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

Marianna Caccavaio, Luisa Carpinelli, and Giuseppe Marinelli
Banca d'Italia

In this paper we study how foreign lending by Italian banks adjust to prudential policy changes of destination markets over the period 2000–14. We find a positive prudential spillover effect: Italian banks tend to lend more to countries that tighten a prudential measure. The impact is not very large nevertheless, and it is driven by cross-border lending and lending by hosted branches that are not directly affected by the changes in regulations. This evidence highlights the need for international cooperation among authorities.

JEL Codes: G20, G21.

1. Introduction

The aim of this paper is to assess how and to what extent the regulatory changes that have interested the prudential environment of the countries to which Italian banks are exposed might have affected the growth rate of lending to foreign residents. We do so by examining the lending of Italian banks over the period 2000–14. The analysis of this topic is particularly insightful for policymaking activity in a supranational environment, in which issues like cross-country prudential spillovers must be taken into account when assessing the effectiveness and outcomes of new measures.

There is the possibility that the non-synchronized introduction of regulatory rules in economies that are financially linked might induce a different behavior in the intermediaries that are headquartered in such countries. Following Buch and Goldberg (2017), we refer to

*Author e-mails: marianna.caccavaio@bancaditalia.it, luisa.carpinelli@bancaditalia.it, giuseppe.marinelli@bancaditalia.it.

spillover-type mechanisms as the consequences that regulations in one market might have on other markets or other institutions. This behavior does not necessarily reflect regulatory arbitrage or policy leakages. Specifically, in our paper we look at how Italian banks adjust credit in response to variations in the prudential settings of foreign markets to which they are exposed. We find a positive prudential spillover effect: lending tends to increase to markets where prudential instruments are tightened.

This impact is not necessarily detrimental to the original purpose behind the tightening of rules. If a stricter regulation is introduced within a prudential framework, with the aim to reduce credit growth in relation to GDP so as to preserve financial stability, then the effect of regulatory spillover can defeat the original objective of regulation. On the other hand, if a tighter regulation is driven by other reasons, regulatory spillover might also have some beneficial effect, in that the presence of foreign banks, sustaining credit to the nonfinancial sector, mitigates the negative impact that more severe rules might have on credit supply by domestic banks, at least in the short run.[1]

The research question is particularly important, from a policy perspective, because the presence of international spillovers of regulation warrants coordination of policies, as pointed out by Visco (2011) and Panetta (2013). A potential case for spillover occurs when prudential policy measures introduced in one country propel imbalances elsewhere in the system, by modifying the flow of credit toward countries other than the one where the regulatory change has occurred. The existence of such spillovers calls for cooperation among authorities, which in turn needs to be grounded in sound empirical analysis of their nature.

We choose to concentrate on outward lending by Italian banks, as we deem outward transmission to be particularly sensible in the Italian case for a number of reasons. First, although a large part of

[1]To fully assess the degree to which the spillover mechanism can weaken the regulatory purpose or, alternatively, mitigate its negative effects, one would need to examine the behavior of foreign banks jointly with the response of local banks to the introduction of the rule. Unfortunately, since we do not have information on loans by domestic banks of destination countries, we are only partially addressing this question and we cannot draw any conclusion on substitutability.

outward credit flows is directed toward EU destinations, cross-country heterogeneity in the destination markets of Italian banks is still quite large, and it is certainly more diversified than the variety of the headquarters' countries of foreign intermediaries operating in Italy. To our knowledge, from a methodological point of view, foreign regulatory tools have not yet been mapped to the presence of Italian banks in each of these markets. Second, it is more meaningful to examine the regulatory frameworks of foreign countries and the outward transmission, given that the Italian regulatory setting varied very little over the period of our analysis. The few relevant measures introduced basically consisted of a tightening of capital requirements and were undertaken mainly after the financial crisis of 2007–08 to address existing risks. The impact of capital requirements on bank lending and real activity is still an open issue (see De Nicolo 2015 for details) and there is no empirical evidence based on Italian data. More significant effects might emerge in the near future with the Basel III full implementation in the European Union through the Capital Requirements Directive IV (CRD IV) and the Capital Requirements Regulation (CRR).

This paper sheds some light on these phenomena. It illustrates how Italian banks have modified their loan growth rates not only based on the destination countries' business cycle but also, though to a lesser degree, depending on the tightness of their regulatory environment. In particular, lending by Italian banks responds positively to tighter rules in the destination markets; the effect is not very large economically, and it is driven by direct cross-border lending and lending by foreign branches. The paper then shows that, on the contrary, Italian banks did not adjust their loan quantities to a specific country depending on the average regulatory stance of the third countries to which they are exposed, thus highlighting the absence of spillover effects across different sets of regulatory stances. Furthermore, we explore the main result more in depth, by examining whether the main finding is common to both banks with foreign subsidiaries and banks that lend to foreign residents through cross-border lending and branches. We find that the two types of international banks adjust their lending to different sets of regulatory instruments. Finally, we also look separately at loans to households and loans to non-financial corporations and find some heterogeneity in their response to regulation.

2. Data

We use data coming from a variety of sources for a period that spans from the first quarter of 2000 to the end of 2014. A first set of data are obtained from statistical and supervisory reports and are relative to banks' balance sheet statistics. A second part of the data set comes from a cross-country database on a set of prudential policy indicators (Cerutti et al. 2017). Country-level measures of economic and financial activity, such as the output gap and the credit-to-GDP ratio, were provided by the Bank for International Settlements (BIS).

2.1 Bank-Level Data

Bank-level statistics are collected from the statistical and supervisory reports that all the banks resident in Italy must transmit to the Bank of Italy. Data for banking groups are taken from the consolidated statistics, while data on stand-alone intermediaries come from the individual reports. We use information at the consolidated level for banking groups (or aggregate information at the banking group level, where only individual information is available) since lending policies are typically decided at the banking group level. The perimeter of consolidated data includes branches and subsidiaries abroad, which could turn out to be problematic in the econometric identification, as branches are in principle subject to the home-country supervision/regulation, whereas subsidiaries are subject to the supervisory and regulatory authority of the host country. The richness of the data set allows us to distinguish lending extended by these two distinct components of the banking groups, which are likely to display different behavior.

2.1.1 Dependent Variables

The baseline dependent variable is the quarterly change in the logarithm of loans to the private non-financial sector broken down by destination country. Moreover, we are able to identify the borrower sector (households and non-financial corporations) and the banking group component which actually extends the loans (the parent bank or one of the domestic banks of the group, the branches, or

the subsidiaries abroad). Our dependent variables therefore are as follows:

- $\Delta Y_{b,j,t}$, the change in the logarithm of loans extended by bank b during quarter t in destination country j
- $\Delta Y^{HH}_{b,j,t}$, the change in the logarithm of loans extended by bank b to households (HHs) during quarter t in destination country j
- $\Delta Y^{NFC}_{b,j,t}$, the change in the logarithm of loans extended by bank b to non-financial corporations (NFCs) during quarter t in destination country j
- $\Delta Y^{PB}_{b,j,t}$, the change in the logarithm of loans extended by the parent bank b and its branches abroad during quarter t in destination country j
- $\Delta Y^{SU}_{b,j,t}$, the change in the logarithm of loans extended by the subsidiaries of bank b during quarter t in destination country j

2.1.2 Balance Sheet Characteristics

The regression specifications include several bank balance sheet characteristics, which are used as control variables and as a measure of possible differential effects of regulation based on bank heterogeneity. All variables are lagged by one period to avoid simultaneity problems. They are as follows:

- The ratio of illiquid assets to total assets ($IlliquidAsset\ Ratio_{b,t-1}$)
- The ratio of deposits placed by households (HHs) and non-financial corporations (NFCs) to total liabilities ($Core\ Deposits_{b,t-1}$)
- The banking organization's ratio of capital to total assets ($CapitalRatio_{b,t-1}$)
- The log of real total assets ($LogRealAssets_{b,t-1}$)
- The ratio of foreign assets plus foreign liabilities relative to total assets plus total liabilities ($InternationalRatio_{b,t-1}$)

Table 7 in the appendix provides further details on how variables are obtained and on other methodological aspects.

Our analysis focuses on international banks. Under such label we include intermediaries characterized by the presence of affiliates

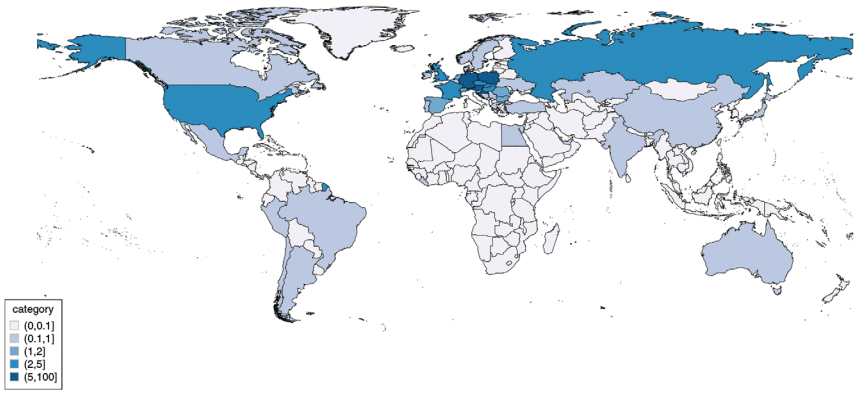
abroad (branches or subsidiaries) and intermediaries that, albeit not having foreign affiliates, hold a share of claims toward foreign countries of at least 2 percent. As illustrated by Caccavaio et al. (2015), international banks (with or without affiliates) are characterized by larger assets, a lower proportion of liquid assets, and a more diversified portfolio of loans and securities with respect to domestic banks. International banks tend to be less capitalized than domestic banks; a significant part of their funding consists of stable deposits placed by households and non-financial corporations (more than 40 percent), but they still rely on the wholesale interbank markets and on intragroup funding more than domestic intermediaries. The proportion of illiquid assets is slightly larger than that of domestic banks.

As already mentioned, in the most recent years about one-fifth of loans of Italian banks has been extended to foreign counterparties. Italian banking groups include several branches and subsidiaries, as several acquisitions of foreign banking groups took place since 2006–07. Prior to that, in the first part of the sample period (2000–06), the average proportion of loans to non-residents was smaller, around 8 percent. Subsidiaries in the first phase (2000–06) predominantly lent to households. They are now the main source of loans for both households and firms: over the period 2007–14, subsidiaries represented 85 percent of total lending to foreign non-financial corporations, and over 97 percent of lending to foreign households.

Italian banking groups mostly lend to European (85 percent) and North American (6 percent) borrowers. Aside from these areas, country shares are negligible (up to 0.1 percent) or smaller than 1 percent, as shown in figure 1, which displays average loan shares by destination country during our period of reference. In Europe, as shown in figure 2, the largest loan shares are directed to Germany, Austria, Poland, and Croatia, which all represent more than 5 percent of loans to foreign residents. Smaller but still significant shares can be found in France, United Kingdom, Russia, the Czech Republic, Slovakia, and Hungary.

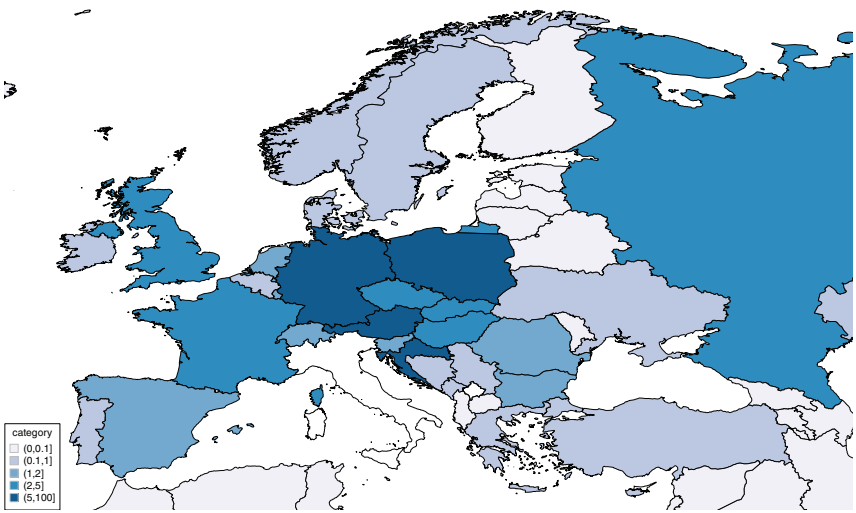
Table 1 reports a few descriptive statistics of the variables used in our regressions. The dependent variable, loans extended by bank b at time t to destination country j, on average slightly decreased in our sample period. The breakdown by counterparty sector shows that the non-financial corporations component is responsible for the

Figure 1. Loan Shares by Destination Country in the World



Notes: The figure represents the average loan shares by destination country of Italian international banks in the sample period (2000–14). The shares are calculated as the percentage ratio of the sum of loans over time in a specific country over the total sum of loans to foreign counterparties over time. A comprehensive description of the variables can be found in table 7 in the appendix.

Figure 2. Loan Shares by Destination Country in Europe



Notes: The figure represents the average loan shares by destination country of Italian international banks in the sample period (2000–14). The shares are calculated as the percentage ratio of the sum of loans over time in a specific country over the total sum of loans to foreign counterparties over time. A comprehensive description of the variables can be found in table 7 in the appendix.

Table 1. Summary Statistics on Bank Lending and Characteristics

Variable	All Banks (N = 61)			Banks without Foreign Affiliates (N = 44)			Banks with Foreign Affiliates (N = 17)		
	Mean	**Median**	**SD**	**Mean**	**Median**	**SD**	**Mean**	**Median**	**SD**
A. Balance Sheet Data									
Dependent Variables:									
Δ logLoans	−0.2	−0.3	25.0	0.7	0.0	20.1	−0.3	−0.4	25.9
of which:									
Δ logLoansHH	1.0	−0.3	24.3	0.6	0.0	20.4	1.0	−0.4	25.0
Δ logLoansNFC	−1.1	−0.0	24.2	1.6	0.7	16.7	−1.5	−0.3	25.2
Δ logLoansPB	−0.3	−0.3	25.2	0.7	0.0	20.1	−0.5	−0.6	26.1
Δ logLoansSU	−0.6	−0.2	25.6	—	—	—	−0.6	−0.2	25.6
Independent Variables:									
Capital Ratio	12.1	8.8	11.1	13.4	8.9	13.2	10.3	8.7	6.6
Core Deposits	45.5	46.7	17.3	49.8	54.4	17.8	39.9	40.0	14.8
International Ratio	6.5	4.0	8.1	4.3	2.8	5.9	9.5	6.5	9.6
Illiquid Assets Ratio	88.3	91.0	10.2	87.2	90.0	11.0	89.8	91.7	8.7
Log Real Assets	8.1	8.1	2.4	6.7	7.1	1.7	9.9	10.1	1.9
B. Other Data									
Financial Cycle	1.7	2.3	16.5						
Business Cycle	0.0	−0.1	2.3						
Consumer Price Index	99.57	98.78	4.57						

Notes: The table provides summary statistics for bank balance sheet and lending data. Data have a quarterly frequency from 2000:Q1 to 2014:Q4. Banking data come from consolidated reports in the case of banking groups and from individual reports in the case of banks not belonging to banking groups. Banks are considered to have a foreign affiliate if they report claims for branches or subsidiaries located in foreign countries. Loans are broken down by counterparty sector (households and non-financial corporations) and by banking group component (parent bank and its branches and subsidiaries abroad). The independent variables, except for *LogRealAssets,* are reported in percentage values. Panel B reports other data on economy-wide variables (financial and business cycle indicators) and the Italian consumer price index which was used to deflate the outstanding amounts of loans. A detailed description of the variables, the derivation methodologies, and the data sources are reported in table 7 in the appendix.

decrease of loans extended by international banks. The different growth patterns of loans to households and to non-financial corporations may suggest heterogeneity in the response of banks depending on the composition of their portfolios and on the nature of the prudential policy instrument.

2.2 Data on Prudential Instruments

Data on prudential instruments, drawn from the International Banking Research Network (IBRN) Prudential Instruments Database described in Cerutti et al. (2017), are available for more than sixty countries over the period 2000–14. Each indicator is expressed in terms of change over the previous quarter; a zero value means an unchanged prudential policy relative to the past, a positive value represents a tightening, and a negative value represents a loosening. The prudential policy instruments include capital requirements, sector-specific capital ratios, loan-to-value ratios, reserve requirements for local and foreign currencies, interbank exposure limits, and concentration ratios. An aggregated prudential policy index is calculated as the sum of all the available indexes in terms of change and of cumulative change over time. Such indicators are employed to capture the response of bank loans to changes in the destination countries' regulations ($DestP_{j,t}$). Tables 2 and 3 provide some key statistics about the above-mentioned indexes for destinations of Italian banking groups. The instruments that have been activated more frequently in the sample period are the reserve requirements on local and foreign currencies, capital ratios, loan-to-value ratios, and sector-specific capital buffers overall, whereas concentration ratios and interbank exposure limits have been used less frequently. Most of the changes in the prudential policy instruments were in the form of a tightening. Unfortunately, the information on certain instruments is missing for some combinations of bank-country-year of our sample, thus reducing the number of observations.

The impact of changes in the regulation of third countries is captured with a second measure, namely the foreign-exposure-weighted regulation index ($ExpP_{b,j,t}$). This is derived for each bank b and destination country j through a weighted mean of the prudential regulation indexes $P_{i,t}$ in all the countries other than the home and destination ones. The weights $\phi_{b,i,t}$ at time t are the shares $e_{b,i,s}$ of

Table 2. Outward Transmission of Policy to Destination Country

Instrument	Policy Changes in Destination Country				
	No. of Country-Time Changes	**No. of Country-Time Changes (Tightening)**	**No. of Country-Time Changes (Loosening)**	**No. of Bank-Country-Time Changes**	**Proportion of Non-zero MPP**
Prudential Index	549	365	184	10,457	19.1
Capital Ratios	100	100	0	2,282	3.0
Sector-Specific Capital Ratios	69	51	18	1,345	2.1
Loan-to-Value Ratios	94	69	25	1,813	8.0
Reserve Requirements: Foreign Currencies	135	85	50	2,045	4.1
Reserve Requirements: Local Currency	274	116	158	4,850	8.7
Interbank Exposure Limits	24	23	1	794	2.2
Concentration Ratios	32	30	2	723	1.7

Notes: This table provides summary statistics on changes in prudential instruments for Italian banking groups over the period 2000–14. Quarterly data on the prudential policy changes broken down by instrument type come from the IBRN Prudential Instruments Database described in Cerutti et al. (2017). The prudential index at time t is calculated as the sum of the changes of all the instruments at time t.

Table 3. Outward Transmission of Policy to Destination Country via Third-Country Exposures

Instrument	Base Data (Before Aggregating to Exposure-Weighted Measures)					Exposure-Weighted Observations
	No. of Country-Time Changes	No. of Country-Time Changes (Tightening)	No. of Country-Time Changes (Loosening)	Proportion of Non-zero MPP	No. of Bank-Country-Time Changes	Proportion of Non-zero MPP
Prudential Index	549	365	184	19.1	10,457	15.0
Capital Ratios	100	100	0	3.0	2,282	2.9
Sector-Specific Capital Ratios	69	51	18	2.1	1,345	1.7
Loan-to-Value Ratios	94	69	25	8.0	1,813	7.6
Reserve Requirements: Foreign Currencies	135	85	50	4.1	2,045	2.6
Reserve Requirements: Local Currency	274	116	158	8.7	4,850	6.4
Interbank Exposure Limits	24	23	1	2.2	794	2.5
Concentration Ratios	32	30	2	1.7	723	1.6

Notes: This table provides summary statistics on changes in prudential instruments for Italian banking groups over the period 2000–14. Quarterly data on the prudential policy changes broken down by instrument type come from the IBRN Prudential Instruments Database described in Cerutti et al. (2017). Tightening (+1) refers to, e.g., an increase in capital or reserve requirements or a reduction in exposure limits; these changes make regulation more binding. Moves in the other direction are loosening (–1). The prudential index at time t is calculated as the sum of the changes of all the instruments at time t.

total exposure of bank b to each country except j, as given by over the four preceding quarters s. Thus the exposure-weighted regulation index is represented by

$$ExpP_{b,j,t} = \sum_{i \neq j} P_{i,t} \cdot \phi_{b,i,t-1}$$

$$\phi_{b,i,t-1} = \frac{\sum_{s=t-4}^{t-1} e_{b,i,s}}{\sum_{i \neq j} \sum_{s=t-4}^{t-1} e_{b,i,s}},$$

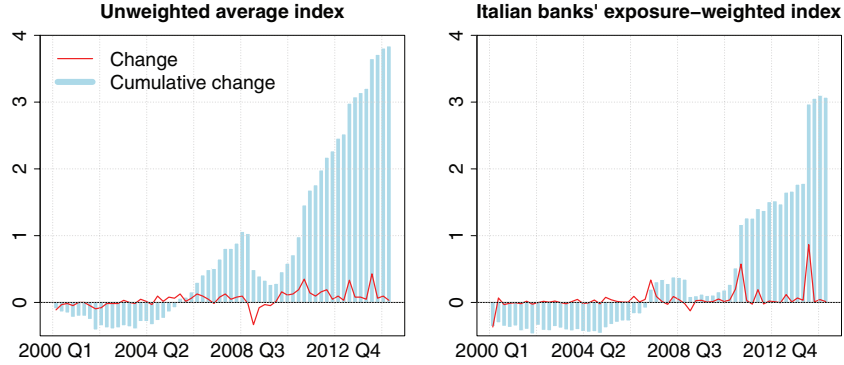
where exposures $e_{b,i,s}$ are calculated as the sum of loans, holdings of securities, deposit liabilities, and other debts, as described in table 7 in the appendix. Figure 3 shows the developments of prudential policy indexes in terms of unweighted average for the full sample of countries in the database (graph on the left) and in terms of Italian banks' exposure-weighted mean (graph on the right). While the former is calculated as a simple mean of the prudential indexes across countries over time, the latter takes into account the relative importance of the exposure to each country for Italian banks. The comparison of the two indexes suggests that the general index moved more steadily, thereby reaching higher values in cumulative terms with respect to the Italian banks' exposure-weighted index. This is mostly explained by the larger exposures of Italian banks toward European countries versus the rest of the world. The largest prudential policy changes occurred in the emerging economies, namely China and India, which have a relatively small weight in Italian banks' portfolios.

3. Empirical Method and Regression Results

3.1 Baseline Analysis of the Outward Transmission of Prudential Policies

We now proceed with the empirical analysis of the effect of changes in regulation on banks' lending growth, following the approach described in Buch and Goldberg (2017). As mentioned above, our interest is in assessing if and to what extent changes in lending to foreign residents respond to changes in prudential policies in destination markets. We begin by estimating the following equation:

Figure 3. Prudential Policy Indexes



Source: Authors' calculations on Cerutti et al. (2017) and Bank of Italy data.
Notes: The graph on the left represents the simple mean of prudential policy changes and cumulative changes for the full sample of countries in the IBRN Prudential Instruments Database described in Cerutti et al. (2017). The graph on the right represents Italian banks' exposure-weighted index of prudential policy changes and cumulative changes, with exposures being calculated as the sum of loans, holdings of securities, deposit liabilities, and other debts. Further details and a comprehensive description of the variables can be found in table 7 in the appendix.

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

where $\Delta Y_{b,j,t}$ is the log change in lending of bank b toward country j at time t, $X_{b,t-1}$ is a vector of bank balance sheet variables that proxy for the degree to which a bank is exposed to changes in regulation, and $Z_{j,t}$ is the vector of financial and business cycle indicators in country j represented by the credit-to-GDP ratio and the output gap. The prudential policy changes are captured by $DestP_j$, the prudential policy measures adopted in country j to which the loan is directed. f_j, f_t, and f_b are, respectively, country, time, and bank fixed effects. The inclusion of a measure of business cycle and time-invariant country fixed effects allows to control for demand effects.

Estimates of this specification, which we consider the baseline model, are shown in table 4, where we report the cumulative effects

Table 4. Outward Transmission of Destination-Country Regulation Policy—Baseline

	Prudential IndexC (1)	Capital Requirement (2)	Sector-Specific Capital Buffer (3)	LTV Ratio (4)	Reserve Requirements: Foreign (5)	Reserve Requirements: Local (6)	Interbank Exposure Limits (7)	Concentration Ratios (8)
Destination-Country Regulation	1.112***	−2.281	2.612*	−0.574	1.736**	2.754***	1.437	−1.531
	(0.058)	(2.026)	(2.960)	(0.058)	(5.726)	(16.673)	(0.215)	(0.699)
Log Total Assets$_{t-1}$	−0.017**	−0.016**	−0.017**	−0.018	−0.016**	−0.017**	−0.011	−0.008
	(0.008)	(0.008)	(0.008)	(0.021)	(0.008)	(0.008)	(0.011)	(0.009)
Tier 1 Ratio$_{t-1}$	0.061	0.062	0.061	0.012	0.062	0.060	0.126	0.057
	(0.097)	(0.096)	(0.097)	(0.208)	(0.096)	(0.097)	(0.108)	(0.144)
Illiquid Assets Ratio$_{t-1}$	−0.199***	−0.200***	−0.199***	−0.173	−0.199***	−0.199***	−0.249***	−0.159**
	(0.056)	(0.057)	(0.056)	(0.111)	(0.056)	(0.056)	(0.074)	(0.068)
International Activity$_{t-1}$	−0.064	−0.065	−0.063	−0.091	−0.065	−0.064	−0.042	−0.083
	(0.056)	(0.056)	(0.056)	(0.065)	(0.056)	(0.056)	(0.079)	(0.070)
Core Deposits Ratio$_{t-1}$	0.012	0.013	0.012	0.014	0.012	0.012	0.073**	0.022
	(0.028)	(0.028)	(0.028)	(0.063)	(0.028)	(0.028)	(0.035)	(0.033)
Financial Cycle (Destination Country)	0.003	0.004	0.003	−0.000	0.004	0.003	0.003	0.023
	(0.014)	(0.015)	(0.015)	(0.019)	(0.015)	(0.015)	(0.032)	(0.018)
Business Cycle (Destination Country)	0.199*	0.217**	0.205**	0.368	0.206*	0.210**	0.451***	0.278***
	(0.103)	(0.103)	(0.102)	(0.225)	(0.104)	(0.103)	(0.150)	(0.103)
Observations	28,273	28,273	28,273	8,575	28,273	28,273	11,981	16,495
R^2	0.019	0.019	0.019	0.031	0.019	0.019	0.028	0.027
Adjusted R^2	0.0132	0.0131	0.0131	0.0153	0.0131	0.0134	0.0168	0.0177
No. of Destination Countries	52	52	52	30	52	52	18	29
No. of Banks	61	61	61	48	61	61	61	60

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 dara are quarterly from 2000:Q1 to 2014:Q4 for a panel of Italian bank holding companies that have cross-border claims greater than 2 percent of assets. Destination-country regulation refers to the changes in regulation in the destination country of the loan. For destination-country regulation, the reported coefficient is the sum of the contemporaneous term and two lags, with the corresponding F-statistics for significance in parentheses. For more details on the variables, see table 7 in the appendix. Each column gives the result for the regulatory measure specified in the column headline. All specifications include bank, time, and destination-country fixed effects. Standard errors are clustered by bank. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent level, respectively.

of the prudential measures ($\alpha_1+\alpha_2+\alpha_3$) over the three periods.[2] We notice that, overall, larger and more illiquid banks tend to increase lending to foreign counterparties at a lower growth rate. Also, lending growth consistently responds to economic activity of the destination country: loans increase (decrease) more toward those countries that are experiencing an expansionary (contractionary) phase of the business cycle.

Then, moving to the prudential variables that are the core of our analysis, we observe that Italian banks increase lending to countries with an overall tighter regulation, as shown by the sign of the aggregated prudential index of column 1. The impact is statistically significant and sizable: a unit variation in the prudential instrument determines a positive readjustment in loans of 1.1 percent. The economic effect is non-negligible but not very large: it corresponds to 4.5 percent of the standard deviation of loans. Such result shows that foreign banks modify their lending policy based on the differences of the regulatory regimes of destination and home countries. Also, the finding has relevant policy implication, as it shows a potential beneficial effect associated with the presence of foreign intermediaries in an environment where regulation is tightened. In case such regulatory change induces a negative credit supply shock for domestic banks, foreign intermediaries seem to be able to step in and offset the decline in loans to local borrowers.

Looking at the specific regulatory measures, lending growth is higher toward destinations that have stricter sector-specific capital buffers (column 3), higher reserve requirements in foreign currency (column 5), and higher reserve requirements in local currency (column 6). We will give a more specific interpretation of the impact of the single measures by looking at the breakdown between different types of international banks in section 3.3. Our baseline estimation was repeated on the subset of observations for the years following 2006, which is when major acquisitions of foreign banks by Italian groups took place, thereby shaping the current

[2]For robustness purposes we also ran weighted regressions with banks' size (logarithm of total assets) as weights so as to take into account the magnitude of the behavior of each bank within our sample. Additionally, we winsorize bank characteristics variables at the 1st and 99th percentiles. In both cases all the results hold.

organization of Italian intermediaries abroad. All results hold in this subperiod.

In order to explore these findings more in depth, we expand our baseline model of table 4 in different directions.

3.2 Third-Country Exposure

First, we examine outward transmission toward the given country j also taking into account what happens in the regulatory framework of all the other countries to which the bank is lending, weighted by the size of its exposure to each one of these countries. The specification is then

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

where $ExpP_{j,t}$ is the measure of exposure-weighted prudential policy of bank b toward all the countries it lends to except country j, at time t. Estimates of this specification are shown in table 5, where we report the cumulative effects for $\alpha_1+\alpha_2+\alpha_3$ and $\beta_1+\beta_2+\beta_3$. It can be argued that third-country changes in prudential regulation basically leave lending growth unaffected, whereas destination-country regulation shifts consistently affect lending growth as in the baseline. This provides evidence of absence of regulatory spillovers between the different destination countries of financial intermediaries.

3.3 Exploration of Heterogeneity by Type of Internationalization and by Borrowing Sector

Second, we rerun the baseline equation *jointly* to include the main regulatory measures of destination countries, so as to address our main question and, at the same time, to take into account cross-correlation between the different prudential indicators. Now $DestP_j$ of equation (1) is a *matrix* of the prudential policy measures adopted in country j to which the loan is directed. Results are shown in table 6.

Table 5. Outward Transmission of Destination-Country Regulation Policy and Third-Country Exposure-Weighted Policy

	Prudential IndexC (1)	Capital Requirement (2)	Sector-Specific Capital Buffer (3)	LTV Ratio (4)	Reserve Requirements: Foreign (5)	Reserve Requirements: Local (6)	Interbank Exposure Limits (7)	Concentration Ratios (8)
Destination-Country Regulation	1.12***	−2.275	2.658*	−0.488	1.802**	2.783***	1.202	−1.484
	(9.648)	(2.037)	(3.120)	(0.042)	(6.133)	(17.209)	(0.153)	(0.639)
Log Total Assets$_{t-1}$	−0.016**	−0.016**	−0.017**	−0.021	−0.014*	−0.016**	−0.010	−0.008
	(0.008)	(0.008)	(0.008)	(0.020)	(0.008)	(0.008)	(0.011)	(0.009)
Tier 1 Ratio$_{t-1}$	0.061	0.064	0.060	−0.016	0.069	0.056	0.128	0.061
	(0.098)	(0.097)	(0.098)	(0.195)	(0.098)	(0.097)	(0.108)	(0.145)
Illiquid Assets Ratio$_{t-1}$	−0.201***	−0.199***	−0.203***	−0.174	−0.198***	−0.198***	−0.249***	−0.161**
	(0.057)	(0.057)	(0.057)	(0.112)	(0.055)	(0.056)	(0.074)	(0.068)
International Activity$_{t-1}$	−0.063	−0.065	−0.062	−0.085	−0.064	−0.063	−0.040	−0.082
	(0.056)	(0.056)	(0.057)	(0.066)	(0.056)	(0.057)	(0.080)	(0.071)
Core Deposits Ratio$_{t-1}$	0.015	0.012	0.012	0.017	0.027	0.013	0.074**	0.023
	(0.029)	(0.028)	(0.028)	(0.062)	(0.031)	(0.029)	(0.035)	(0.034)
Financial Cycle (Destination Country)	0.004	0.004	0.003	−0.000	0.004	0.003	0.003	0.023
	(0.014)	(0.015)	(0.015)	(0.018)	(0.015)	(0.015)	(0.032)	(0.018)
Business Cycle (Destination Country)	0.200*	0.217**	0.204*	0.357	0.206*	0.209**	0.452***	0.278***
	(0.103)	(0.103)	(0.102)	(0.226)	(0.104)	(0.103)	(0.150)	(0.103)
Foreign-Exposure-Weighted Regulation	1.124	1.596	3.727	−16.234	10.419**	7.047	−4.292	2.854
	(0.569)	(0.175)	(0.922)	(2.072)	(5.740)	(1.162)	(0.719)	(0.181)
Observations	28,273	28,271	28,271	8,575	28,271	28,271	11,981	16,495
R^2	0.019	0.019	0.019	0.032	0.019	0.020	0.028	0.027
Adjusted R^2	0.0132	0.0131	0.0130	0.0159	0.0132	0.0135	0.0167	0.0176
No. of Destination Countries	52	52	52	30	52	52	18	29
No. of Banks	61	61	61	48	61	61	61	60

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 2014:Q4 for a panel of Italian bank holding companies that have cross-border claims greater than 2 percent of assets. Destination-country regulation refers to the changes in regulation in the destination country of the loan. Foreign-exposure-weighted regulation 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 change in regulation, the reported coefficient is the sum of the contemporaneous term and two lags, with the corresponding F-statistics for significance in parentheses. For more details on the variables, see table 7 in the appendix. Each column gives the result for the regulatory measure specified in the column headline. All specifications include bank, time, and destination-country fixed effects. Standard errors are clustered by bank. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Table 6. Outward Transmission of Destination-Country Regulation Policy: Breakdown by Type of Foreign Presence and Sectors

	Total Lending (1)	Total Lending (2)	Direct Cross-Border Lending and Lending through Branches (3)	Lending through Subsidiaries (4)	Loans to Households (5)	Loans to Non-financial Corporations (6)
Log Total Assets$_{t-1}$	-0.017^{**}	-0.017^{**}	-0.020^{*}	-0.031	-0.012	-0.019^{**}
	(0.008)	(0.008)	(0.011)	(0.031)	(0.010)	(0.009)
Tier 1 Ratio$_{t-1}$	0.058	0.058	0.088	-0.049	0.009	-0.099
	(0.097)	(0.098)	(0.116)	(0.198)	(0.129)	(0.124)
Illiquid Assets Ratio$_{t-1}$	-0.199^{***}	-0.202^{***}	-0.176^{***}	0.006	-0.071	-0.203^{***}
	(0.056)	(0.057)	(0.066)	(0.256)	(0.047)	(0.073)
International Activity$_{t-1}$	-0.063	-0.062	0.002	-0.147	0.001	-0.083
	(0.056)	(0.057)	(0.062)	(0.097)	(0.039)	(0.057)
Core Deposits Ratio$_{t-1}$	0.012	0.015	-0.001	0.126	-0.011	0.029
	(0.028)	(0.028)	(0.028)	(0.193)	(0.036)	(0.071)
Financial Cycle (Destination Country)	0.002	0.003	0.009	0.017	0.011	-0.008
	(0.014)	(0.014)	(0.015)	(0.022)	(0.016)	(0.011)
Business Cycle (Destination Country)	0.201^{*}	0.202^{*}	0.103	0.093	0.197^{*}	0.213
	(0.105)	(0.105)	(0.126)	(0.221)	(0.115)	(0.135)
Capital Requirements:	-2.34	-2.299	-2.467	4.501^{**}	-1.414	0.099
	(2.158)	(2.109)	(1.963)	(4.596)	(0.877)	(0.003)
Sector-Specific Capital Buffer	2.275	2.303	2.673^{*}	1.687	1.848	-0.258
	(2.156)	(2.228)	(3.337)	(1.200)	(2.720)	(0.026)
Reserve Requirements: Foreign	0.643	0.676	0.701	-0.515	3.593^{***}	-1.135
	(0.683)	(0.745)	(0.705)	(0.032)	(10.200)	(1.364)
Reserve Requirements: Local	2.383^{***}	2.392^{***}	1.361^{**}	1.061	-0.851	1.691
	(9.541)	(9.568)	(4.044)	(0.807)	(0.927)	(2.500)
Foreign-Exposure-Weighted Regulation		1.237				
		(0.708)				

(*continued*)

Table 6. (Continued)

	Total Lending (1)	**Total Lending (2)**	**Direct Cross-Border Lending and Lending through Branches (3)**	**Lending through Subsidiaries (4)**	**Loans to Households (5)**	**Loans to Non-financial Corporations (6)**
Observations	28,273	28,273	27,476	7,919	24,016	16,535
R^2	0.020	0.020	0.019	0.046	0.018	0.027
Adjusted R^2	0.0133	0.0132	0.0127	0.0290	0.0101	0.0173
No. of Destination Countries	52	52	52	52	52	52
No. of Banks	61	61	61	19	60	47

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 2014:Q4 for a panel of Italian bank holding companies that have cross-border claims greater than 2 percent of assets. Capital requirements, sector-specific capital buffer, reserve requirements foreign and reserve requirements local refer to the changes in regulation in the destination country of the loan. Foreign exposure-weighted regulation 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 change in regulation, the reported coefficient is the sum of the contemporaneous term and two lags, with the corresponding F-statistics for significance in parentheses. For more details on the variables, see table 7 in the appendix. Each column gives the result for the regulatory measure specified in the column headline. All specifications include bank, time, and destination-country fixed effects. Standard errors are clustered by bank. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent level, respectively.

Of all the measures in the original data set, we select those that have enough observations in our sample of destination countries. These are capital requirements, sector-specific capital ratios, and reserve requirements for local and foreign currencies, for which we have more than 28,000 bank-country-time observations. As can be seen in table 4, observations on concentration ratios, interbank exposure limits, and loan-to-value ratios drop to half to a quarter of that number, hence we chose to exclude them.

Within this setting, we begin by rerunning the basic regression (column 1) and then add the third-country exposure-weighted index (column 2), in order to check the consistency with the results found in tables 4 and 5. Then, we explore the heterogeneity across banks in their degree of internationalization, to shed light on whether the type of foreign presence determines a different response to the regulatory framework. Indeed, one possibility is that subsidiaries' lending is characterized by a different response of lending policy to prudential regulation of destination countries relative to cross-border and branches' lending. Whereas subsidiaries located in EU countries are, all in all, legal entities of the destination market and are fully subject to its legal framework, Italian banks and their branches abroad might be differently affected, as they have to respect the domestic legal setting and comply with less foreign regulation. Thus we run equation (1) separately for cross-border and branches' lending $\Delta Y^{PB}_{b,j,t}$ and subsidiaries' lending $\Delta Y^{SU}_{b,j,t}$; results are shown in columns 3 and 4.

Finally, we also examine the possibility that the response to regulation might differ depending on whether loans are directed to households or non-financial corporations. Indeed, ex ante, one could expect that regulatory tools, such as sector-specific capital buffers (mostly associated with lending to residential and commercial real estate) and capital requirements, might affect different components of lending. Sector-specific capital buffers will presumably have a stronger effect on households' financing, since they are largely related to the real estate market, while capital requirements will presumably have an impact on loans to firms, since these are the ones that display higher probability of default and therefore imply a higher absorption of capital. The specification is therefore the same as in equation (1), except that the dependent variables are now $\Delta Y^{HH}_{b,j,t}$ and $\Delta Y^{NF}_{b,j,t}$; estimates are shown in columns 5 and 6.

Results show an interesting picture. First, adding the four measures of prudential rules together does not alter the picture of the baseline: lending growth is higher toward countries that are economically growing more and also responds positively to a stricter regulation in the destination country, namely in the form of higher reserve requirements in the local currency (column 1). The result is unchanged once one takes into consideration the possible interactions with the regulatory frameworks of the other countries toward which the bank is lending, which are confirmed to be irrelevant (column 2).

Second, we observe that the impact of reserve requirements in local-currency and sector-specific capital buffers on lending growth operates through branches and direct cross-border lending by Italian banks (columns 3 and 4). Domestic banks and branches operating abroad are not subject to these requirements and can easily step in with more expansive credit policy, possibly substituting credit that might be reduced by local banks that suffer a negative regulatory shock. Subsidiaries are instead behaving differently. Not only do they remain unaffected by regulatory changes in reserve requirements and sector-specific capital buffers, but they also do not adjust lending based on balance sheet characteristics. Presumably this latter phenomenon is due to the very limited degree of heterogeneity among this class of banks, since subsidiaries all belong to very large banking groups, with a similar business model and funding structure. Interestingly, subsidiaries' lending growth is higher toward countries whose capital requirements become stricter. Although they are subject to the destination-country regulation, these banks more likely benefit from a more than adequate capitalization and liquidity position of their parent, which allows them to easily comply with destination-country regulation and to increase their lending toward the private non-financial sector of those destinations. Furthermore, tightening capital requirements might signal a generally sounder financial environment in the destination country, making foreign banks more inclined to strengthen their position in the credit market. Finally, as to the type of borrower (columns 5 and 6), we observe that reserve requirements play a role in lending growth to households, whereas lending to non-financial corporations is less responsive to the regulatory stance of the destination country.

4. Concluding Remarks

This paper provides evidence on the impact of foreign regulatory measures on international credit flows by Italian banks. We take into account the regulatory regime of the recipient country itself, but also of the whole set of countries toward which the bank is exposed, so as to assess the existence and the size of the impact of regulatory spillovers on these flows. The issue is of central importance for regulators and is a relevant empirical background to evaluate the pros and cons of coordination among prudential authorities.

We find that Italian banks adjusted their lending to the strictness of the regulatory environment of destination countries, whereas they did not modify lending patterns depending on the regulatory regime of their overall foreign exposure, highlighting the absence of spillover effects. Interestingly, Italian banks increased lending toward countries with stricter regulation, although the effect is not very large. This seems to point to a mechanism of regulatory spillover by which foreign banks are more insulated from the stricter requirements and can increase their market shares. This implies that the presence of foreign banks might make a prudential policy aimed at reducing the credit-to-GDP ratio less effective; at the same time it possibly offsets a potential retrenchment by local banks, thus working as a cushion for local negative temporary shocks.

When exploring heterogeneity by type of presence that Italian banks establish abroad, we find that most of the response to foreign regulation of the destination country takes place through cross-border and branches' lending, which are insulated from changes in the regulation of the recipient country. Subsidiaries' lending seems overall less responsive to changes in regulation, although it interestingly responds positively to tighter capital requirements.

Appendix

Table 7. Construction of Variables

Variable Name	Report Form Description	Source	Notes
	Dependent Variables		
ΔLoans	ΔLog(Loans to Households + Loans to Non-financial Corporations)	§A1, EP	Loans include also the non-performing components.
ΔLoansHH	ΔLog(Loans to Households)	§A1, EP	Loans include also the non-performing components.
ΔLoansNFC	ΔLog(Loans to Non-financial Corporations)	§A1, EP	Loans include also the non-performing components.
ΔLoansPB	ΔLog(Loans Extended by the Parent Bank, other Domestic Banks Belonging to the Same Group, and Their Branches Abroad)	§A1, EP	Loans include also the non-performing components.
ΔLoansSU	ΔLog(Loans Extended by the Subsidiaries Abroad)	§A1, EP	Loans include also the non-performing components.
	Independent Variables		
Log Real Assets	log(Total Assets) – log(Consumer Price Index)	§A1, EP, Istat	The consumer price index for the whole nation (NIC) was used in order to obtain real assets.
Illiquid Assets Ratio	(Assets – Cash – Holdings of Government Securities)/Assets	§A1, EP	
International Ratio	100 * (Foreign Claims + Liabilities vis-à-vis Foreign Residents)/ (Total Assets + Total Liabilities)	§A1, EP	

(*continued*)

Table 7. (Continued)

Variable Name	Report Form Description	Source	Notes
Independent Variables			
Capital Ratio	(Capital + Reserves)/Assets	§Y	As the reporting frequency for banking groups is semi-annual from 2008:Q4, the first and third quarters' values are derived as the average of the lagged and leaded values (linear interpolation).
Core Deposits	(Deposits of Households + Deposits of Non-financial Corporations)/Liabilities	§A1, EP	Deposits include the following instruments: overnight deposits, deposits with agreed maturity, deposits redeemable at notice, and repurchase agreements.
Other Variables			
Exposures	Loans + Holdings of Securities + Deposit Liabilities + Other Debts	§A1, EP	Loans include also the non-performing components. Deposits include the following instruments: overnight deposits, deposits with agreed maturity, deposits redeemable at notice, and repurchase agreements.
Financial Cycle	Credit-to-GDP Gap	BIS	
Business Cycle	Output Gap Measured as the Difference between the Actual Output and the HP-filtered Output	BIS	

Notes: Data sources for banks' balance sheet data are section A1 (individual balance sheet data reporting), section EP (consolidated banking group balance sheet data broken down by counterparty sector and country), and section Y (capital requirements) of the Italian bank supervision data. All data are confidential.

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