



European Bank
for Reconstruction and Development

Selection and hidden bias in cross-border bank acquisitions:

Ukraine's takeover wave

Muzaffarjon Ahunov, Leo Van Hove and Marc Jegers

Abstract

We investigate the impact of cross-border takeovers on the performance of target banks in Ukraine. We combine propensity score matching and a difference-in-difference methodology, checking for temporary unobservables. Acquirers mainly targeted large less-capitalised banks with average efficiency and profitability. After takeover, the cost efficiency of the acquired banks improved thanks to a decreased reliance on deposits but this did not result in higher profitability or higher loan market shares. Overall, our findings only tally piecemeal with the existing multi-country studies for transition economies.

Keywords: cross-border takeovers, bank performance, selection bias, hidden bias

JEL Classification Number: G15, G21, G34, F36

Contact details: Muzaffarjon Ahunov, EBRD, One Exchange Square, London EC2A 2JN, UK.

Phone: +44 20 7338 8427; Fax: +44 20 7338 6111.

Email: ahunovm@ebrd.com ; mahunov@gmail.com

Muzaffarjon Ahunov is at the Office of the Chief Economist, EBRD. Leo Van Hove and Marc Jegers are Professors at the Free University Brussels (VUB).

We are indebted to Rudi Vander Vennet, Diane Breesch and Martin Brown for helpful comments on an earlier version of this paper. We also thank Ralph de Haas and seminar participants at the EBRD for their valuable comments.

The working paper series has been produced to stimulate debate on the economic transformation of central and eastern Europe and the CIS. Views presented are those of the authors and not necessarily those of the EBRD.

1. Introduction

Bank efficiency studies such as Fries and Taci (2005), Grigorian and Manole (2006) and Kyj and Isik (2008) conclude that in the early 2000s Ukraine had the most inefficient banking system among transition economies. Besides other factors, it was the low number of cross-border takeovers and the resulting low level of strategic foreign ownership that were often blamed for this inefficiency. Kyj and Isik (2008: 390), for instance, conjecture that “the lack of strong foreign participation in the banking sector [of Ukraine] does not create a competitive climate that would lead to greater efficiency”, and claim that a “majority foreign ownership (with some local support) is the ideal form for efficiency”. Interestingly, from the mid-2000s onwards, Ukraine experienced a surge in the number of cross-border bank takeovers. In the span of two years, 2005 and 2006, the number of foreign majority takeovers jumped from 2 to 14. Dushkevych and Zelenyuk (2006) label this period the “sixth stage” of development of the Ukrainian banking system, a stage characterised by a wave of foreign takeovers¹.

However, whether these cross-border takeovers have improved the efficiency of the Ukrainian target banks remains an open question, as is true for all former Soviet Union (FSU) transition economies for that matter. In a recent study, Havrylchuk and Jurzyk (2011) report evidence on the benefits of cross-border takeovers in a number of central and eastern European (CEE) transition economies. However, all these countries aim(ed) for EU accession and are both institutionally and economically more advanced compared to most of their FSU counterparts. This said, Havrylchuk and Jurzyk raise an important issue that may explain the mixed evidence for FSU transition economies so far. In particular, following Peek et al. (1999), they point out that existing studies fail to take into account that foreign banks typically acquire institutions with specific characteristics. In other words, acquired banks and banks not acquired by foreign banks are not necessarily fully comparable in the pre-takeover period, so their post-takeover performance cannot be evaluated correctly without controlling for selection bias. Following Havrylchuk and Jurzyk, we therefore first explore whether acquired and non-acquired banks in Ukraine were any different in the pre-takeover period. Because this proved to be the case, we subsequently use matching methods to control for the differences when assessing performance effects.

We focus on the case of Ukraine for a number of reasons. Firstly, as we discuss in section 2, we are convinced that a single-country study may have certain advantages over the existing multi-country studies. Secondly, the surge in the number of cross-border takeovers in Ukraine happened in a late stage of its transition when domestic banks were already complying with the International Accounting Standards (IAS). As a result, there are no issues with data

¹ Dushkevych and Zelenyuk (2006) point out that this surge in the number of banks in foreign hands coincided with the removal of Ukraine from the “black list” of the Financial Action Task Force (FATF). The FATF earlier had classified Ukraine as a country failing to implement anti-money laundering legislation that would meet international standards. Other analysts associate the surge with the formal recognition of Ukraine by the European Commission as a full-fledged market economy; see for instance “Istoriya Ukrainskogo Kapitalizma”, special project of Investgazeta Number 24, 24 June 2010, last accessed on 7 February 2013 at url: <http://www.investgazeta.net/ekonomika/istorija-ukrainskogo-kapitalizma---2005-159221/>

availability, quality and comparability across banks, whereas this is an important problem in other studies, in particular for the early years of the transition period. Thirdly, as with other transition economies, while Ukraine experienced a large inflow of foreign investment into its banking system, a significant share of the assets remained in domestic hands. Specifically, foreign banks' share in the total assets of the Ukrainian banking sector increased from 8.8 per cent in 2004 to 31.9 and 45.0 per cent in 2006 and 2008 respectively. In contrast, foreign banks in 2006 controlled, respectively, 74 per cent of the sector in Poland, 80 per cent in Hungary and 95 per cent in both the Czech Republic and Slovakia (Degryse et al., 2012). Moreover, the Ukrainian banking sector has always been characterised by a low level of concentration. Raiffeisen Bank Aval in its Annual Report for 2007, for instance, notes that "the concentration in the banking sector remains relatively low as compared to other neighbouring countries, with top 10 banks controlling 56 per cent of Ukraine's loan market and 54 per cent of the deposit market" (Raiffeisen Bank Aval, 2007: 148). The bottom line from these two observations is that the pool of non-acquired banks that can serve as a benchmark is larger for the case of Ukraine which, *ceteris paribus*, should result in better-quality matches. Lastly, like other FSU economies Ukraine had (and still has) a worse institutional environment compared to the CEE economies. In 2012 the *Financial Times* reported that "Ukraine's failure to establish rule of law and effective institutions have [sic] left its economy lagging far behind those of its neighbours. Its nominal gross domestic product per capita last year [in 2011], at \$3,621, was little over a quarter of EU member Poland's \$13,540, or Russia's \$12,993"². The Ukrainian case can therefore provide unique lessons on foreign banks' performance in an institutionally adverse environment.

We examine all foreign takeovers that took place at the brim of the "merger wave"; to be more precise, between January 2005 and December 2007. To that end, we have constructed an unbalanced panel dataset with 768 observations on 134 banks for the period 2004-09 (because we also needed pre- and post-acquisition years) and for a broad range of performance indicators. We focus on takeovers that give foreign investors a majority participation.

The following four important findings emerge from our analysis.

1. In Ukraine foreign banks acquired mainly large less-capitalised banks, with average efficiency and profitability.
2. The takeovers significantly decreased the interest expenses and cost-income ratios of the acquired banks relative to comparable non-acquired banks, and this was thanks to a decreased reliance on deposits.

² Source: "Ukraine: An orange era gone bitter", *Financial Times*, 3 June 2012, last accessed on 13 May 2013 at url: <http://www.ft.com/cms/s/0/7c7f15d8-ab19-11e1-b875-00144feabdc0.html>

3. Somewhat surprisingly, the foreign banks in Ukraine were not able to translate the reduced funding costs into higher profitability ratios, at least not in the first two years following takeover.
4. While the foreign banks were quick to further increase the size of their Ukrainian targets, this did not result in increased deposit and loan market shares relative to comparable domestic banks.

A comparison of our post-takeover findings with the existing evidence for CEE economies yields a mixed picture. The increased cost efficiency is in line with Havrylchyk and Jurzyk (2011) and clashes with, for example, Lanine and Vander Vennet (2007). However, the absence of any impact on profitability in our findings is in line with Lanine and Vander Vennet (2007) and at odds with those of Havrylchyk and Jurzyk (2011). The bottom line appears to be that the case of Ukraine is quite unique for several possible reasons - the worse institutional environment, the lateness of the foreign takeover wave and also the regulatory restrictions imposed after the onset of the financial crisis.

In terms of methodology, a novelty of our paper is that we add a step to Havrylchyk and Jurzyk's approach and therefore our paper is the first observational study in the banking field to conduct a sensitivity analysis that checks for the presence of hidden bias. In particular, we test the extent to which our results for the post takeover period are sensitive to temporary unobservable factors that we might have failed to control for. Compared to other papers we also use a broader selection of matching methods. The rest of the paper is organised as follows. Section 2 reviews the relevant literature. Section 3 describes the data collection process and Section 4 reports descriptive statistics for our bank-level variables. Section 5 explains our empirical methodology. Section 6 then presents our analysis of the main determinants of cross-border takeovers and the post takeover performance of Ukrainian banks. Lastly, section 7 reports on our sensitivity analysis for the presence of unobservable factors.

2. Related literature

Our paper can be situated in the literature that links post-takeover performance of banks with pre-takeover characteristics that might explain why these specific banks have been the target of a cross-border takeover in the first place. In a seminal paper, Peek et al. (1999) claim that foreign investors choose banks based on specific characteristics such as bank size and capitalisation. Crucially, these variables at the same time also determine bank performance. When assessing the post-takeover performance of acquired banks, one therefore must check for such endogeneity and, if needed, control for the "selection effect", as Berger et al. (2005) call it.

There is a growing body of empirical research that looks into the existence of these selection effects. The papers differ in multiple respects such as the type of data used, countries and periods covered, as well as methodology. Our goal here is not to provide a comprehensive

overview (for this, see Havrylchuk and Jurzyk, 2011), rather, since the present paper examines the case of Ukraine, we specifically focus on recent contributions concerning transition economies. The main goal of our selective survey is also to show how our paper contributes to this stand of the literature. For reasons that will become clear below, we have grouped the papers per data source.

To start with a recent contribution, the paper that looks most thoroughly at possible selection effects is Havrylchuk and Jurzyk (2011), as they are the first to apply propensity score matching (PSM) in this context. Relying on Bankscope data on 11 CEE countries for the period 1993-2005, they find that foreign banks acquired mainly large well-capitalised institutions with low profitability. Using PSM, Havrylchuk and Jurzyk then compare the change in performance of acquired banks (in the takeover year and the three following years) with that of domestic banks that had a similar probability of being taken over by a foreign bank. They find that cross-border acquisitions effectively improved the profitability of the target banks. Havrylchuk and Jurzyk's results are at odds with the findings of earlier papers, not only concerning the existence and nature of a selection effect but also concerning the post-takeover performance of target banks. Obviously, chances are that these two observations are interlinked because controlling for selection effects alters the benchmark for the post-takeover performance of acquired banks.

Lanine and Vander Venet (2007) provide, as Caiazza et al. (2012) also note, a particularly well-suited first point of comparison. Indeed, they rely on the same Bankscope database, their dataset on 13 CEE countries for the period 1995-2003 includes all 11 countries covered in the Havrylchuk and Jurzyk paper (and starts only two years later), they estimate a pooled logit model that is very similar to a specification used by Havrylchuk and Jurzyk and they employ almost identical proxies for the bank-level variables. Yet, while Lanine and Vander Venet do find that foreign banks specifically acquired large banks, they find no evidence that the target banks were either under- or over-performing compared to the non-acquired banks. Controlling for bank size, Lanine and Vander Venet also investigate the post-takeover performance of target banks and conclude that the takeovers did not improve their efficiency or profitability.

Another point of comparison is provided by Poghosyan and de Haan (2010) and Poghosyan and Poghosyan (2010), which can be seen as companion papers. In fact, the first paper studies the microeconomic determinants of cross-border acquisitions and the second paper uses the same data to examine the post-takeover performance of target banks. An important difference between the two papers just mentioned, which both use pooled logit models to estimate the probability of a takeover, is that Poghosyan and de Haan (2010) use a multilevel mixed panel model that better deals with country differences in a wide range of factors, including institutional and economic development. Poghosyan and de Haan use Bankscope data for the same 11 CEE countries covered by Havrylchuk and Jurzyk (2011), albeit for the period 1992-2006. They find that foreign banks had a preference for large and efficient banks only in economies with a poor institutional environment; in other countries they mainly targeted underperforming banks. Poghosyan and de Haan argue that in countries with less favourable institutional and economic conditions, foreign banks target large and efficient institutions because they need higher returns to compensate for more volatile

earnings. Conversely, in more stable economies foreign banks are more likely to be successful and are therefore more interested in acquiring underperforming local institutions.

As mentioned, Poghosyan and Poghosyan (2010) use the same dataset to study post-takeover performance. Given the results in Poghosyan and de Haan (2010), they do not control for selection bias. Poghosyan and Poghosyan find that the efficiency of target banks deteriorates in the initial years following takeover and improves slightly afterwards. Overall, the impact on performance is insignificant. Poghosyan and Poghosyan speculate that this might be due to foreign investors primarily acquiring poorly performing banks - which would argue in favour of controlling for selection bias after all.

Another interesting paper is by Caiazza et al. (2012), even though they only look at the pre-takeover period. Caiazza et al. combine financial statement data from Bankscope with mergers and acquisitions data from Platinum Worldwide databases for the period 1988-2006 and for over 100 countries (which include all transition economies studied in the aforementioned papers). They find that in both domestic and cross-border takeovers target banks are large and relatively inefficient institutions. Interestingly, unlike Havrylchyk and Jurzyk (2011) and Lanine and Vander Vennet (2007), Caiazza et al. also include the sensitivity of the regulatory system to risk taking by banks as a country-level determinant of takeovers. Caiazza et al. (2012: 2653) find that “[a] supervisory framework that is more vigilant with regard to bank risk taking has a positive effect on the probability that banks are targets in domestic deals, while it has a negative effect in the case of cross-border deals”.

Claessens and van Horen (2013) focus on the impact of foreign ownership on banks’ asset and liability structures in 129 countries for the period 1995-2009. They also scrutinise the impact on profitability but only for the period 1995-2007. Claessens and van Horen exploit ownership data collected from a wide range of sources that include the Bankscope database, bank annual reports and central bank websites. They find that banks with foreign ownership outperform domestic banks only in countries with a poor institutional environment in which the banking system has low levels of foreign capital participation. Profitability is also higher for foreign banks that come from geographically proximate countries. All the above studies overlook this factor and treat foreign banks as a homogenous group. Note, however, that Claessens and van Horen do not control for selection effects.

Continuing our overview, there are also papers that do not rely on Bankscope data. In their analysis of foreign currency lending in transition countries, Brown and de Haas (2012) use Banking Environment and Performance Survey (BEPS) data collected in 2005 by the European Bank for Reconstruction and Development (EBRD) in 20 transition economies. Using observations from 193 banks (also covered in the Bankscope database), they find that only bank size is a significant micro-level determinant of cross-border takeovers.

Finally, Degryse et al. (2012) use National Bank of Poland data on 110 local banks for the period 1996-2006. After controlling for variations in banks’ portfolio compositions, they find no significant differences in efficiency between foreign and domestic banks. Degryse et al.

conclude that foreign banks do not charge lower lending rates because they are more efficient but simply because they lend relatively more to lower risk borrowers.

To sum up, the evidence on the existence of selection effects in cross-border bank takeovers in transition economies is mixed. Incidentally, the same is true for other countries.³ This is a sufficient reason in itself to warrant (re)considering the issue. However, in our view, there is a second reason, namely the quality of the data used in most of the existing literature. For one, judging from the comments on the Bankscope database proffered by Bonin et al. (2005) and Grigorian and Manole (2002, 2006), the results of Poghosyan and de Haan (2010) might simply reflect cross-country differences in data quality. Bonin et al. (2005), who also use the database and focus on the same 11 countries (to analyse the effects of ownership on bank performance), deliberately limit their sample to observations from 1996 onwards. They explain that “although financial data are available beginning in 1993, the early years include only a handful of institutions even in the most advanced transition countries. Consequently, we use data for 1996 to 2000 for broader coverage” (o.c., p. 37). As Grigorian and Manole (2002, 2006) point out, there is a high risk that in the early years the Bankscope database covers mainly “national champions” – that is, the best performing institutions.

Hence, Poghosyan and de Haan’s conclusion that foreign banks have mainly acquired the better performing banks in less-developed CEE economies may merely reflect the fact that poorly performing banks from these economies – some of which may have been taken over too – are underrepresented in the data at the early stages of transition. These concerns on data quality also apply to Havrylchyk and Jurzyk (2011) and Caiazza et al. (2012) because they use data starting from 1993 and 1988 respectively. This is not to say that the BEPS survey is necessarily a better option. De Haas et al. (2010, p. 392) point out that in the 2005 BEPS survey, banks with previous relationships with EBRD were more likely to participate.

As a final remark, we would like to stress that existing studies using multi-country data might fail to reliably measure the effects of important sources of heterogeneity across countries. Poghosyan and de Haan (2010: 642) point out that “although it is now widely acknowledged that both country-level and bank-level variables influence cross-border bank acquisitions, the importance of bank-level factors conditional on country-level determinants has not been treated systematically in previous work”. Poghosyan and de Haan therefore apply multilevel mixed models that control for cross-country heterogeneity in an aggregated way. We are therefore of the opinion, and Degryse et al. (2012) would seem to share this opinion, that the main benefit of cross-country studies – their ability to explore the impact of country-level variables – is counterbalanced by the difficulty of including a set of variables that control for the complex cross-country heterogeneity in terms of technological, institutional and economic factors. The conclusion of Caiazza et al. (2012), for instance, suggests that Havrylchyk and Jurzyk (2011) and Lanine and Vander Vennet (2007) fail to control for the

³ Using US data, Peek et al. (1999) find that foreign investors specifically acquired poorly performing institutions, and also that takeovers did not result in improved performance. For the case of Argentina, however, Berger et al. (2005) report that banks that were taken over by foreign investors did not differ from those that were not acquired, and this in both the pre- and post-takeover periods.

sensitivity of the regulatory system to risk-taking by banks which according to their findings is an important determinant of takeovers.

In light of the above, this paper sets out to test the impact of cross-border takeovers on the performance of target banks (1) for a single country; (2) with more recent (and therefore hopefully better quality) data; and (3) with data from a source other than Bankscope or BEPS, namely the National Bank of Ukraine (NBU), that covers all banks in the country studied.⁴

3. Data

We use two types of data – data generated by means of a self-conducted survey of the websites of business newspapers and banks and data from the NBU website. We started by searching the archives of leading international and Ukrainian business news websites (such as ft.com, wsj.com, delo.ua, korrespondent.net and news.liga.net) and commercial banks' websites for the period 2004-09. From these sites, we collected the dates when takeover deals were announced and when they were effectively signed. Afterwards we cross-checked these dates with the Bankscope dataset as well as with the recently published ownership database of Claessens and van Horen (2013). In total, we initially identified 26 cross-border majority takeovers that were completed between 1 January 2004 and 31 December 2009.

In a second step, we then focused on the 16 takeovers that were completed in 2005-07 (see Table 1) for two reasons. First, we need to check whether acquired banks were any different from the other domestic banks prior to takeover to detect whether there is a selection bias. Hence, the earliest takeovers that we are able to examine are those completed in 2005, for which we then use observations on 2004 as the baseline. Second, to assess banks' post-takeover performance we wanted to be able to look at the impact every year for two years, as it may take more than one year for banks to adjust and change their performance. Because our observation period stops in 2009, the latest takeovers that we can examine in this way are therefore those completed in 2007.

In a third step, we matched the data on acquisitions with data from the NBU website. In particular, we obtained yearly balance sheet and income statement data on all banks in Ukraine for the period 2004-09 from the NBU website. As already mentioned, Ukrainian banks were obliged from 2004 onwards to report according to IAS (Love and Rachinsky, 2008). This should make our data more comparable across banks and represents a major advantage over Bankscope data, especially for the early transition years. Moreover, as explained in section 2, the Bankscope data utilised by other studies also suffer from incomplete coverage for these years. Incidentally, using the BEPS database was not an option as it only covers a limited number of Ukrainian banks.⁵

⁴ As explained in Section 3, other studies that (also) deal with Ukraine either focus on a period when foreign bank presence was still limited or do not cover a representative number of banks.

⁵ The BEPS 2005 survey, for example, covers only eight banks in Ukraine (De Haas et al., 2010).

Table 1: Cross-border takeovers in Ukraine, 2005-07

Pre-takeover name	Post-takeover name	Acquirer	Takeover year	Country of acquirer
Post-Pension Bank	Raiffeisen Bank Aval	Raiffeisen Zentralbank Oesterreich	2005	Austria
Ajio Bank	SEB Bank	SEB Bankas	2005	Sweden
Ukrainian Trade Credit Bank	BTA Bank	BTA Bank	2006	Kazakhstan
Energobank	Energobank	Russian National Reserve Corporation	2006	Russia
Agro Bank	Home Credit Bank	Home Credit Group	2006	Netherlands
Industrial-Export Bank	Index Bank	Crédit Agricole	2006	France
UkrSibbank	UkrSibbank	BNP Paribas	2006	France
Universal Bank	Universal Bank	Eurobank Ergasias	2006	Greece
Mriya Bank	VTB Bank	Government of Russian Federation	2006	Russia
Ukrsots Bank	Ukrsots Bank	Unicredit Bank	2007	Austria
Credit Dnepr Bank	Credit Dnpr JSB	Brancroft Enterprises Limited	2007	Cyprus
Kievsk Rus Bank	Kievsk Rus Bank	Growth Management Limited	2007	UK
Marine Transport Bank	Marfin Bank	Cyprus Popular Bank	2007	Cyprus
International Commercial Bank	Piraeus Bank	Piraeus Bank	2007	Greece
Bank Prikarpatiya	Plus Bank	Getin Holding	2007	Poland
Tas Commerts Bank	Swed Bank	Swed Bank	2007	Sweden

Our initial dataset from the NBU website contained more than 1,000 bank-year observations on some 170 banks per year. As we are only interested in the effects of cross-border takeovers on domestic private banks, we excluded all observations on state banks, investment banks and development banks, as well as banks that remained under foreign ownership during the whole period of our study. We also excluded the observations on institutions that had no loans and/or deposits. By this, we have tried to limit the number of “pocket banks”, which service the needs of a limited number of business groups or wealthy individuals (Baum et al., 2008). Our final dataset is an unbalanced panel dataset with 768 observations on 134 banks for the period 2004-09.

4. Selection bias: bivariate analysis

In this section we focus on the baseline period (2004-06) and we compare, year by year, the observable characteristics of the banks that were acquired by a foreign bank in 2005-07 (the “acquired banks”) with those of a control group defined below. We do this in order to decide

upon the methodology to be used when assessing the impact of acquisitions on performance (see section 6.2.2). Indeed, our choice of methodology depends on whether the two groups of banks were significantly different prior to takeover. If this is the case, then conventional regression models may, as explained by Havrylchuk and Jurzyk (2011), under- or overestimate the effects of cross-border takeovers.

To make our results comparable to earlier evidence, we mainly use the proxies proposed by Lanine and Vander Venet (2007); see Table 2. Additionally, we also use interest income, interest expenses and loss provision, as in Havrylchuk and Jurzyk (2011). The latter ratios are major components of our proxies for profitability and will allow us to examine the causes of divergences, if any, in more detail. We only consider takeovers that give foreign investors control over at least 50 per cent of the target bank's equity.

Table 2: List of variables, based on Lanine and Vander Venet (2007)

Profitability	
<i>Return on assets</i>	Pre-Tax Profit (Loss)/Total Assets
<i>Return on equity</i>	Pre-Tax Profit (Loss)/Total Equity
<i>Net interest margin</i>	Net Interest Income/Total Assets
<i>Interest income</i>	Interest Income/Total Assets
Cost efficiency	
<i>Interest expenses</i>	Interest Expenses/Total Assets
<i>Non-interest expenses</i>	Non-Interest Expenses/Total Assets
<i>Cost-income ratio</i>	Cost to Income Ratio = (Interest Expenses + Non-Interest Expenses)/(Interest Income + Non-Interest Income)
Funding structure and lending activity	
<i>Equity-assets ratio</i>	Total Equity/Total Assets
<i>Deposits-assets ratio</i>	Total Customer Deposits/Total Assets
<i>Loan-assets ratio</i>	Net Loans/Total Assets
<i>Loss provision*</i>	Loan Loss Reserves/Interest Income
Size characteristics	
<i>Size**</i>	The natural logarithm of the bank's assets, in thousands of hryvnia (UAH).
<i>Deposit market share</i>	The bank's market share in total deposits in Ukraine.
<i>Loan market share</i>	The bank's market share in total loans in Ukraine.
<i>Assets market share</i>	The bank's market share in total banking sector assets in Ukraine.
Ownership	
TARGET	Dummy variable; 1 in year t if the acquisition of the bank is completed in year $t+1$, and 0 otherwise.
Macroeconomic and institutional variables	
<i>GDP_growth</i>	Real annual GDP growth
<i>EBRD_index</i>	EBRD's banking sector reform and interest liberalization index

Note that we have multiplied all ratios by 100. Based on Havrylchuk and Jurzyk (2011). ** We have adjusted bank assets by the GDP deflator to express them in 2004 prices.

Table 3a: Profitability and efficiency of acquired banks and control group, per-year comparisons, baseline period

	2004			2005			2006		
	Acquired	Control group	Difference	Acquired	Control group	Difference	Acquired	Control group	Difference
<i>Return on assets</i>	1.26 (1.48)	1.59 (1.26)	-0.32 (0.90)	1.00 (0.86)	1.49 (0.96)	-0.49 (0.37)	1.47 (1.16)	1.69 (1.32)	-0.23 (0.52)
<i>Return on equity</i>	5.50 (4.93)	7.07 (5.74)	-1.56 (4.09)	8.04 (7.67)	7.57 (6.10)	0.47 (2.43)	12.50 (9.81)	7.89 (5.75)	4.60* (2.40)
<i>Net interest margin</i>	5.52 (1.49)	5.07 (2.40)	0.45 (1.71)	3.63 (1.68)	4.40 (2.08)	-0.77 (0.81)	3.64 (1.47)	4.44 (2.14)	-0.80 (0.83)
<i>Interest income</i>	10.45 (0.20)	10.91 (3.07)	-0.46 (2.18)	9.11 (1.44)	9.82 (2.43)	-0.71 (0.93)	9.55 (1.41)	9.81 (2.28)	-0.25 (0.88)
<i>Interest expenses</i>	4.93 (1.29)	5.83 (2.59)	-0.91 (1.84)	5.48 (1.39)	5.43 (2.22)	0.05 (0.85)	5.91 (1.68)	5.36 (1.92)	0.55 (0.75)
<i>Non-interest expenses</i>	0.44 (0.01)	0.34 (0.29)	0.10 (0.21)	0.23 (0.13)	0.24 (0.23)	-0.01 (0.09)	0.20 (0.09)	0.25 (0.28)	-0.04 (0.11)
<i>Cost-income ratio</i>	35.01 (6.02)	44.14 (15.53)	-9.13 (11.04)	49.82 (12.78)	45.87 (15.60)	3.95 (6.05)	49.38 (11.14)	46.84 (14.03)	2.54 (5.45)
Number of banks/bank-years	2	101		7	97		7	85	

Standard errors are reported in parentheses. *, **, *** indicate significance levels of 10 per cent, 5 per cent, and 1 per cent, respectively.

Table 3b: Funding structure, lending activity and size of acquired banks and control group, per-year comparisons, baseline period

	2004			2005			2006		
	Acquired	Control group	Difference	Acquired	Control group	Difference	Acquired	Control group	Difference
<i>Equity-assets ratio</i>	18.35 (10.41)	27.64 (15.26)	-9.29 (10.86)	14.50 (9.47)	25.31 (15.52)	-10.80* (5.96)	12.06 (2.51)	25.09 (14.35)	-13.04*** (5.46)
<i>Deposits-assets ratio</i>	61.41 (15.11)	56.81 (15.04)	4.60 (10.74)	67.67 (15.35)	58.50 (17.52)	9.17 (6.81)	68.56 (7.22)	58.43 (15.73)	10.14* (6.02)
<i>Loan-assets ratio</i>	58.90 (13.07)	60.32 (11.92)	-1.43 (8.52)	64.98 (11.61)	61.65 (11.97)	3.33 (4.68)	68.44 (3.53)	63.22 (12.61)	5.22 (4.80)
<i>Loss provision*</i>	27.54 (16.14)	40.48 (39.51)	-12.94 (28.10)	31.60 (10.50)	38.01 (34.47)	-6.41 (13.13)	37.02 (26.87)	33.81 (27.17)	3.20 (10.68)
<i>Size</i>	14.53 (2.49)	12.49 (1.19)	2.04*** (0.86)	13.52 (1.43)	12.56 (1.21)	0.96*** (0.48)	13.87 (1.37)	12.64 (1.27)	1.22*** (0.50)
<i>Deposit market share</i>	4.80 (6.51)	0.52 (1.43)	4.28*** (1.11)	0.96 (1.31)	0.47 (1.35)	0.48 (0.53)	1.17 (1.91)	0.45 (1.41)	0.72 (0.57)
<i>Loan market share</i>	4.99 (6.77)	0.52 (1.32)	4.47*** (1.06)	1.19 (1.96)	0.48 (1.32)	0.71 (0.53)	1.10 (1.83)	0.42 (1.35)	0.69 (0.55)
<i>Assets market share</i>	4.99 (6.17)	0.54 (1.34)	4.09*** (1.05)	1.11 (1.78)	0.47 (1.24)	0.63 (0.50)	1.11 (1.85)	0.42 (1.20)	0.69 (0.49)
Number of banks/bank-years	2	101		7	97		7	85	

Standard errors are reported in parentheses. *, **, *** indicate significance levels of 10 per cent, 5 per cent and 1 per cent, respectively.

In Tables 3a and 3b, we test – for all bank-level variables – whether the acquired banks were any different from the banks in the control group prior to takeover. Unlike Havrylchuk and Jurzyk (2011) and Lanine and Vander Vennet (2007), we do not use averages over the baseline period. The problem with working with such averages is that the number of years in the baseline period can differ for both groups of banks. For our acquired banks, for example, the number of years varies between one (for banks taken over in 2005) and three (for banks acquired in 2007). In order to make sure that the performance indicators relate to the same point in time, we therefore compare single years. For the acquired banks, we always look at the year preceding the takeover year, in other words, the year when the deal was actually signed (as opposed to merely announced). By coincidence, as also partly explained in footnote 6, with the exception of JSCB UkrSots Bank, for all the takeovers that we study, the announcement date fell in the calendar year preceding the takeover year. As a result, our approach is largely in line with Lanine and Vander Vennet (2007), who define the pre-takeover period as the year containing the announcement date. The control group includes all banks that remained domestic throughout the entire period 2004-09 but also acquired banks for those years when they had not yet become a target (that is, for years prior to the pre-takeover year). For example, in the first row of Table 3a we compare the mean return on assets in 2004 of banks that were acquired in 2005 with that of banks that were either not acquired at all or only acquired in later years.

Table 3a shows that, with one minor exception at the 10 per cent level, the profitability and efficiency measures are not statistically different for acquired banks and those in the control group. This is in line with Lanine and Vander Vennet (2007) who find, as already pointed out in section 2, no evidence that acquired banks in CEE economies were either under- or over-performing. Appendix III additionally reports box plots on the selected variables for all bank types in Ukraine.

Turning to Table 3b, the mean equity-assets ratio is significantly lower for the acquired banks in 2005 and especially in 2006 but not in 2004, where the difference is insignificant. Part of the explanation may be that for the latter year the control group includes observations on banks that became targets for takeover in either 2005 or 2006 and that were subsequently acquired in 2006 and 2007 respectively. Overall, in line with Lanine and Vander Vennet (2007), we find that foreign investors have acquired banks with lower capitalisation (equity-assets ratio) relative to the rest of the banks.

All but one of the single-year differences in deposits-assets ratio, loan-assets ratio, and loss provision between the two groups of banks are insignificant. This indicates that the share of assets financed through deposits, the portion of assets allocated to loans and the level of the loan loss provisions did not play a role in investors' choice of Ukrainian banks. Strikingly, size is statistically larger for acquired banks in all three years. The other proxies for size – deposit market share, loan market share and assets market share – are only significantly larger in 2004. But overall the picture is one where investors who entered the country in 2005-07 particularly targeted large banks.

To sum up, the analysis of Tables 3a and 3b suggests that foreign investors have targeted banks that were less capitalised and were larger. This effectively is a selection bias, which must be controlled for when assessing the post-takeover performance of banks, as we will now explain.

5. Empirical methodology

If we want to correctly gauge whether cross-border takeovers have improved the efficiency and/or profitability of target banks, we first need to control for the baseline differences between acquired banks and those in the control group. To do so, we use the propensity score matching methodology, which consists of two steps. In the first step, we focus on the baseline period. We estimate the probability that an institution is targeted for a cross-border takeover as determined by its observable characteristics for all banks in our sample and with yearly data (as in section 4). To estimate these probabilities, we use the logit model proposed by Lanine and Vander Vennet (2007):

$$Y_{i,t} = f(\text{Bank size}_{i,t}, \text{Bank efficiency}_{i,t}, \text{Controls for banking environment}_i).$$

In this equation, $Y_{i,t}$ stands for the log-odds ratio of the probability that the i -th bank is taken over by a foreign bank in the following year. As a proxy for this probability, we use the dummy TARGET, which equals one in the year t if the acquisition of the bank is completed in the year $t+1$, and zero otherwise.⁶ For the explanatory variables, we refer to Table 2. Note that the baseline period for which we estimate the above model, the years 2004-06, is much shorter compared to the studies reviewed in section 2. We should therefore be better able to identify the bank-level determinants of takeovers because most institutional and structural factors are relatively stable in the short run.

In step two, we use the results from step one to match the acquired banks with banks from the control group that had a similar probability of being acquired in the same year. We do so because we want to ensure that the banks have comparable pre-existing characteristics (in terms of size and capitalisation for instance). Rather than simply comparing post-takeover performance levels of the acquired banks and their matches, we then compare the difference between post- and pre-takeover performance of the acquired banks with the same difference in the performance of the matched banks. In other words, we combine PSM with a difference-in-difference methodology (DID). Havrylchyk and Jurzyk (2011) provide a detailed explanation of this approach. Combining PSM and DID enables us, as Blundell and Dias (2009) explain, to relax a restrictive assumption that is needed when using PSM alone, namely that banks are selected for takeover solely based on their observable characteristics. Instead, combining PSM and DID allows control for unobservable fixed effects, such as time-invariant covariates.

⁶ As explained in Section 4, in practice this is by and large equivalent to saying that TARGET takes 1 in the year when the agreement is announced.

Such unobservable fixed factors may indeed be relevant in the case of Ukraine and may include, for instance, banks' unofficial affiliations with powerful political and economic elites. In their study of the affiliations of Ukrainian banks with Parliamentary deputies, Baum et al. (2008: 540) suggest that "one possible reason why deputy-affiliated banks might be appealing to a foreign investor is the ease of overcoming bureaucratic obstacles...Several examples have proven the attractiveness of politically affiliated banks for foreign investors. For instance, Forbes reports on 7 February 2007: 'Swedbank AB said it is acquiring Ukraine's TAS-Kommerzbank (TAS)...owned by its chief executive...who is former governor of Ukraine's central bank, as well as a former minister of economy and vice prime minister.'"

Gorodnichenko and Grygorenko (2008) argue that oligarchic groups – politically and economically strong conglomerates – significantly improve the performance of the businesses they own in Ukraine and Russia. For Ukraine, Gorodnichenko and Grygorenko identify 13 oligarchic groups, five of which own major banks. These banks' links to political and economic elites are not always observable for the simple reason that Ukrainian banks were largely non-transparent concerning their true domestic owners, in particular in the early 2000s.⁷

There may be other unobservable factors besides political affiliations. For instance, in the baseline period many Ukrainian banks routinely re-lend funds of foreign banks domestically. Because of such lender-borrower relationships between foreign and domestic banks, certain foreign investors may have had access to extra information on certain Ukrainian banks and may therefore have been more inclined to buy them. If such unobservable factors indeed play a role then matching solely based on observable differences, as with PSM, is misleading. Combining PSM with DID enables us to isolate the impact of unobservable factors, provided that they are time-invariant.

Finally, as a robustness check, we use Rosenbaum's (2005) methodology to test the sensitivity of the results obtained in step two to the presence of other unobservable variables that we possibly failed to control for. As explained by Blundell and Dias (2009), combining PSM and DID does not allow to control for unobservable temporary bank-specific shocks that may have contributed to a takeover. In economies with low-quality institutions like Ukraine, the political affiliations that we have discussed may not only have a fixed effect but may also generate bank-specific shocks. For example, after an election, such as the 2004-05 vote in Ukraine, certain bank owners may suddenly find themselves in the opposition.⁸ If they think this will negatively affect the economic prospects of their bank, they might be more inclined to sell it at that time. In such a scenario, two banks that seem to have more or less the same baseline prior to takeover – that is, two banks with similar observable financial indicators such as volume of assets, return on assets and return on equity – may still be different in terms of temporary unobservable factors, so that the bank with the "wrong" political connections has a higher probability to be (self-) selected for takeover. In technical terms, the odds of such a bank being

⁷ The NBU only started publishing information on the owners of Ukrainian banks at the end of 2007. Reports from news websites corroborate that most banks were not particularly interested in revealing their true domestic owners; see for instance "Natsbank obnarodoval imena valdeltsev 174 bankov", an article published on the news website *Focus* on 28 January 2008, last accessed on 7 February 2013 at url: <http://focus.ua/economy/15918>.

⁸ A timeline of the Ukrainian elections of 2004 can be found on the BBC website, last accessed on 7 February 2013 at url: <http://news.bbc.co.uk/1/hi/world/europe/4061253.stm>

acquired are greater than those for similar banks and the ratio of the odds, denoted as Γ by Rosenbaum (2005), is larger than one. If all banks have similar odds of being acquired, Γ equals one. The interesting feature of Rosenbaum’s sensitivity analysis is that it “asks how much hidden bias can be present – that is, how large can Γ be – before the qualitative conclusions of the study begin to change. A study is highly sensitive to a hidden bias if the conclusions change for Γ barely larger than 1.” The opposite is true if the conclusions change only for large values of Γ .

Following Rosenbaum (2005), we will therefore compute confidence intervals and associated probabilities (p) for the estimated differences in banks’ post-takeover performance at various increasing values of Γ . As the confidence interval becomes wider with increasing Γ , the uncertainty about the estimated differences in performance between the two groups of banks also becomes larger and the differences become less informative. The value of Γ at which we can no longer be confident about the existence of a difference in performance - in the words of Rosenbaum (2005, p. 1810): the point “at which the interval becomes uninformative” - is the degree of sensitivity to hidden bias.

6. Results

We first report on our logit model that aims to detect observable factors that have guided the takeover decisions of foreign investors. In section 6.2, we report on the difference-in-differences in pre- and post-takeover performance of the acquired and matched banks.

6.1 Logit model: estimating the propensity scores

Columns (a) to (d) in Table 4 report a logit model where TARGET is a function of bank size (measured by the log of bank assets) together with alternative proxies for bank efficiency and profitability. In all specifications we control for banks’ funding structure (deposits-assets ratio), lending activity (loan-assets ratio), and the overall economic environment (GDP growth).⁹ The likelihood ratio (Chi-squared) statistics and associated p -values suggest that the independent variables collectively have explanatory power. The models thus fit the data well. The pseudo R squared in specifications (a) to (d) is always in the range of 0.14-0.15, making the fit of our models comparable to earlier studies. In columns (e), (f), and (g) we replace size with the deposit market share, the loan market share and the assets market share respectively. These are all direct measures of foreign banks’ success in seizing market share but, as Lanine and Vander Venet (2007) point out, deposit market share is a more direct proxy of the local presence of a bank. After the replacement of size, the coefficients are still jointly different from zero but the fit of the model deteriorates apparently because, compared to assets, deposit market share, loan market share and assets market share have a smaller variation across banks. We now focus on the signs and significance of the individual coefficients.

⁹ We do not include equity-assets ratio in our regressions because it is highly correlated with size and therefore is likely to create a multi-collinearity problem (see Appendix I).

Table 4 : Determinants of cross-border takeovers: logit model, baseline period

	(a)	(b)	(c)	(d)	(e)	(f)	(g)
Constant	-11.44*** (3.01)	-11.72*** (3.06)	-11.20*** (3.06)	-11.90*** (3.07)	-5.00*** (2.06)	-4.96*** (2.07)	-5.02*** (2.07)
Size	0.56*** (0.19)	0.54*** (0.19)	0.53*** (0.19)	0.56*** (0.20)			
Deposit market share					0.18* (0.10)		
Loan market share						0.20*** (0.10)	
Assets market share							0.22*** (0.11)
Cost-income ratio	-0.01 (0.02)						
Non-interest expenses		-0.09 (1.32)					
Return on assets			-0.28 (0.32)		-0.33 (0.31)	-0.32 (0.31)	-0.32 (0.31)
Return on equity				-0.01 (0.04)			
Deposits-assets ratio	0.03 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.03 (0.02)	0.03 (0.02)	0.03 (0.02)
Loan-assets ratio	0.02 (0.03)	0.01 (0.03)	0.01 (0.03)	0.01 (0.03)	0.02 (0.03)	0.01 (0.03)	0.02 (0.03)
GDP_growth	-0.10 (0.07)	-0.10 (0.08)	-0.10 (0.07)	-0.10 (0.07)	-0.10 (0.07)	-0.10 (0.07)	-0.10 (0.07)
Number of observations	302	302	302	302	302	302	299
Log likelihood	-54.25	-54.46	-54.03	-54.43	-56.40	-56.01	-55.95
LR (Chi sq)	16.64	16.23	17.09	16.30	12.35	13.12	12.92
Prob > (Chi sq)	0.01	0.01	0.00	0.01	0.03	0.02	0.02
Pseudo R sq	0.13	0.13	0.14	0.13	0.10	0.10	0.10

Note: The dependent variable in all regressions is the dummy TARGET. Regressions were run with binary logit; the estimated coefficients therefore correspond to log odds ratios. Standard errors are reported in parentheses. *, **, *** indicate significance levels of 10 per cent, 5 per cent and 1 per cent respectively.

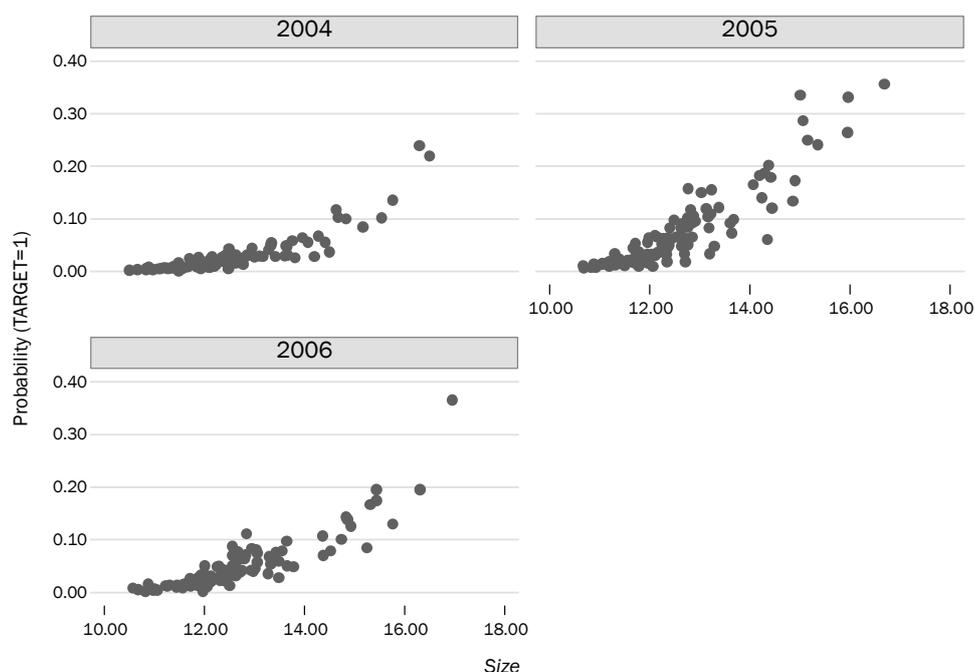
The significant and positive coefficient of size, in specifications (a) to (d), suggests that foreign banks targeted particularly large banks. The significant coefficients of deposit market share, loan market share and assets market share (which, unlike size, are relative variables) confirm this¹⁰. Interestingly, the coefficient on size not only has the same sign as in Lanine and Vander Venet (2007) but is also almost identical in magnitude. We also estimated our models with equity-assets ratio instead of size. Equity-assets ratio proved to have the same predictive power as size, which confirms our earlier conclusion that foreign investors acquired under-capitalised banks.

¹⁰ See specifications (e), (f) and (g).

Moving down the list of variables, none of the proxies for efficiency or profitability is statistically significant. In line with Lanine and Vander Vennet (2007) but at odds with Havrylchuk and Jurzyk (2011), foreign banks thus do not appear to have chosen underperforming (or overperforming) institutions in Ukraine. This result is compatible with Poghosyan and de Haan's (2010) explanation that foreign banks are not interested in acquiring poorly performing institutions in less favourable business environments, of which Ukraine is an example.

Similarly, the insignificant coefficient of loan-assets ratio in all specifications implies that the portfolio allocation of the domestic banks did not affect foreign banks' takeover decisions. Unlike Lanine and Vander Vennet, our logit model includes deposits-assets ratio as an explanatory variable for two reasons. First, we think that deposits-assets ratio - which reflects a bank's liabilities structure - is as important as loan-assets ratio. Secondly, Lanine and Vander Vennet find a significant impact of deposits-assets ratio in their analysis of the post-takeover performance of banks.

Figure 1: Bank size and probability of a cross-border takeover, baseline period



The coefficient on real GDP growth is negative but, unlike in other studies, not significant. This indicates that Ukraine's political transformations, which entailed a drop in GDP growth rates, did not deter foreign banks from entering the country.¹¹ Finally, following Lanine and Vander Vennet (2007), we also have tried to include the banking sector reform and interest liberalisation index of the EBRD, which increased from 2.33 in 2004 to 2.67 in 2005 and to 3 in 2006. In fact, in these three years banking reforms were the most salient. However, unlike in earlier studies, the EBRD index did not prove significant and is therefore not included

¹¹ Political changes such as the Orange Revolution, which took place from late November 2004 to January 2005 and brought a pro-reform government to power, also caused uncertainty in the business environment.

in the specifications in Table 4. A possible explanation is that Ukraine was already at a late stage of its transition, as mentioned earlier. Indeed, the value of 2.33 for 2004 was already high compared to other FSU countries such as Russia, Tajikistan and Belarus (which all had an index of 2)¹² and comparable to other advanced reformers such as Kazakhstan. In the next step of our analysis – the matching of banks – we rely on specification (c) because it has the highest goodness of fit.

Overall, the above analysis suggests that foreign investors acquired mainly large banks. As Figure 1 further demonstrates, the probability – based on specification (c) – that a bank is selected for cross-border takeover increases with its size. This effectively is a selection bias, which must be controlled for when comparing the post-takeover performance of banks. In the next section we therefore match the acquired banks with domestic banks that had a similar probability of being acquired by foreign investors.

6.2 Propensity score matching

In this section, we present our analysis of banks' post-takeover performance based on PSM and DID, as in Havrylchuk and Jurzyk (2011). In particular, we compare the difference in post- and pre-takeover performance of acquired and matched banks in terms of profitability and cost efficiency ratios, proxies for their funding structure, as well as market share indicators.¹³ Combining PSM and DID allows us to control for unobserved fixed effects that we might have overlooked in our logit model. Since it is not possible to find acquired and domestic banks with identical pre-takeover characteristics, we use multiple matching methods to find similar banks. We discuss the matching methods (in section 6.2.1) and then present our matching results (in section 6.2.2).

6.2.1 Matching methods

Following Brown and de Haas (2012), we use Kernel and Nearest Neighbour matching (with replacement) to determine which banks are most similar. In Kernel matching, we match each acquired bank with a counterfactual bank constructed as a weighted average of all non-acquired (control group) banks, and this with weights that are inversely proportional to the distance between the propensity scores of the acquired bank and its domestic counterparts. To determine the weights of the control group banks, unlike Brown and de Haas (2012) who employ Gaussian Kernel, we use Epanechnikov and Biweight Kernel. In Epanechnikov Kernel, domestic banks with the closest propensity scores to their acquired counterparts receive a higher weight compared to Gaussian Kernel. In Biweight Kernel, these banks are assigned a doubled weight. Epanechnikov Kernel is thus less restrictive compared to Biweight Kernel. We use these methods because we want to ensure that we select the most similar banks.

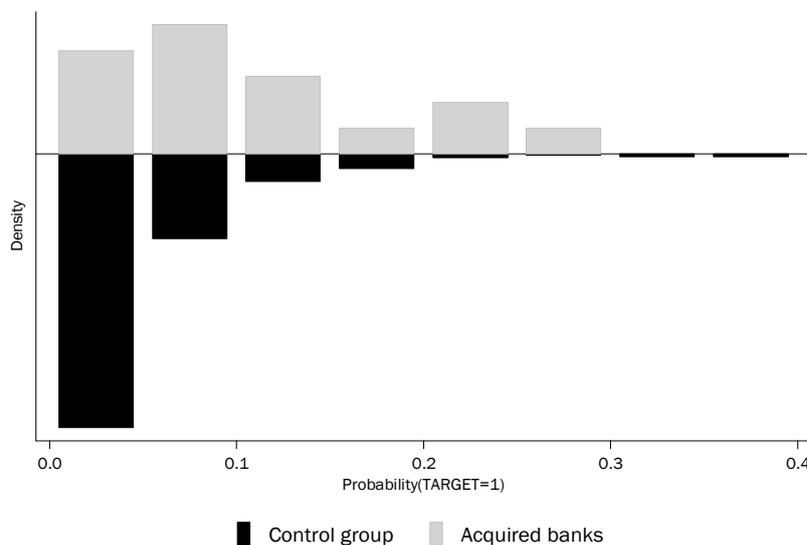
¹² The EBRD's banking sector reform and interest liberalisation index ranges from 1 (little progress beyond establishment of a two-tier system) to 4 (banking standards and performance norms of advanced industrial economies). For details, see for instance EBRD (2005: 203).

¹³ In view of the small sample size of matched banks, we do not use direct measures of bank performance based on cost and profit efficiency frontier analysis.

Alternatively, in Nearest-Neighbour matching (NN1) with replacement, we match each acquired bank with an individual existing domestic bank with the closest propensity score. Using the replacement option means that a domestic bank can be used several times as a match. The advantage of this approach is that the quality of matches is high compared to Kernel, at least when the overlap in the propensity scores of acquired and matched banks is low, and when there are few domestic banks with high propensity scores. However, matching acquired banks with only one of their neighbour domestic banks might be too restrictive. We therefore also use Two Nearest-Neighbours (NN2) matching; that is, we match acquired banks with their two nearest neighbours and again use the replacement option. The drawback of using some of the banks of the control group several times is that, due to the smaller number of banks, the variance of the estimates is likely to be high (Caliendo and Kopeinig, 2008).

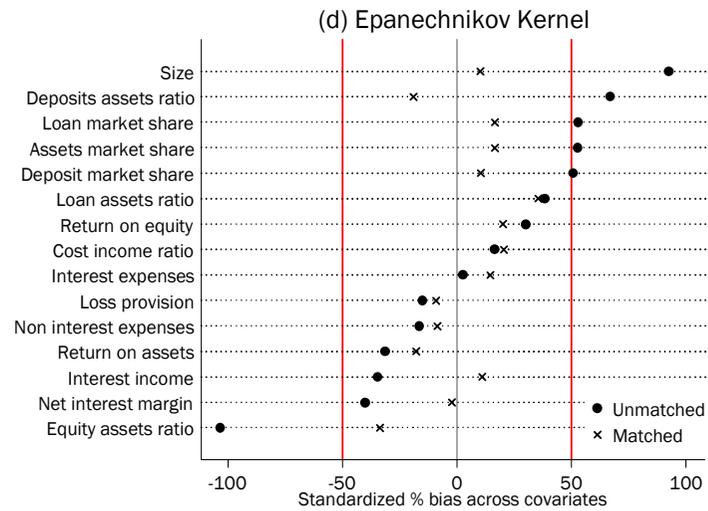
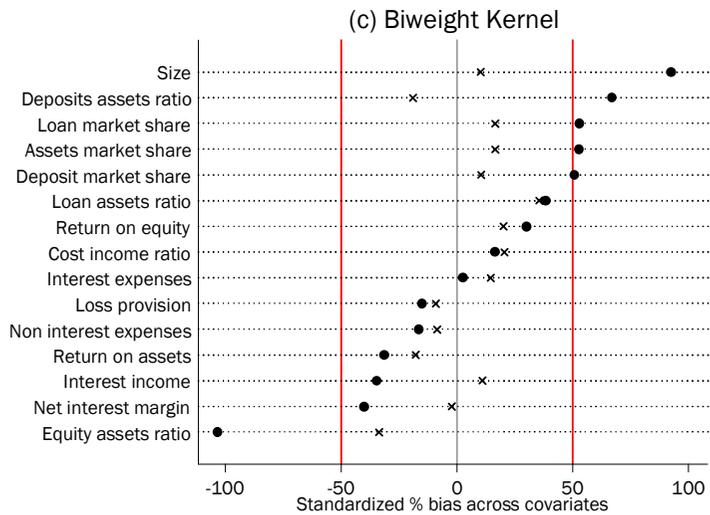
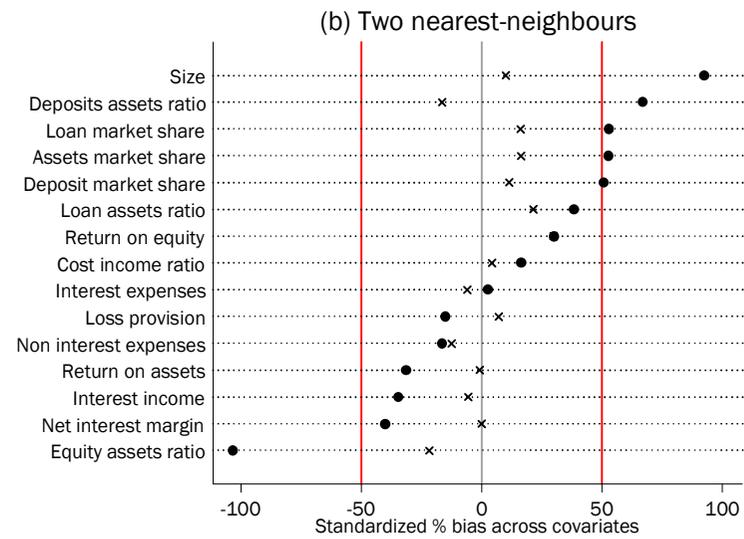
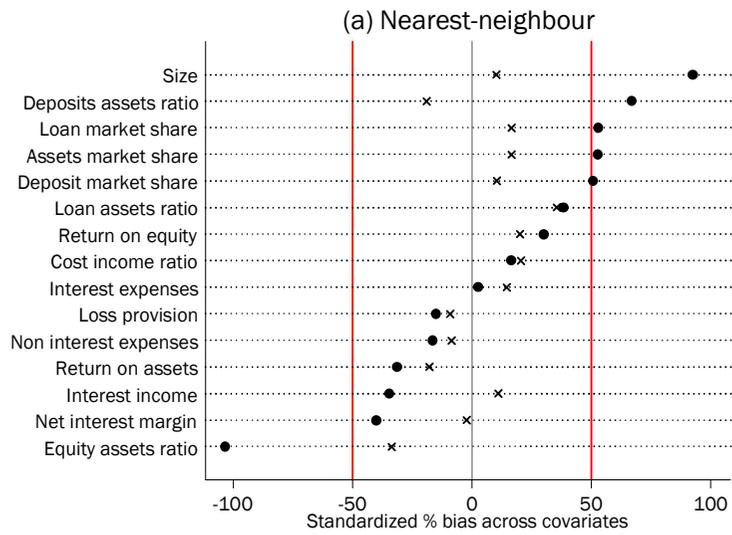
In Figure 2 we have plotted the propensity scores as a histogram in order to gauge the overlap between acquired and domestic banks. This shows the overlap at higher propensity scores between the two groups of banks is indeed small in our case. Hence, NN with replacement will provide the best matches for these cases. At lower propensity scores, however, where the majority of both acquired and domestic banks are located, the overlap is high, so that for these banks NN with replacement is probably too restrictive and therefore likely to produce larger standard errors relative to Kernel matching. For these cases, Kernel matching would seem to be the better approach.

Figure 2: Propensity score matching, acquired and control group



To assess the performance of the above approaches, we check the balancing hypothesis. That is, we test whether the matching procedures are effectively able to remove the significant differences in the means of the relevant baseline-period variables. To that end, we compute a statistic of standardised bias before and after matching. This specific statistic is suggested by Rosenbaum and Rubin (1985) and described in detail by Caliendo and Kopeinig (2008). For a given variable, the standardised bias is “the difference of sample means in the treated [in our context: acquired] and matched control subsamples as a percentage of the square root of the average of sample variances in both groups” (Caliendo and Kopeinig, 2008: 48).

Figure 3: Standardised bias before and after matching



In panels (a) to (d) of Figure 3, we present tests of the balancing hypothesis under both versions of Nearest-Neighbour and Kernel matching. The horizontal axis shows the bias, which can be negative or positive. An interval between -50 and +50 per cent, marked by a vertical red line, shows the standardised bias for which the difference in the baseline mean values of acquired and matched banks is insignificant.¹⁴ The vertical axis shows the list of relevant baseline-period variables, ranked in descending order of bias. For each of these variables, solid circles and small ‘x’-s indicate the bias before and after matching respectively. In panel (a), the solid circle and the ‘x’ for size, for instance, indicate almost one hundred percent positive standardised bias before matching and close to zero percent bias after NN1 matching respectively. As we saw in section 4, acquired banks are large in size relative to all domestic banks (the unmatched sample) but this is not the case relative to the matched banks. A similar observation can be made for all other variables in all panels. We can thus conclude that all matching methods satisfy the balancing hypothesis.

Note that a potential drawback of our analysis lies in the relatively small sample size. To overcome this issue, and following the literature, we use bootstrapping to obtain standard errors in Kernel matching. This allows us to control, in step two, for the errors from step one. To achieve an adequate level of accuracy of our coefficients, we set the bootstrapping option at 1,000 replications. In the tables of the next section, we therefore always report bootstrapped errors on estimates based on Kernel matching. Note, however, that we do not apply bootstrapping for NN matching, unlike in Havrylchyk and Jurzyk (2011). We do so because Abadie and Imbens (2008) demonstrate that when applied in NN matching, bootstrapping produces biased standard errors.

6.2.2 Results from DID on the matched banks

We now present our analysis of banks’ post-takeover performance based on PSM and DID. Table 5 shows our comparisons of the differences in post- and pre-takeover profitability of acquired and matched banks. The four blocks (A) to (D) report, respectively, the difference in post- and pre-takeover return on assets, return on equity, net interest margin and interest income and this for the first two years following takeover, as indicated in column (ii).¹⁵ Note that we do not examine the takeover year itself, as this year is a mix of post- and pre-takeover months. Columns (iii)-(vii) report the average difference-in-difference in post- and pre-takeover performance levels of acquired and matched banks. Standard errors are reported in parentheses.

Our results in blocks (A) to (D) show that the difference-in-difference in post- and pre-takeover profitability measured by either return on assets, return on equity, net interest margin and interest income is never statistically significant. Hence, the change in return on assets and other profitability ratios seems to be no different for acquired and matched banks. These findings suggest that cross-border takeovers in a country that is in a late stage of its transition affect the profitability of target banks differently than when takeovers would have

¹⁴ Note, we use t-tests, that we do not report here, to judge on the significance of the remaining bias.

¹⁵ For instance, by the difference in post- and pre-takeover return on assets after two years following takeover we mean return on assets (after two years) – return on assets (in pre-takeover year).

been initiated in earlier transition stages. Indeed, the results of Havrylchyk and Jurzyk (2011), whose sample includes takeovers in CEE economies at early stages of their transition, indicate that takeovers significantly increase return on assets. From a methodological point of view, it is interesting to observe in Table 5 that an unmatched performance comparison would have led to erroneous conclusions where the two-year effect on return on assets and net interest margin is concerned.

We now turn to Table 6, which presents our comparisons of the difference-in-difference in post- and pre takeover cost efficiency of acquired and matched banks, and more precisely in interest expenses, non-interest expenses and cost-income ratio. Panel (II) is a novelty compared to Table 5. Concretely, in Panel (II) we modify the propensity scores used in Panel (I) by adding the pre-takeover values of, respectively, interest expenses, non-interest expenses, and cost-income ratio into the logit model presented in column (c) of Table 4. We do so because we want to control for the remaining, although insignificant, bias in these variables (see Figure 3).

Block (A) reports that in year one cross-border takeovers decreased interest expenses of the acquired banks by, depending on the matching method, between 1.70 to 1.96 percentage points (see also Figure AIII-1). Given that in the baseline period the mean interest expenses of the acquired banks was 4.93 to 5.91 percent (Table 3a), a change by 1.70 to 1.96 percentage points - that is, by more than 29 to 40 per cent - is clearly economically meaningful. The changes are also in line with the results for CEE economies reported in Havrylchyk and Jurzyk (2011). In year two, the differences between the two groups of banks are still significant for the majority of the estimates.

Table 5: Takeover effects on profitability: PSM and DID

Block			Unmatched	Biweight Kernel	Epanechnikov Kernel	NN1	NN2
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
(A)	<i>Return on assets</i> after	one year	-0.24 (0.36)	-0.17 (0.33)	-0.17 (0.35)	-0.17 (0.35)	-0.08 (0.31)
		two years	-2.33*** (0.97)	-0.31 (2.69)	-0.31 (2.63)	-0.31 (2.70)	-1.15 (2.33)
(B)	<i>Return on equity</i> after	one year	-2.76 (1.68)	-1.13 (2.61)	-1.13 (2.57)	-1.13 (2.70)	-1.30 (2.41)
		two years	7.46 (5.70)	21.08 (19.74)	21.08 (20.18)	21.08 (19.81)	17.98 (18.84)
(C)	<i>Net interest margin</i> after	one year	0.44 (0.46)	0.33 (0.71)	(0.33) (0.69)	0.33 (0.69)	0.36 (0.66)
		two years	1.45*** (0.62)	1.40 (1.10)	1.40 (1.17)	1.40 (1.13)	1.44 (1.07)
(D)	<i>Interest income</i> after	one year	-1.07 (0.72)	-1.57 (0.96)	-1.57 (0.96)	-1.57 (0.85)	-1.41 (0.79)
		two years	0.65 (0.99)	-0.22 (1.38)	-0.22 (1.38)	-0.22 (1.40)	-0.35 (1.37)

Standard errors on the difference-in-difference between acquired and matched banks are reported in parentheses.

We report bootstrapped standard errors on Biweight and Epanechnikov Kernel.

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Table 6: Takeover effects on cost efficiency: PSM and DID

Block			Unmatched	(I) Estimates based on propensity scores from model presented in column (c), Table 4.				(II) Estimates based on propensity scores that additionally include pre-takeover values of, respectively, <i>Interest expenses</i> , <i>Non-interest expenses</i> and <i>Cost-income ratio</i> .			
				Biweight Kernel	Epanechnikov Kernel	NN1	NN2	Biweight Kernel	Epanechnikov Kernel	NN1	NN2
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)
(A)	<i>Interest expenses</i>										
	after	one year	-1.51*** (0.53)	-1.90** (0.75)	-1.90*** (0.73)	-1.90*** (0.66)	-1.77*** (0.54)	-1.70* (0.87)	-1.70* (0.94)	-1.69*** (0.82)	-1.96*** (0.62)
		two years	-0.80 (0.71)	-1.62** (0.82)	-1.62** (0.79)	-1.62* (0.87)	-1.80*** (0.77)	-0.92 (1.01)	-0.92 (0.98)	-0.93 (0.97)	-1.42* (0.85)
(B)	<i>Non-interest expenses</i>										
	after	one year	0.00 (0.11)	-0.04 (0.17)	-0.04 (0.17)	-0.04 (0.14)	-0.01 (0.12)	-0.02 (0.17)	-0.02 (0.18)	-0.02 (0.14)	0.01 (0.12)
		two years	-0.16 (0.16)	-0.14 (0.21)	-0.14 (0.20)	-0.14 (0.15)	-0.08 (0.12)	-0.06 (0.24)	-0.06 (0.23)	-0.06 (0.14)	-0.16 (0.18)
(C)	<i>Cost-income ratio</i>										
	after	one year	-7.64*** (3.07)	-7.89* (4.43)	-7.89* (4.51)	-7.89* (4.15)	-7.79*** (3.42)	-9.56** (4.75)	-9.56** (4.56)	-9.56*** (3.75)	-9.97*** (3.61)
		two years	-8.42*** (3.70)	-11.14** (5.55)	-11.14** (5.29)	-11.14*** (5.44)	-12.04*** (4.60)	-10.89* (6.04)	-10.89* (5.81)	-10.88*** (5.05)	-12.35*** (4.59)

Standard errors on the difference-in-difference between acquired and matched banks are reported in parentheses. We report bootstrapped standard errors on Biweight and Epanechnikov Kernel. *, **, *** indicate significance levels of 10 per cent, 5 per cent and 1 per cent respectively.

Our results in Block (B) show that the matched difference-in-differences in NIEXP are statistically insignificant. The explanation might be that the non-acquired banks continued operating the way they always had and that, following their takeover, acquired banks simultaneously cut costs by making redundancies and spent more on efficiency enhancing activities such as staff training. Kiy and Isik (2008) document that Ukrainian banks were indeed traditionally overstaffed – they mention “the firing of 20 out of 24 chauffeurs at the headquarters of a bank in Ukraine when it was acquired by a Swedish Bank” (2008, p. 382, footnote 16). The 2007 Annual Report of the Raiffeisen Bank Aval (2007, p. 138) provides an illustration of increased spending on staff training: “During 2007, staff training programmes became more intensive. As compared to 2006, the total number of trainees grew 10 times to 19,623 participants. By the end of the year, the Bank had exceeded its annual training plan in terms of training days per employee achieving 3 training days vs. 0.2 training days in 2006....Specifically, the Bank placed a major focus on training the retail business staff.”

Note that our sample includes these specific takeovers (see Table 1). Further research may thus want to look into such components of costs. Due to limitations of our dataset we are unable to shed further light on this aspect.

Table 7: Takeover effects on funding structure and lending activity: PSM and DID

		Unmatched	Biweight Kernel	Epanechnikov Kernel	NN1	NN2
	(i) (ii)	(iii)	(iv)	(v)	(vi)	(vii)
(A)	<i>Deposits-assets ratio</i> after one year	-22.41 ^{***} (3.62)	-13.24 ^{**} (5.42)	-13.24 ^{**} (5.48)	-13.24 ^{***} (6.81)	-14.57 ^{***} (5.70)
	two years	-26.31 ^{***} (4.93)	-16.65 ^{***} (5.40)	-16.65 ^{***} (5.32)	-16.64 ^{***} (6.63)	-17.86 ^{***} (5.14)
(B)	<i>Loan-assets ratio</i> after one year	1.54 (2.98)	-1.36 (3.11)	-1.36 (3.20)	-1.36 (3.09)	-0.12 (2.51)
	two years	0.66 (3.58)	1.59 (5.36)	1.59 (5.37)	1.59 (5.44)	-1.45 (4.28)
(C)	<i>Loss provision</i> after one year	11.62 [*] (6.65)	12.59 [*] (7.42)	12.59 [*] (7.15)	12.59 [*] (7.01)	9.14 (6.09)
	two years	32.46 ^{***} (9.87)	18.43 (17.89)	18.43 (17.07)	18.43 (18.15)	22.92 (14.99)
(D)	<i>Equity-assets ratio</i> after one year	4.62 [*] (2.75)	0.69 (2.43)	0.69 (2.46)	0.69 (3.69)	2.13 (2.91)
	two years	5.50 (3.35)	0.56 (4.49)	0.56 (4.55)	0.56 (4.38)	2.33 (3.42)

Note that standard errors on the difference-in-difference between acquired and matched banks are reported in parentheses. We report bootstrapped standard errors on Biweight and Epanechnikov Kernel. *, **, *** indicate significance levels of 10 per cent, 5 per cent and 1 per cent respectively.

Another explanation might be that domestic banks often face adjustment costs if they want to be able to compete with foreign banks (Lensink and Hermes, 2004). For instance, domestic banks may very well decide to invest in a redesign of their offices or pay higher salaries to their workers to prevent them from moving to better-paying foreign competitors. If this is the case, then the assumption embedded in PSM that a takeover does not affect domestic banks is incorrect and the effect of cross border takeovers on target banks is likely to be under- or overestimated as a result, depending on the way in which domestic banks react. This should be taken into account when interpreting the results from any matching analysis, especially if the ability of domestic banks to react to the changes in the competitive environment is dependent on the development stage of the banking system. Finally, significant difference-in-differences in cost-income ratios in year two suggest that acquired banks were able to decrease their costs, and this is primarily because of a decrease in interest expenses.

Table 7 reports our comparisons of the difference-in-difference in post- and pre-takeover funding structure ratios and lending activity indicators of acquired and control group banks. Among the funding structure ratios, only the difference-in-differences in post- and pre-takeover deposits to total assets (deposits-assets ratio) and loan loss provision to interest income (loss provision) are statistically significant. The difference-in-differences in deposits-assets ratio suggest that, in both year one and year two following takeover, at the acquired banks the proportion of assets financed through deposits declined relative to the control group banks. This result is in line with the findings of Claessens and Van Horen (2013) for emerging economies, as well as with remarks in the Raiffeisen Bank Aval 2007 Annual Report (2007: 150), which comments on the Ukrainian banks' funding structure as follows:

“Historically, loan growth in Ukraine has been mostly financed by build-up in the deposits and capital accumulation. However, this situation has changed in the last two years, with the share of external borrowing increasing to 1/3 of banks funding in 2007. Specifically, Ukrainian banks were actively tapping international debt markets... Private foreign debt of the banking sector went up from USD 14.1 bln at the end of 2006 to USD 31 bln in 2007...As a result, the loan-to-deposit ratio moved upwards from 1.1 in 2003 to 1.35 in 2007”.

Our results suggest that foreign banks were leading in attracting international funding into the Ukrainian banking sector.

Table 8: Takeover effects on market share and size: PSM and DID

		Unmatched	Biweight Kernel	Epanechnikov Kernel	NN1	NN2
	(i) (ii)	(iii)	(iv)	(v)	(vi)	(vii)
(A)	<i>Deposit market share</i>					
	after one year	-0.25 ^{***} (0.06)	-0.22 (0.18)	-0.22 (0.18)	-0.22 (0.16)	-0.25 (0.16)
	two years	-0.27 ^{***} (0.08)	-0.22 (0.18)	-0.22 (0.19)	-0.22 (0.20)	-0.23 (0.19)
(B)	<i>Loan market share</i>					
	after one year	0.21 ^{***} (0.08)	0.13 (0.21)	0.13 (0.20)	0.13 (0.17)	0.13 (0.16)
	two years	0.31 ^{***} (0.09)	0.39 [*] (0.24)	0.39 (0.24)	0.39 (0.24)	0.29 (0.21)
(C)	<i>Assets market share</i>					
	after one year	0.16 ^{***} (0.07)	0.18 (0.15)	0.18 (0.15)	0.18 (0.15)	0.13 (0.13)
	two years	0.18 ^{***} (0.08)	0.22 (0.24)	0.22 (0.24)	0.22 (0.24)	0.19 (0.20)
(D)	<i>Size</i>					
	after one year	0.47 ^{***} (0.11)	0.33 [*] (0.17)	0.33 [*] (0.17)	0.33 ^{***} (0.16)	0.37 ^{***} (0.14)
	two years	0.53 ^{***} (0.16)	0.47 ^{**} (0.23)	0.47 ^{**} (0.23)	0.47 ^{***} (0.23)	0.52 ^{***} (0.21)

Note that standard errors on the difference-in-difference between acquired and matched banks are reported in parentheses.

We report bootstrapped standard errors on Biweight and Epanechnikov Kernel.

*, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Importantly, these results also indicate that in emerging economies the lower DEP ratios for foreign banks as compared to domestic banks –also documented recently by Claessens and Van Horen (2013) – are a result of foreign ownership. Turning to LLP, the difference-in-difference for the first year shows (although it is only marginally significant) that the acquired banks increased their loan loss provisions ratio by 12.59 percentage points more relative to the matched domestic banks. This is in contrast to Havrylchyk and Jurzyk (2011) who report that acquired banks in CEE countries decreased their loan loss provision ratios by 17.28 and 13.81 percentage points more than comparable domestic banks after one and two years respectively. Following Havrylchyk and Jurzyk’s explanations, in the case of Ukraine, the higher LLP ratio could very well reflect increased risk. Anecdotal evidence in this direction can be found in the 2008 Annual Report of Raiffeisen Bank Aval (2008: 93): “due to high share of FX loans to borrowers without income in foreign currency (for example, 80% mortgage loans are in foreign currency), 60% hryvnia depreciation since September [2008] eroded borrowers’ ability to repay their FX loans, thus leading to mounting default risk of the banks”.

Finally, Table 8 reports the difference-in-differences in post- and pre-takeover market shares and sizes of acquired and matched banks. Interestingly, for all three market share measures the difference-in-differences are statistically insignificant across all matching methods. This is in contrast to both Lanine and Vander Venet (2007) and Havrylchyk and Jurzyk (2011). Havrylchyk and Jurzyk report that the target banks were able to increase their market shares of total CEE banking assets by between 0.96 and 0.99 percentage points more than their control group in year two and by between 1.55 and 1.56 points in year three following takeover. The difference-in-differences in size, however, are statistically significant, as they are in CEE economies. As the impact of takeovers is only statistically apparent for size and not for market share, one might infer that growth was more of a motive for takeovers than market share increase.

Overall, the analysis from our propensity score (Kernel) matching exercise demonstrates that cross-border takeovers reduced target banks’ funding and other costs, which allowed them to grow faster. However, unlike in the CEE economies, they were not able to seize additional market shares in terms of loans or assets. In Ukraine the lending ability of the foreign banks in particular was apparently constrained as a result of two developments, both of which took place in 2008.¹⁶ First, Ukraine completely banned foreign currency lending to households in late 2008, whereas there was no such ban in countries like Hungary, Latvia or Poland (Brown and de Haas, 2012). Brown and de Haas (2012: 86) comment on this as follows: “In countries with weak monetary and fiscal institutions a strong regulatory response to reduce FX lending may [...] be counterproductive as lending in domestic currency is not a realistic alternative in the short term. In those cases, reducing FX lending through regulation may just lead to less credit.”

Presumably the foreign banks in Ukraine were hit harder by the ban than the domestic banks, as it may be assumed that they had been experiencing faster growth in foreign currency loans

¹⁶ As can be derived from Table 1, developments that affect 2008 and later years impact 7 out of the 16 bank-years that we have for year 1 following takeover and no less than 14 out of 16 for year 2.

to retail (household) clients, as in central Europe and the Baltics (Brown and de Haas, 2012: 80).

A methodological conclusion is that, in Tables 5-8, NN and Kernel matching always yield the same signs on the difference-in-differences. Given that estimates obtained by means of NN matching are of lower efficiency by construction, this consistency in signs across matching methods lends further credibility to our conclusions.

7. Robustness check: sensitivity analysis

In this section we present our sensitivity analysis based on Rosenbaum's bounds analysis, as described in the methodology section. In particular, Tables 9 to 12 report on the sensitivity of the observed significant differences in post- and pre-takeover differences in, respectively, interest expenses, cost-income ratio, deposits-assets ratio and size of acquired and matched banks. In doing so, we concentrate on NN1 matching because this is the only matching method the relevant Stata procedure can handle for the time being. As mentioned earlier, the goal is to check for the presence of unobserved random factors that we might have failed to control for by combining PSM and DID.

Column (a) in Tables 9 to 12 relates to the post-takeover periods, and column (b) reports the Γ odds that a particular bank is selected for cross-border takeover. As mentioned, if all banks had the same probability of being selected, then the Γ odds ratio would equal 1. In other words, in our previous analysis the main task was to match acquired and non-acquired banks by means of PSM so that $\Gamma = 1$. By increasing the value of Γ we now reintroduce unobservable factors, so that at $\Gamma = 1.2$, for instance, a bank has a 20 per cent higher odds ratio of being the target of a cross-border takeover relative to other banks with similar observable characteristics.

By reintroducing this hidden bias, we want to see to what extent the differences obtained solely based on observable factors stay significant. Instead of single-point estimates for the difference-in-differences, we therefore determine bounds, which are reported in columns (e) and (f) by means of their lowest and highest points, respectively. The associated p-values are shown in columns (c) and (d). For instance, in Table 9, at $\Gamma = 1.8$, the difference in post- and pre-takeover difference in interest expenses after one year is equal to at least -2.52 (column e) and to at most -1.23 (column f), with 0.00 and 0.055 probability, respectively, that these values are zero (columns c and d). The upper-bound difference -1.23 is thus only significantly different from zero at 5.5 percent ($p = 0.055$). Columns (g) and (h) additionally report the associated confidence intervals.

Crucially, the value of Γ at which the estimated bounds for the largest and smallest difference become uncertain is the point where the hidden bias starts to affect our conclusions derived from PSM. In Tables 9-12 we have highlighted these Γ values by means of bold borders. For instance, in Table 9, at $\Gamma = 2.4$, the difference in post- and pre-takeover difference in IEXP after two years is equal to at least -2.90 (column e) and at most -0.85 (column f). However, here the lower-bound difference has a 0.12 probability, implying that it is insignificant. Hence, at $\Gamma = 2.4$ our bounds become uninformative. Obviously, the lower the value of Γ at which the

estimated bounds become uninformative, the higher the sensitivity of our results for hidden bias.

As Tables 9 to 12 demonstrate, the results from our PSM and DID analysis exhibit varying degrees of sensitivity. The difference-in-difference in interest expenses for the first year following takeover is highly significant, and this significance only vanishes when we introduce an unobserved variable that would put the odds ratio at 2.4. Our conclusions for the two-year result only vanish once we introduce an unobservable factor that would put Γ at 1.8. Table 10 shows that the difference-in-differences in cost-income ratios are substantially more sensitive to hidden bias, because the bounds become uninformative at $\Gamma \geq 1.2$ for year one, and at $\Gamma \geq 1.6$ for year two.

Finally, the difference-in-differences in deposits-assets ratio and size are largely insensitive to hidden bias. For deposits-assets ratio, for instance, the bounds only become uninformative at $\Gamma \geq 2.2$ and $\Gamma > 2.4$. We cannot compare the sensitivity of our results to other studies, as we think we are the first to apply this methodology in this context. Nevertheless, with the exception of the result for cost-income ratio in year 2, all difference-in-differences obtained through NNI seem to be robust for a possible hidden bias caused by unobserved temporarily shocks.

Table 9: Sensitivity to hidden bias of takeover effects on interest expenses: Rosenbaum's bounds analysis

Difference in post- and pre-takeover difference in <i>Interest expenses</i> after	Γ	Upper-bound sig. level (<i>p-value</i>)	Lower-bound sig. level (<i>p-value</i>)	Upper-bound point estimate	Lower-bound point estimate	Upper-bound confidence interval ($\alpha = 0.95$)	Lower-bound confidence interval ($\alpha = 0.95$)
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
One year	1	0.01	0.006	-1.92	-1.92	-3.30	-0.49
	1.2	0.00	0.013	-2.18	-1.58	-3.63	-0.25
	1.4	0.00	0.024	-2.27	-1.46	-3.73	-0.02
	1.6	0.00	0.038	-2.36	-1.36	-4.08	0.27
	1.8	0.00	0.055	-2.52	-1.23	-4.43	0.51
	2	0.00	0.074	-2.72	-1.02	-4.60	0.76
	2.2	0.00	0.095	-2.80	-0.92	-4.74	0.89
	2.4	0.00	0.12	-2.90	-0.85	-5.06	1.12
Two years	1	0.01	0.01	-1.66	-1.66	-2.7	-0.4
	1.2	0.00	0.02	-1.76	-1.40	-3.0	0.0
	1.4	0.00	0.04	-1.92	-1.34	-3.4	0.3
	1.6	0.00	0.07	-2.01	-1.12	-3.8	0.5
	1.8	0.00	0.09	-2.13	-0.97	-3.9	0.6
	2	0.00	0.12	-2.30	-0.91	-4.4	0.8
	2.2	0.00	0.15	-2.39	-0.80	-4.6	1.0
	2.4	0.00	0.18	-2.43	-0.75	-4.9	1.2

Note: all statistics are based on Wilcoxon's matched-pairs signed-rank test.

Table 10: Sensitivity to hidden bias of takeover effects on cost-income *ratio*: Rosenbaum's bounds analysis

Difference in post- and pre-takeover difference in <i>Cost-income ratio</i>	Γ	Upper-bound sig. level (p -value)	Lower-bound sig. level (p -value)	Upper-bound point estimate	Lower-bound point estimate	Upper-bound confidence interval ($\alpha = 0.95$)	Lower-bound confidence interval ($\alpha = 0.95$)
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
One year	1	0.07	0.07	-6.44	-6.44	-17.1	1.3
	1.2	0.03	0.12	-8.98	-5.36	-19.1	3.0
	1.4	0.02	0.18	-10.17	-4.35	-19.8	4.7
	1.6	0.01	0.24	-10.70	-4.15	-21.0	5.1
	1.8	0.00	0.30	-12.07	-3.22	-22.3	7.2
	2	0.00	0.36	-12.34	-2.86	-26.2	9.1
	2.2	0.00	0.42	-12.63	-1.79	-27.8	9.1
	2.4	0.00	0.48	-13.59	-0.81	-28.2	9.5
Two years	1	0.02	0.02	-10.22	-10.22	-21.6	-0.6
	1.2	0.01	0.05	-11.74	-8.44	-23.2	1.2
	1.4	0.00	0.08	-13.39	-7.58	-24.6	2.4
	1.6	0.00	0.12	-14.38	-6.44	-25.7	4.7
	1.8	0.00	0.16	-15.98	-5.87	-28.0	5.2
	2	0.00	0.20	-16.60	-5.11	-32.4	6.5
	2.2	0.00	0.24	-18.20	-4.44	-33.2	9.1
	2.4	0.00	0.29	-18.50	-3.64	-37.9	9.5

Note: all statistics are based on Wilcoxon's matched-pairs signed-rank test.

Table 11: Sensitivity to hidden bias of takeover effects on deposits-assets ratio: Rosenbaum's bounds analysis

Difference in post- and pre-takeover difference in <i>Deposits-assets ratio</i> after	r	Upper-bound sig. level (p -value)	Lower-bound sig. level (p -value)	Upper-bound point estimate	Lower-bound point estimate	Upper-bound confidence interval ($\alpha = 0.95$)	Lower-bound confidence interval ($\alpha = 0.95$)
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
One year	1	0.01	0.01	-13.34	-13.34	-21.5	-3.7
	1.2	0.00	0.02	-14.29	-12.00	-23.5	-2.8
	1.4	0.00	0.03	-15.08	-10.77	-25.3	0.1
	1.6	0.00	0.05	-15.99	-10.52	-28.4	2.5
	1.8	0.00	0.07	-17.37	-8.71	-31.4	4.0
	2	0.00	0.09	-17.44	-7.23	-35.2	4.2
	2.2	0.00	0.12	-17.71	-6.93	-35.3	7.6
	2.4	0.00	0.14	-18.68	-6.53	-36.9	7.6

Two years	1	0.00	0.00	-16.48	-16.48	-26.5	-7.3
	1.2	0.00	0.01	-17.59	-15.66	-27.4	-5.2
	1.4	0.00	0.01	-18.95	-14.21	-28.3	-2.9
	1.6	0.00	0.02	-19.77	-12.22	-31.4	-0.7
	1.8	0.00	0.03	-20.81	-10.64	-35.1	0.3
	2	0.00	0.04	-22.79	-10.35	-36.3	1.7
	2.2	0.00	0.06	-24.55	-9.34	-37.8	3.2
	2.4	0.00	0.07	-24.81	-8.85	-38.6	4.6

Note: all statistics are based on Wilcoxon's matched-pairs signed-rank test.

Table 12: Sensitivity to hidden bias of takeover effects on size: Rosenbaum's bounds analysis

Difference in post- and pre-takeover difference in Size after	r	Upper-bound sig. level (p -value)	Lower-bound sig. level (p -value)	Upper-bound point estimate	Lower-bound point estimate	Upper-bound confidence interval ($\alpha = 0.95$)	Lower-bound confidence interval ($\alpha = 0.95$)
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
One year	1	0.01	0.01	0.35	0.35	0.1	0.6
	1.2	0.02	0.00	0.29	0.40	0.0	0.7
	1.4	0.03	0.00	0.24	0.43	0.0	0.8
	1.6	0.05	0.00	0.23	0.47	-0.1	0.8
	1.8	0.07	0.00	0.20	0.50	-0.2	0.8
	2	0.09	0.00	0.20	0.52	-0.4	0.9
	2.2	0.12	0.00	0.18	0.56	-0.4	1.0
	2.4	0.14	0.00	0.14	0.57	-0.5	1.0

Two years	1	0.02	0.02	0.48	0.48	0.1	0.9
	1.2	0.04	0.01	0.43	0.55	0.0	1.0
	1.4	0.07	0.00	0.38	0.60	-0.1	1.0
	1.6	0.10	0.00	0.33	0.61	-0.2	1.2
	1.8	0.13	0.00	0.27	0.68	-0.2	1.2
	2	0.17	0.00	0.25	0.69	-0.3	1.3
	2.2	0.21	0.00	0.25	0.74	-0.6	1.3
	2.4	0.25	0.00	0.22	0.76	-0.6	1.4

Note: all statistics are based on Wilcoxon's matched-pairs signed-rank test.

8. Conclusions

In this paper we investigate whether cross-border takeovers have increased the efficiency, profitability and market shares of target banks in Ukraine, a prime example of a country with a relatively weak institutional and economic development. Before the surge in foreign entry, which happened later than in the CEE economies, Ukraine had a very inefficient banking system compared to the other transition economies and therefore hopes that the foreign takeovers would improve the efficiency of the target banks were particularly high.

Using a combination of propensity score matching and a difference-in-difference methodology, we account for possible selection biases and control for unobservable fixed effects. Unlike other studies, we also apply a novel sensitivity analysis method to the (significant) results of our PSM-*cum*-DID application, in order to check for the presence of temporary bank-level unobservable factors. As we argue, such hidden bias is potentially particularly relevant in countries with a poor business environment such as Ukraine.

Our analysis yields four main findings. Firstly, where the microeconomic determinants of the takeovers are concerned, we find that foreign investors in Ukraine acquired mainly large banks with average efficiency and profitability but with lower capitalisation. The preference for large banks has been identified in literally all previous papers that focus on transition economies. Our other pre-takeover results are in line with those obtained for CEE economies by Lanine and Vander Venet (2007), Poghosyan and de Haan (2010) and Brown and de Haas (2012). However, they do clash notably with the findings of Havrylchyk and Jurzyk (2011) who find that foreign banks acquired mainly well-capitalised institutions with low profitability.

A second interesting result of our analysis is that the cross-border takeovers that were signed in Ukraine in 2004-06 significantly decreased the interest expenses and cost-income ratios of the acquired banks relative to comparable non-acquired banks. Here the comparison with the existing literature on CEE economies yields a completely different picture than for the pre-takeover characteristics. The improvement in cost efficiency is in line with Havrylchyk and Jurzyk (2011) but at odds with Lanine and Vander Venet (2007), Poghosyan and Poghosyan (2010) and Degryse et al. (2012), all of whom find no significant effects. A closer inspection of our results reveals a relative drop in the acquired banks' interest expenses/total assets ratio, driven by a decreased reliance on deposits, which were apparently replaced by international funding.

Thirdly, and somewhat surprisingly, the foreign banks in Ukraine were not able to translate the reduced funding costs into higher profitability ratios, at least not in the first two years following takeover. Moreover, and this is the fourth result that we would like to highlight, as in CEE countries, foreign banks were quick to increase the size of their Ukrainian targets but, unlike in CEE countries, this did not result in increased deposit and loan market shares relative to comparable domestic banks. This again tallies with the findings of Lanine and Vander Venet (2007) but clashes with the findings of Havrylchyk and Jurzyk (2011). In particular, Havrylchyk and Jurzyk find that foreign investors in CEE countries were

able to pass their gains from reduced funding costs to their clients in the form of lower lending rates. As a result, the acquired banks were able to increase their lending volumes. The reason this did not materialise in Ukraine might be because, as mentioned earlier, cross-border takeovers affect the profitability of target banks differently in a country that is in a late stage of its transition. Alternatively, the differences might reflect specific challenges faced by foreign banks in a FSU economy that has a weaker institutional environment.

An indication of this is that while the loan loss provisions/interest income (loss provision) ratios before takeover were no different, the acquired banks in the first year after takeover increased their loss provision by 12.59 percentage points more relative to the matched non-acquired domestic banks. This contrasts with Havrylchuk and Jurzyk (2011) who report that, in CEE countries, the acquired banks *decreased* their loan loss provision ratios, even more so than the domestic banks. Note also that, as mentioned, Ukraine completely banned foreign currency lending to households in 2008.

Overall, the picture that emerges from our findings is one more in line with Lanine and Vander Venet (2007) than with Havrylchuk and Jurzyk (2011) but does not completely dovetail with either, nor with any of the preceding studies on transition economies. Apparently, the case of Ukraine is quite idiosyncratic and as such, in our view, serves as a warning that one should not solely rely on multi-country studies. Not only is there the risk that important country-specific factors are overlooked, our results also raise a red flag as to the reliability of PSM with multi-country data because in such a setting foreign banks are not necessarily matched with banks from the same country. In fact, in the dataset used by Havrylchuk and Jurzyk (2011) overall no less than 67 per cent of the foreign banks are matched with non-acquired banks from a different country. Part of the explanation is probably that in some of the CEE countries almost the entire banking sector was sold to foreign investors.¹⁷ The danger then is that banks may be matched with a bank from a foreign country that is atypical, just like Ukraine would appear to be.

A unique contribution of our paper is that we do not accept the results of the PSM and DID analysis at face value but are the first to add a step and apply a sensitivity analysis to check for the presence of hidden bias. In other words, we check to what extent the results are sensitive for the presence of temporary unobservable factors that we possibly failed to control for. Our sensitivity analysis shows that all observed significant differences-in-differences are indeed robust, with the exception of the cost/income ratio in year 1.

Our results also suggest a number of areas for future research. As explained, we believe the domain would benefit from additional single-country research. Also, in order to remove all doubts about the causal impact of foreign ownership, we think it would be wise to revisit the results of the multi-country studies on CEE economies that control for selection effects and exclude those countries where no comparable domestic banks could be found because foreign banks control almost the entire banking sector. Moreover, in view of the evidence proffered by

¹⁷ On the level of individual countries, only in Hungary (8 out of 9), Poland (8/16), and Croatia (2/4) half or more of the acquired banks are matched with a non-acquired bank from the same country. Literally all Estonian and Lithuanian takeovers are matched with a bank from a different country. For Bulgaria this figure is 8 out of 9, and for Romania, Slovakia, and the Czech Republic 6 out of 7. See the Appendix of Havrylchuk and Jurzyk (2010).

Claessens and van Horen (2013), it would seem advisable to control for the cultural, institutional and geographical distances between the host country and the home country of the acquiring banks.

References

- A. Abadie and G.W. Imbens (2008), “On the failure of the bootstrap for matching estimators”, *Econometrica*, Vol. 76, No. 6, pp. 1537-57.
- C.F. Baum, M. Caglayan, D. Schafer and O. Talavera (2008), “Political patronage in Ukrainian banking”, *Economics of Transition*, Vol. 16, No. 3, pp. 537-57.
- A.N. Berger, G.R.G. Clarke, R. Cull, L. Klapper and G.F. Udell (2005), “Corporate governance and bank performance: A joint analysis of the static, selection, and dynamic effects of domestic, foreign, and state ownership”, *Journal of Banking and Finance*, Vol. 29, No. 8-9, pp. 2179-2221.
- R. Blundell and M.C. Dias (2009), “Alternative approaches to evaluation in empirical microeconomics”, *Journal of Human Resources*, Vol. 44, No 3, pp. 565-640.
- J. Bonin, I. Hasan and P. Wachtel (2005), “Bank performance, efficiency and ownership in transition countries”, *Journal of Banking and Finance*, Vol. 29, No 1, pp. 31–53.
- M. Brown and R. De Haas (2012), “Foreign banks and foreign currency lending in emerging Europe”, *Economic Policy*, Vol. 27, No 69, pp 57-98.
- M. Caliendo and S. Kopeinig (2008), “Some practical guidance for the implementation of propensity score matching”, *Journal of Economic Surveys*, Vol. 22, No 1, pp. 31–72.
- S. Caiazza, A. Clare and A. F. Pozzolo (2012), “What do bank acquirers want? Evidence from worldwide bank M&A targets”, *Journal of Banking and Finance*, Vol. 36, No. 9, pp. 2641–59.
- S. Claessens, and N. van Horen (2013), “Foreign banks: Trends and impact”, *Journal of Money, Credit, and Banking*, forthcoming.
- R. De Haas, D. Ferreira and A. Taci (2010), “What determines the composition of banks’ loan portfolios? Evidence from transition countries”, *Journal of Banking and Finance*, Vol. 34, No 2, pp. 388-98.
- H. Degryse, O. Havrylchyk, E. Jurzyk and S. Kozak (2012), “Foreign bank entry, credit allocation and lending rates in emerging markets: Empirical evidence from Poland”, *Journal of Banking and Finance*, Vol. 36, No. 11, pp. 2949-59.
- N. Dushkevych and V. Zelenyuk (2006), “Ukrainian banking sector: Evolution and current state”, *The Ukrainian Observer*, Last accessed on 2 August 2011 at url: <http://advisors.com.ua/en/publications/show/28>
- European Bank for Reconstruction and Development (2005), *Transition Report*, EBRD, London.

- S. Fries and A. Taci (2005), “Cost efficiency of banks in transition: Evidence from 289 banks in 15 post-communist countries”, *Journal of Banking and Finance*, Vol. 29, No. 1, pp. 55–81.
- Y. Gorodnichenko and Y. Grygorenko (2008), “Are oligarchs productive? Theory and evidence”, *Journal of Comparative Economics*, Vol. 36, No. 1, pp.17-42.
- D. Grigorian and V. Manole (2006), “Determinants of commercial bank performance in transition: An application of data envelopment analysis”, *Comparative Economic Studies*, Vol. 48, No. 3, pp. 497–522.
- D. Grigorian and V. Manole (2002), “Determinants of commercial bank performance in transition: An application of data envelopment analysis”, Working Paper 2850, World Bank, Washington, D.C.
- O. Havrylchyk and E. Jurzyk (2011), “Inherited or earned? Performance of foreign banks in Central and Eastern Europe”, *Journal of Banking and Finance*, Vol. 35, No. 5, pp.1291-1302.
- O. Havrylchyk and E. Jurzyk (2010), “Inherited or earned? Performance of foreign banks in Central and Eastern Europe”, Working Paper 10/04, International Monetary Fund, Washington, D.C.
- L. Kyj and I. Isik (2008), “Bank *x*-efficiency in Ukraine: An analysis of service characteristics and ownership”, *Journal of Economics and Business*, Vol. 60, No 4, pp. 369–93.
- G. Lanine and R. Vander Venet (2007), “Microeconomic determinants of acquisitions of Eastern European banks by Western European banks”, *Economics of Transition*, Vol. 15, No. 2, pp. 285-308.
- R. Lensink and N. Hermes (2004), “The short-term effects of foreign bank entry on domestic bank behaviour: Does economic development matter?”, *Journal of Banking and Finance*, Vol. 28, No 3, pp. 553-68.
- I. Love and A. Rachinsky (2007), “Corporate governance, ownership and bank performance in emerging markets: evidence from Russia and Ukraine”, Working Paper, World Bank, Washington, D.C.
- J. Peek, E. Rosengren and F. Kasirye (1999), “The poor performance of foreign bank subsidiaries: were the problems acquired or created?”, *Journal of Banking and Finance*, Vol. 23, No. 2-4, pp. 579–604.
- T. Poghosyan and A. Poghosyan (2010), “Foreign bank entry, bank efficiency and market power in Central and Eastern European Countries”, *Economics of Transition*, Vol. 18, No. 3, pp. 571–98.

- T. Poghosyan and J. de Haan (2010), “Determinants of cross-border bank acquisitions in transition economies: A latent class analysis”, *Economics of Transition*, Vol. 18, No. 4, pp. 671-96.
- Raiffeisen Bank Aval (2010), Annual report 2010.
- Raiffeisen Bank Aval (2008), Annual report 2008.
- Raiffeisen Bank Aval (2007), Annual report 2007.
- P.R. Rosenbaum (2005), “Sensitivity analysis in observational studies”, *Encyclopedia of Statistics in Behavioral Science*, Vol. 4, pp.1809-14.
- P.R. Rosenbaum and D.B. Rubin (1983), “The central role of the propensity score in observational studies for causal effects”, *Biometrika*, Vol. 70, No 1, pp. 41–55.

Appendix I

Table A1: Correlations, 2004-06

	<i>Return on assets</i>	<i>Return on equity</i>	<i>Interest income</i>	<i>Interest expenses</i>	<i>Non-interest expenses</i>	<i>Cost-income ratio</i>	<i>Equity-assets ratio</i>	<i>Deposits-assets ratio</i>	<i>Loan-assets ratio</i>	<i>Loss provision</i>	<i>Size</i>	<i>Loan market share</i>	<i>Assets market share</i>	<i>Deposit market share</i>
<i>Return on assets</i>	1													
<i>Return on equity</i>	0.66**	1												
<i>Interest income</i>	0.28**	0.18**	1											
<i>Interest expenses</i>	-0.10	0.11**	0.60**	1										
<i>Non-interest expenses</i>	0.02	-0.008	0.12**	0.05	1									
<i>Cost-income ratio</i>	-0.31**	-0.003	0.09	0.78**	0.02	1								
<i>Equity-assets ratio</i>	0.19**	-0.41**	-0.04	-0.52**	0.008	-0.59**	1							
<i>Deposits-assets ratio</i>	-0.05	0.37**	0.17**	0.51**	0.02	0.40**	-0.77**	1						
<i>Loan-assets ratio</i>	-0.01	0.12**	0.50**	0.39**	-0.09	0.09	-0.18**	0.30**	1					
<i>Loss provision</i>	0.07	-0.06	-0.06	-0.26**	-0.03	-0.29**	0.28**	-0.29**	-0.04	1				
<i>Size</i>	-0.14**	0.39**	-0.09	0.23**	-0.05	0.34**	-0.71**	0.51**	0.16**	-0.06	1			
<i>Loan market share</i>	-0.07	0.21**	-0.01	0.07	-0.02	0.08	-0.29**	0.21**	0.12**	0.06	0.70**	1		
<i>Assets market share</i>	-0.07	0.21**	-0.02	0.07	-0.02	0.08	-0.29**	0.21**	0.11**	0.06	0.73	0.99**	1	
<i>Deposit market share</i>	-0.07	0.22**	-0.03	0.07	-0.02	0.08	-0.30**	0.23**	0.09	0.05	0.70**	0.99**	0.99**	1
<i>Gdp_growth</i>	0.04	-0.04	0.17**	0.07	0.17**	-0.06	0.08	-0.06	-0.06	0.03	-0.03	0.02	0.05	0.03

**Correlation is significant at 0.05 level (2-tailed).

Appendix II

Table A2: Acquired and matched banks: Two Nearest-Neighbours

Takeover year	Acquired bank (post-takeover name)		NN1		NN2	
	Name	Propensity score	Name	Propensity score	Name	Propensity score
2005	Raiffeisen Bank Aval	0.238	PrivatBank	0.219	Ukrsotsbank	0.135
2005	SEB Bank	0.012	Metalurg Bank	0.012	Avtokraz Bank	0.013
2006	UkrSibbank	0.264	Brokbusiness Bank	0.251	Nadra	0.241
2006	Index Bank	0.201	Tas-Commerz Bank	0.187	Rodovid Bank	0.181
2006	Home Credit Bank	0.149	Ukrin Bank	0.155	Zoloti Vorota	0.156
2006	VTB Bank	0.138	First Ukrainian International Bank	0.133	Mega Bank	0.122
2006	Universal Bank	0.090	Transbank	0.091	Big Energy	0.092
2006	Energo Bank	0.087	Noviy Bank	0.084	Poltava Bank	0.084
2006	BTA Bank	0.021	Soccom Bank	0.020	Ukrainian Financial Group	0.022
2007	Ukrsots Bank	0.193	Finance and Credit Bank	0.193	Forum	0.174
2007	Swed Bank	0.138	Pivdennyi	0.142	Nadra	0.128
2007	Marfin Bank	0.096	Rodovid Bank	0.100	Bank National Kredit	0.086
2007	Piraeus Bank	0.080	Avtozaz Bank	0.082	Mega Bank	0.078
2007	Kievsk Rus Bank	0.076	Bank Petrocommerce	0.076	Noviy Bank	0.077
2007	Credit-Dnibr JSB	0.046	Promekonom Bank	0.047	Avtokraz Bank	0.049
2007	Plus Bank	0.034	Expo Bank	0.035	Starokievskyy Bank	0.033

Appendix III

Figure AIII-1: Interest expenses of Ukrainian banks, 2004-09

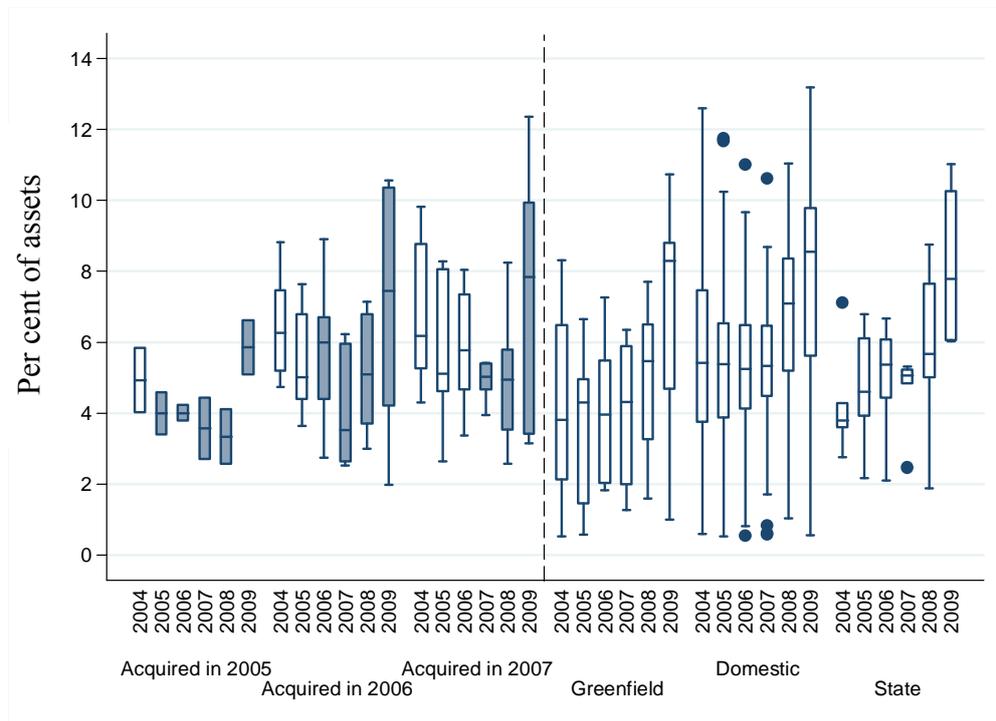
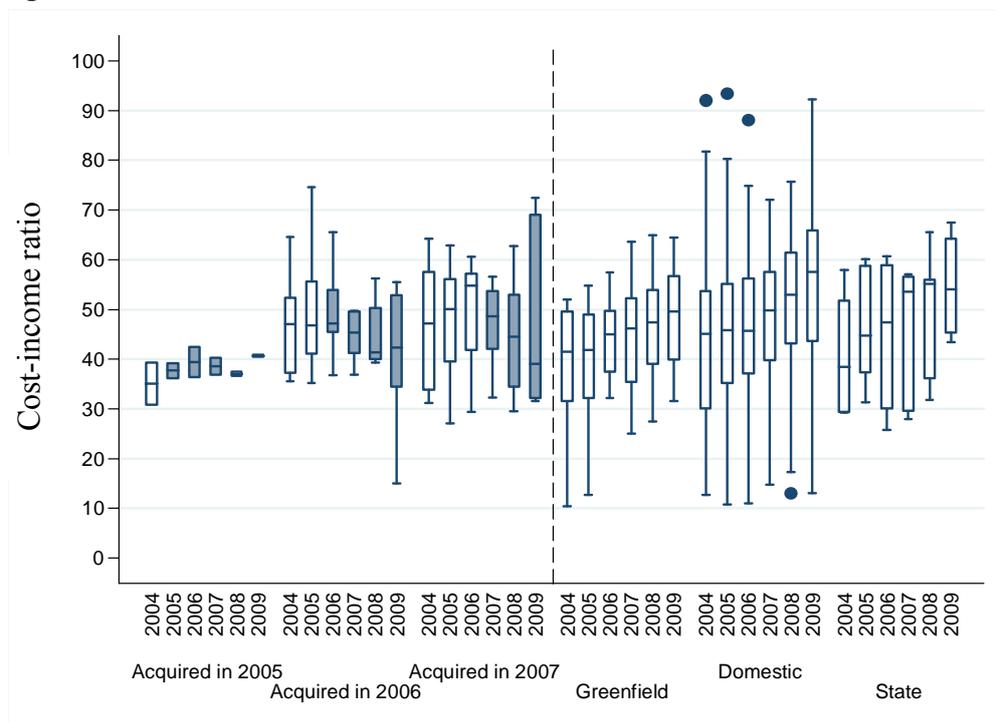


Figure AIII-2: Cost-income ratio of Ukrainian banks, 2004-09



Note that, in the above graphs, blank and coloured boxes for the acquired banks (to the left of the dashed line), respectively represent pre- and post-takeover years. The category 'domestic banks' excludes the target banks. The horizontal line in each box represents the median value. The top and bottom hinges of the boxes show, respectively, the 75th and 25th quantiles. The adjust lines to the whiskers indicate adjustment values. Lastly, the dots show outside values. Also note that we consider a bank as a greenfield if it was established by foreign investors and continues to be predominantly foreign-owned (at least 50 percent).

Figure AIII-3: Deposits-assets ratio of Ukrainian banks 2004-09

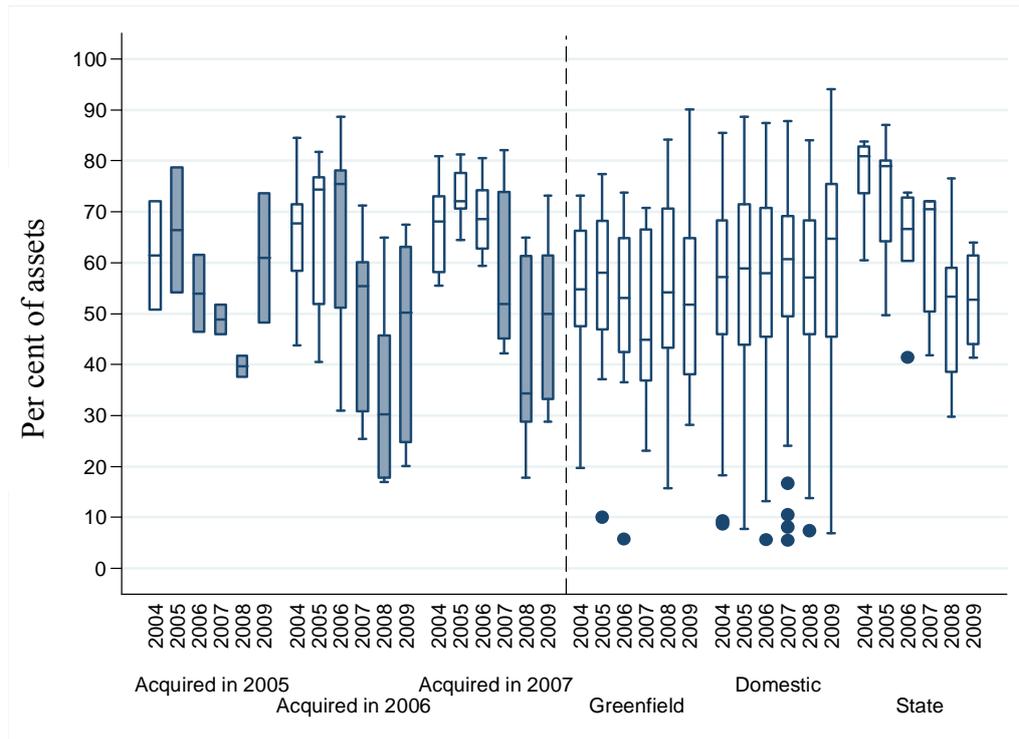
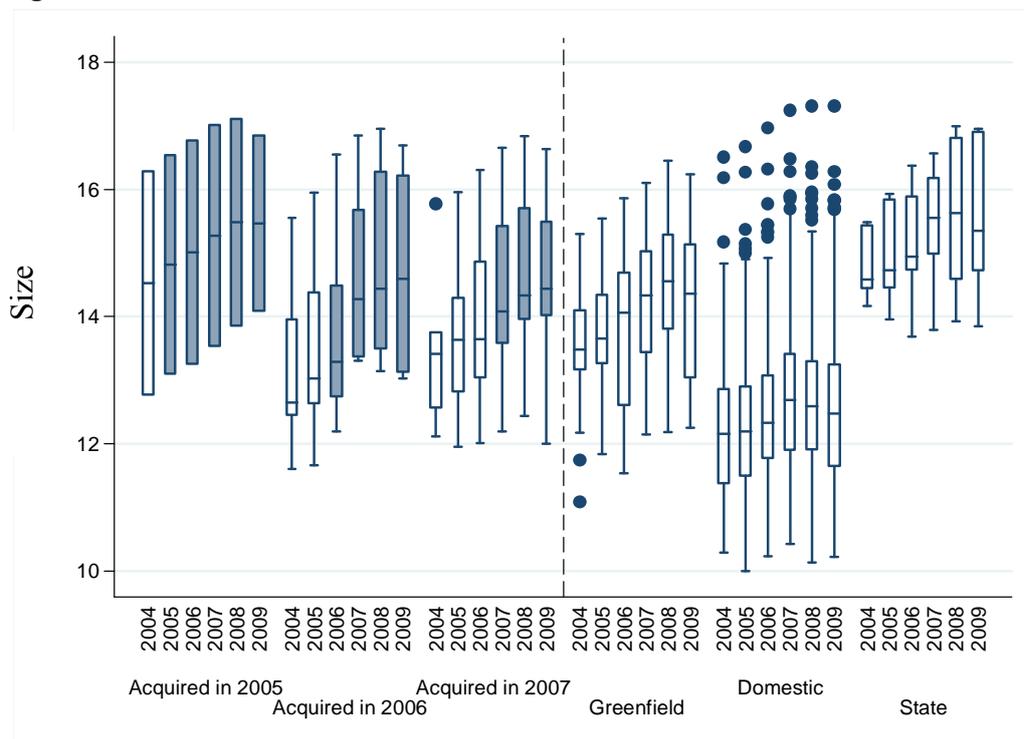


Figure AIII-4: Size of Ukrainian banks 2004-09



Note that, in the above graphs, blank and coloured boxes for the acquired banks (to the left of the dashed line), respectively represent pre- and post-takeover years. The category 'domestic banks' excludes the target banks. The horizontal line in each box represents the median value. The top and bottom hinges of the boxes show, respectively, the 75th and 25th quantiles. The adjust lines to the whiskers indicate adjustment values. Lastly, the dots show outside values. Also note that we consider a bank as a greenfield if it was established by foreign investors and continues to be predominantly foreign-owned (at least 50 percent).