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Abstract

This paper examines the impact of non-price competition, indicated by multimarket contacts, on bank performance. Using a unique data set of Ukrainian banks' branch locations, we construct three measures of multimarket linkages. We find that banks with a higher level of multimarket contacts are more likely to have higher financial performance. The findings support the mutual forbearance hypothesis: when banks compete in multiple markets, they have incentives to cooperate instead of competing aggressively. This cooperative incentive is induced by the familiarity and the similarity among multimarket competitors. The positive effect of multimarket competition on bank profitability is stronger when banks interact in more competitive markets. However, the anti-competitive effect of multimarket contacts is lessened following an exogenous shock to banks' branch networks. Banks that were more exposed to the shock experience worsened competitive positions and no longer benefited from multimarket contacts.

JEL classification: G21; L11; L25; L40

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

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Abstract

This paper examines the impact of non-price competition, indicated by multimarket contacts, on bank performance. Using a unique data set of Ukrainian banks' branch locations, we construct three measures of multimarket linkages. We find that banks with a higher level of multimarket contacts are more likely to have higher financial performance. The findings support the mutual forbearance hypothesis: when banks compete in multiple markets, they have incentives to cooperate instead of competing aggressively. This cooperative incentive is induced by the familiarity and the similarity among multimarket competitors. The positive effect of multimarket competition on bank profitability is stronger when banks interact in more competitive markets. However, the anti-competitive effect of multimarket contacts is lessened following an exogenous shock to banks' branch networks. Banks that were more exposed to the shock experience worsened competitive positions and no longer benefited from multimarket contacts.

1. Introduction

Over the past decades, the structure of banking systems has changed dramatically as banks have diversified branches across different geographic markets, resulting in interbank engagement. For example, Citibank, Standard Charter, and HSBC have eight overlapped markets in Americas, fifteen overlapped markets in Asia, seven overlapped markets in Europe as well as seven overlapped markets in Middle East and Africa. Banks can also experience repeated competition in local markets within a country like the case of Barclays, Lloyds, and Royal Bank of Scotland in the UK. On the one hand, banks' geographic diversification could improve performance. On the other hand, it raises the question as to what extent multimarket competition can affect banks' competitive behavior and thus profitability.

Research on multimarket competition can be divided into two main strands. The first view, mutual forbearance hypothesis, suggests that the high degree of multimarket contacts might have anti-competitive effect on firms' strategy (e.g., Edwards, 1955; Feinberg, 1984; Sorenson, 2007). It is the case when vigorous competitive attitude of a firm in one market might lead to simultaneous attacks from its multimarket rivals in all other markets. Thus, multimarket firms have incentives to cooperate for a reciprocal exchange of favor. In contrast, the second view suggests the pro-competitive effect of multimarket contacts. Solomon (1972) argues that if banks already compete aggressively in given markets in one region, higher level of multimarket linkages within that region might enhance the intensity of competition and reduce bank profitability. Similarly, multimarket contacts, coupled by imperfect information, might have pro-competitive effect if firms compete in quantities (Mester, 1992). Although these theories have been empirically explored (e.g., Degl'Innocenti et al., 2014; Li and Greenwood, 2004), evidence in banking is scarce and inconclusive. One of the key problems is a lack of detailed and rich data on banks' branch location.[1] This leads to (i) problems with measuring competition at local levels and (ii) difficulty in examining the channels through which repeated competition affects competitive strategies and performance.

Our paper provides new evidence of the relationship between multimarket competition and bank profitability using data of Ukrainian banking sector over the 2009-2015 period. This banking sector presents a well-suited case for our research exploration due to two main reasons. Firstly, existing studies document the effect of bank branch expansion following the deregulation on branch opening in the US and Italy. This is different from the situation in Ukraine where both network growth and network reduction are witnessed. From 2009 to late 2013, 1,809 new bank branches were opened while the number of branches decreased by 16.14% during the 2014-2015 period. Secondly, the network reduction in the Ukraine is unique in the sense that it is caused by an exogenous shock. More specifically, following the geopolitical conflict between Ukraine and Russia in 2014, all Ukrainian credit institutions completely withdrew from Crimea, along with the closure of some (or most) of their branches in the self-proclaimed regions in Eastern Ukraine. For example, the number of banks operating

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[1] To the best of our knowledge, only two data sets are available for research including data on the US banking (e.g., Pilloff, 1999; Whalen, 1996) and the Italian banking (e.g., Coccorese and Pellecchia, 2009; De Bonis and Ferrando, 2000).

in these regions dropped from 122 in 2014Q1 to 80 as of 2015Q4, accounting for only 54% of existing banks. Thus, we could use the variation in multimarket banks' exposure to the conflict to sharpen our identification.

In the first part of our analysis, we test the effects of multimarket competition on the performance of Ukrainian banks. Our results show a positive and significant relationship between repeated competition and profitability. However, this link is observed only when banks' market shares are relatively similar or banks have a high degree of familiarity. In contrast, powerful banks do not have incentives to mutual forbear with their weaker multimarket counterparts. Further analysis shows that the anti-competitive effect of multimarket competition is facilitated by a high level of competitiveness in the markets. Our results are robust to the use of alternative measures of multimarket competition and different sets of samples. In the second set of tests, we examine the multimarket competition–profitability relationship in the presence of the exogenous shock. This approach provides an insight into the competitive attitudes of banks that have responded to the changes in the markets. As a result of the conflict between Ukraine and Russia, more affected banks have closed many of their branches, leading to the significant changes in banks' market shares and the lowered competitiveness of the markets. Consequently, after the conflict, less affected banks do not have incentives to cooperate with more affected ones.

Our findings have several implications for the reform of banking sectors in Ukraine and other Central and Eastern European (CEE) countries as they share similar institutional setup and legal frameworks. First, the Central Bank could promote the consolidation of small and medium banks. Thus, consolidated banks can improve their competitive positions and gain benefits from anti-competitive effect of multimarket contacts. Second, given the importance of the familiarity in shaping competitive strategies, the new and undiversified banks could consider branch network expansion. Hence, they can attract new customers as well as increase the familiarity with the multimarket competitors.

The rest of the paper is organized as follows. 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.

2. Literature review

2.1. Mutual forbearance hypothesis

One of the earliest phenomenon, referred to as linked oligopoly theory or mutual forbearance hypothesis, is proposed by Edwards (1955). It suggests that multimarket firms may not have aggressive attitudes toward their multimarket competitors due to the risk of multipoint attacks from the rivals. More specifically, if a firm has aggressively competitive action in one market, the interdependence might provoke simultaneous attacks in all markets where that firm meets its rivals. In contrast, firms might have incentives to cooperate with multimarket competitors in the hope of a reciprocal exchange of favors. Other theoretical studies provide support for this

argument by employing game theory models (e.g., Feinberg, 1984; Hughes and Oughton, 1993) or infinitely repeated game with discounting (Matsushima, 2001). Furthermore, Sorenson (2007) argues that the intensity of collusion is facilitated by the reciprocal recognition of multipoint contacts rather than by market differences or other factors.

Several studies suggest that the mutual forbearance incentive is induced by the familiarity which is a firm's awareness about its rivals' competitive strategies, capabilities or actions (e.g., Baum and Korn 1999; Jayachandran et al., 1999). In the multimarket setup, a higher level of multimarket contacts allows banks to collect more information about their rivals. Thus, firms' competitive strategies are constrained by the potential multipoint attacks from rivals. The mutual forbearance can also be induced by the deterrence that is enhanced by spheres of influence (Bernheim and Whinston, 1990; Edwards, 1955).[2] In case firms compete in multiple markets and firms have different market positions in different markets, multimarket firms might have tacit arrangements. As a result, firms could benefit from the markets which they dominate and prevent the multimarket rivals from vigorously competitive attitudes in those markets at the same time.

The mutual forbearance hypothesis has been empirically tested in different aspects. A large body of literature focuses on the relationship between multimarket contacts and the level of competition. For instance, using high price as a signal of less rivalry, Evans and Kessides (1994) provide evidence for linked oligopoly in airline industry. That is, 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) find that airlines choose to enter in low-density routes and exit from high-density routes to sustain themselves from their rivals. However, the enter/exit rates are lowered with the increases in multimarket contacts, especially in markets dominated by a single airline.

Other studies examine the effects of multimarket contacts with respect to firms' profitability. Scott (1991) provides evidence for 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 industries with a high level of multimarket linkages among sellers. Conducting a study in the UK manufacturing sector, Hughes and Oughton (1993) state that multimarket contacts are positively related to the rate of return on capital and price-cost margins. The positive association between multimarket contacts and yields of profits has been also found in the airline industry (e.g., Gimeno and Woo, 1996; Signal, 1996) or Canadian insurance sector (Li and Chuang, 2001). Li and Greenwood (2004) find evidence for the mutual forbearance hypothesis under specified conditions. That is, multimarket firms can only improve their performance through multiple market interactions if they are similar in size. Whalen (1996) studies interstate bank holding companies in the US and finds that the higher level of multimarket linkages, in conjunction with high concentration, is related to higher profitability. Pilloff (1999) finds similar results: a higher level of outside MMC would reduce competition in a reference market and increase the profitability of a focal bank. More recently, Coccorese

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[2] Deterrence is a firm's ability to prevent the rivals from aggressive actions that cause financial damage to the firm.

and Pellecchia (2009) analyse a sample of 655 Italian banks over a four-year period and document that banks that heavily exposed to outside contacts are more likely to mutual forbear with the multimarket rivals in a reference market.

2.2. Alternative views about multimarket competition

The alternative view suggests a pro-competitive effect of multiple market contacts. Solomon (1972) proposes that strong multimarket linkages within a region might lead to more competition if banks have already competed aggressively in local markets in that region. Using the perpetual signaling model, Mester (1992) finds that geographic overlaps promote higher competition if firms compete in quantities, regardless of imperfect information and finite horizon. When a firm competes with competitors through the quantity of output, it may initially produce more than its actual single-period profit-maximizing quantity. This may mislead the competitors that the firm is a low-cost one and the competitors would put a lower quantity of products on the market in the following periods. As a result, the firm can benefit from its quantity advantage against its rivals. When the rival firms choose a similar strategy, the level of competition in the market will increase.

The negative relationship between multimarket contacts and competition has been empirically supported by a number of studies. 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. The pro-competitive behavior of multimarket contacts is also found in the mobile phone industry (Parker and Roller, 1997). Further, no evidence of the linked oligopoly theory is found in the leasing industry (Degl'Innocenti et al., 2014) or in the loan market (Alexander, 1985). Alexander (1985) finds that banks with high levels of multiple market contacts have higher interest rates and fees as well as lower returns on assets. Mester (1987) finds similar results by considering two multimarket contact measures based on the distribution of multiple market linkage probability. Moreover, documenting the cross product between multimarket contacts and market concentration, the interaction is found to be more important than the individual effects. Rhoades and Heggestad (1985) only find partial support for the mutual forbearance nexus: multipoint contacts adversely affect the profitability in the markets where the large firms have a large number of outside contacts. With reference to Italian banking sector in the 1990s, De Bonis and Ferrando (2000) observe that the higher level of multimarket linkages might promote competition and lower lending rates.

Some other studies propose a U-shaped relationship between multimarket linkages and rivalry. Analyzing the competitive interaction between pairs of rival airlines, Baum and Korn (1999) show that at the beginning, multimarket contacts induce relatively competitive advantage for airlines. This advantage declines with the increases in pairwise multimarket contacts: when the number of multimarket rivals increases, the airlines have incentives to compete vigorously. Fuentelsaz and Gomez (2006) also find the inverted U-shaped relationship in Spanish banking market: deregulation provides incentives for banks with a low level of multimarket contacts to enter the new markets. In contrast, it reduces the entry rates of banks that already have a high level of multiple contacts due to the familiarity effect and the retaliatory threat.

Recent studies on multiple market contacts have been drawn in a new perspective that considers the effects of competition from multimarket firms on performance of small, single-market firms. Hannan and Prager (2004) analyse the pricing behavior of single-market banks in the presence of multimarket banks and find that it is driven by local market concentration regardless of multimarket banks. However, this influence is weakened by the growth of multimarket banks' market shares. Further, competition from multimarket banks reduces the deposit interest rates offered by single-market banks in the same market, resulting in lower profits. Berger et al. (2007) support this view when they test both efficiency hypothesis and hubris hypothesis in the US banking market from 1982 to 2000. They find that in the 1990s, multimarket banks enjoyed a competitive advantage over single-market banks due to their geographic expansion. Consequently, single-market banks experienced a decline in revenues and an increase in costs. Hannan and Prager (2009) examine the extent to which the presence of multimarket banks influences single-market banks' profitability. Dividing the sample by rural and urban markets, they find that the presence of multimarket banks only diminishes profitability of the single-market banks in the rural markets. This decline is sharper in higher concentration markets while it is smaller with the size of single-market banks.

Empirical studies about multimarket competition–bank profitability relationship face several challenges, leaving some gaps in the literature. The first challenge is about data requirement. To measure multimarket competition, the detailed data about branch address of each bank are required. However, to the best of our knowledge, most of the existing data is about the US banking, resulting in limited studies outside the US context. The second challenge arises from the methodological difficulties. 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. Recent studies have not yet addressed this problem. We aim to fulfill those gaps in several ways. First, a rich and detailed dataset of branch location allows us to define multimarket competition at different geographical levels. Second, using the political conflict between Ukraine and Russia as a negative shock to the banking sector, we can control for the identification problem relating to the MMC-performance relationship.

3. Ukrainian banking sector

The establishment of the modern Ukrainian banking sector started in 1991, following the collapse of the Soviet Union and the adoption of the Law "On Banks and Banking". This banking sector 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, mostly domestic banks with private ownership. As of 2015Q4, of the 113 banks holding licenses, there were 41 banks with foreign capital with only 17 banks had 100% foreign ownership. Figure 1 shows the distribution of all Ukrainian banks and branches across 26 regions in different periods. Even though Ukrainian banks have been diversifying their branches across all regions, the distribution is asymmetric: banks tend to cluster in some major markets including the Kiev region, Kiev city, regions of Lviv, Kharkiv, Dnipropetrovsk, Zaporizhzhia and Odessa.

<<Insert Fig 1 about here>>

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) and a political crisis (early 2014 until now). During the recovery and expansion periods, loan growth increased from 1.03% by 2010Q4 to 11.78% by 2013Q4 (National Bank of Ukraine, 2016). Over this period, asset growth and deposit growth also witnessed the increases of 6.37% and 8.19%, respectively (Panel A, Fig 1). Correspondingly, Ukrainian banks steadily expanded their activities and branches all over the country leading to a significant increase in the number of branches over this period (Panel B, Fig 1). Since 2014, the deep recession of the economy, coupled with the Russian annexation of Crimea and the armed confrontation in two Eastern regions (Donetsk and Luhansk), have had negative effects on the banking sector. As of 2015Q4, the banking sector lost about 4% of assets and loans along with 1.55% decrease in deposits. Following Regulation No. 260 issued by the National Bank of Ukraine in 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 has resulted 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 sector has heterogeneity since it has a large number of banks and is mixed between small and big banks. Interestingly, the extent to which banks diversify their branch networks does not necessarily depend on size. For example, some single-market banks (e.g., ING Bank) belong to Group 2, group of the second-largest banks, while some geographically diversified banks (e.g., Accent Bank, Omega Bank) are classified into Group 4, group of the smallest banks. Differently, other Eastern European banking sectors do not have such large size. For example, as of 2015Q1, there were 46 banks in Czech Republic (Czech National Bank, 2016) and 28 banks in Slovakia (National Bank of Slovakia, 2016), about one third of the Ukrainian banking size. The Polish and Hungarian banking sectors have similar size with Ukrainian banking with about 605 banks (The Polish Bank Association, 2016) and 126 banks (The Banks, 2016), respectively. However, their systems are not well diversified compared to the Ukrainian banking: about a half of banks in Hungary is mortgage and savings banks while local 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 estimate model (1) using fixed-effect estimator. Next, using difference-in-differences approach (model (2)), we develop an identification of a causal effect of multimarket competition on bank

performance in the presence of the exogenous shock. Finally, we check 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:

$$ROA_{it} = \alpha + \beta MMC_{i,t-1} + Bank_{i,t-1}\delta + v_t + u_i + \varepsilon_{it} \ (1)$$

where *i* is the index of banks, *t* is the index of time. The dependent variable is return on assets (*ROA*). We measure the degree of multimarket competition by multimarket contacts. Since the performance of banks could be affected by bank-specific characteristics, we also consider a vector of bank-level variables including: (i) bank size measured by natural logarithm of the bank's assets (*Size*), (ii) the ratio of liquid assets to total assets (*Liquidity*), (iii) the equity ratio (*Equity*), (iv) the deposit ratio (*Deposits/Total assets*), and (v) the loans-to-assets ratio (*Loans/Total assets*).[3] Additionally, a vector of time fixed effects (v_t) and bank fixed effects (u_i) are also included into the specification.[4] Finally, ε_{it} is the error term. Appendix 1 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 economies of scale, bank size tends to have a positive impact on banks' profits. Because larger banks are more likely to save more operating costs, they are more efficient (e.g., Pasiouras and Hosmidou, 2007). However, banks might experience dis-economies of scale due to a possible trade-off between bank growth and profitability. Hence, 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.

According to the conventional risk-return theory, banks that hold more liquid assets and have a higher capital-to-assets ratio are safer but less profitable compared to riskier banks (e.g., Berger, 1995). However, some studies suggest that banks with higher liquidity and equity ratios are indeed 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 deposits are the two main sources of banks' profits. On the one hand, more loans and deposits generate more profits. On the other hand, loans and deposits may have negative impact on profitability because of potential losses. If loans are composed mostly of high-risk

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[3] We also experience with different sets of control variables such as adding the ratio of non-interest income to total operating income and/or cost to income ratio. The results are quantitatively similar.
[4] Bank fixed-effects also include ownership effects as banks did not report changes in type of ownership (state owned, private, and foreign) during the observation period.

loans, more loans are associated with higher potential losses (e.g., Miller and Noulas, 1997). In addition, the extent that increases in deposits contribute to profits depends on the banks' ability to convert deposits into income-earning assets. If the deposit is converted into low credit assets such as high-risk loans, more deposits could mitigate bank profitability (e.g., Dietrich and Wanzenried, 2011).

We estimate model (1) using the fixed-effects estimator to control for time-invariant and bank-specific heterogeneity and measure multimarket competition at both the regional and the city levels. In terms of competition at city level, we first define the center city of each region as a market. Alternatively, we also consider cities having at least 30 and 50 bank branches as our second and third definitions of a market at the city level, respectively.[5] Urban villages, villages and settlements are excluded from our sample. The competition is measured with the samples of all regions and unoccupied regions. To avoid causal ambiguity, we use one-quarter lag of all independent variables.

Identification strategy using quasi-experimental design

To identify banks' competitive strategies towards multimarket rivals deeper, we employ the geopolitical conflict between Ukraine and Russia that seriously affected the occupied regions and regions with pro-Russian protests.[6] Since this conflict is unexpected, banks could not adjust the number of branches in these regions in anticipation of the shock. In fact, there are banks that kept high presence or even expanded their branch networks in the affected regions just before the conflict happened (e.g., Sberbank or Bank Forward). However, after escalation of unrest in 2014, the number of branches in these regions significantly declined. For example, Akta Bank, of which about 78% of branches were located in the affected regions before the conflict, revoked in 2014Q3. There are also banks (e.g., Artem Bank or Bank Alliance) which do not present or maintain the low presence in these regions in both pre- and post-conflict periods. Therefore, the unexpected exogenous shock has a variable effect on Ukrainian banks depending on location of their branches. Given this setup, we aim to investigate the causal relationship between bank profitability and multimarket competition that is possibly disrupted by the shock.[7]

In our difference-in-differences setting, banks with larger branch shares in the affected regions in the pre-conflict period belong to the treatment group, while banks with fewer or no branches in affected regions constitute the control group. In contrast to the standard difference-in-differences setup, our treatment variable is continuous.[8] Our model is specified as follows:

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[5] Similar results are obtained when we test with cities with at least 10, 15 and 20 bank branches

[6] Regions with pro-Russian protests include Kharkiv, Dnipropetrovsk and Odesa regions.

[7] Almeida et al. (2015) examine the efficiency of the internal capital market of different business groups using the 1997 Asian financial crisis shock. Yang and Zhao (2014) study the relationship between CEO duality and firm performance using the Canadian – United States Free Trade Agreement of 1989 as a shock.

[8] For references of papers using continuous treatment, see Gilje et al. (2016), Guadalupe and Wulf (2010) or Yang and Zhao (2014).

$$ROA_{it} = \alpha + \beta MMC_{i,t-1} + \gamma MMC_{i,t-1} * Share_i * Post + \varphi Share_i * Post + Bank_{i,t-1}\delta + u_i + \varepsilon_{it} \quad (2)$$

where *Share* is the share of branches of bank *i* in the occupied regions and regions with pro-Russian protests (affected regions) as of 2014Q1. Since this variable is time-invariant and we employ fixed-effect estimator, our treatment indicator is not included into the econometric specification (2). *Post* is a dummy variable that takes value of 0 for the pre-conflict period and 1 for the post-conflict period. We restrict our sample to eight quarters, four quarters before and four quarters after the conflict start date (2014Q1), to control for the delay of the impact.

The parallel trend is the main assumption in this identification strategy. In the absence of the exogenous shock, we would observe no difference in performance - multimarket competition sensitivity for the treatment and control groups. Adopting similar approach with Autor (2003), we test this assumption by augmenting model (1) with the pre- and post- conflict effects of the treatment as follows.

$$ROA_{it} = \alpha + \beta MMC_{it-1} + \sum_{j=-m}^{q} \theta_j Conflict_{2014Q1-j} * Share_{it} * MMC_{it} + Bank_{it-1}\delta + v_t + u_i + \varepsilon_{it} \quad (3)$$

where *Share* equals the branch share in affected regions for all quarters before 2014Q1 and equals the share as of 2014Q1 for the post-conflict period.[9] Pre-conflict and post-conflict effects of the treatment on the MMC-performance sensitivity are indicated by variable(s) $Conflict_{2014Q1-j}$. These binary variables indicate the conflict, 4 quarters before and after as well as quarter 5th backward and forward. We expect the coefficients θ_j on all variables indicating the treatment effect before the conflict equals zero.

4.1.2. *Multimarket contact measures*

In the literature, multimarket contacts are measured based on either counting basis or probability basis. The counting method calculates contacts in four different levels: the dyad-in-market level (e.g., Scott, 1982), the dyad level (e.g., Baum and Korn, 1999), the firm level (e.g., Gimeno and Woo, 1996), and the 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 attitudes towards different multimarket rivals. Following Coccorese and Pellecchia (2009), Degl'Innocenti et al. (2014), and Li and Greenwood (2004), we modify this measure and

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[9] Variable *Share* varies over time. However, the variation is low and it is in range between -0.1 and 0.1 for 94.77% observations in our sample.

compute three multimarket linkage measures to make use of different weighting factors as follows.[10]

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. We construct this measure due to two reasons. First, banks are more likely to give attention to similar sized competitors as they deal with the same regulations (e.g., capital requirement) and have identical products and customers. Second, competitive strategies of banks that have similar market shares might be affected by deterrence.

$$s_{ik,t} = \frac{branches_{ik,t}}{branches_{k,t}}$$

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^1_{j,t_i}) that ranges between 0 and 1. w^1_{j,t_i} 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 $SI_{ij,t}$.

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

$$MMC^1_{it} = \frac{\sum_{j \neq i} m_{ij,t} w^1_{j,t_i}}{rivals_{it}}$$

The second weighting factor, w^2_{j,t_i}, 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 are. This might affect the banks' competitive strategy. In addition, banks would pay more attention to those rivals that coincide with them in more markets. Thus, w^2_{j,t_i} is calculated as:

$$w^2_{j,t_i} = \frac{m_{ij,t}}{markets_{it}}$$

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[10] Numeric example for multimarket contact measures is specified in Appendix 3.

where $markets_{it}$ 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:

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

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 and 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 2009Q1 to 2015Q4. After dropping those cases for which variables are missing or misleading, our final sample consists of 209 Ukrainian banks with 4,687 observations.[11] Our panel is unbalanced and allows for both entry and exit. In terms of data about branch location, we exclude Crimea because of the following reason: after the Russian annexation of Crimea in March 2014, Ukrainian banks had withdrawn from this market completely. Thus, the available data about bank branches in Crimea, even the data in the pre-conflict period, is limited. Our cleaned branch dataset contains 34,434 observations with detailed information about the 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 at the regional and center-city levels.[12][13] The average return on assets of single-market banks is positive while ROA of multimarket banks is negative. In other words, single-market banks seem to be more profitability than multimarket banks. Using the t-test for mean comparison between two groups, we find that the difference is

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[11] 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.

[12] Multimarket banks are those operating in more than one market; single-market banks are those operating in only one market.

[13] 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.

statistically significant. Further, 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 return 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 although these differences are weakened at the city level.

<<Insert Tables 1 and 2 about here>>

Panel B in Fig 2 displays the changes in the number of banks and branches over time. In the first two quarter of 2009, the Ukrainian banking sector experienced the peak in the number of banks with the presence of 207 banks in the market. In contrast, the number of banks dropped significantly in 2014Q4 to 148 banks. Although the number of banks fluctuates during 2009-late 2014, the number of branches gradually increased over that period. After 2014Q1, there was a sharp downward trend in the number of banks and branches. Regarding the changes in the average multimarket contacts (Panel C, Fig 2), multimarket contacts measures weighted by the similarity and the ratio of coincided markets increased steadily from 2009 to the third quarter of 2012, fluctuated during the 2013-late 2014 period, and 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. Since 2014, the numbers of banks and their branches have dropped significantly, resulting in the possibly increased market shares of the existing banks. This, in turn, might lead to an increase in the magnitude of the third multimarket contacts measure.

<<Insert Fig 2 about here>>

In 2014Q1, two pro-Russian regions in the Eastern Ukraine, Luhansk and Donetsk, self-proclaimed themselves to be independent states and Crimea was also integrated into Russia. Corresponding to this conflict, the number of banks in those regions as well as some other regions decreased significantly (Panel D, Fig 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 shares in occupied and affected southeastern regions because the reduction in the number of banks and branches could lessen the competitiveness in the markets.

5. Results and discussions

5.1. Multimarket competition and bank profitability

Table 3 reports the fixed-effect regression results regarding the competition at the regional level and the sample of multimarket banks. In columns (1)-(3), we use multimarket contacts weighted

by the similarity, the coincided markets ratio, and the rival's size, respectively. We find that generally multimarket competition enhances bank profitability but the signs vary depending on the employed multipoint contact measures. The coefficients on the multimarket contacts weighted by the similarity and the coincided market ratios are significant and positive, but the coefficient on the multimarket contacts weighted by the size of the rivals is negative but insignificant. In particular, one standard deviation increase in multimarket contacts weighted by the similarity results in 1.73% increase in returns on assets while one standard deviation increase in multimarket contacts weighted by the overlapped markets ratio improves bank performance by 1.26%.

<<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 share 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 both the magnitudes and the signs because the coefficients on multimarket competition at the regional level are only significant at the 10% significance level regardless of employed measures. Further, profits of multiple market banks can rise by 1.61% and 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 exclude all occupied regions (Crimea, Donetsk, and Lugansk) from our data and re-measure our multimarket competition.[14] 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 bank profitability. In addition, we observe stronger signs for this relationship at both 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 are somewhat affected by the political issues.

<<Insert Table 5 about here>>

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[14] See Table A1 for descriptive statistics of multimarket competition indicators with reference to the exclusion.

When we measure the competition at the regional level, multimarket banks can improve their profits by 1.60-1.89% with one standard deviation increase in multimarket contacts. The positive impact of multimarket competition at city levels on bank performance is also observed. For example, banks can improve their profitability by 1.25-2.13% with one standard deviation increase in multiple market linkages. Similarly, the improvements are 1.29-2.05% and 2.27% regarding competition in cities with at least 50 branches and cities with at least 30 branches, respectively. Although the magnitudes of the competition at different market levels are quantitatively similar, the significant levels are quite different. The strength of the effect is weaker when we consider competition in center cities, cities with at least 50 branches and cities with at least 30 branches, respectively. Since 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 in more competitive markets.

Our results support the mutual forbearance hypothesis: banks can benefit from repeated competition. Consistent with other studies, we argue that the anti-competitive effect is facilitated by the information advantage. More specifically, repeated competition allows banks to collect relevant information about the rivals. This rises awareness about the competitive retaliation. Consequently, multipoint market banks should avoid vigorous competition and co-operate instead. This effect is strengthened by the competitive level of the markets. When banks operate simultaneously in multiple markets with a high level of competitiveness, they have more incentives to mutual forbear. These results are in line with previous studies by Li and Chuang (2001), Scott (1991), and Whalen (1996) despite the differences in employed industries, multimarket contact measures and econometrics techniques. Moreover, the results for multimarket measure account for market share similarity in our study are consistent with 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 linkages. They also find that the positive impact of multipoint contact on the performance of Canadian insurance companies increases with firm similarity.

The use of different weighting factors in competition measure gives an insight into the channels through which multimarket contacts induce mutual forbearance incentives. The first channel is the similarity in terms of market shares. The argument is that banks pay more attention to the share-similar competitors because they have common interests and setups including targeted customers or services. Further, similarity leads to the increase of deterrence. That is, competing in multiple markets provides opportunities for banks to "hurt" rivals while having similar market shares implies symmetric ability to "hurt". This result in increased deterrence that makes banks less prone to aggressive strategies. This provides evidence for the theoretical base proposed by Bernheim and Whinston (1990) and Edwards (1955). The second channel is the familiarity. More geographic overlaps increase the familiarity among multimarket banks and this makes multimarket competitors more salient. As a result, banks will avoid aggressive competition with the rivals which they are familiar with due to the anticipation of possible retaliation. This finding is in line with theoretical studies by Baum and Korn (1999) or Jayachandran et al. (1999). However, multimarket competition no longer has anti-competitive

effect when the mere size of the competitors is considered. If banks do not hold strong competitive positions, such as banks with small market share, they cannot benefit from their multimarket contacts. In other words, more powerful banks do not have incentives to refrain from aggressive attitudes towards relatively weaker counterparts (Teece et al., 1997).

Regarding the impact of bank-specific variables on profitability, the deposit-to-assets ratio is positively and significantly related to returns on assets even though the coefficient is only significant at the 10% 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. Multimarket competition–profitability relationship in the presence of exogenous shock

The conflict between Ukraine and Russia has led to a huge reduction in in banks' branch networks. However, some banks lost more branches than some others. Thus, we make use of the variation in banks' exposure to the conflict in examining the anti-competitive effect of multimarket contacts using difference-in-differences approach. The regression results for the parallel trend test are presented in Panel A of Table 6. As expected, the coefficients on the treatment effect during the pre-conflict period are close to zero while the coefficients on the treatment effect after the conflict are negative. The pattern of these coefficients is showed in Fig 3. In general, we find robust evidence for the parallel trend. That is, before the conflict, the extent to which multimarket banks mutual forbear is not driven by the branch shares in the affected regions. Moreover, there is no evidence for the anticipatory branch adjustment of banks to prevent the exogenous shock. These estimates and pattern also suggest that the presence of banks in the affected regions before the conflict might have impact on the MMC-profitability relationship after the conflict.

Since the parallel assumption is satisfied, we identify the sensitivity of multimarket competition–bank performance relationship in the presence of political dispute by estimating model (2). Regression results are presented in Panel B of Table 6. The coefficients on the interaction term between repeated competition and share of branches in affected regions are negative and significant. These results suggest that the share of branches in affected regions during the pre-conflict period weakens the effect of multipoint competition in the post-conflict period. More specifically, after 2014Q1, more affected banks, which had large branch networks in the affected regions before 2014Q1, no longer benefit from multimarket competition, compared to less affected counterparts that were less exposure to those markets. This complements our previous finding that banks' incentives to cooperate with their multipoint rivals are driven by the importance of the rivals and the competitiveness of the markets.

<<Insert Table 6 about here>>

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These results can be explained by two reasons. The first reason is due to the change in the competitiveness of the whole banking system. That is, the conflict hit the East and affected not only the occupied regions but also other regions, resulting in a significant decrease in the number of banks and branches. As a result, the competitiveness of the markets also decreases. Second, although the conflict influences the entire banking system, banks with more branches in the affected regions before 2014Q1 are more affected than others since they experience a sharper branch reduction or their banks were revoked. In other words, after the conflict, among the existing banks, more affected ones no longer have market share similarity with less affected counterparts and their competitive position is reduced substantially. Consequently, less affected banks may not want to mutual forbear with more affected opponents.

5.3. Robustness of tests and results

The robustness of previous results can be tested by a wide set of tests. First, we re-estimate model (1) with different samples. The fixed-effect regression results are presented in Table A2 and Table A3. We observe consistent results for multimarket competition weighted by the market share similarity with positive and significant coefficients. Interestingly, regardless of samples of multimarket competition, we find 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. This result strengthens our previous findings of the importance of geographic overlaps in profitability improvement. Further, it supports our argument that powerful banks tend not to co-operate with unimportant competitors. This may harm the performance of single-market banks and small multimarket banks.[15]

Regarding competition in all regions, one standard deviation increase in multipoint contacts at 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 center city level increase by one standard deviation, profits of all banks can be improved by 0.038% while domestic banks' returns can be increased by 0.046%. For the sample of competition in unoccupied regions, we find similar results: positively significant coefficients on repeated contacts weighted by similarly and negatively significant coefficients on multimarket contacts 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 another multimarket contact measure weighted by the ratio of developed coincided markets to total coincided markets then re-estimate model (1) with 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:

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

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[15] For the sake of space, we only report regressions with significant results. Full results are available upon request.

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

where $developed\ markets_{ij,t}$ is the number of financial and industrial developed regions in which bank i meets bank j.[16] The estimation results are reported in Table A4. We find positive and significant coefficients on multimarket competition at both regional level and center city level regardless of employed samples. Furthermore, the magnitudes of the coefficients in these regressions are 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 the difference-in-differences estimation with continuous treatment, we employ the traditional difference-in-differences approach in which the treatment and control groups are divided by a binary variable. More specifically, we modify model (2) as follows:

$$ROA_{it} = \alpha + \beta MMC_{it-1} + \gamma MMC_{it-1} * Treatment_{it} * Post + Bank_{it-1}\delta + v_t + u_i + \varepsilon_{it}$$
(4)

where *Treatment* equals 1 if the share of branches in affected regions as of 2014Q1 is more than 25%; 0 otherwise; *Post* equals 1 for the period after 2014Q1 and 0 otherwise.

Before estimating model (4), we also test the assumption about parallel trend by estimating the mean difference between the two groups before the treatment (Panel A, Table A5). We observe that the difference is insignificant, suggesting the validity of parallel trend assumption. Panel B of Table A5 presents estimated results for model (4), and the results are consistent with the ones from difference-in-differences approach using continuous treatment. That is, after the conflict, less affected banks do not have incentives to co-operate with more affected banks.

Fourth, it is possible that our results are subjected to the heterogeneity of some regions where banks operate their branches. More specifically, banks might benefit from the operation in other regions rather than the operation in Southeastern regions.[17] If banks do not benefit from operating in Southeastern regions, classifying treatment and control groups by the share in affected Southeastern regions would not be appropriate. To rule out this possibility, we re-estimate model (1) with reference to branches located in Southeastern regions only. The estimation results are presented in Panel C of Table A5. The coefficients on repeated competition in Southeastern regions are positive and significant at the 10% significance level. This suggests that in the absence of the external shock, banks can actually improve their profitability by operating and competing in the Southeastern part of Ukraine.

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[16] Financial and industrial developed regions include Dnipropetrovsk, Donetsk, Kharkiv, Kyiv city, Kyiv region, Lviv, Odesa, and Zaporizhzhia.
[17] Southeastern regions include Dnipropetrovsk, Donetsk, Kharkiv, Kherson, Luhansk, Mykolaiv, Odesa, and Zaporizhzhia.

6. Conclusion

The effect of multimarket competition 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 banks can benefit from competing in multiple markets. However, studies examining the multiple market contacts – profitability relationship have been marginal - mainly due to the lack of relevant data and the problem of the identification strategy.

In this paper, we address three issues. First, we document to what extent multimarket competition, indicated by multipoint linkages, affects banks' financial performance. Second, we study the channels through which multimarket contacts can affect banks' competitive strategies and thus performance. Third, we study the causal inference between multimarket competition and profitability in the presence of the exogenous shock.

Using data of the Ukrainian banking sector from 2009Q1 to 2015Q4, we provide evidence for the mutual forbearance hypothesis. More specifically, multimarket contacts can improve bank profitability through anti-competitive effect. This effect is driven by (1) the increased deterrence among multimarket rivals caused by the similarity in market shares and (2) the increased familiarity led by the high number of overlapped markets. On the contrary, banks do not have incentives to cooperate with their smaller multipoint rivals. Our results are robust when we adopt different samples as well as redefine market at different geographical levels. We find stronger evidence for the positive relationship between multimarket contacts and financial performance if we exclude regions with Russia driven political unrest from our sample.

Furthermore, we employ the difference-in-differences approach to track the changes in multimarket competition-profitability relationship as consequences of an unexpected shock to Ukrainian banks. In particular, we evaluate how Russia-caused political unrest in Eastern Ukraine affects competitive position of banks and the competitiveness of the markets. More specifically, we create the continuous treatment variable that equals the share of branches in the affected regions as of 2014Q1 to indicate the degree of which the banks are affected by the conflict. We expect that the higher degree of branch share in affected regions do not have significant effects on the positive association between multimarket competition and profitability before the conflict happened. Differently, after the conflict, the less affected banks no longer have incentives to cooperate with the more affected multimarket rivals and the effect of multimarket competition on performance has declined. Our regression results are consistent with those expectations.

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 could consider the mixture of geographical expansion and online service development. One the one hand, online services like internet banking or mobile bring convenience for customers in terms of finance access. On the other hand, the expanding branch networks to remote markets would benefit local customers having limited

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access to online services. This also enhances the competitiveness of the markets that incentivizes multimarket banks to cooperate to get mutual benefits.

Acknowledgements

References

Alexander, D.L., 1985. An empirical test of the mutual forbearance hypothesis: The case of bank holding companies. *Southern Economic Journal*, 52(1), pp.122-40.

Almeida, H., Kim, C.S. and Kim, H.B., 2015. Internal capital markets in business groups: Evidence from the Asian financial crisis. *The Journal of Finance*, *70*(6), pp.2539-86.

Autor, D.H., 2003. Outsourcing at will: The contribution of unjust dismissal doctrine to the growth of employment outsourcing. *Journal of Labor Economics, January*.

Baum, J.A. and Korn, H.J., 1996. Competitive dynamics of interfirm rivalry. *Academy of Management journal*, *39*(2), pp.255-91.

Baum, J.A. and Korn, H.J., 1999. Dynamics of dyadic competitive interaction. *Strategic Management Journal*, *20*(3), pp.251-78.

Berger, A.N., 1995. The relationship between capital and earnings in banking. *Journal of money, credit and Banking*, *27*(2), pp.432-56.

Berger, A.N., Dick, A.A., Goldberg, L.G. and White, L.J., 2007. Competition from Large, Multimarket Firms and the Performance of Small, Single-Market Firms: Evidence from the Banking Industry. *Journal of Money, Credit and Banking*, *39*(2-3), pp.331-68.

Bernheim, B.D. and Whinston, M.D., 1990. Multimarket contact and collusive behavior. *The RAND Journal of Economics*, pp.1-26.

Bourke, P., 1989. Concentration and other determinants of bank profitability in Europe, North America and Australia. *Journal of Banking & Finance*, *13*(1), pp.65-79.

Coccorese, P. and Pellecchia, A., 2009. Multimarket contact and profitability in banking: evidence from Italy. *Journal of Financial Services Research*, *35*(3), pp.245-71.

Czech National Bank. (2016). [online] Available at: https://apl.cnb.cz/apljerrsdad/JERRS.WEB24.SUBJECTS_COUNTS_2 [Accessed 19 March 2017].

De Bonis, R. and Ferrando, A., 2000. The Italian banking structure in the 1990s: testing the multimarket contact hypothesis. *Economic Notes*, *29*(2), pp.215-41.

Degl'Innocenti, M., Girardone, C. and Torluccio, G., 2014. Diversification, multimarket contacts and profits in the leasing industry. *Journal of International Financial Markets, Institutions and Money*, *31*, pp.231-52.

Dietrich, A. and Wanzenried, G., 2011. Determinants of bank profitability before and during the crisis: Evidence from Switzerland. *Journal of International Financial Markets, Institutions and Money*, *21*(3), pp.307-27.

Edwards, C.D., 1955. Conglomerate bigness as a source of power. In *Business concentration and price policy* (pp. 331-59). Princeton University Press.

Eichengreen, B. and Gibson, H. D., 2011. Greek Banking at the Dawn of the New Millennium. Center for Economic Policy Research Discussion Paper No. 2791. London: CEPR

Evans, W.N. and Kessides, I.N., 1994. Living by the "golden rule": Multimarket contact in the US airline industry. *The Quarterly Journal of Economics*, 109(2), pp.341-66.

Feinberg, R.M., 1984. Mutual forbearance as an extension of oligopoly theory. *Journal of Economics and Business*, *36*(2), pp.243-49.

Fuentelsaz, L. and Gómez, J., 2006. Multipoint competition, strategic similarity and entry into geographic markets. *Strategic Management Journal*, *27*(5), pp.477-99.

García-Herrero, A., Gavilá, S. and Santabárbara, D., 2009. What explains the low profitability of Chinese banks?. *Journal of Banking & Finance*, *33*(11), pp.2080-92.

Gilje, E.P., Loutskina, E. and Strahan, P.E., 2016. Exporting liquidity: Branch banking and financial integration. *The Journal of Finance*.

Gimeno, J. and Woo, C.Y., 1996. Hypercompetition in a multimarket environment: The role of strategic similarity and multimarket contact in competitive de-escalation. *Organization science*, *7*(3), pp.322-41.

Guadalupe, M. and Wulf, J., 2010. The flattening firm and product market competition: The effect of trade liberalization on corporate hierarchies. *American Economic Journal: Applied Economics*, *2*(4), pp.105-27.

Hannan, T.H. and Prager, R.A., 2004. The competitive implications of multimarket bank branching. *Journal of Banking & Finance*, *28*(8), pp.1889-1914.

Hannan, T.H. and Prager, R.A., 2009. The profitability of small single-market banks in an era of multi-market banking. *Journal of Banking & Finance*, *33*(2), pp.263-71.

Hughes, K. and Oughton, C., 1993. Diversification, multi-market contact and profitability. *Economica*, *60*(238), pp.203-24.

Jayachandran, S., Gimeno, J. and Varadarajan, P.R., 1999. The theory of multimarket competition: A synthesis and implications for marketing strategy. *The Journal of Marketing*, pp.49-66.

Li, S.X. and Chuang, Y.T., 2001. Racing for market share: Hypercompetition and the performance of multiunit-multimarket firms. *Advances in Strategic Management*, *18*, pp.329-55.

Li, S.X. and Greenwood, R., 2004. The effect of within-industry diversification on firm performance: synergy creation, multi-market contact and market structuration. *Strategic Management Journal*, *25*(12), pp.1131-53.

Matsushima, H., 2001. Multimarket contact, imperfect monitoring, and implicit collusion. *Journal of Economic Theory*, *98*(1), pp.158-78.

Mester, L.J., 1987. Multiple market contact between savings and loans: Note. *Journal of Money, Credit and Banking*, *19*(4), pp.538-49.

Mester, L.J., 1992. Perpetual signalling with imperfectly correlated costs. *The RAND Journal of Economics*, *23*(4), pp.548-63.

Miller, S.M. and Noulas, A.G., 1997. Portfolio mix and large-bank profitability in the USA. *Applied Economics*, *29*(4), pp.505-12.

Mirzaei, A., Moore, T. and Liu, G., 2013. Does market structure matter on banks' profitability and stability? Emerging vs. advanced economies. *Journal of Banking & Finance*, *37*(8), pp.2920-37.

Molyneux, P. and Forbes, W., 1995. Market structure and performance in European banking. *Applied Economics*, *27*(2), pp.155-59.

Molyneux, P. and Thornton, J., 1992. Determinants of European bank profitability: A note. *Journal of Banking & Finance*, *16*(6), pp.1173-78.

National bank of Slovakia. (2016). *Development of the Banking Sector in the Slovak Republic since 2013 to 2016 - www.nbs.sk*. [online] Available at: http://www.nbs.sk/en/statistics/a-survey-of-financial-sector-development/development-of-the-banking-sector-in-the-sr/roz13_16a [Accessed 19 March 2017].

National Bank of Ukraine, 2014. *On Recalling and Cancellation of Banking Licenses and General Licenses for Carrying out Foreign Currency Operations of Certain Banks and Closing of Banks' Branches Located on the Territory of the Autonomous Republic of Crimea and the City of Sevastopol*. Available at http://www.bank.gov.ua/control/uk/publish/article?art_id=7319429&cat_id=13436768 [Accessed 19 March 2017].

National Bank of Ukraine, 2016. *Key performance indicators of banks*. [online] Available at: http://bank.gov.ua/control/en/publish/article?art_id=37942&cat_id=37937 [Accessed 19 March 2017].

Parker, P.M. and Röller, L.H., 1997. Collusive conduct in duopolies: multimarket contact and cross-ownership in the mobile telephone industry. *The RAND Journal of Economics*, *28*(20, pp.304-22.

Pasiouras, F. and Kosmidou, K., 2007. Factors influencing the profitability of domestic and foreign commercial banks in the European Union. *Research in International Business and Finance*, *21*(2), pp.222-37.

Pilloff, S.J., 1999. Multimarket contact in banking. *Review of Industrial Organization*, *14*(2), pp.163-82.

Rhoades, S.A. and Heggestad, A.A., 1985. Multimarket interdependence and performance in banking: Two tests. *Antitrust Bull.*, *30*, p.975.

Sandler, R.D., 1988. Market share instability in commercial airline markets and the impact of deregulation. *The Journal of Industrial Economics*, *36*(3), pp.327-35.

Scott, J.T., 1991. Multimarket contact among diversified oligopolists. *International Journal of Industrial Organization*, *9*(2), pp.225-38.

Singal, V., 1996. Airline mergers and multimarket contact. *Managerial and Decision Economics*, *17*(6), pp.559-74.

Solomon, E.H., 1972. Bank merger policy and problems: a linkage theory of oligopoly. *Banking Law Journal*, *89*(2), pp.116-35.

Sorenson, T.L., 2007. Credible collusion in multimarket oligopoly. *Managerial and Decision Economics*, *28*(2), pp.115-28.

Spagnolo, G., 1999. On interdependent supergames: multimarket contact, concavity, and collusion. *Journal of Economic Theory*, *89*(1), pp.127-39.

Teece, D.J., Pisano, G. and Shuen, A., 1997. Dynamic capabilities and strategic management. *Strategic Management Journal*, pp.509-33.

The Banks (2016). *List of Banks in Hungary*. [online] Available at: https://thebanks.eu/banks-by-country/Hungary [Accessed 19 March 2017].

The Polish Bank Association (2016). *ZBP: General Information*. [online] Available at: https://zbp.pl/eng/first [Accessed 19 March 2017].

Whalen, G.W., 1996. Nonlocal concentration, multimarket linkages, and interstate banking. *Antitrust Bull.*, *41*, p.365.

Yang, T. and Zhao, S., 2014. CEO duality and firm performance: Evidence from an exogenous shock to the competitive environment. *Journal of Banking & Finance*, *49*, pp.534-52.

Figure 1. Banks and branches distribution
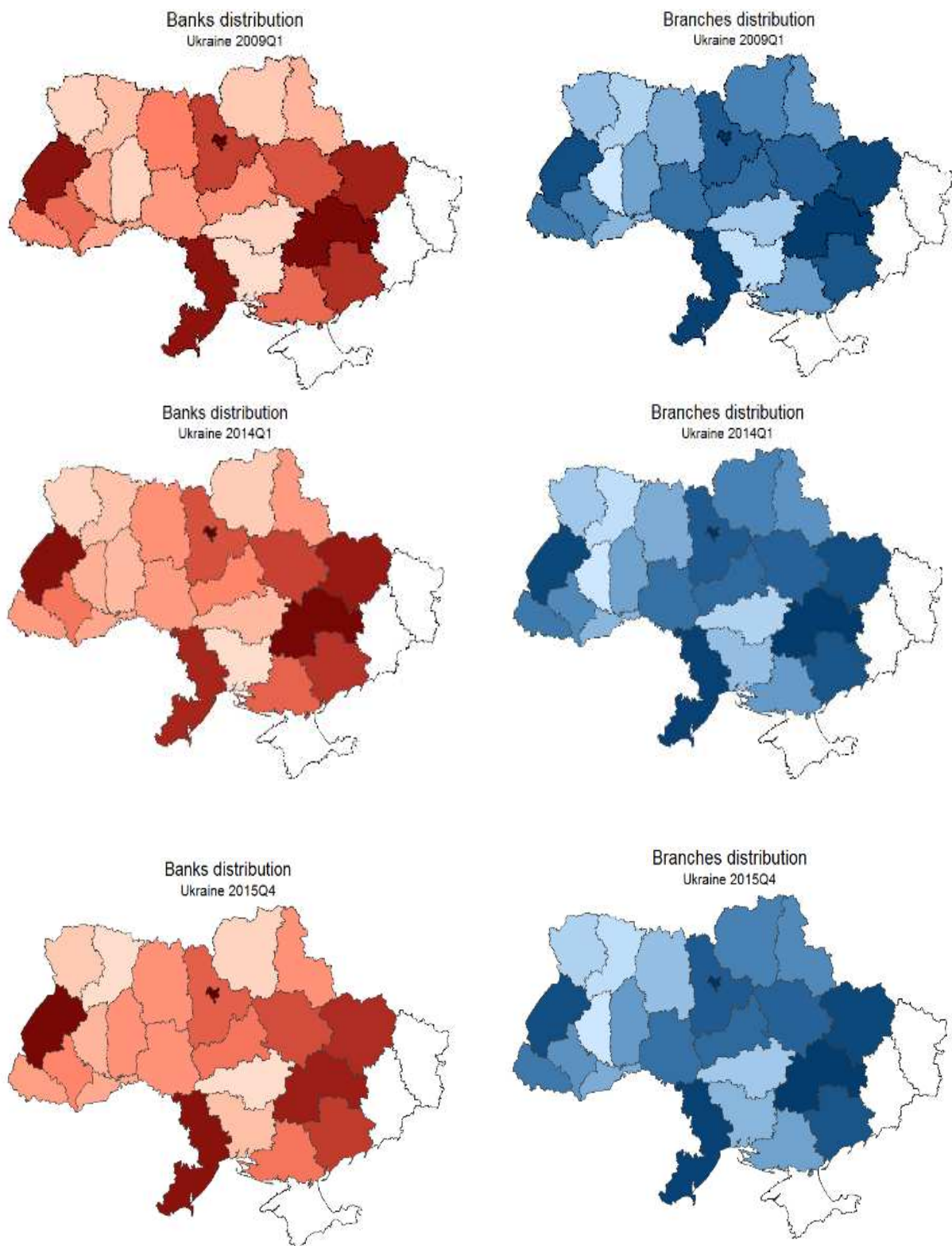
This figure displays the distribution of Ukrainian banks and branches across 27 regions. The white parts refer to occupied regions (Crimea, Donetsk and Lugansk). The darker shading indicates relatively more banks/branches in the region.

Figure 2. Development of Ukrainian banking system over time (2009-2015)
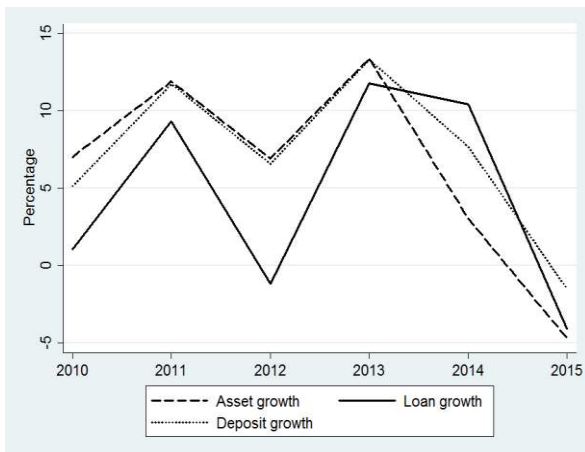
Panel A
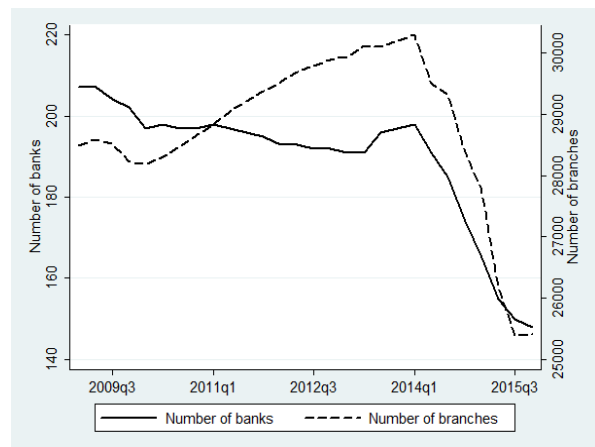
Panel B
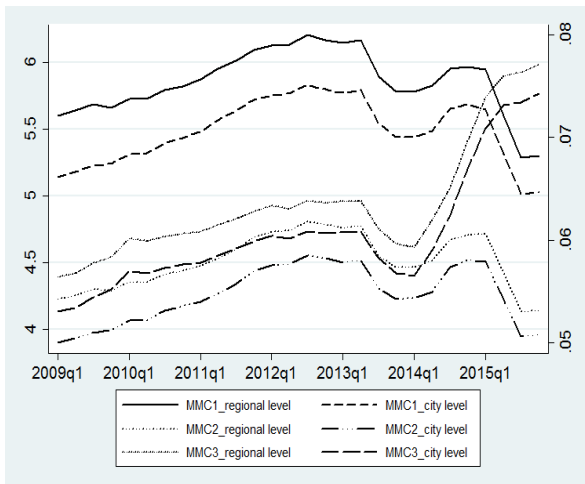
Panel C
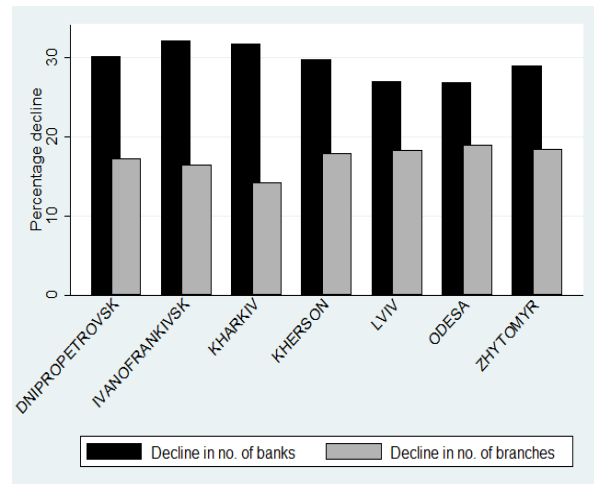
Panel D

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 the 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.

Figure 3. Effects of share in affected regions on MMC – performance sensitivity for quarters before, during and after the conflict
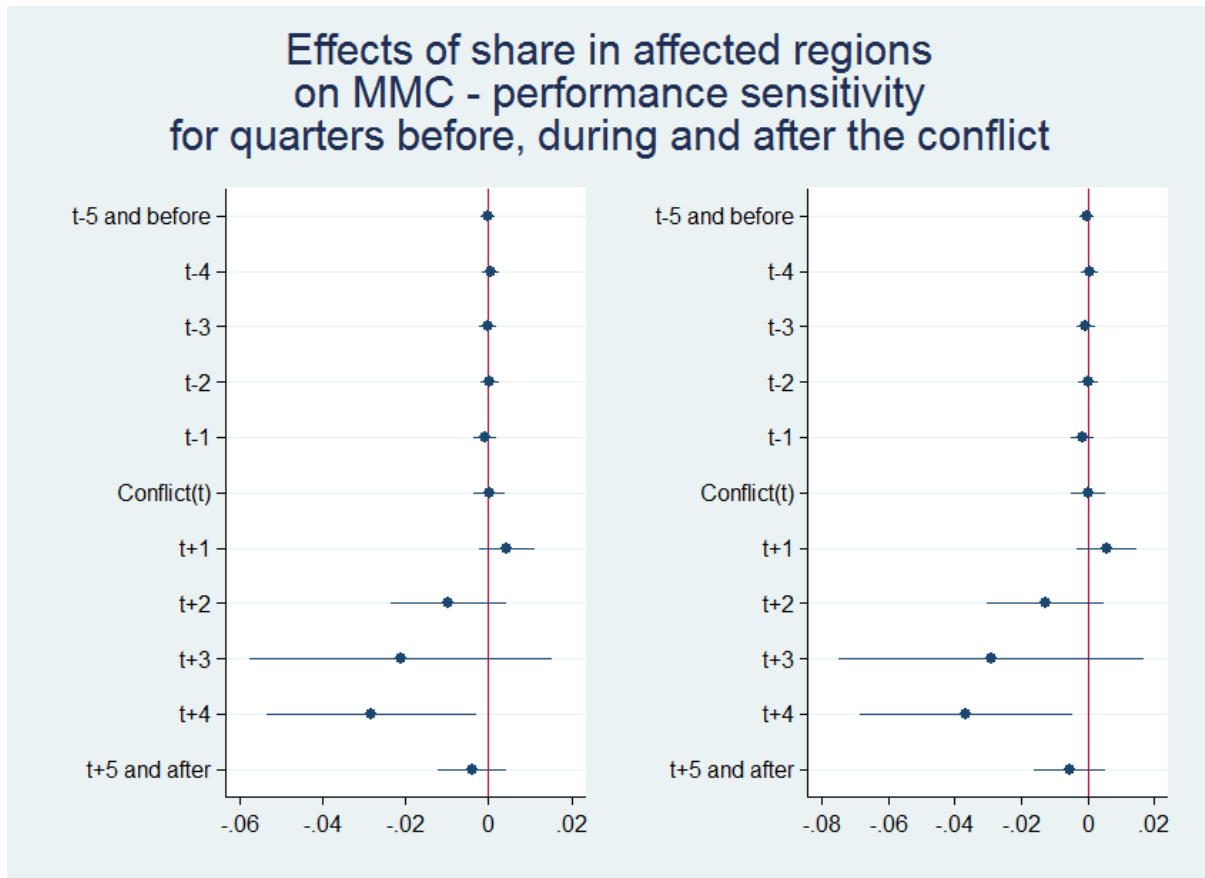
This figure indicates the point estimates and 95% confidence intervals of coefficients on the treatment effect in model (3). Estimates are taken from estimations with multimarket competition weighted by similarity and multimarket competition weighted by familiarity.

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

	Mean	*SD*	N
	Multimarket competition at regional level		
MMC *weighted by similarity*	5.865	3.723	4,687
MMC *weighted by coincided markets ratio*	4.517	2.711	4,687
MMC *weighted by rival's size*	0.063	0.047	4,687
	Multimarket competition at center city level		
MMC *weighted by similarity*	5.494	3.607	4,687
MMC *weighted by coincided markets ratio*	4.262	2.652	4,687
MMC *weighted by rival's size*	0.060	0.046	4,687
	Bank profitability		
ROA	-0.012	0.106	4,660
	Bank-specific variables		
Size	14.225	1.584	4,684
Liquidity	0.160	0.158	4,572
Equity	0.243	0.191	4,593
Loans/Total assets	0.649	0.271	4,682
Deposits/Total assets	0.515	0.850	4,680

Descriptive statistics for all banks in the sample of all regions. ROA is net profits 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; Deposits/Total assets is ratio of total deposits to total assets; Loans/Total assets is ratio of total loans 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 *weighted by similarity*	6.573	3.453	4,092	-	-	-	-
MMC *weighted by coincided markets ratio*	5.028	2.521	4,092	-	-	-	-
MMC *weighted by rival's size*	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 *weighted by similarity*	6.305	3.324	3,972	-	-	-	-
MMC *weighted by coincided markets ratio*	4.849	2.457	3,972	-	-	-	-
MMC *weighted by rival's size*	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***
Loans/Total assets	0.672	0.268	3,969	0.521	0.252	713	0.151***
Deposits/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 profits 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; Deposits/Total assets is ratio of total deposits to total assets; Loans/Total assets is ratio of total loans 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 *weighted by similarity*	MMC2 *weighted by coincided markets ratio*	MMC3 *weighted by rival's size*
	(1)	(2)	(3)
Multimarket competition	0.005*	0.005*	-0.172
	(0.003)	(0.003)	(0.197)
Size	-0.000	0.000	0.001
	(0.012)	(0.012)	(0.012)
Liquidity	0.044	0.044	0.0431
	(0.037)	(0.037)	(0.0367)
Equity	-0.042	-0.043	-0.046
	(0.044)	(0.044)	(0.043)
Loans/Total assets	0.018	0.019	0.018
	(0.027)	(0.027)	(0.027)
Deposits/Total assets	0.039*	0.039*	0.045**
	(0.023)	(0.023)	(0.023)
Quarter and year fixed-effect	Yes	Yes	Yes
Bank 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-effect 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. All regressions include a constant term, but the estimated coefficients are not reported. ROA is net profits 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; Deposits/Total assets is ratio of total deposits to total assets; Loans/Total assets is ratio of total loans 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 *weighted by similarity*	MMC2 *weighted by coincided markets ratio*	MMC1 *weighted by similarity*	MMC1 *weighted by similarity*
	(1)	(2)	(3)	(4)
Multimarket competition	0.006**	0.006*	0.004*	0.003*
	(0.003)	(0.003)	(0.002)	(0.002)
Size	-0.001	-0.000	-0.000	-0.000
	(0.012)	(0.012)	(0.012)	(0.012)
Liquidity	0.045	0.044	0.045	0.045
	(0.038)	(0.038)	(0.037)	(0.037)
Equity	-0.043	-0.044	-0.041	-0.042
	(0.044)	(0.044)	(0.043)	(0.043)
Loans/Total assets	0.017	0.017	0.018	0.018
	(0.027)	(0.027)	(0.027)	(0.027)
Deposits/Total assets	0.041*	0.042*	0.040*	0.040*
	(0.023)	(0.023)	(0.023)	(0.023)
Quarter and year fixed-effect	Yes	Yes	Yes	Yes
Bank 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-effect 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. All regressions include a constant term, but the estimated coefficients are not reported. ROA is net profits 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; Deposits/Total assets is ratio of total deposits over total assets; Loans/Total assets is ratio of total loans 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 *weighted by similarity*	MMC2 *weighted by coincided markets ratio*	MMC1 *weighted by similarity*	MMC2 *weighted by coincided markets ratio*	MMC1 *weighted by similarity*	MMC2 *weighted by coincided markets ratio*	MMC1 *weighted by similarity*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Multimarket competition	0.006**	0.007*	0.006**	0.007**	0.005**	0.005*	0.005*
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Size	0.001	0.001	0.001	0.001	0.000	0.001	0.000
	(0.012)	(0.012)	(0.013)	(0.013)	(0.012)	(0.012)	(0.012)
Liquidity	0.040	0.040	0.040	0.040	0.042	0.042	0.042
	(0.037)	(0.037)	(0.038)	(0.038)	(0.037)	(0.037)	(0.037)
Equity	-0.040	-0.041	-0.040	-0.040	-0.040	-0.041	-0.040
	(0.045)	(0.044)	(0.046)	(0.046)	(0.045)	(0.045)	(0.045)
Loans/Total assets	0.013	0.013	0.011	0.011	0.013	0.013	0.013
	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)	(0.027)	(0.028)
Deposits/Total assets	0.039*	0.039*	0.041*	0.041*	0.040*	0.041*	0.040*
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
Quarter and year fixed-effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank 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-effect 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 profits 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; Deposits/Total assets is ratio of total deposits over total assets; Loans/Total assets is ratio of total loans to total assets. *, ** and *** denote significance at 10%, 5% and 1%, respectively.

Table 6. Results for quasi-experimental approach.

	(1)	(2)	(3)
	MMC1	MMC2	MMC3

Panel A: The parallel trend of treatment and control banks in pre-conflict period

	MMC1 *weighted by similarity*	MMC2 *weighted by coincided markets ratio*	MMC3 *weighted by rival's size*
Multimarket competition	0.006**	0.008**	0.263
	(0.003)	(0.004)	(0.195)
MMC*Share in affected regions leads and lags			
$Conflict_{t-5\ backward}$	-0.000	-0.000	0.012
	(0.001)	(0.001)	(0.084)
$Conflict_{t-4}$	0.001	0.000	0.094
	(0.001)	(0.001)	(0.102)
$Conflict_{t-3}$	-0.000	-0.001	0.013
	(0.001)	(0.001)	(0.103)
$Conflict_{t-2}$	0.000	0.000	0.052
	(0.001)	(0.001)	(0.110)
$Conflict_{t-1}$	-0.001	-0.001	-0.075
	(0.001)	(0.002)	(0.125)
$Conflict_{t}$	0.000	0.000	0.012
	(0.002)	(0.003)	(0.179)
$Conflict_{t+1}$	0.004	0.006	0.392
	(0.003)	(0.005)	(0.291)
$Conflict_{t+2}$	-0.010	-0.013	-0.760
	(0.007)	(0.009)	(0.629)
$Conflict_{t+3}$	-0.021	-0.029	-1.330
	(0.018)	(0.023)	(1.597)
$Conflict_{t+4}$	-0.028**	-0.037**	-2.121*
	(0.013)	(0.016)	(1.075)
$Conflict_{t+5}$	-0.004	-0.005	-0.367
	(0.004)	(0.005)	(0.301)
Quarter and year fixed-effect	Yes	Yes	Yes
Bank fixed-effect	No	No	No
Group fixed-effect	Yes	Yes	Yes
Observations	3,096	3,096	3,096
Adj. R-Square	0.063	0.064	0.061

Panel B: The effect of multimarket competition on profitability in relation with exogenous shock

	MMC1 *weighted by similarity*	MMC2 *weighted by coincided markets ratio*	MMC3 *weighted by rival's size*
Multimarket competition	0.020	0.021	0.267
	(0.013)	(0.015)	(0.964)
MMC*Share in affected regions*Post	-0.014*	-0.019*	-1.220
	(0.008)	(0.011)	(0.779)
Share in affected regions*Post	-0.004	0.002	-0.012
	(0.037)	(0.037)	(0.037)
Size	0.071*	0.072*	0.076*
	(0.041)	(0.041)	(0.040)
Liquidity	-0.010	-0.014	-0.021
	(0.092)	(0.091)	(0.091)
Equity	-0.105	-0.106	-0.108
	(0.167)	(0.167)	(0.167)
Loans/Total assets	-0.060	-0.059	-0.057
	(0.126)	(0.125)	(0.125)
Deposits/Total assets	0.108	0.110	0.118
	(0.102)	(0.103)	(0.104)
Quarter and year fixed-effect	Yes	Yes	Yes
Bank fixed-effect	No	No	No

Group fixed-effect	Yes	Yes	Yes
Observations	1,042	1,042	1,042
Adj. R-Square	0.077	0.077	0.076

Panel A reports fixed-effect regressions testing the parallel trend of the treatment and control banks during the pre-conflict period. Conflict dummies t-4 – t+4 equals1 in only one quarter per bank. Dummies Conflict$_{t-5 \text{ backward}}$ and Conflict $_{t+5 \text{ forward}}$ equal 1 in every quarter beginning with the fifth quarter before and the fifth quarter after the conflict, respectively. Panel B reports fixed-effect difference-in-differences regression with continuous treatment. Regression is estimated for multimarket domestic banks. All regressions include a constant term, but the estimated coefficients are not reported. Robust standard errors are reported in parentheses. ROA is net profits 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; Deposits/Total assets is ratio of total deposits over total assets; Loans/Total assets is ratio of total loans to total assets. *Share in the affected regions* is the share of branches of a bank in the occupied regions and regions with pro-Russian protests (affected regions) as of 2014Q1. *Post* equals 1 for post-conflict period, 0 for pre-conflict period. *, ** and *** denote significance at 10%, 5% and 1%, respectively.

Appendix 1. Variable description.

Variable	Description	Expected sign
	Multimarket competition	
MMC *weighted by similarity*	Multimarket contact measure weighted by similarity $$s_{ik,t} = \frac{branches_{ik,t}}{branches_{k,t}}$$ $$SI_{ij,t} = \sum_k |s_{ik,t} - s_{jk,t}|$$ $$w^1_{ij,t} = \frac{m_{ij,t} - SI_{ij,t}}{m_{ij,t}}$$ $$MMC^1_{it} = \frac{\sum_{j \neq i} m_{ij,t} w^1_{ij,t}}{rivals_{it}}$$	+/-
MMC *weighted by coincided markets ratio*	Multimarket contact measure weighted by coincided markets ratio $$w^2_{ij,t} = \frac{m_{ij,t}}{markets_{it}}$$ Where $markets_{it}$ is the total markets in which bank i operates at least one branch in quarter t. $$MMC^2_{it} = \frac{\sum_{j \neq i} m_{ij,t} w^2_{ij,t}}{rivals_{it}}$$	+/-
MMC *weighted by rival's size*	Multimarket contact measure weighted by rival's size $$w^3_{ij,t} = \frac{\sum_k s_{jk,t}}{m_{ij,t}}$$ $$MMC^3_{it} = \frac{\sum_{j \neq i} m_{ij,t} w^3_{ij,t}}{rivals_{it}}$$	+/-
	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	+/-
Deposits/Total assets	Total deposits over total assets	+/-
Loans/Total assets	Ratio of total loans to total assets	+/-

Appendix 2

Table A1. Descriptive statistics for multimarket competition in different samples.

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

Descriptive statistics for multimarket contacts corresponding to different samples.

Table A2. Robustness check – sample of all banks.

	All banks		Domestic banks
	(1)	(2)	(3)
	MMC1	MMC3	MMC1
	weighted by similarity	*weighted by rival's size*	*weighted by similarity*
	Panel A. Regional level		
Multimarket competition	0.004*	-0.358*	0.004**
	(0.002)	(0.194)	(0.002)
Size	0.003	0.005	-0.001
	(0.011)	(0.011)	(0.016)
Liquidity	0.035	0.036	0.026
	(0.027)	(0.027)	(0.029)
Equity	-0.036	-0.037	-0.056
	(0.035)	(0.035)	(0.040)
Loans/Total assets	0.022	0.021	0.008
	(0.023)	(0.023)	(0.028)
Deposits/Total assets	0.032*	0.040**	0.028
	(0.018)	(0.018)	(0.020)
Quarter and year fixed-effect	Yes	Yes	Yes
Bank 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. Center city level		
Multimarket competition	0.004*	-0.369*	0.004*
	(0.002)	(0.197)	(0.002)
Size	0.003	0.005	-0.001
	(0.011)	(0.011)	(0.016)
Liquidity	0.035	0.036	0.026
	(0.027)	(0.027)	(0.029)
Equity	-0.036	-0.038	-0.056
	(0.035)	(0.035)	(0.040)
Loans/Total assets	0.022	0.021	0.008
	(0.023)	(0.023)	(0.028)
Deposits/Total assets	0.033*	0.040**	0.028
	(0.018)	(0.018)	(0.020)
Quarter and year fixed-effect	Yes	Yes	Yes
Bank 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

This table reports fixed-effect regressions for the sample of all banks. Panels A and B report regressions for multimarket competition at regional and center city levels, respectively. 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 natural logarithm of total assets; Equity is ratio of total equity over total assets; Liquidity is ratio of liquid assets over total assets; Deposits/Total assets is ratio of total deposits over total assets; Loans/Total assets is ratio of total loans to total assets. *, ** and *** denote significance at 10%, 5% and 1%, respectively.

Table A3. Robustness check – sample of domestic banks.

	All banks		Domestic banks
	(1)	(2)	(3)
	MMC1	MMC3	MMC1
	weighted by similarity	*weighted by rival's size*	*weighted by similarity*
	Panel A. Regional level		
Multimarket competition	0.004*	-0.369*	0.005*
	(0.002)	(0.202)	(0.003)
Size	0.003	0.004	-0.001
	(0.011)	(0.011)	(0.017)
Liquidity	0.035	0.036	0.027
	(0.027)	(0.027)	(0.029)
Equity	-0.038	-0.041	-0.058
	(0.036)	(0.036)	(0.042)
Loans/Total assets	0.022	0.021	0.009
	(0.024)	(0.023)	(0.028)
Deposits/Total assets	0.033*	0.039**	0.028
	(0.019)	(0.019)	(0.021)
Quarter and year fixed-effect	Yes	Yes	Yes
Bank 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 B. Center city level		
Multimarket competition	0.004*	-0.385*	0.005*
	(0.002)	(0.204)	(0.002)
Size	0.003	0.004	-0.001
	(0.011)	(0.011)	(0.017)
Liquidity	0.035	0.036	0.026
	(0.027)	(0.027)	(0.029)
Equity	-0.038	-0.041	-0.059
	(0.036)	(0.036)	(0.042)
Loans/Total assets	0.022	0.021	0.009
	(0.024)	(0.023)	(0.028)
Deposits/Total assets	0.033*	0.039**	0.028
	(0.019)	(0.019)	(0.021)
Quarter and year fixed-effect	Yes	Yes	Yes
Bank 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-effect regressions for the sample of domestic banks. Panels A and B report regressions for multimarket competition at regional and center city levels, respectively. 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 natural logarithm of total assets; Equity is ratio of total equity over total assets; Liquidity is ratio of liquid assets over total assets; Deposits/Total assets is ratio of total deposits over total assets; Loans/Total assets is ratio of total loans to total assets. *, ** and *** denote significance at 10%, 5% and 1%, respectively.

Table A4. 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	0.014**	0.014**	0.009**	0.009*
of developed markets	(0.006)	(0.006)	(0.005)	(0.004)
Size	-0.000	0.003	-0.001	-0.001
	(0.012)	(0.011)	(0.012)	(0.012)
Liquidity	0.045	0.035	0.046	0.046
	(0.037)	(0.027)	(0.036)	(0.036)
Equity	-0.042	-0.035	-0.042	-0.042
	(0.044)	(0.035)	(0.043)	(0.043)
Loans/Total assets	0.016	0.021	0.017	0.018
	(0.027)	(0.024)	(0.027)	(0.027)
Deposits/Total assets	0.041*	0.033*	0.040*	0.040*
	(0.022)	(0.018)	(0.022)	(0.023)
Quarter and year fixed-effect	Yes	Yes	Yes	Yes
Bank 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	0.015**	0.014**	0.014**	0.014**
of developed markets	(0.006)	(0.007)	(0.006)	(0.006)
Size	0.000	0.001	-0.000	-0.000
	(0.012)	(0.013)	(0.012)	(0.012)
Liquidity	0.040	0.040	0.043	0.043
	(0.037)	(0.038)	(0.037)	(0.037)
Equity	-0.041	-0.040	-0.040	-0.040
	(0.045)	(0.046)	(0.045)	(0.045)
Loans/Total assets	0.011	0.010	0.013	0.013
	(0.028)	(0.028)	(0.028)	(0.028)
Deposits/Total assets	0.040*	0.042*	0.040*	0.040*
	(0.022)	(0.023)	(0.023)	(0.023)
Quarter and year fixed-effect	Yes	Yes	Yes	Yes
Bank 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-effect regressions for the sample of multimarket banks. Multimarket competition in 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. All regressions include a constant term, but the estimated coefficients are not reported. ROA is net profits 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; Deposits/Total assets is ratio of total deposits over total assets; Loans/Total assets is ratio of total loans to total assets. *, ** and *** denote significance at 10%, 5% and 1%, respectively.

Table A5. Robustness check for difference-in-differences approach

	(1)	(2)	(3)
	Panel A. Parallel trend test of the dependent variable for the pre-treatment period		
	$Mean_{control\ group}$	$Mean_{treated\ group}$	Difference
ROA	-0.007	-0.004	-0.003
	Panel B. Difference-in-differences estimation with binary treatment		
	MMC1 *weighted by similarity*	MMC2 *weighted by coincided markets ratio*	MMC3 *weighted by rival's size*
Multimarket competition	0.016	0.015	-0.116
	(0.012)	(0.014)	(0.967)
MMC*Treatment*Post	-0.006**	-0.008**	-0.556**
	(0.003)	(0.004)	(0.264)
Size	0.075*	0.076*	0.081*
	(0.042)	(0.042)	(0.041)
Liquidity	-0.015	-0.018	-0.025
	(0.092)	(0.091)	(0.090)
Equity	-0.092	-0.094	-0.090
	(0.164)	(0.164)	(0.164)
Loans/Total assets	-0.066	-0.064	-0.063
	(0.125)	(0.124)	(0.124)
Deposits/Total assets	0.118	0.119	0.129
	(0.104)	(0.104)	(0.105)
Quarter and year fixed-effect	Yes	Yes	Yes
Bank fixed-effect	No	No	No
Group fixed-effect	Yes	Yes	Yes
Observations	1,042	1,042	1,042
Adj. R-Square	0.078	0.078	0.078
	Panel C: The effect of multimarket competition in south-eastern regions on bank performance		
	MMC1 *weighted by similarity*	MMC2 *weighted by coincided markets ratio*	MMC3 *weighted by rival's size*
Multimarket competition	0.005*	0.013*	-0.498
	(0.003)	(0.008)	(0.513)
Size	-0.000	0.005	0.005
	(0.012)	(0.012)	(0.012)
Liquidity	0.044	0.061	0.057
	(0.037)	(0.051)	(0.044)
Equity	-0.042	-0.016	-0.021
	(0.044)	(0.043)	(0.041)
Loans/Total assets	0.018	0.008	0.020
	(0.027)	(0.034)	(0.033)
Deposits/Total assets	0.039*	0.057**	0.055**
	(0.023)	(0.025)	(0.022)
Quarter and year fixed-effect	Yes	Yes	Yes
Bank 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-effect difference-in-differences regression using traditional binary treatment. Regression is estimated for multimarket domestic banks. Panel C reports fixed-effect regression for multimarket banks with reference to multimarket competition in Southeastern regions. All regressions include a constant term, but the estimated coefficients are not reported. Robust standard errors are reported in parentheses. ROA is net profits 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; Deposits/Total assets is ratio of total deposits over total assets; Loans/Total assets is ratio of total loans to total assets. *, ** and *** denote significance at 10%, 5% and 1%, respectively.

Appendix 3

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	$s_{1A} = 0.25$	$s_{2C} = 0.25$	$s_{3C} = 0$	$s_{4C} = 0.5$

MMC1 calculation for bank 1:

$$SI_{12} = |0.25 - 0.25| + |0.25 - 0.25| = 0 \Rightarrow w1_{12} = {(2-0)}/{2} = 1$$

$$SI_{13} = |0.1 - 0.4| = 0.3 \Rightarrow w1_{12} = {(1-0.3)}/{1} = 0.7$$

$$SI_{14} = |0.1 - 0.5| + |0.25 - 0.5| + |0.25 - 0.5| = 0.9 \Rightarrow w1_{12} = {(3-0.9)}/{3} = 0.7$$

$$MMC1 = \frac{2\times1 + 1\times0.7 + 3\times0.7}{3} = 1.6$$

MMC2 calculation for bank 1:

$$w2_{12} = {2}/{3} = 0.667$$

$$w2_{13} = {1}/{3} = 0.333$$

$$w2_{14} = {3}/{3} = 1$$

$$MMC2 = \frac{2\times0.667 + 1\times0.333 + 3\times1}{3} = 1.556$$

MMC3 calculation for bank 1:

$$w3_{12} = {(0.25 + 0.25)}/{2} = 0.25$$

$$w3_{13} = {0.4}/{1} = 0.4$$

$$w3_{14} = {(0.5 + 0.5 + 0.5)}/{3} = 0.5$$

$$MMC3 = \frac{2\times0.25 + 1\times0.4 + 3\times0.5}{3} = 0.8$$