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# Multimarket Competition and Profitability: Evidence from Ukrainian banking

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## Abstract

This paper examines the impacts of non-price competition on bank performance in the Ukrainian banking industry from 2009 Q1 to 2015 Q4. The competition is proxied by three measures of multimarket contacts. Our data reveal that banks with higher level of multiple market contacts are more likely to be profitable. The findings support the mutual forbearance hypothesis. When banks compete with rivals that are similar in size in multiple markets, they have incentives to cooperate instead of competing aggressively. Moreover, the effect is stronger when multimarket competitors are highly similar in size and interact in more competitive markets. Furthermore, we develop an identification strategy in which military actions are treated as an exogenous shock to banks with branches in those regions. The results suggest that after the conflict, the less affected banks do not have incentives to mutual forbear with more affected banks that experienced a sharper decline in number of branches.

JEL classification: G21; L11; L25; L40

Key words: Banking; Multimarket competition; Multimarket contact; Mutual forbearance hypothesis; Profitability; Identification strategy; Exogenous shock; Political conflict.

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## Abstract

This paper examines the impacts of non-price competition on bank performance in the Ukrainian banking industry from 2009 Q1 to 2015 Q4. The competition is proxied by three measures of multimarket contacts. Our data reveal that banks with higher level of multiple market contacts are more likely to be profitable. The findings support the mutual forbearance hypothesis. When banks compete with rivals that are similar in size in multiple markets, they have incentives to cooperate instead of competing aggressively. Moreover, the effect is stronger when multimarket competitors are highly similar in size and interact in more competitive markets. Furthermore, we develop an identification strategy in which military actions are treated as an exogenous shock to banks with branches in those regions. The results suggest that after the conflict, the less affected banks do not have incentives to mutual forbear with more affected banks that experienced a sharper decline in number of branches.

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## 1. Introduction

Over the past decades, the structure of banking systems has changed dramatically because of deregulation and international branch expansion. As the number of geographically diversified banks has increased, the number of markets in which banks coincide has also increased. There is some concern whether banks could improve their financial performance through geographic overlaps. On one hand, banks' regional diversification could improve performance. On the other hand, a decision of entering market could be doubtful because of the effects competition. The trade-offs are even more complicated when we consider the multimarket setup. Thus there is a growing literature examining how repeated competition affects firm performance in all sectors of the economy generally and in banking system particularly.

There are two different theoretical views about the impact of multimarket contacts on competition and profitability. The mutual forbearance hypothesis suggests that firms with a high degree of multimarket contact are more profitable because these firms tend to operate in collusion with each other instead of competing aggressively (e.g., Edwards, 1955; Feinberg, 1984; Spagnolo, 1999). However, multimarket contacts may enhance the intensity of competition and lead to a further reduction in profitability (e.g., Solomon, 1970; Mester, 1992). The empirical literature in the banking sector provides mixed and inconclusive findings. Several studies argue that a multimarket contact is positively related to banks' profitability (e.g., Whalen, 1996; Pilloff, 1999; Coccorese and Pellicchia, 2009), while other papers (e.g., Rhoades and Heggstad, 1985; De Bonis and Ferrando, 2000) provide limited support for the mutual forbearance nexus. Moreover, Mester (1987) shows that the cross-product between market concentration and contact is more important than the individual effects.

Here, we investigate the relationship between non-price competition as measured by multiple geographic overlaps and bank financial performance of Ukrainian banks. Our unique dataset has financial and branch information for 209 Ukrainian banks from 2009 Q1 to 2015 Q4. We define competition on the basis of various weighting factors to account for the change in competitive attitude towards different markets and rivals. Given the magnitude of the current political conflict between Ukraine and Russia, we make use of it as a quasi-experiment. Specifically, we employ the differences-in-differences (DID) approach with fixed effects regressions.

The Ukrainian banking system is a well-suited case for several reasons. First, the Ukrainian banking system is well diversified in terms of banks' size i.e. large and small banks, and the intensity of competitive interaction i.e. multimarket and single-market banks. It is quite interesting that some smaller banks experience higher levels of multimarket contact in comparison with bigger banks. Second, the banking system in the Ukraine has changed dramatically since 1991—after the collapse of the Soviet Union and the adoption of the Law on Banks and Banking. From 1991 to 2014, the banking system developed in terms of the number of banks as well as its role in the economy. However, Ukraine's banking system has been on the brink of collapse since 2014 because of the significant drop in the number of banks as well as their massive losses. Furthermore, there is a political dispute between Ukraine and Russia starting in 2014 Q1—this might have had a huge impact on Ukraine's banking system. Therefore it is worth assessing how multimarket competition plays a role in the banking system during the period of the notable branch and geographic expansion by taking advantage of this quasi-experimental setting.

Our first set of results shows a positive and significant relationship between repeated competition and banks' profitability. The relationship is stronger when banks' sizes are relatively similar and when banks overlap in more competitive markets. However, banks do not benefit from geographic overlaps with the multimarket competitors with significant different sizes. Our results are robust to the use of alternative variables of multimarket competition and different sets of samples. The differences-in-differences approach provides a good method to address endogeneity: an insight into the competitive attitude of banks that have responded to changes in the markets. As a consequence of the conflict, more affected banks have closed many of their branches. This decreases the banks' size and reduces the competitiveness of the banking system. Thus, after the conflict, less affected banks do not have incentives to co-operate with more affected ones.

This study provides empirical evidence for the mutual forbearance hypothesis in the banking sector and contributes to the literature in several dimensions. First, our unique and rich data allow us to define multimarket competition at different geographical levels. More specifically, we measured competition at the regional level and at the city level<sup>1</sup>. Second, we use different weighting factors to measure multimarket contact, to account for the size similarity of the two rival banks as well as the ratio of the coincided markets and the relative size of competitors. These measures account for the different attitudes of a bank towards its multipoint rivals depending on the importance of their rivals. Third, we address the potential obstacles relating to the causal inference by employing a differences-in-differences method. More specifically, we document the multimarket competition-performance relationship in the presence of the current conflict between Ukraine and Russia. Fourth, this study provides micro economic evidence for the link between multimarket contacts and profitability in the context of developing countries.

Our findings have several implications in policy making. First, consolidation of small and medium banks should be encouraged. Hence, the consolidated banks can improve their competitive positions and gain benefits from anti-competitive effect of multimarket contacts. Second, regulators should encourage banks to operate new branches in remote or less competitive markets. This brings benefits not only to customers in terms of access to finance but also to banks because banks can get more benefits from repeated competition in more competitive markets.

The next section reviews the literature on multimarket competition. Section 3 provides the overview about the Ukrainian banking system. Section 4 illustrates our empirical strategy and data description. Section 5 presents empirical results and discussion. Section 6 concludes and provides the policy implications.

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<sup>1</sup> Empirical studies about multimarket competition-profitability relationship with reference to banking sector are facing several challenges. The first challenge is about data requirement. To be able to measure multimarket competition, the detailed data about branch address of each bank are required. The second challenge arises from the problem of omitted variable bias: the relationship between banks' competitive behavior and performance might be mediated by other unobserved bank characteristics. Therefore, regressing profitability on multimarket competition in the absence of experimental experience might fail to identify the causal relationship.

## 2. Literature review

### 2.1. Mutual forbearance hypothesis

Issues related to multimarket contacts have been examined both theoretically and empirically over the past few decades. In terms of theoretical frameworks, the traditional phenomenon, referred to as linked oligopoly theory or mutual forbearance hypothesis, was first proposed by Edwards (1955). This suggests that a large and diversified firm may not have aggressive attitudes toward their multimarket competitors due to the fear of multipoint attacks from those rivals. In contrast, multimarket firms might have incentive to cooperate with others in the hope of a reciprocal exchange of favors. Consequently, the multimarket firms could be more profitable versus smaller firms due to anti-competitive effects along with tie-in sales and exclusive dealing arrangements. This conjecture has been supported in other studies by employing game theory models (e.g., Feinberg, 1984; Hughes and Oughton, 1993). More recently, Matsushima (2001) provided a theoretical foundation of the mutual forbearance hypothesis by adopting an infinitely repeated game with discounting. This suggests that multimarket contacts can lead to implicit collusion and hence sustain firms' efficiency even in the presence of imperfect monitoring. Furthermore, Sorenson (2007) argues that the intensity of collusion is facilitated by the reciprocal recognition of multipoint contact rather than by market differences or other factors.

Several studies have found evidence supporting the mutual forbearance hypothesis by employing price, entry/exit rates or profitability to indicate the intensity of competition. For instance, high price is a signal of less rivalry, Evans and Kessides (1994) provide evidence supporting the mutual forbearance hypothesis: airlines with more multipoint contacts avoid aggressively low prices because they fear that their rivals might act in the same way in other routes. Similarly, Baum and Korn (1996) report that to sustain themselves from their rivals, airlines choose to enter in low density routes and exit from high density routes. However, the enter/exit rates are lowered with increases in multimarket contacts—especially in markets dominated by a single airline.

Turning to studies about multimarket contact-profitability relationship, Scott (1991) provides evidence supporting the linked oligopoly theory by exploring a sample of 64 US firms in 35 industries. Further analysis shows that the impact of diversified concentration on profits is enhanced in the industry with a high level of multimarket linkages among sellers. Conducting this study in the UK manufacturing industry, Hughes and Oughton (1993) state that multimarket contact is positively related with a rate of return on capital and price-cost margins. A positive association between multimarket contact and yields of profits is also achieved in the airline industry (e.g., Signal, 1996; Gimeno and Woo, 1996) or Canadian insurance sector (Li and Chuang, 2001).

Furthermore, Li and Greenwood (2004) argue that the mutual forbearance hypothesis advantages under specified conditions. Specifically, multimarket firms can only improve their performance through multiple market interactions if they are similar in size. Whalen (1996) studied interstate bank holding companies in the US and showed evidences for the mutual forbearance nexus in the banking industry: higher multimarket linkages, in conjunction with high concentration, are related to higher profitability. Similar results were observed by Pilloff (1999): a higher level of outside MMC would reduce competition in a reference market and increase profitability of a focal bank. More recently, Coccoresse and Pellecchia (2009) analyzed a sample of 655 Italian banks over a 4-year period and found that the mutual

forbearance hypothesis is more likely for banks heavily exposed to outside contacts. The results are robust in terms of different measures of multimarket linkages, different subsamples and model specifications.

## **2.2. Alternative views about multimarket competition**

The alternative view suggests a pro-competitive effect of multiple market contacts. Solomon (1972) proposes that strengthened multimarket linkages result in more competition if the multiple competition already exists. Using the perpetual signaling model, Mester (1992) found that geographic overlaps promote higher competition if quantity is the strategic variable, regardless of imperfect information and finite horizon. For instance, when a firm competes with competitors through product quantity, it may initially produce more than its actual single-period profit-maximizing quantity. Thus, this may mislead the competitors that the firm is a low-cost firm and the competitors would put lower quantity of products on the market in the following periods. As a result, the firm can benefit from its quantity advantage versus rivals. When the rival firms choose a similar strategy, the level of competition in the market will increase.

This view is empirically supported by studies in different industries. For example, Sandler (1988) illustrates that more multiple market contacts with major rivals have increased the degree of market rivalry in the US airline industry. This is conceptualized by market share variation. The pro-competitive behavior of multimarket contact is also drawn in the mobile phone industry (Parker and Roller, 1997). However, Degl'Innocenti et al. (2014) found no evidence of the linked oligopoly theory in the leasing industry. In terms of research in banking sector, Alexander (1985) found no support of the linked oligopoly theory in loan market. This indicates that markets that have high levels of multiple market contact also have higher loan rates and fees as well as lower returns on assets. Similar results are achieved in Mester (1987) by considering two multimarket contact measures based on the distribution of multiple market linkage probability. Moreover, considering the cross product between multimarket contact and market concentration, the interaction is found to be more important than individual effects. Rhoades and Heggstad (1985) only found partial support for the mutual forbearance nexus: multipoint contacts adversely affects the rivalry within markets that have no link with returns on assets, service charges or loan rates. With reference to Italian banking sector in the 1990s, De Bonis and Ferrando (2000) observed that higher multimarket linkage is related to higher competition and lower lending rates, which is contrary to the mutual forbearance theory.

Some other studies propose a U-shaped relationship between multimarket linkages and rivalry. Analyzing the competitive interaction between pairs of rivalry airlines, Baum and Korn (1999) demonstrate that at the beginning, multimarket contacts induce relatively competitive advantage for airlines. This advantage declines with increases in pairwise multimarket contacts, The airlines have incentives for competing aggressively. Fuentelsaz and Gomez (2006) also find the inverted U-shaped relationship in Spanish banking market, but they explain the relationship differently. On one hand, deregulation incentivizes banks with a low level of multimarket contacts to enter in the new markets. On the other hand, it reduces the entry rates of banks that already have a high level of multiple contacts due to familiarity effect and retaliatory threat.

Recently, studies on multiple market contacts have been drawn in a new perspective to consider the effects of competition from multimarket firms on performance of small, single-

market firms. Hannan and Prager (2004) analyzed the pricing-behavior of single-market banks with the presence of multimarket banks and found that pricing behavior of single market banks is driven by local market concentration regardless of multimarket banks. However this influence is weakened by the growth of multimarket banks' market share. Further, competition from multimarket banks reduces the deposit interest rates offered by single-market banks in the same market. This potentially reduces single-market banks' profits. This view is supported by Berger et al. (2007) when they test both the efficiency hypothesis and the hubris hypothesis in the US banking market from 1982 to 2000. They found that in the 1990s, multimarket banks enjoyed a competitive advantage over single-market banks due to their geographic expansion. As a consequence, single-market banks experienced a decline in revenues and an increase in costs. A study by Hannan and Prager (2009) isolates the extent to which the presence of multimarket banks influences single-market banks' profitability. Dividing the sample by rural and urban markets, they found that the presence of multimarket banks only diminishes profitability of a single-market bank in the rural markets. This decline is sharper in higher concentration markets and smaller in single-market banks' size.

Despite the existence of this literature base, there are some gaps that have not been fulfilled. First, the multimarket contact in previous papers is mostly measured at the regional or state levels. These are quite broad markets. Second, studies into the relationship between multimarket competition and bank performance are still limited—especially studies in the context of developing countries. Third, to the best of our knowledge, there is no study considering the identification problem related to this causal relationship. In this paper, we aim to fill these gaps.

### **3. Ukrainian banking system**

The establishment of the modern Ukrainian banking system started from 1991, after the collapse of the Soviet Union and the adoption of the Law “On Banks and Banking”. This banking system has a two-level structure. The first level is the National Bank of Ukraine (NBU), which serves as the central bank and bank regulator. The second level includes commercial banks. The Ukrainian banking system includes a big number of so-called “pocket banks”, which serve the particular individual firms or business groups. Moreover, this banking system is mostly domestically owned. As of 2015 Q4, of the 113 banks holding licenses, there were 41 banks with foreign capital with only 17 banks had 100 percent foreign ownership. Figure 1 shows the distribution of all Ukrainian banks and branches across 27 regions in different periods. Even though Ukrainian banks have been diversifying their branches across all regions, the distribution is still unequal: banks are concentrated in some main markets while other markets have smaller number of banks. Major markets include the Kiev region, Kiev city, and regions of Lviv, Kharkiv, Dnipropetrovsk, Zaporizhzhia and Odessa.

The development of the Ukrainian banking sector after the 2007-2008 financial crisis can be divided into three phases. A recovery time (late 2009 to late 2012) was followed by an expansion period (late 2012 to early 2014) then a crisis (early 2014 till now). During the recovery and expansion periods, lending growth grew from 1.03 percent by 2010 Q4 to 11.78 percent by 2013 Q4 (National Bank of Ukraine, 2016). Asset growth and deposit growth also witnessed the increase of 6.37 percent and 8.19 percent, respectively (Panel A, Figure 1). Correspondingly, Ukrainian banks steadily expanded their activities and branches all over the country resulting in a significant increase in the number of banks and branches over this period (Panel B, Figure 1).



Since 2014, the deep recession of the economy, together with the Russian annexation of Crimea and the armed confrontation in two eastern regions (Donetsk and Luhansk) have had negative effects on the banking system. As of 2015 Q4, the banking sector has lost about four percent of assets and loans along with 1.55 percent loss of deposits. Following Regulation No. 260 issued by the National Bank of Ukraine (2014), all Ukrainian credit institutions completely suspended their operation in Crimea and withdrew from this peninsula. Further, some banks also announced the closure of some (or most) of their branches in the self-proclaimed regions. This results in a steep reduction in the number of banks and branches—especially in the occupied regions and their neighboring regions.

In comparison with banking systems in other Eastern European countries, the Ukrainian banking system has more banks and branches. For example, as of 2015 Q1, there are 46 banks in Czech Republic (Czech National Bank, 2016) and 28 banks in Slovakia (National bank of Slovakia, 2016). This is about one third of the Ukrainian banking size. The banking systems closest in terms of size to the Ukrainian banking are the Polish and Hungarian banking systems with about 605 banks (The Polish Bank Association, 2016) and 126 banks (The Banks, 2016), respectively. However, their structures are totally different. As mentioned earlier, the banking sector in Ukraine is dominated by domestically-owned commercial banks while about a half of banks in Hungary are mortgage and savings banks and co-operative banks dominate the Polish banking sector.

## 4. Data and methodology

### 4.1. The econometric model

#### 4.1.1. Baseline specification

To investigate the relationship between repeated competition and bank profitability, we first estimated the economic model and examined the repeated competition-performance relationship using the fixed-effects estimator. Next, using a differences-in-differences approach, we provide a clean identification of a causal effect of multimarket competition on bank performance in the presence of the exogenous shock. Finally, we checked the robustness of our results by using different sets of samples and a variety of weighting strategy in the analysis.

#### Multimarket competition and profitability

To test the role of multimarket competition on bank performance, we estimate the following equations:

$$ROA_{it} = \alpha + \beta MMC_{it-1} + \delta Bank_{it-1} + v_t + v_i + \varepsilon_{it} \quad (1)$$

where the subscript  $i$  is the index of banks. The dependent variable is return on assets (ROA). We measure the degree of multimarket competition by multimarket contact. Since the performance of banks could be affected by bank-specific characteristics, we also consider a vector of bank-level variables including: (1) bank size measured by natural logarithm of the bank's assets (*Size*) (2) the ratio of liquid assets to total assets (*Liquidity*); (3) the equity ratio (*Equity*); (4) the deposit ratio (*Deposit/Total assets*); and (5) the loans-to-assets ratio

(*Loans/Total assets*). Additionally, a vector of time fixed effects ( $v_t$ ), and bank fixed effects<sup>2</sup> ( $v_i$ ), are also included into the specification. Finally,  $\varepsilon_{it}$  is the error term. Appendix A contains the detailed definitions of all variables.

Bank size has been widely used as a determinant of profitability. However studies into this relationship provide ambiguous results. According to economics of scale, bank size tends to have a positive impact on banks' profits because larger banks are more likely to save more operating costs. Thus, they are more efficient (e.g., Pasiouras and Hosmidou, 2007). There is also a possible trade-off between bank growth and profitability in which banks experience diseconomies of scale. Thus, bank size may have negative impact on profits (e.g., Baumol, 1959). Further, Eichengreen and Gibson (2001) suggest a U-shaped size-profitability relationship: small banks can benefit from economies of scale when they grow in size while profits of large banks are lower because they no longer benefit from economies of scale along with higher costs.

It is expected to be safer for banks to hold more liquid assets and to have a higher capital-to-assets ratio. According to the conventional risk-return theory, those banks are considered to have lower returns than riskier banks (e.g., Berger, 1995). In contrast, banks with higher liquidity ratio and equity ratio are less likely to go bankrupt even they experience a short period of difficult time (e.g., Berger, 1995). Additionally, a higher level of capitalization helps banks avoid the cost premium of external funding, which in return could have a positive effect on its profitability (e.g., Bourke, 1989; Molyneux and Thornton, 1992; Molyneux and Forbes, 1995; Garcia-Herrero et al., 2009).

Loans and deposit are the two main sources of banks' profits. On the one hand, more loans and deposits generate more profits. On the other hand, they may have negative impacts on profitability because if loans are composed mostly of high-risk loans, more loans are associated with higher potential losses (e.g., Miller and Noulas, 1997). Also, the extent that increases in deposits contribute to profits depends on the banks' ability to convert deposit liabilities into income-earning assets. Furthermore, if the deposit is converted into low credit assets such as high-risk loans, more deposits could mitigate banks' profitability (e.g., Dietrich and Wanzenried, 2011).

Model (1) is estimated for the sample of multimarket banks. We estimate multimarket competition at both the regional and the city level. In terms of market definition at the city level, we first defined the center city of each region as a market. Alternatively, we also consider cities that have at least 30 and 50 bank branches as our second and third definition of a market at city level, respectively<sup>3</sup>. Urban villages, villages and settlements are excluded from our sample. The competition is first considered in all regions and is then later considered in unoccupied regions. To avoid causal ambiguity, we use 1-quarter lag of all independent variables. We estimate model (1) using the fixed-effects estimator to control for time-invariant and bank-specific heterogeneity.

#### Identification strategy using quasi-experimental design

It has been widely recognized in finance research that naïve regression might fail to identify causal effects. One of the major obstacles in causal inference is the omitted variable bias that

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<sup>2</sup> Bank fixed effects include ownership and bank group. The National Bank of Ukraine classifies banks into 4 groups based on their total assets.

<sup>3</sup> We also test with cities with at least 10, 15 and 20 bank branches. The results are more or less similar.

can be partly addressed by the fixed-effects strategy used in the first part of our analysis. However this strategy is only useful in dealing with unobserved individual characteristics but not with unobserved confounders at the more aggregate level. To address the concern of endogeneity, we adopted a differences-in-difference method given by the exogenous political dispute between Ukraine and Russia. The idea is that because the conflict was unexpected, banks could not change their competitive strategy beforehand to deal with the new competitive environment.<sup>4</sup>

Since the conflict mainly affects the occupied regions and some other southeastern regions, banks with more branches in these regions are more likely to be affected. Hence, we define those banks to be the treatment group and assign the banks with smaller share in affected regions as the control group. The main assumption in this identification strategy is that in the absence of the quasi-experiment, there is no difference between treatment group (banks that are more affected) and control group (banks that are less affected) in terms of competitive attitude and the benefits from multimarket competition. Our model is specified as follows:

$$ROA_{it} = \alpha + \beta MMC_{it-1} + \gamma MMC_{it-1} * Share_{it} + \delta Bank_{it-1} + v_t + v_i + \varepsilon_{it} \quad (2)$$

where the control and treatment groups are categorized by the continuous treatment, *Share*, which is the share of branches in affected southeastern regions<sup>5</sup>. It takes value of 0 for pre-conflict period<sup>6</sup>. We estimate model (2) using the four quarters before and the four quarters after 2014 Q1 to control for the delay of the impact.

#### 4.1.2. Multimarket contact measures

In the literature, multimarket contact is measured based on either the counting basis or the probability basis. The counting method calculates contacts in four different levels: dyad-in-market level<sup>7</sup> (e.g., Scott, 1982), dyad level<sup>8</sup> (e.g., Baum and Korn, 1999), firm level (e.g., Gimeno and Woo, 1996) and market level (e.g., Feinberg, 1985). The most common firm level measure accounts for the average number of contacts of a bank *i* in quarter *t*.

$$MMC_{it} = \frac{\sum_{j \neq i} m_{ij,t}}{rivals_{it}}$$

Here,  $m_{ij,t}$  is the number of markets in which bank *i* and its rival *j* operate simultaneously in quarter *t*, and  $rivals_{it}$  is the number of banks that meet bank *i* in at least one market in quarter *t*. This non-weighting measure does not consider the difference in banks' competitive attitude towards the different multimarket rivals. Thus, we modify this measure and compute three multimarket linkage measures to make use of different weighting factors as follows<sup>9</sup>. This approach of calculating multimarket linkage has been also employed in previous papers (see e.g., Li and Greenwood, 2004; Coccoresse and Pellicchia, 2009; Degl'Innocenti et al., 2014).

<sup>4</sup> For references of papers using similar approach, see Bonin et al. (2005), Boubakri et al. (2005), Micco et al. (2007), Yang and Zhao (2014), Hanlon et al. (2015), Qian et al. (2015), Cerqueiro et al. (2016) or Gilje et al. (2016).

<sup>5</sup> Affected southeastern regions include Luhansk, Donetsk, Dnipropetrovsk, Kharkiv and Odesa.

<sup>6</sup> Pre-conflict period is the period before 2014Q1.

<sup>7</sup> Dyad-in-level measure calculates every possible within-market pairs of a firm and its rivals.

<sup>8</sup> Dyad level measure calculates geographic overlaps of every pairwise rivals.

<sup>9</sup> Numeric example for multimarket contact measures is specified in Appendix C.

Banks are more likely to give attention to similar sized competitors as they face similar regulations (e.g., capital requirement) and have similar types of products and customers. Thus, the first weighting factor considers the similarity of bank  $i$  and bank  $j$  (in terms of their market shares) in the markets they meet. The market share is the ratio of all branches of bank  $i$  in market  $k$  to total branches of all bank in market  $k$  in quarter  $t$ .

$$s_{ik,t} = \frac{\text{branches}_{ik,t}}{\text{branches}_{k,t}}$$

The similarity index between banks  $i$  and  $j$ ,  $SI_{ij}$ , is the sum of the absolute differences of the market shares for all markets where they coincide.

$$SI_{ij,t} = \sum_k |s_{ik,t} - s_{jk,t}|$$

The minimum value of SI index is 0 (when banks have the same market share in every market) and the maximum value of SI index is close to the number of markets in which banks coincide (when banks are very dissimilarity in terms of market shares). The smaller SI is more similar when two banks are in terms of market shares. Then  $SI$  is used to calculate the first weighting factor ( $w_{j,t_i}^1$ ) that ranges between 0 and 1. This increases with the similarity. Essentially, this measure is the basic measure of multimarket contact weighted by  $SI_{ij,t}$ , or we can consider it as the interaction between the basic measure and  $SI_{ij,t}$ .

$$w_{j,t_i}^1 = \frac{m_{ij,t} - SI_{ij,t}}{m_{ij,t}}$$

$$MMC_{it}^1 = \frac{\sum_{j \neq i} m_{ij,t} w_{j,t_i}^1}{\text{rivals}_{it}}$$

The second weighting factor,  $w_{j,t_i}^2$ , reflects the importance of the rival bank  $j$  based on the number of markets in which bank  $i$  meets bank  $j$ . The more markets they meet, the more familiar they have. This might affect the banks' competitive strategy. Banks would pay more attention to those rivals that coincide with them in more markets. Thus,  $w_{j,t_i}^2$  is calculated as:

$$w_{j,t_i}^2 = \frac{m_{ij,t}}{\text{markets}_{it}}$$

where  $\text{markets}_{it}$  is the total markets in which bank  $i$  operates at least one branch in quarter  $t$ .

Then the second multimarket indicator,  $MMC_{it}^2$ , is defined as:

$$MMC_{it}^2 = \frac{\sum_{j \neq i} m_{ij,t} w_{j,t_i}^2}{\text{rivals}_{it}}$$

The third measure of weighting factor reflects the size (in terms of market share) of the rival  $j$  as follows:

$$w_{j,t_i}^3 = \frac{\sum_k S_{jk,t}}{m_{ij,t}}$$

This indicator ranges between 0 to 1, and increases with the size of the rival  $j$ . This measure indirectly indicates the competitive position of a bank versus its multimarket rivals.

$$MMC_{it}^3 = \frac{\sum_{j \neq i} m_{ij,t} w_{j,t_i}^3}{rivals_{it}}$$

## 4.2. Data and sample

Our original sample contains 4,739 observations of 214 Ukrainian banks with financial data available from 2009 Q1 to 2015 Q4. After dropping those cases for which variables are missing or misleading, our final sample contains 209 Ukrainian banks with 4,687 observations<sup>10</sup>. Our panel is unbalanced and allows for both entry and exit. In terms of data about branch location, we exclude Crimea because Russia annexed it in March 2014. Ukrainian banks had withdrawn from this market completely after the annexation. Thus, the available data about bank branches in Crimea—even the data in the pre-conflict period—are very limited. Our branch dataset contains 34,434 observations with detailed information about location as well as the open and close dates of all branches.

Table 1 reports summary statistics for all banks. Overall, the Ukrainian banking system experiences a poor performance with a negative average return. The average values of other bank-specific variables are relatively similar to those in other Eastern European emerging markets (see, e.g., Mirzaei et al., 2013). Table 2 reports descriptive statistics for samples of multimarket banks and single-market banks<sup>11</sup>. By dividing banks into single-market banks and multimarket banks (at the regional level and at the center-city level<sup>12</sup>), we can compare the statistics between two sub-samples. The mean values of return on assets of single-market banks are positive while those of multi-market banks are negative. Using the t-test to test the mean difference between the two groups, we found that the difference is statistically significant. The volatility of return on assets of multimarket banks is also higher than those of single-market banks. These signs hold when we compare the mean difference between multimarket and single-market banks at the center city level. It is possible that multimarket banks are exposed to more risks versus single-market banks because they have lower liquidity ratios and lower equity ratios. However, multimarket banks experience higher deposit ratios and loan-to-assets ratios than single-market banks. These differences are weakened at the city level.

Panel B in Figure 2 displays the changes in number of banks and branches over time. In terms of number of banks, the highest number of banks was 181 banks in 2014 Q1 and the lowest number of banks was 113 banks in 2015 Q4. Although the number of banks fluctuates from 2009 to late 2014, the number of branches gradually increased over that period. However, after 2014 Q1, there was a sharp downward trend in both the number of banks and branches.

<sup>10</sup> This is the number of banks in our sample. Due to the entry/exit of several banks, number of banks in each quarter may be less than 209.

<sup>11</sup> Multimarket banks are those operating in more than one market; single-market banks are those operating in only one market.

<sup>12</sup> At regional level, each Ukrainian region (except from Crimea) is defined as a market. At center-city level, each center city (as given by the National Bank of Ukraine) is defined as a market.

Regarding the changes in the average multimarket contacts (Panel C, Figure 2), multimarket contacts weighted by the similarity and multimarket contacts weighted by the ratio of coincided markets increased steadily from 2009 to the third quarter of 2012, and then fluctuated during 2013 and the late 2014 period and then dropped dramatically afterwards. This evolution is in line with the development of the Ukrainian banking system as specified in Section 3. In contrast, multimarket contacts weighted by the size of the rivals increased after 2014. The difference in the changes of contact measures can be explained by the difference in employed weighting factors. As stated above, the third weighting factor accounts for the mere size of the competitors. While the numbers of banks and branches have dropped significantly since 2014, market shares of the remained banks would be larger. This overall increases the magnitude of the third multimarket contact measure.

In 2014 Q1, two pro-Russian regions in the eastern Ukraine, Luhansk and Donetsk, self-proclaimed themselves to be independent states. Crimea was also integrated into Russia leading to the conflict between Ukraine and Russia. Corresponding to this conflict, the number of banks in those regions as well as some other regions decreased significantly (Panel D, Figure 2). Most of the affected regions are located in the southeastern part of Ukraine and share borders with occupied regions. It is worth assessing the impact of multimarket competition on bank performance in relation with the political shock with reference to the share in occupied and affected southeastern regions because the reduction in number of banks and branches could lessen the competitiveness in the markets.

## **5. Results and discussions**

### **5.1. Multimarket competition and banks' profitability**

Table 3 reports the fixed-effects regression results for competition at the regional level with the sample of multimarket banks. In columns (1)-(3), we use multimarket contact weighted by the similarity, the coincided markets ratio and the rival's mere size, respectively. We found that a general multimarket competition enhances banks' profitability but the signs vary depending on the employed multipoint contact measures. The coefficients on multimarket competition weighted by the similarity and the coincided market ratios are significant and positive, but the coefficient for multiple market contacts is weighted by the size of the rivals and is negative but insignificant. In particular, a one standard deviation increase in multimarket contact weighted by the size similarity results in 1.73% increase in returns on assets while one standard deviation increase in multimarket contact weighted by the overlapped markets ratio improves bank performance by 1.13%.

<<Insert Table 3 about here>>

Estimated results for the effects of multimarket competition at the city level are reported in Table 4. Columns (1)-(2) display results for competition in center cities, while columns (3) and (4) refer to the competition in cities with at least 50 branches and cities with at least 30 branches, respectively. For the sake of space, we only report regressions with significant coefficients on multimarket competition. We also acknowledge the positive association between multimarket competition at the city level and bank performance. Moreover, the coefficients of repeated contact are significant only if we control for the size similarity and overlapped markets ratio.

This is consistent with previous findings. Particularly, multimarket banks repeatedly competing in center cities can improve their returns on assets by about 1.47-2% with one

standard deviation increase in multipoint linkages. This effect is stronger than the effect at the regional level in terms of sign because the coefficients on multimarket competition at regional level are only significant at 10 percent significance level regardless of employed measures. Consistently, profits of multiple market banks can rise by about 1.61-1.92% with one standard deviation increase in contacts if the banks compete in cities that have at least 30 branches and 50 branches, respectively.

<<Insert Table 4 about here>>

Referring to the current conflict between Ukraine and Russia, we excluded all occupied regions (Crimea, Donetsk and Lugansk) from our data and re-measured our multimarket competition<sup>13</sup>. Previous findings are confirmed when we acknowledge that the estimation results in Table 5 are consistent with the results presented in Table 3 and Table 4. Generally, multipoint competition is positively associated with banks' profitability. In addition, we get stronger signs for this relationship at both the regional and city levels when excluding the occupied regions from our sample. This suggests that the level of competition as well as the performance of the Ukrainian banking industry is somewhat affected by the political issues.

When competition at the regional level, multimarket banks can improve their profits by 1.60-1.89% with one standard deviation in multimarket contacts. At the city level, the increases in profitability are 1.25-2.13%, 1.29-2.05%, and 2.27% with reference to competition in center cities, cities with at least 50 branches and cities with at least 30 branches, respectively. Although the magnitudes of the competition in different types of markets are more or less similar, but the signs are quite different. When we consider the competition in center cities, cities with at least 50 branches and cities with at least 30 branches both show decreasing strength of the effect. The central locations as well as the number of banks and branches in the market indicate the competitive level of that market. This result suggests that banks can get more benefits from geographic overlaps if they coincide in more competitive markets.

<<Insert Table 5 about here>>

As a whole, our results support the mutual forbearance hypothesis—banks can benefit from repeated competition. Despite the differences in employed industries, multimarket contact measures and econometrics techniques, these results are in line with previous studies (e.g., Scott, 1991; Whalen, 1996; Li and Chuang, 2001). Moreover, the results for multimarket measure account for market share similarity in our study and are consistent with the results achieved by Li and Greenwood (2004) regardless of different employed industries. Li and Greenwood (2004) account for the similarity in revenue collecting from overlapped markets when calculating multimarket linkage. They also found that the positive impact of multipoint contact on the performance of Canadian insurance companies increases with firm similarity. Furthermore—consistent with those other studies—we also argue that the anti-competitive effect is facilitated by the information advantage. More specifically, repeated competition allows banks to collect more relevant information about the rivals. This rises awareness about the competitive retaliation. Consequently, multipoint market banks should avoid aggressive competition and co-operate instead.

This effect is strengthened if banks compete with the multipoint rivals in more competitive markets. This suggests that when banks operate simultaneously in multiple markets with a high level of competitiveness, they tend to not compete aggressively towards others. In

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<sup>13</sup> See Table B1 for descriptive statistics of multimarket competition indicators with reference to the exclusion.

contrast, the coincidences induce incentives for banks to cooperate and have reciprocal exchanges. However, not all multimarket rivals are treated similarly. The cooperating incentive is strongest if two competitors are relatively similar in terms of market shares. Similarly, banks have incentives to mutual forbear when they have more overlapped markets. However, multimarket competition no longer has anti-competitive effect if the mere size of the competitors is considered. In other words, relatively smaller banks do not benefit by competing with bigger ones in multiple markets. The argument is that banks will pay more attention to the size-similar competitors because they have common interests and setups including targeted customers or services. This induces mutual forbearance among the multimarket rivals that are in the same size category. Moreover, more geographic overlaps increase the familiarity between banks and this makes multimarket competitors more salient. As a result, banks will avoid aggressive competition with those rivals. On the contrary, if banks do not have strong competitive positions, such as banks with small market share, they cannot benefit from their multimarket contact.

In terms of impacts of bank-specific variables on profitability, deposit-to-assets ratio is positively and significantly related to returns on assets even though the coefficient is only significant at 10 percent significance level. This suggests that the Ukrainian banks can transfer deposit liabilities into earnings. We also observe that bank size and loan-to-asset ratios have negative coefficients, while liquidity ratio and equity ratio have positive coefficients. However, those coefficients are insignificant regardless of employed samples.

## **5.2. Identification strategies using a quasi-experimental design**

Before estimating model (2), we need to test the assumption that with the absence of the exogenous shock, there is no difference between the treatment group and the control group regarding the impact of repeated competition on profitability. Our treatment is a continuous variable, and we cannot use the traditional way. This tests the mean difference of the dependent variable between two groups. Alternatively, we tested the assumption indirectly by adding a new variable, *Pre\_conflict*, into model (1). This variable equals the share in affected regions for all quarters before 2014 Q1 and equals 0 for post-conflict period. The regressions results are presented in Panel A of Table 6. Consistent with the assumption, the coefficients on this variable are insignificant suggesting a parallel trend of treatment group and control group in the absence of the shock. Further, the coefficients of interest are consistent with the ones in regression without this control variable.

Because the parallel assumption is satisfied, we identify the role of multimarket competition on bank performance in the presence of political dispute by estimating model (2). Regression results are presented in Panel B of Table 6. The coefficient for repeated competition weighted by the size similarity is significant at the 10 percent level while multimarket competition weighted by the overlapped market ratio loses its significance. However the coefficients on the interaction term between repeated competition and share of branches in affected regions are negative and significant in all regressions. The results suggest that in the post-conflict period, the share of branches in affected regions weakens the effect of multipoint competition. More specifically, after 2014 Q1, banks with higher share in affected southeastern regions in previous periods no longer benefit from multimarket competition. This complements our previous finding that bank incentives to co-operate with their multipoint rivals change depending on the importance of the rivals and the competitiveness of the markets.



The competitiveness of the whole system is reduced with a significant decrease in the number of banks and branches because the conflict hits the east and affects not only the occupied regions but other regions as well. This lessens the competitiveness of the markets. In addition, even though the conflict influences the entire banking system, banks having more branches in the affected regions are more affected than others because they experienced a sharper branch reduction or their banks were revoked. In other words, after the conflict, more affected banks no longer have size similarity with less affected banks. As a result, less affected banks may not want to mutual forbear with more affected counterparts.

<<Insert Table 6 about here>>

### 5.3. Robustness of tests and results

The robustness of previous results can be tested by a wide set of tests. First, we re-estimated model (1) with different samples. Instead of samples of multimarket banks, we estimate model (1) with reference to the samples of all banks and domestic banks. The fixed-effect regressions results are presented in Table B2. We observed consistent results for multimarket competition weighted by the size similarity with positive and significant coefficients. Interestingly, regardless of samples of multimarket competition, we get negative and significant coefficients on multimarket competition weighted by the rival's size when we include both multimarket and single-market banks in our regressions. On the one hand, this result strengthens our previous findings about the importance of geographic overlaps in profitability improvement. On the other hand, it supports our argument that banks tend to not co-operate with unimportant competitors. This may harm the performance of small and single-market banks.

Regarding competition in all regions, one standard deviation increase in multipoint contacts at the regional level leads to an increase of 0.041% in profits for all banks and 0.048% increase in profits for domestic banks. Similarly, if multimarket contacts at the center city level increase by one standard deviation, profits of all banks can be improved by 0.038% while domestic banks' returns can increase by 0.046%. For the sample of competition in unoccupied regions, we find similar results: positive and significant coefficients on repeated contacts are weighted similarly; negative and significant coefficients on multimarket contacts of all banks are weighted by the size of the rivals.

Second, it is possible that the relationship between multipoint competition and profitability could be driven by the development of the overlapped markets. We check this possibility by constructing the other multimarket contact measure weighted by the ratio of developed coincided markets to total coincided markets then re-estimate model (1) for this measure. We expect to find a stronger magnitude of the anti-competitive effect of this multimarket competition measure. The detailed measure is specified as follows:

$$w_{j,t_i}^4 = \frac{\text{developed markets}_{ij,t}}{m_{ij,t}}$$

$$MMC_{it}^4 = \frac{\sum_{j \neq i} m_{ij,t} w_{j,t_i}^4}{\text{rivals}_{it}}$$

Here, *developed markets*<sub>ij,t</sub> is the number of financial and industrial developed regions<sup>14</sup> in which two banks meet each other. The results for regressions with this measure are reported in Table B3. We find positive and significant coefficients on multimarket competition at both the regional level and the center city level regardless of employed samples. Furthermore, the magnitude of the coefficients in these regressions is significantly higher than those in regressions with other competition measures. This suggests that repeated competition in more developed markets brings more benefits to banks than competing in less developed markets.

Third, to test the robustness of our identification strategy, we employ the traditional differences-in-differences method in which the treatment and control groups are divided by a binary variable instead of continuous variable. More specifically, we modified model (2) as follows:

$$ROA_{it} = \alpha + \beta MMC_{it-1} + \gamma MMC_{it-1} * Treatment_{it} * Post + \delta Bank_{it-1} + v_t + v_i + \varepsilon_{it} \quad (3)$$

Here, *Treatment* equals 1 if the share of branches in affected regions is more than 20 percent; 0 otherwise; *Post* equals 1 for the period after 2014 Q1 and 0 otherwise.

Before estimating model (3), we also tested the validity of the parallel trend assumption of the dependent variable for the treatment and control groups prior to the conflict. We estimate the mean difference between the two groups before the treatment and found that the difference is insignificant (Panel A, Table B4). Although there is a significant difference in other banks' characteristics between two groups, the differences-in-differences method does not require a parallel trend in any variables other than the dependent variable. Hence these differences would not affect our results. Panel B of Table B4 presents estimated results for model (3), and the results are consistent with the ones from differences-in-differences approach using continuous treatment. That is, after the conflict, less affected banks do not have incentives to mutually forbear with more affected banks.

Fourth, it is possible that our results are driven by multimarket competition in other regions rather than competition in south-eastern regions<sup>15</sup>. If banks do not benefit from repeated competition in south-eastern regions, classifying treatment and control groups by the share in affected southeastern regions would not be appropriate. To rule out this possibility, we re-estimated model (1) with reference to multimarket competition in southeastern regions only. The estimation results are presented in Panel C of Table B4. The coefficients on repeated competition in southeastern regions are positive and significant at 10% significance level. This suggests that without the presence of the external shock, banks can improve their profitability by competing in the southeastern part of Ukraine regardless of their share in those regions.

## 6. Conclusions

Multimarket contact has been well documented in the literature with reference to different industries. Turning to the issue of multimarket competition in banking industry, there is an ongoing debate about whether or not banks can benefit from competing in multiple markets.

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<sup>14</sup> Financial and industrial developed regions include Dnipropetrovsk, Donetsk, Kharkiv, Kyiv city, Kyiv region, Lviv, Odesa and Zaporizhzhia.

<sup>15</sup> South-eastern regions include: Dnipropetrovsk, Donetsk, Kharkiv, Kherson, Luhansk, Mykolaiv, Odesa and Zaporizhzhia.

However studies examining the multiple market contact-profitability relationship have been marginal—mainly due to the lack of relevant data and problem of the identification strategy.

In this paper, we address these three issues. First, we document to what extent multimarket competition, indicated by multipoint linkage, affects banks' profitability. Second, we studied whether the effect differs according to different levels of markets. Third, we studied the causal inference between multimarket competition and profitability in the presence of the exogenous shock.

For the purposes of analysis, we employed a sample of the Ukrainian banking market from 2009 Q1 to 2015 Q4. Our first set of empirical results indicates that multimarket contacts can improve banks' profitability through anti-competition effect. Furthermore, the positive association between multipoint competition and banks' profitability is strongest when in-paired multimarket rivals are highly close in terms of market shares. On the contrary, banks do not have incentives to cooperate if their multipoint rivals are relatively smaller. Our results are robust when we adopt different samples as well as measure competition at different levels. We also find stronger evidence for the positive relationship between multimarket contact and financial performance if we exclude occupied regions from our sample. In the second part of the analysis, we found consistent evidence for the anti-competitive effect by exploiting differences-in-differences approach as an identification strategy. Further investigation shows that this effect is weakened by the political shock caused by the change in banks' competitive attitude. More specifically, banks have more share in the affected regions and are more affected by the conflict. Thus, they are not considered to be important competitors. Together with the less competitive condition of the markets, in the aftermath of the conflict, the less affected banks no longer have incentives to co-operate with those more affected multimarket rivals.

These results have important implications for the future changes in banking system structure. First, consolidation of small and medium banks should be promoted. Thus, consolidated banks can improve their competitiveness and gain benefits from anti-competition effect of multimarket contacts. Second, regulators should encourage banks to operate new branches in remote or less competitive markets. On the one hand, this brings convenience for customers in terms of finance access. On the other hand, it enhances competitiveness of the markets. This in turn incentivizes multimarket banks to co-operate to get mutual benefits.

This study can be extended to further research in several ways. First, if we can collect branch-specific balance sheet data, we can examine the anti-competition effect induced by multimarket contacts in more details. For examples, we can investigate to what extent multimarket competitors cooperate with each other. Second, it might be worthwhile to address the relationship between the performance of the banking system and political issues with reference to the current dispute between Ukraine and Russia in more detail.

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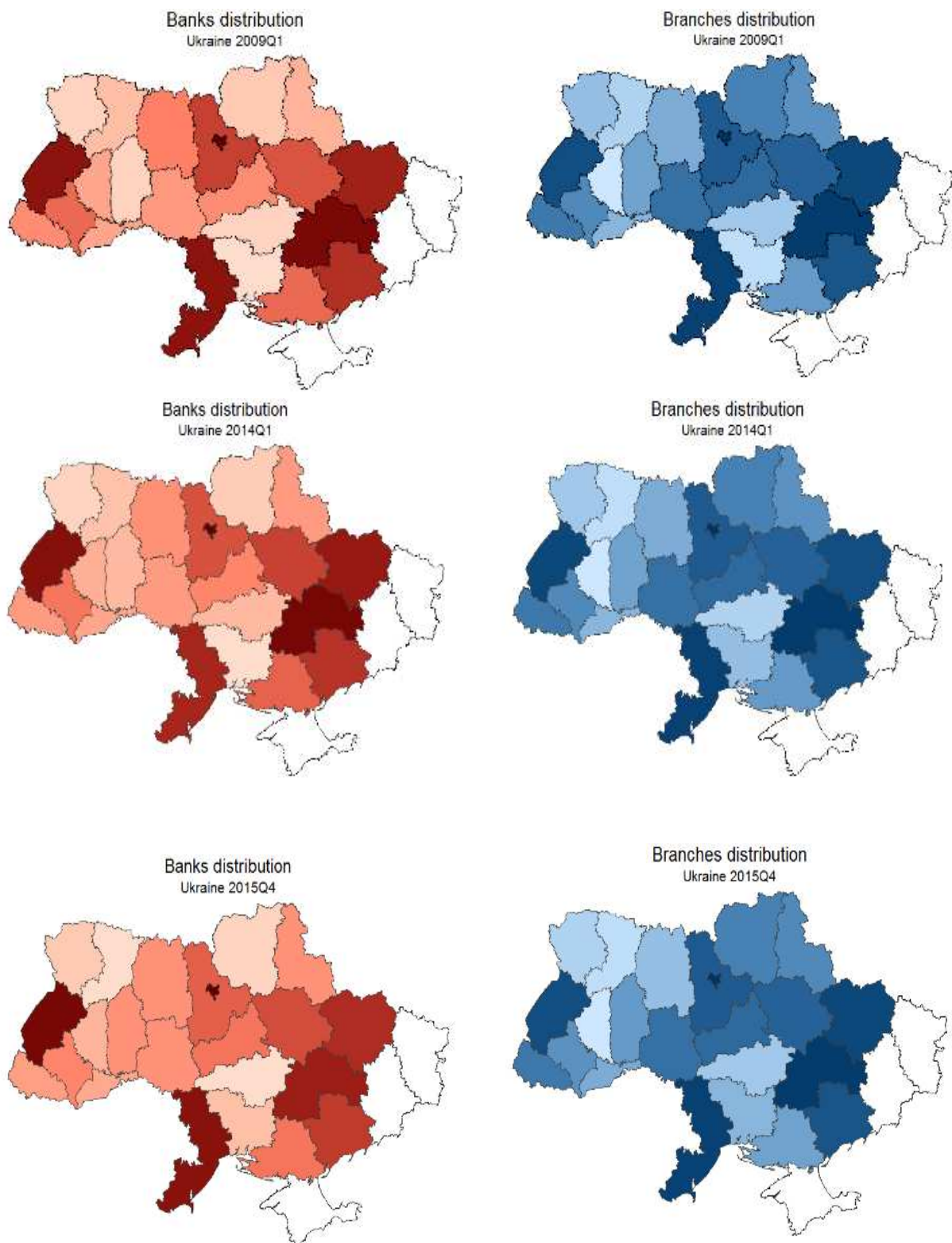
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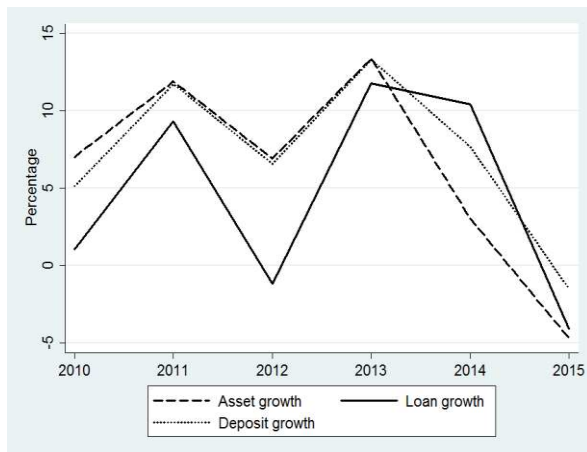
**Figure 1. Banks and branches distribution**



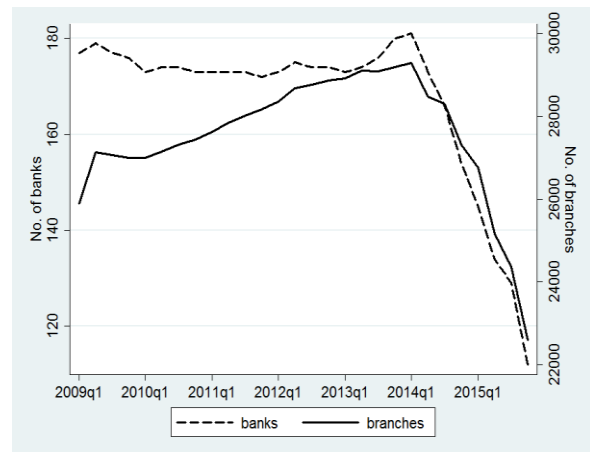
This figure displays the distribution of Ukrainian banks and branches across 27 regions. The white parts refer to occupied regions (Crimea, Donetsk and Lugansk). The darker shading indicates relatively more banks/branches in the region.



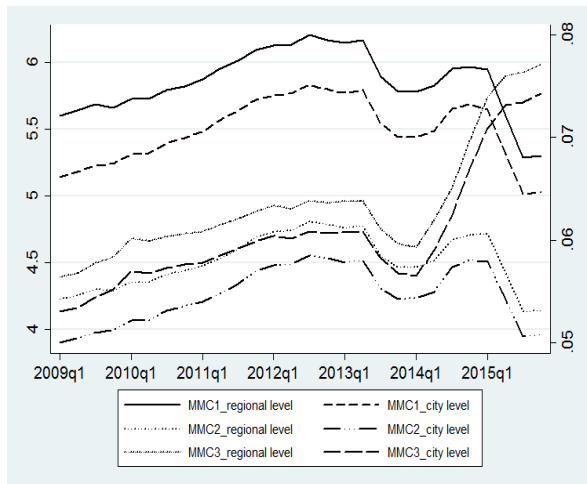
**Figure 2. Development of Ukrainian banking system over time (2009-2015)**



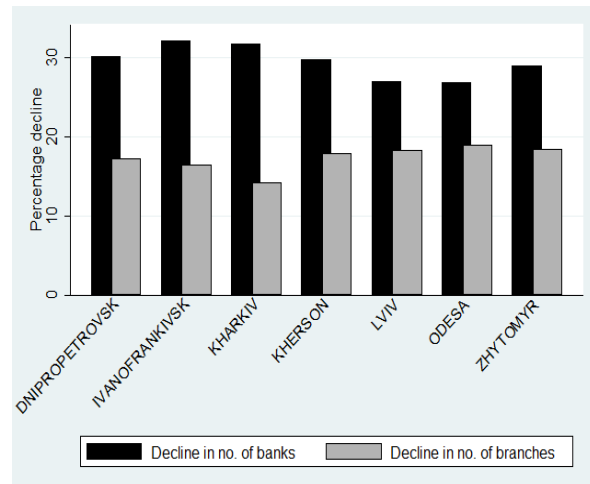
Panel A



Panel B



Panel C



Panel D

Panel A displays the growth of assets, loan and deposit from 2010 to 2015. Panel B displays the evolution of branches and banks in the Ukrainian banking system (2009Q1-2015Q4). The vertical axis on the right shows the range of number of branches. Panel C displays the decline in number of banks and number of branches in post-conflict period (after 2014Q1) in most affected regions. These regions, along with three occupied regions (Crimea, Donetsk, Luhansk), are top 10 most affected regions. Panel D displays the evolution of average multimarket contacts corresponding to different measures at regional level and center city level (2009Q1-2015Q4). The vertical axis on the right shows the range of multimarket contact (MMC) weighted by the size of rivals.

**Table 1. Descriptive statistics for sample of all regions, all banks.**

	<i>Mean</i>	<i>SD</i>	N
Multimarket competition at regional level			
<i>MMC weighted by similarity</i>	5.865	3.723	4687
<i>MMC weighted by coincided markets ratio</i>	4.517	2.711	4687
<i>MMC weighted by rival's size</i>	0.063	0.047	4687
Multimarket competition at center city level			
<i>MMC weighted by similarity</i>	5.494	3.607	4687
<i>MMC weighted by coincided markets ratio</i>	4.262	2.652	4687
<i>MMC weighted by rival's size</i>	0.060	0.046	4687
Banks' profitability			
ROA	-0.012	0.106	4660
Bank-specific variables			
Size	14.225	1.584	4684
Liquidity	0.160	0.158	4572
Equity	0.243	0.191	4593
Loan/Total assets	0.649	0.271	4682
Deposit/Total assets	0.515	0.850	4680

Descriptive statistics for all banks in the sample of all regions. ROA is net profit over total assets; Size is natural logarithm of total assets; Equity is ratio of total equity over total assets; Liquidity is ratio of liquid assets over total assets; Deposit/Total assets is ratio of total deposits over total assets; Loan is ratio of total loans to total assets; Deposit is ratio of total deposit to total assets.

**Table 2. Descriptive statistics for sample of all regions, multimarket banks vs. single-market banks.**

	Multimarket banks			Single-market banks			Difference
	$Mean_M$	$SD_M$	$N_M$	$Mean_S$	$SD_S$	$N_S$	$Mean_M - Mean_S$
Regional level							
MMC <i>weighted by similarity</i>	6.573	3.453	4,092	-	-	-	-
MMC <i>weighted by coincided markets ratio</i>	5.028	2.521	4,092	-	-	-	-
MMC <i>weighted by rival's size</i>	0.071	0.045	4,092	-	-	-	-
ROA	-0.014	0.112	4,076	0.002	0.042	584	-0.016***
Size	14.404	1.547	4,089	12.998	1.252	595	1.406***
Liquidity	0.152	0.145	3,997	0.220	0.220	575	-0.068***
Equity	0.218	0.161	4,001	0.409	0.275	592	-0.190***
Loan/Total assets	0.672	0.265	4,089	0.495	0.260	593	0.176***
Deposit/Total assets	0.534	0.902	4,089	0.383	0.260	591	0.151***
Center city level							
MMC <i>weighted by similarity</i>	6.305	3.324	3,972	-	-	-	-
MMC <i>weighted by coincided markets ratio</i>	4.849	2.457	3,972	-	-	-	-
MMC <i>weighted by rival's size</i>	0.070	0.044	3,972	-	-	-	-
ROA	-0.015	0.114	3,957	0.002	0.041	703	-0.016***
Size	14.446	1.540	3,969	13.002	1.224	715	1.444***
Liquidity	0.153	0.146	3,880	0.202	0.208	692	-0.049***
Equity	0.215	0.159	3,882	0.392	0.266	711	-0.177***
Loan/Total assets	0.672	0.268	3,969	0.521	0.252	713	0.151***
Deposit/Total assets	0.535	0.915	3,969	0.405	0.252	711	0.130***

Descriptive statistics for multimarket and single-market banks in the sample of all regions. Difference  $Mean_M - Mean_S$  is mean differences and t-test significance. ROA is net profit over total assets; Size is natural logarithm of total assets; Equity is ratio of total equity over total assets; Liquidity is ratio of liquid assets over total assets; Deposit/Total assets is ratio of total deposits over total assets; Loan is ratio of total loans to total assets; Deposit is ratio of total deposit to total assets. \*, \*\* and \*\*\* denote significance at 10%, 5% and 1%, respectively.

**Table 3. Effect of multimarket competition at regional level on multimarket banks performance.**

	MMC1 <i>weighted by similarity</i>	MMC2 <i>weighted by coincided markets ratio</i>	MMC3 <i>weighted by rival's size</i>
	(1)	(2)	(3)
Multimarket competition	0.005* (0.003)	0.005* (0.003)	-0.172 (0.197)
Size	-0.000 (0.012)	0.000 (0.012)	0.001 (0.012)
Liquidity	0.044 (0.037)	0.044 (0.037)	0.0431 (0.0367)
Equity	-0.042 (0.044)	-0.043 (0.044)	-0.046 (0.043)
Loans/Total assets	0.018 (0.027)	0.019 (0.027)	0.018 (0.027)
Deposits/Total assets	0.039* (0.023)	0.039* (0.023)	0.045** (0.023)
Quarter and year fixed-effects	Yes	Yes	Yes
Ownership fixed-effect	Yes	Yes	Yes
Group fixed-effect	Yes	Yes	Yes
Observations	3,876	3,876	3,876
Adj. R-Square	0.054	0.054	0.054

This table reports fixed-effects regressions for multimarket banks in the sample of all regions. The multimarket competition at regional level in columns (1)-(3) is indicated by multimarket contact in all regions weighted by size similarity, coincided markets ratio and rivals' size, respectively. Robust standard errors are reported in parentheses. In all regressions a constant term is estimated but not reported. ROA is net profit over total assets; Size is natural logarithm of total assets; Equity is ratio of total equity over total assets; Liquidity is ratio of liquid assets over total assets; Deposit/Total assets is ratio of total deposits over total assets; Loan is ratio of total loans to total assets; Deposit is ratio of total deposit to total assets. \*, \*\* and \*\*\* denote significance at 10%, 5% and 1%, respectively.

**Table 4. Effect of multimarket competition at city levels on multimarket banks performance.**

	Center city level		City level (≥50 branches)	City level (≥30 branches)
	MMC1 <i>weighted by similarity</i>	MMC2 <i>weighted by coincided markets ratio</i>	MMC1 <i>weighted by similarity</i>	MMC1 <i>weighted by similarity</i>
	(1)	(2)	(3)	(4)
Multimarket competition	0.006** (0.003)	0.006* (0.003)	0.004* (0.002)	0.003* (0.002)
Size	-0.001 (0.012)	-0.000 (0.012)	-0.000 (0.012)	-0.000 (0.012)
Liquidity	0.045 (0.038)	0.044 (0.038)	0.045 (0.037)	0.045 (0.037)
Equity	-0.043 (0.044)	-0.044 (0.044)	-0.041 (0.043)	-0.042 (0.043)
Loans/Total assets	0.017 (0.027)	0.017 (0.027)	0.018 (0.027)	0.018 (0.027)
Deposits/Total assets	0.041* (0.023)	0.042* (0.023)	0.040* (0.023)	0.040* (0.023)
Quarter and year fixed-effects	Yes	Yes	Yes	Yes
Ownership fixed-effect	Yes	Yes	Yes	Yes
Group fixed-effect	Yes	Yes	Yes	Yes
Observations	3,764	3,764	3,911	3,911
Adj. R-Square	0.055	0.055	0.055	0.054

This table reports fixed-effects regressions for multimarket banks in the sample of all regions. The multimarket competition in columns (1) and (2) is indicated by multimarket contact at center city level weighted by size similarity and coincided markets ratio, respectively. The multimarket competition in columns (3) and (4) is indicated by multimarket contact in cities having at least 50 branches and 30 branches which is weighted by size similarity, respectively. Robust standard errors are reported in parentheses. In all regressions a constant term is estimated but not reported. ROA is net profit over total assets; Size is natural logarithm of total assets; Equity is ratio of total equity over total assets; Liquidity is ratio of liquid assets over total assets; Deposit/Total assets is ratio of total deposits over total assets; Loan is ratio of total loans to total assets; Deposit is ratio of total deposit to total assets. \*, \*\* and \*\*\* denote significance at 10%, 5% and 1%, respectively.

**Table 5. Effect of multimarket competition in unoccupied regions on multimarket banks performance.**

	Regional level		Center city level		City level (≥50 branches)		City level (≥30 branches)
	MMC1 <i>weighted by similarity</i>	MMC2 <i>weighted by coincided markets ratio</i>	MMC1 <i>weighted by similarity</i>	MMC2 <i>weighted by coincided markets ratio</i>	MMC1 <i>weighted by similarity</i>	MMC2 <i>weighted by coincided markets ratio</i>	MMC1 <i>weighted by similarity</i>
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Multimarket competition	0.006** (0.003)	0.007* (0.004)	0.006*** (0.003)	0.007** (0.003)	0.005** (0.003)	0.005* (0.003)	0.005* (0.003)
Size	0.0007 (0.0124)	0.0009 (0.0124)	0.0007 (0.0126)	0.0008 (0.0125)	0.0002 (0.0124)	0.0006 (0.0123)	0.0002 (0.0124)
Liquidity	0.0403 (0.0371)	0.0399 (0.0371)	0.0401 (0.0378)	0.0398 (0.0378)	0.0424 (0.0370)	0.0417 (0.0370)	0.0424 (0.0370)
Equity	-0.0399 (0.0446)	-0.0411 (0.0445)	-0.0389 (0.0456)	-0.0401 (0.0456)	-0.0397 (0.0445)	-0.0405 (0.0445)	-0.0402 (0.0445)
Loans/Total assets	0.0125 (0.0276)	0.0130 (0.0275)	0.0107 (0.0281)	0.0110 (0.0280)	0.0131 (0.0275)	0.0132 (0.0274)	0.0132 (0.0275)
Deposits/Total assets	0.0385* (0.0228)	0.0389* (0.0227)	0.0405* (0.0233)	0.0409* (0.0232)	0.0401* (0.0231)	0.0414* (0.0229)	0.0404* (0.0231)
Quarter and year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ownership fixed-effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Group fixed-effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,829	3,829	3,704	3,704	3,851	3,851	3,851
Adj. R-Square	0.055	0.054	0.056	0.056	0.055	0.055	0.055

This table reports fixed-effects regressions for sample of multimarket banks. The multimarket competition in columns (1)-(7) is indicated by multimarket contact in unoccupied regions. Robust standard errors are reported in parentheses. All regressions include a constant term, but the estimated coefficients are not reported. ROA is net profit over total assets; Size is the natural logarithm of total assets; Equity is ratio of total equity over total assets; Liquidity is ratio of liquid assets over total assets; Deposit/Total assets is ratio of total deposits over total assets; Loan is ratio of total loans to total assets; Deposit is ratio of total deposit to total assets. \*, \*\* and \*\*\* denote significance at 10%, 5% and 1%, respectively.

**Table 6. Results for quasi-experimental approach.**

	(1)	(2)	(3)
Panel A: The parallel trend of treatment and control banks in pre-conflict period			
	MMC1 <i>weighted by similarity</i>	MMC2 <i>weighted by coincided markets ratio</i>	MMC3 <i>weighted by rival's size</i>
Multimarket competition	0.006** (0.003)	0.006* (0.003)	-0.148 (0.205)
Size	-0.000 (0.012)	-0.000 (0.012)	0.001 (0.012)
Liquidity	0.045 (0.037)	0.045 (0.037)	0.044 (0.037)
Equity	-0.047 (0.044)	-0.048 (0.044)	-0.051 (0.044)
Loans/Total assets	0.019 (0.027)	0.020 (0.027)	0.019 (0.027)
Deposits/Total assets	0.037* (0.022)	0.038* (0.022)	0.043* (0.022)
Pre_conflict	0.034 (0.023)	0.033 (0.023)	0.032 (0.023)
Quarter and year fixed-effects	Yes	Yes	Yes
Ownership fixed-effect	Yes	Yes	Yes
Group fixed-effect	Yes	Yes	Yes
Observations	3,876	3,876	3,876
Adj. R-Square	0.055	0.055	0.055
Panel B: The effect of multimarket competition on profitability in relation with exogenous shock			
	MMC1 <i>weighted by similarity</i>	MMC2 <i>weighted by coincided markets ratio</i>	MMC3 <i>weighted by rival's size</i>
Multimarket competition	0.022* (0.013)	0.022 (0.015)	0.229 (1.010)
MMC*share in affected regions	-0.010* (0.005)	-0.014* (0.007)	-0.940* (0.526)
Size	0.064* (0.038)	0.065* (0.038)	0.069* (0.037)
Liquidity	-0.009 (0.091)	-0.013 (0.090)	-0.020 (0.090)
Equity	-0.114 (0.153)	-0.117 (0.153)	-0.114 (0.152)
Loans/Total assets	-0.069 (0.124)	-0.068 (0.123)	-0.066 (0.123)
Deposits/Total assets	0.126 (0.098)	0.127 (0.099)	0.139 (0.101)
Quarter and year fixed-effects	Yes	Yes	Yes
Ownership fixed-effect	No	No	No
Group fixed-effect	Yes	Yes	Yes
Observations	1,081	1,081	1,081
Adj. R-Square	0.077	0.076	0.076

Panel A reports fixed-effects regressions testing the parallel trend of the treatment and control banks for the pre-conflict period. Panel B reports fixed-effects differences-in-differences regression with continuous treatment. Regression is estimated for multimarket domestic banks. The constant term is estimated but not reported. Robust standard errors are reported in parentheses. ROA is net profit over total assets; Size is the natural logarithm of total assets; Equity is ratio of total equity over total assets; Liquidity is ratio of liquid assets over total assets; Deposit/Total assets is ratio of total deposits over total assets; Loan is ratio of total loans to total assets; Deposit is ratio of total deposit to total assets. \*, \*\* and \*\*\* denote significance at 10%, 5% and 1%, respectively.

## Appendix A. Variable description.

Variable	Description	Expected sign
	Multimarket competition	
MMC <i>weighted by similarity</i>	Multimarket contact measure weighted by similarity	+/-
	$s_{ik,t} = \frac{branches_{ik,t}}{branches_{k,t}}$ $SI_{ij,t} = \sum_k  s_{ik,t} - s_{jk,t} $ $w_{ij,t}^1 = \frac{m_{ij,t} - SI_{ij,t}}{m_{ij,t}}$ $MMC_{it}^1 = \frac{\sum_{j \neq i} m_{ij,t} w_{ij,t}^1}{rivals_{it}}$	
MMC <i>weighted by coincided markets ratio</i>	Multimarket contact measure weighted by coincided markets ratio	+/-
	$w_{ij,t}^2 = \frac{m_{ij,t}}{markets_{it}}$ <p>Where <math>markets_{it}</math> is the total markets in which bank <math>i</math> operates at least one branch in quarter <math>t</math>.</p> $MMC_{it}^2 = \frac{\sum_{j \neq i} m_{ij,t} w_{ij,t}^2}{rivals_{it}}$	
MMC <i>weighted by rival's size</i>	Multimarket contact measure weighted by rival's size	+/-
	$w_{ij,t}^3 = \frac{\sum_k s_{jk,t}}{m_{ij,t}}$ $MMC_{it}^3 = \frac{\sum_{j \neq i} m_{ij,t} w_{ij,t}^3}{rivals_{it}}$	
Bank-specific variables		
ROA	Net profit over total assets	
Size	Natural logarithm of total assets	+/-
Equity	Total equity over total assets	+/-
Liquidity	Ratio of liquid assets over total assets	+/-
Deposit/Total assets	Total deposits over total assets	+/-
Loans/Total assets	Ratio of total loans to total assets	+/-
Share	Number of branches in affected and occupied south-eastern regions/Total branches	



## Appendix B

**Table B1. Descriptive statistics for multimarket competition in different samples.**

	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>
Sample of all regions				
Domestic banks				
	Regional level		Center city level	
<i>MMC weighted by similarity</i>	5.334	3.508	4.979	3.414
<i>MMC weighted by coincided markets ratio</i>	4.134	2.562	3.882	2.511
<i>MMC weighted by rival's size</i>	0.056	0.044	0.053	0.043
Multimarket banks				
	City level (≥30 branches)		City level (≥50 branches)	
<i>MMC weighted by similarity</i>	7.759	5.379	7.353	4.818
<i>MMC weighted by coincided markets ratio</i>	4.965	2.975	5.035	2.990
<i>MMC weighted by rival's size</i>	0.123	0.121	0.102	0.086
Sample of unoccupied regions				
All banks				
	Regional level		Center city level	
<i>MMC weighted by similarity</i>	5.436	3.405	5.127	3.320
<i>MMC weighted by coincided markets ratio</i>	4.186	2.466	3.987	2.438
<i>MMC weighted by rival's size</i>	0.059	0.044	0.056	0.043
Domestic banks				
	Regional level		Center city level	
<i>MMC weighted by similarity</i>	4.944	3.198	4.650	3.140
<i>MMC weighted by coincided markets ratio</i>	3.833	2.323	3.636	2.305
<i>MMC weighted by rival's size</i>	0.052	0.040	0.049	0.040
Multimarket banks				
	Regional level		Center city level	
<i>MMC weighted by similarity</i>	6.100	3.152	5.907	3.045
<i>MMC weighted by coincided markets ratio</i>	4.662	2.291	4.550	2.250
<i>MMC weighted by rival's size</i>	0.066	0.042	0.065	0.041
Multimarket banks				
	City level (≥30 branches)		City level (≥50 branches)	
<i>MMC weighted by similarity</i>	6.940	4.532	6.609	4.091
<i>MMC weighted by coincided markets ratio</i>	4.534	2.561	4.596	2.577
<i>MMC weighted by rival's size</i>	0.105	0.097	0.088	0.070

Descriptive statistics for multimarket contacts corresponding to different samples.

**Table B2. Robustness check – different samples.**

	All banks		Domestic banks
	(1)	(2)	(3)
	MMC1	MMC3	MMC1
	<i>weighted by similarity</i>	<i>weighted by rival's size</i>	<i>weighted by similarity</i>
Panel A. Sample of all regions			
Panel A1. Regional level			
Multimarket competition	0.004* (0.002)	-0.358* (0.194)	0.004** (0.002)
Size	0.003 (0.011)	0.005 (0.011)	-0.001 (0.016)
Liquidity	0.035 (0.027)	0.036 (0.027)	0.026 (0.029)
Equity	-0.036 (0.035)	-0.037 (0.035)	-0.056 (0.040)
Loans/Total assets	0.022 (0.023)	0.021 (0.023)	0.008 (0.028)
Deposits/Total assets	0.032* (0.018)	0.040** (0.018)	0.028 (0.020)
Quarter and year fixed-effects	Yes	Yes	Yes
Ownership fixed-effect	Yes	Yes	No
Group fixed-effect	Yes	Yes	Yes
Observations	4,430	4,430	3,710
Adj. R-Square	0.046	0.047	0.046
Panel A2. Center city level			
Multimarket competition	0.004* (0.002)	-0.369* (0.197)	0.004* (0.002)
Size	0.003 (0.011)	0.005 (0.011)	-0.001 (0.016)
Liquidity	0.035 (0.027)	0.036 (0.027)	0.026 (0.029)
Equity	-0.036 (0.035)	-0.038 (0.035)	-0.056 (0.040)
Loans/Total assets	0.022 (0.023)	0.021 (0.023)	0.008 (0.028)
Deposits/Total assets	0.033* (0.018)	0.040** (0.018)	0.028 (0.020)
Quarter and year fixed-effects	Yes	Yes	Yes
Ownership fixed-effect	Yes	Yes	No
Group fixed-effect	Yes	Yes	Yes
Observations	4,430	4,430	3,710
Adj. R-Square	0.046	0.047	0.046
Panel B. Sample of unoccupied regions			
Panel B1. Regional level			
Multimarket competition	0.004* (0.002)	-0.369* (0.202)	0.005* (0.003)
Size	0.003 (0.011)	0.004 (0.011)	-0.001 (0.017)
Liquidity	0.035 (0.027)	0.036 (0.027)	0.027 (0.029)
Equity	-0.038 (0.036)	-0.041 (0.036)	-0.058 (0.042)
Loans/Total assets	0.022 (0.024)	0.021 (0.023)	0.009 (0.028)
Deposits/Total assets	0.033* (0.019)	0.039** (0.019)	0.028 (0.021)
Quarter and year fixed-effects	Yes	Yes	Yes
Ownership fixed-effect	Yes	Yes	No
Group fixed-effect	Yes	Yes	Yes
Observations	4,390	4,390	3,670
Adj. R-Square	0.046	0.047	0.046
Panel B2. Center city level			
Multimarket competition	0.004* (0.002)	-0.385* (0.204)	0.005* (0.002)
Size	0.003 (0.011)	0.004 (0.011)	-0.001 (0.017)
Liquidity	0.035 (0.027)	0.036 (0.027)	0.026 (0.029)
Equity	-0.038 (0.036)	-0.041 (0.036)	-0.059 (0.042)
Loans/Total assets	0.022 (0.024)	0.021 (0.023)	0.009 (0.028)
Deposits/Total assets	0.033* (0.019)	0.039** (0.019)	0.028 (0.021)
Quarter and year fixed-effects	Yes	Yes	Yes
Ownership fixed-effect	Yes	Yes	No
Group fixed-effect	Yes	Yes	Yes
Observations	4,390	4,390	3,670
Adj. R-Square	0.046	0.047	0.046

This table reports fixed-effects regressions for samples of all banks and domestic banks. Panels A and B report regressions for multimarket competition in all regions and in unoccupied regions, respectively. Robust standard errors are reported in parentheses. In all regressions a constant term is estimated but not reported. ROA is net profit over total assets; Size is natural logarithm of total assets; Equity is ratio of total equity over total assets; Liquidity is ratio of liquid assets over total assets; Deposit/Total assets is ratio of total deposits over total assets; Loan is ratio of total loans to total assets; Deposit is ratio of total deposit to total assets. \*, \*\* and \*\*\* denote significance at 10%, 5% and 1%, respectively.

**Table B3. Robustness check – different weighting factor.**

	Panel A. Sample of all regions			
	Regional level	Center city level	City level (≥50 branches)	City level (≥30 branches)
	(1)	(2)	(3)	(4)
Multimarket competition weighted by ratio of developed markets	0.014** (0.006)	0.014** (0.006)	0.009** (0.005)	0.009* (0.004)
Size	-0.000 (0.012)	0.003 (0.011)	-0.001 (0.012)	-0.001 (0.012)
Liquidity	0.045 (0.037)	0.035 (0.027)	0.046 (0.036)	0.046 (0.036)
Equity	-0.042 (0.044)	-0.035 (0.035)	-0.042 (0.043)	-0.042 (0.043)
Loans/Total assets	0.016 (0.027)	0.021 (0.024)	0.017 (0.027)	0.018 (0.027)
Deposits/Total assets	0.041* (0.022)	0.033* (0.018)	0.040* (0.022)	0.040* (0.023)
Quarter and year fixed-effects	Yes	Yes	Yes	Yes
Ownership fixed-effect	Yes	Yes	Yes	Yes
Group fixed-effect	Yes	Yes	Yes	Yes
Observations	3,876	3,764	3,911	3,911
Adj. R-Square	0.055	0.056	0.055	0.055
	Panel B. Sample of unoccupied regions			
	Regional level	Center city level	City level (≥50 branches)	City level (≥30 branches)
	(1)	(2)	(3)	(4)
Multimarket competition weighted by ratio of developed markets	0.015** (0.006)	0.014** (0.007)	0.014** (0.006)	0.014** (0.006)
Size	0.000 (0.012)	0.001 (0.013)	-0.000 (0.012)	-0.000 (0.012)
Liquidity	0.040 (0.037)	0.040 (0.038)	0.043 (0.037)	0.043 (0.037)
Equity	-0.041 (0.045)	-0.040 (0.046)	-0.040 (0.045)	-0.040 (0.045)
Loans/Total assets	0.011 (0.028)	0.010 (0.028)	0.013 (0.028)	0.013 (0.028)
Deposits/Total assets	0.040* (0.022)	0.042* (0.023)	0.040* (0.023)	0.040* (0.023)
Quarter and year fixed-effects	Yes	Yes	Yes	Yes
Ownership fixed-effect	Yes	Yes	Yes	Yes
Group fixed-effect	Yes	Yes	Yes	Yes
Observations	3,829	3,704	3,851	3,851
Adj. R-Square	0.055	0.056	0.055	0.055

This table reports fixed-effects regressions for sample of multimarket banks. Multimarket competition is weighted by the ratio of developed markets. Panels A and B report multimarket contact in all regions and in unoccupied regions, respectively. Robust standard errors are reported in parentheses. In all regressions a constant term is estimated but not reported. ROA is net profit over total assets; Size is natural logarithm of total assets; Equity is ratio of total equity over total assets; Liquidity is ratio of liquid assets over total assets; Deposit/Total assets is ratio of total deposits over total assets; Loan is ratio of total loans to total assets; Deposit is ratio of total deposit to total assets. \*, \*\* and \*\*\* denote significance at 10%, 5% and 1%, respectively.

**Table B4. Robustness check for differences-in-differences approach**

	(1)	(2)	(3)
Panel A. Test of mean difference for the pre-treatment period			
	<i>Mean<sub>control group</sub></i>	<i>Mean<sub>treated group</sub></i>	Difference
Parallel trend test of the dependent variable for the pre-treatment period			
ROA	-0.007	-0.004	-0.003
Mean comparisons for the pre-treatment period			
Size	13.423	14.560	-1.137***
Liquidity	0.220	0.145	0.075***
Equity	0.289	0.209	0.080***
Loans/Total assets	0.615	0.692	-0.077***
Deposits/Total assets	0.470	0.495	-0.025***
Panel B. Traditional differences-in-differences estimation			
	MMC1	MMC2	MMC3
	<i>weighted by similarity</i>	<i>weighted by coincided markets ratio</i>	<i>weighted by rival's size</i>
Multimarket competition	0.021* (0.012)	0.021 (0.014)	0.214 (0.927)
MMC* <i>Treatment</i> * <i>Post</i>	-0.005* (0.002)	-0.006** (0.003)	-0.436* (0.229)
Size	0.069* (0.039)	0.069* (0.038)	0.073* (0.038)
Liquidity	-0.015 (0.090)	-0.019 (0.089)	-0.026 (0.088)
Equity	-0.111 (0.154)	-0.113 (0.154)	-0.111 (0.153)
Loans/Total assets	-0.073 (0.124)	-0.072 (0.123)	-0.070 (0.123)
Deposits/Total assets	0.127 (0.098)	0.128 (0.099)	0.139 (0.100)
Quarter and year fixed-effects	Yes	Yes	Yes
Ownership fixed-effect	No	No	No
Group fixed-effect	Yes	Yes	Yes
Observations	1,081	1,081	1,081
Adj. R-Square	0.077	0.077	0.076
Panel C: The effect of multimarket competition in south-eastern regions on bank performance			
	MMC1	MMC2	MMC3
	<i>weighted by similarity</i>	<i>weighted by coincided markets ratio</i>	<i>weighted by rival's size</i>
Multimarket competition	0.005* (0.003)	0.013* (0.008)	-0.498 (0.513)
Size	-0.000 (0.012)	0.005 (0.012)	0.005 (0.012)
Liquidity	0.044 (0.037)	0.061 (0.051)	0.057 (0.044)
Equity	-0.042 (0.044)	-0.016 (0.043)	-0.021 (0.041)
Loans/Total assets	0.018 (0.027)	0.008 (0.034)	0.020 (0.033)
Deposits/Total assets	0.039* (0.023)	0.057** (0.025)	0.055** (0.022)
Quarter and year fixed-effects	Yes	Yes	Yes
Ownership fixed-effect	Yes	Yes	Yes
Group fixed-effect	Yes	Yes	Yes
Observations	3,876	3,204	3,672
Adj. R-Square	0.054	0.065	0.056

Panel A reports the test of mean differences of banks' characteristics between control and treatment groups. Panel B reports fixed-effects differences-in-differences regression using traditional binary treatment. Regression is estimated for multimarket domestic banks. Panel C reports fixed-effects regression for multimarket banks with reference to multimarket competition in south-eastern regions. The constant term is estimated but not reported. Robust standard errors are reported in parentheses. ROA is net profit over total assets; Size is the natural logarithm of total assets; Equity is ratio of total equity over total assets; Liquidity is ratio of liquid assets over total assets; Deposit/Total assets is ratio of total deposits over total assets; Loan is ratio of total loans to total assets; Deposit is ratio of total deposit to total assets. \*, \*\* and \*\*\* denote significance at 10%, 5% and 1%, respectively.

## Appendix C

Assume that there are 4 banks which operate in 3 markets A, B and C. Each bank has the number of branches in each market as follows:

	Bank 1	Bank 2	Bank 3	Bank 4
Market A	1	0	4	5
Market B	2	2	0	4
Market C	3	3	0	6

We have market share of each bank in each market as follows:

	Bank 1	Bank 2	Bank 3	Bank 4
Market A	$s_{1A} = 0.1$	$s_{2A} = 0$	$s_{3A} = 0.4$	$s_{4A} = 0.5$
Market B	$s_{1B} = 0.25$	$s_{2B} = 0.25$	$s_{3B} = 0$	$s_{4B} = 0.5$
Market C	$s_{1C} = 0.25$	$s_{2C} = 0.25$	$s_{3C} = 0$	$s_{4C} = 0.5$

MMC1 calculation for bank 1:

$$SI_{12} = |0.25 - 0.25| + |0.25 - 0.25| = 0 \Rightarrow w_{112} = (2 - 0)/2 = 1$$

$$SI_{13} = |0.1 - 0.4| = 0.3 \Rightarrow w_{113} = (1 - 0.3)/1 = 0.7$$

$$SI_{14} = |0.1 - 0.5| + |0.25 - 0.5| + |0.25 - 0.5| = 0.9 \Rightarrow w_{114} = (3 - 0.9)/3 = 0.7$$

$$MMC1 = \frac{2 \times 1 + 1 \times 0.7 + 3 \times 0.7}{3} = 1.6$$

MMC2 calculation for bank 1:

$$w_{212} = 2/3 = 0.667$$

$$w_{213} = 1/3 = 0.333$$

$$w_{214} = 3/3 = 1$$

$$MMC2 = \frac{2 \times 0.667 + 1 \times 0.333 + 3 \times 1}{3} = 1.556$$

MMC3 calculation for bank 1:

$$w_{312} = (0.25 + 0.25)/2 = 0.25$$

$$w_{313} = 0.4/1 = 0.4$$

$$w_{314} = (0.5 + 0.5 + 0.5)/3 = 0.5$$

$$MMC3 = \frac{2 \times 0.25 + 1 \times 0.4 + 3 \times 0.5}{3} = 0.8$$