then our results potentially point to the need for closer international policy coordination. Raising awareness of individual jurisdictions, on how their policy actions may affect the credit cycles of other countries, may be warranted.

Appendix

Table 8. Construction of Balance Sheet Independent Variables

Variable Name	Report Form Description	Source
Illiquid Assets $\text{Ratio}_{b,t-1}$	[All Loans Net of Allowance for Impairment/Total Assets] * 100	Balance Sheet (M4).
Log Real $\text{Assets}_{b,t-1}$	Ln[Total Assets in 2012 Canadian Dollars]	Balance Sheet (M4). CPI is from the Bank of Canada.
Core Deposits $\text{Ratio}_{b,t-1}$	[Demand, Notice, and Time Deposits by Individuals/Total Assets] * 100	Balance Sheet (M4).
Tier 1 $\text{Ratio}_{b,t-1}$	[Tier 1 Risk-Based Capital/Risk-Weighted Assets] * 100	Basel Capital Adequacy Return (BCAR-BA).

(*continued*)

Table 8. (Continued)

Variable Name	Report Form Description	Source
Net Dut $To_{b,t-1}$	[(Total Head-Office Claims on Foreign Branches, Agencies, and Consolidated Subsidiaries – Total Head-Office Liabilities to Foreign Branches, Agencies, and Consolidated Subsidiaries)/Total Liabilities] * 100	Geographic Assets and Liabilities Booked in Canada (GQ). Total Liabilities from Balance Sheet (M4).
International $Ratio_{b,t-1}$	[(Total Foreign Assets + Total Foreign Liabilities)/(Total Assets + Total Liabilities)] * 100	Geographic Assets and Liabilities Booked in Canada (GQ). Total Assets and Total Liabilities from Balance Sheet (M4).

Table 9. LTV Changes in Canada over the Sample Period

Period	Direction	Details
2006:Q4	Loosening	From 95% to 100% on all home buyers
2007:Q1	Loosening	From 90% to 95% on refinancing activities
2008:Q4	Tightening	From 100% to 95% on all home buyers
2010:Q2	Tightening	From 95% to 80% on investment properties From 95% to 90% on refinancing activities
2011:Q1	Tightening	From 95% to 85% on refinancing activities
2012:Q3	Tightening	From 85% to 80% on refinancing activities

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