Editorial Board

PREFACE OF THE CHAIRMAN
OF THE EDITORIAL BOARD

Dear readers,

The September issue of the journal *Visnyk of the National Bank of Ukraine* contains articles pertaining to important issues of central bank balance sheet management, the impact of tax changes on the performance of the real and financial sectors of Ukraine, as well as issues of market heterogeneity and competition in the auditing services market of Ukraine. The proposed materials allow experts to discover, in detail, peculiarities of central banks' operations and important aspects of financial market functioning.

The article by Iryna Kachur, Volodymyr Lepushynskyi, and Robert Zammit entitled *The NBU's Balance Sheet: Before, During, and After the Crisis* opens the issue. This article investigates the NBU's balance sheet as an analytical tool reflecting macroeconomic processes. Assuming current NBU priorities for monetary policy the authors make simulations on the central bank's balance sheet for the next five years. The article contains conclusions about the future financial position of the NBU and recommendations for its strengthening. The authors emphasize that a strong financial position and clear goals are essential prerequisites for successful monetary policy.

The article *Economic Impact of the Recent Decrease in Social Security Contributions in Ukraine* by Philipp Engler, Simon Voigts, Robert Kirchner, and Oleksandra Betliy, based on a DSGE model, studies the impact of a sizable decrease in social security contributions on Ukraine's GDP under different monetary policy regimes. The study results show that the decrease in the social security contributions rate facilitates to GDP and consumption growth and, in the meantime, reduces the inflation rate. These positive effects are substantial in both the short-term and long-term outlooks. At that, in the short-term perspective, the beneficial effect of the decrease in the social security contributions rate is significantly stronger under inflation targeting than under exchange rate stabilization framework.

The article *Quasi-Competitiveness of the Audit Services Market in Ukraine: The Aspect of European Integration* by Inna Makarenko and Oleksiy Plastun focuses on the study of the concentration level of the audit services market of Ukraine. To confirm the hypothesis about the market heterogeneity, the authors use conventional approaches to determine the concentration level as well as the Kruskal-Wallis test. The results of the study corroborate a high concentration level in the regional audit services market. The recommendations given in the article are related to the need to develop a competitive market environment, which should facilitate an increase in the efficiency of auditing in Ukraine.

We hope that the materials in this issue will be of use to a wide range of researchers, academics, and experts in macroeconomics, monetary policy, banking, finance, and other areas.

We encourage researchers and academics to join the debate on topical issues of ensuring financial stability and macroprudential regulation, developing new approaches and tools for monetary policy, and other areas of NBU activities. The Editorial Board invites everyone interested to send us original articles with well-grounded conclusions and recommendations for further consideration and publishing in the Visnyk of the National Bank of Ukraine. When considering articles and preparing them for publication, the Editorial Board exerts all efforts to adhere to high international standards of publishing ethics based on transparency and objectiveness.

Best regards   *Dmytro Sologub*

CONTENTS

The NBU's Balance Sheet: Before, During, and After the Crisis

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ABSTRACT

Looking at the evolution of the central bank's balance sheet gives us a unique window on the forces that have shaped our economy and central bank reaction functions. This paper considers the evolution of the NBU's balance sheet over the period from 2001-2016, focusing on explicit and implicit monetary policy priorities at different periods. We then make simulations on the NBU's balance sheet for the next five years assuming current NBU priorities for monetary policy. We then draw conclusions on the likely financial position of the NBU in the future and recommendations to ensure the NBU's financial strength – essential for its continued independence.

JEL Codes: E58, E61, G01

Keywords: central bank finances, National Bank of Ukraine, balance sheet, central bank independence, monetary policy.

1. INTRODUCTION

The global economic crisis in 2008 led to a significant expansion in central bank balance sheets around the world, consistent with policy efforts to stabilize financial systems and restore economic growth. During the period of 2014 and 2015, the National Bank of Ukraine's (NBU) balance sheet expended further in response to the combined effects of a balance of payments, fiscal and banking crisis brought on by a collapse in confidence in the economy, political turbulence, and military aggression.

As a percentage of Gross Domestic Product (GDP), the balance sheets of the NBU and that of other central banks in both developed and emerging market economies are a multiple of what they were only a decade ago (Figure 1).

Figure 1. Central bank balance sheets as a percentage of annual nominal GDP
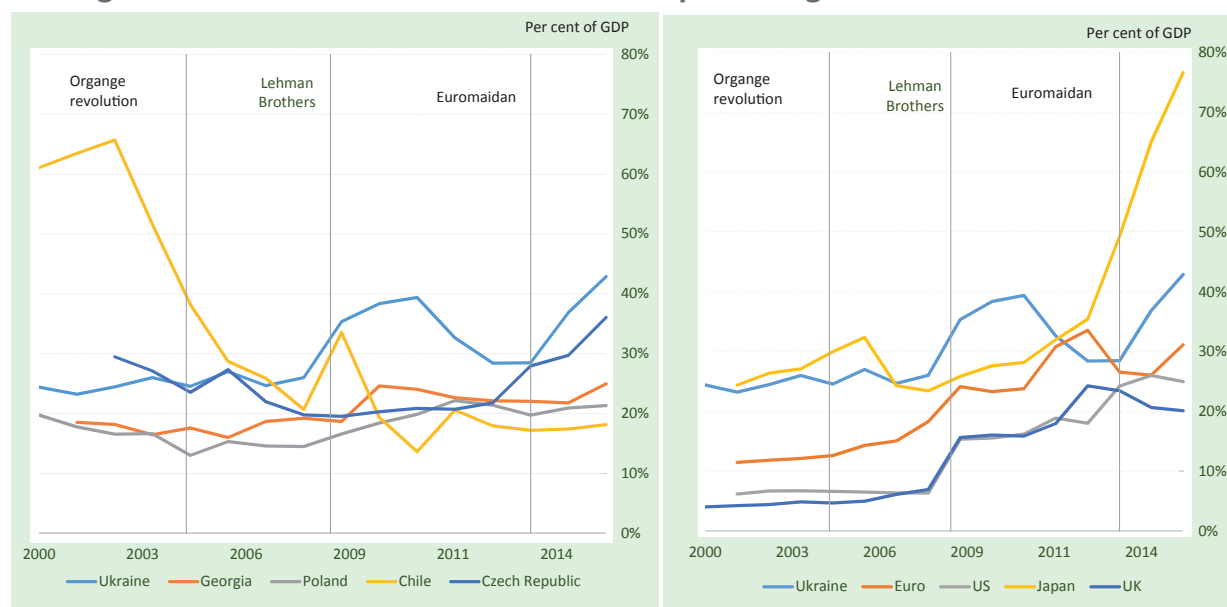
Source: NBU calculations.

Central bank balance sheets serve a very different purpose to commercial bank balance sheets. Whereas in the commercial sector balance sheets serve the purely commercial function of channeling funds from savers to borrowers, central bank balance sheets serve an important policy function through the provision of central bank money to the economy.

Looking at the evolution of central banks' balance sheets gives us a unique window on the forces that have shaped our economy and central bank reaction functions. Equally, thinking about what might impact a central bank's balance sheet in the future helps us understand what policy options are available for central banks to fulfill their core functions of price and financial stability and sustainable economic growth.

This article does the following. The next section uses a simplified model to explain the main components of a central bank balance sheet. The following section explains the evolution of the NBU's balance sheet over the period of 2001-2016. We then present a simple simulation that maps the possible future evolution of the NBU's balance sheet over the period of 2016-2020, and conclude with a number of policy recommendations.

2. A SIMPLIFIED CENTRAL BANK BALANCE SHEET: BRIEF LITERATURE REVIEW

As noted in Archer and Moser-Boehm (2013), while the overall central bank balance sheet configuration is not something that monetary policy makers decide upon on a day-by-day basis, it is, in the end, a policy decision which balance sheet items the central bank is willing to adjust endogenously and which items it wants to steer actively in the conduct of monetary policy. Our analysis of central bank balance sheets focuses not just on the absolute and relative size of the balance sheet, but also the composition of the items within it.

We start off with a simple model of a central bank accounting balance sheet shown in Table 1 below.

Table 1. Simplified central bank balance sheet

Assets	Liabilities and equity
Foreign assets Domestic assets	Currency in circulation Commercial bank reserves Securities issued by the central bank Equity

In addition to a central bank's equity or capital, the liabilities side of a central bank reflects the two sources of demand for central bank money: the demand for physical banknotes and the demand for commercial bank balances at the central bank. The asset side of the balance sheet reflects the assets that a central bank purchases – through regular open market operations or outright asset purchases – to back its liabilities.

Liabilities

Just like on any other balance sheet, the liabilities of a central bank are claims payable to others that arise from central bank operations.

Banknotes are one of the biggest components of the liability side of a central bank's balance sheet. They are provided by the central bank at the request of commercial banks, which provide them in turn to customers on demand.

The other large central bank liability is the reserve accounts of commercial banks held at the central bank. Reserve accounts are high-quality assets of commercial banks held at the central bank, and the amount held in individual accounts will fluctuate depending on payments from one commercial bank to another effected through the central bank. In some countries, central banks may set, for each bank, a specific amount to be held in each bank's reserve account, whereas, in other countries, commercial banks set the amount they wish to hold in their reserve account over a particular period of time.

Central bank liabilities may also include certificates of deposit or short-term monetary instruments issued by the central bank and held by the commercial sector. Certificates of deposit are typically issued as a method for absorbing excess liquidity from the commercial banking sector.[3]

Taken together, banknotes, reserves, and certificates of deposit constitute what is known as central bank money.

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[3] It is worth noting that sterilization of excess central bank liquidity and the associated reduction in the amount held in commercial bank reserve accounts at the central bank does not reduce a commercial bank's lending capacity to the real economy in any way. As noted by Peter Stella, former head of the Central Banking and Monetary and Foreign Exchange Operations Divisions at the International Monetary Fund, "In a modern monetary system–fiat money, floating exchange rate world–there is absolutely no correlation between bank reserves and lending. And, more fundamentally, that banks do not lend reserves" (Kaminska, 2012).

Assets

The asset side of a central bank's balance sheet includes those assets – domestic and foreign – that 'back' a central bank's liabilities.

Foreign exchange assets include those assets denominated in currencies other than the national currency, as well as holdings of precious commodities such as gold. In some countries, these will include government foreign exchange holdings if held on the central bank balance sheet.

Domestic currency debt includes assets denominated in the national currency issued by both the government and the private sectors. Domestic debt can consist of holdings of government debt acquired in regular central bank short-term money market operations. More recently, and especially in countries that have introduced quantitative or credit easing operations, this category has also come to include holdings of government, financial, and non-financial debt bought outright by the central bank, sometimes on behalf of the government to increase the supply of liquidity to the economy.

The asset side of the balance sheet also includes loans by a central bank to the financial sector – typically banks – through liquidity insurance and stabilization lending operations.

Equity and capital

Unlike private financial institutions, central banks are not subject to regulatory capital requirements (Rule, 2015). Given that central banks are typically owned by the state, the decision of how much capital a central bank holds is typically a question of political economy rather than purely finance.

The question of whether the financial strength of a central bank is important for its ability to deliver its objectives has attracted widespread interest in literature. There is some consensus, as noted by former Bank of Japan Governor Fukui (2003), that central bank concerns with the soundness of their own capital base are typically focused on `political economic instincts,' rather than just purely economic reasons. As a result, capital buffers typically vary significantly among central banks.

There is markedly less consensus, however, about the level of capital that central banks should hold.

Though in theory central banks are not constrained by liquidity and can operate even when negatively capitalized, some of the literature argues that a strong central bank balance sheet position helps underpin public confidence in the central bank's operational independence and commitment to fulfilling its mission and objectives, free from undue influence from their political masters. For example, Adler et al. (2012) use linear and nonlinear techniques on a sample of 41 countries and find that central bank financial strength can be a statistically significant factor explaining large negative interest rate deviations from "optimal levels." Stella (2008; 2011) finds that inflation in central banks with weak financial positions is on average more than twice as high as for those central banks with stronger financial positions.

In the same vein, Perera et al. (2013) analyze a cross-section of countries and find a statistically significant and robust negative relationship between central bank financial strength and inflation. On the basis of this, they conclude that the financial health of a central bank's balance sheet is an essential pre-condition for desirable policy outcomes. Similarly, Del Negro and Sims (2015) argue for central banks with large balance sheets composed of long-term nominal assets to have access to, and be willing to ask for, support for its balance sheet from the fiscal authority. Otherwise, their ability to control inflation may be at risk. Interestingly, Benigno and Nisticò (2015) find that, in the absence of support from a central fiscal authority, large and recurrent central bank losses can undermine the central bank's long-run solvency and should be resolved through a prolonged increase in inflation.

To the contrary, Benecká et al. (2012) conclude, on the basis of a cross-country analysis, that the explanatory power of central bank financial strength indicators is rather weak. Instead, they note that the other factors (including the adoption of an inflation targeting regime) have a more significant impact on inflation.

Overall, the relationship between central bank finances and their policy outcomes is likely to be a complex one, with many factors at play. In our analysis, we do not concentrate on the direct links between central bank capital and policy outcomes, but rather share the views of Cukierman (2011) that the finances of the central bank need to be assessed in the broad context of other institutional aspects, such as the range of central bank responsibilities, risks assumed, independence, the exchange rate regime, and the degree of fiscal responsibility.

In keeping with Fry (1993), we also assume that a central banks' fiscal or quasi-fiscal activities undermine both their independence and monetary policy objectives.

3. THE NATIONAL BANK'S BALANCE SHEET BEFORE AND AFTER THE CRISIS

Pre-crisis: 2001-2007

Figures 2 and 3 below show the NBU's assets and liabilities in both absolute terms and as a percentage of the NBU's balance sheet between 2001 and present day.

Taking the pre-crisis period of 2001-2007:

- The liabilities side of the balance sheet is dominated by three components: notes and coins; liabilities to the IMF stemming from previous assistance; and accounts of banks and the government at the NBU. During the period of 2001-2007, notes and coins rise both in absolute terms but also as a share of the total balance sheet (from 31% of total balance sheet size at the start of 2001 to a high of 63% at the end of 2007), reflecting the traditional importance of cash in the Ukrainian economy.

- On the assets side, by far the biggest component is holdings of foreign currency-denominated assets (including monetary gold), which rise from a low of 43% at the start of 2001 to 91% at the end of 2007), reflecting the NBU's pre-crisis fixed exchange rate targeting regime.

Figure 2. NBU liabilities and equity: absolute levels and as a percentage of total balance sheet size
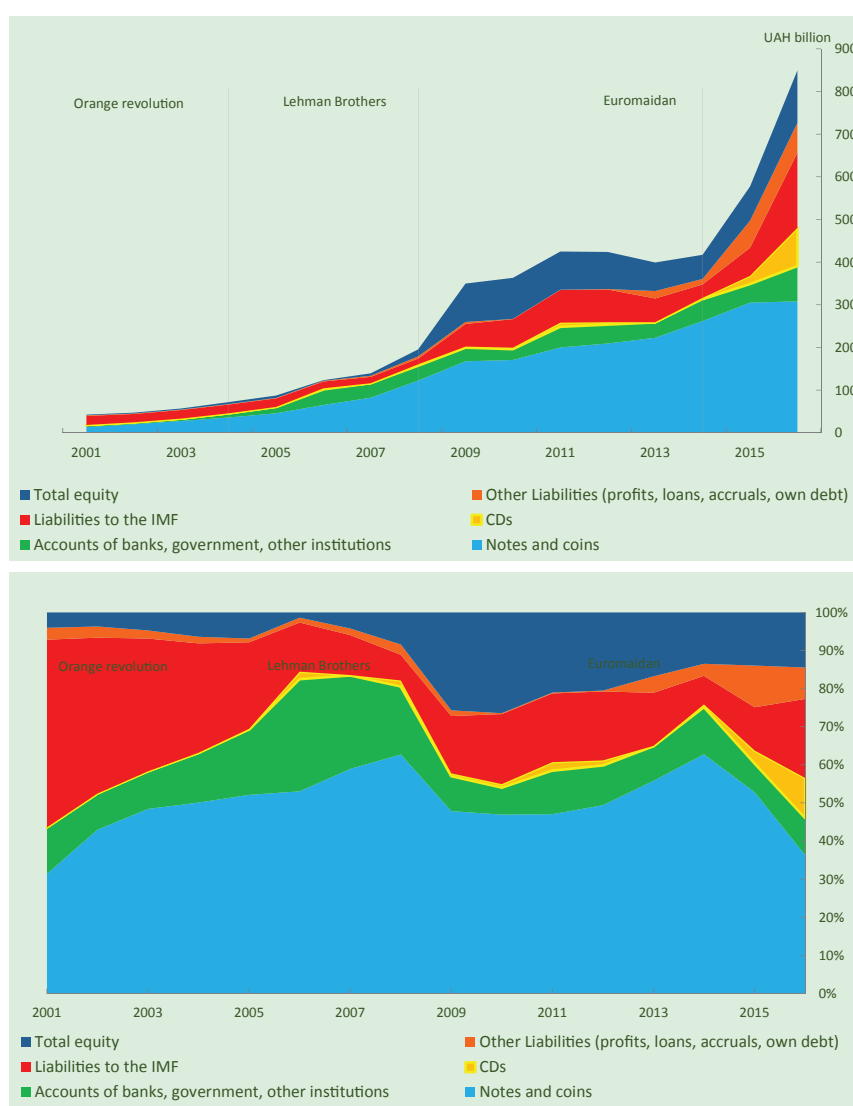
Source: NBU calculations.

Figure 3. NBU assets: absolute levels and as a percentage of total balance sheet size
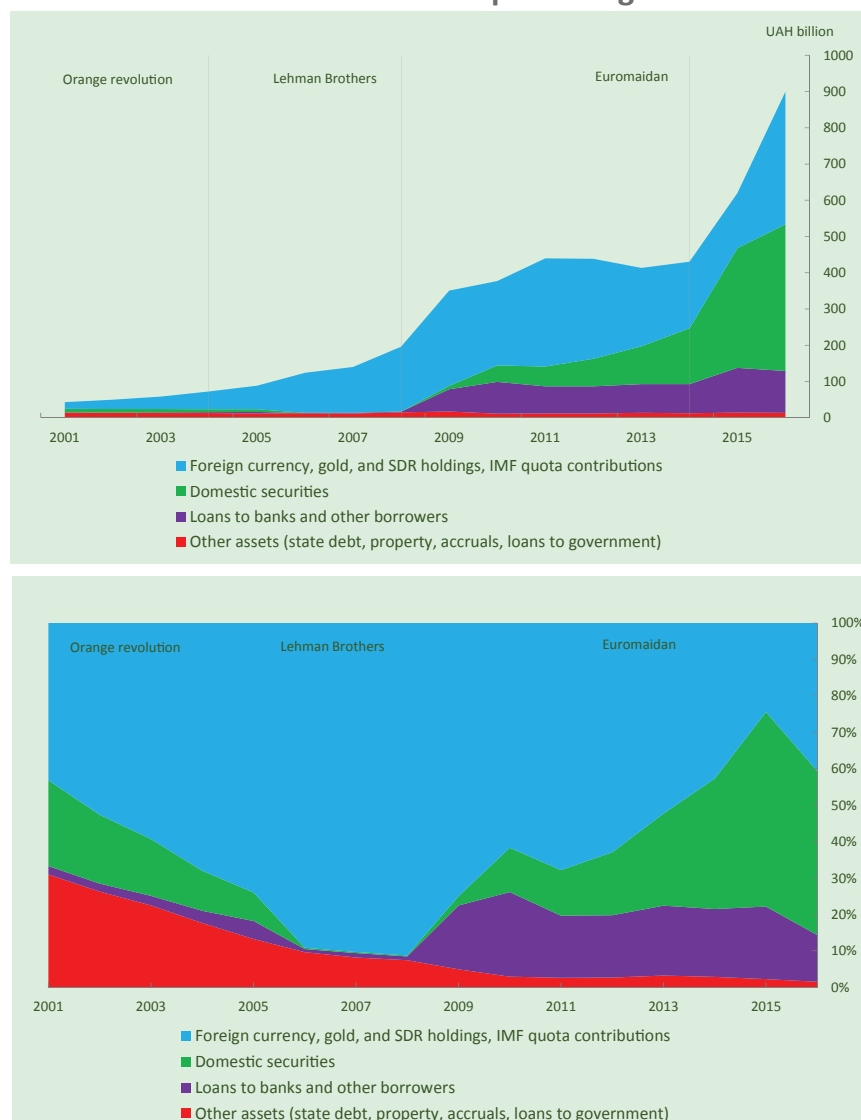
Source: NBU calculations.

The global financial crisis: 2007-2009

The global financial crisis saw a significant expansion in the NBU's balance sheet, which expanded from 27% of GDP at the end of 2007 to 40% of GDP at the end of 2010.

In terms of underlying components, the increase in the size of the NBU's balance sheet was driven by two factors:

- *Changes in the NBU' FX reserves:* Following the initial correction of the hryvnia in Autumn 2008, the NBU spent a significant amount of foreign reserves in a bid to find a new level of 'resistance' and protect the currency from further depreciation. Official reserves terms fell from a peak of USD 38 billion in August 2008 to USD 24.5 billion in April 2009. It was only after a further depreciation of the hryvnia that foreign exchange reserves in USD terms started recovering in line with an improvement in the balance of payments position. The depreciation of the hryvnia meant an increase in the NBU's equity (dark blue swathe in Figure 2) owing to realized and unrealized profit from the revaluation, in hryvnia terms, of the NBU's foreign exchange reserves (light blue swathe in Figure 3).

▪ *Provision of liquidity to the banking sector:* In response to a bank run caused by rumors of insolvency of a particular bank, increasing strains in the global financial system, and, in particular, in bank funding markets, the NBU offered liquidity to the banking sector in a number of operations. As a result, claims on banks increased from UAH 6 billion in August 2008 to UAH 87.5 billion at the end of 2009. This provision of liquidity (purple swathe in Figure 3) initially led to a corresponding liability in the form of an increase in notes and coins in circulation (light blue swathe in Figure 2). However, following the rapid devaluation of the hryvnia, the NBU's liquidity support to the commercial sector was used to purchase foreign currency, which caused additional pressure for further devaluation.

Accumulation of imbalances: 2010-2013

Seen solely through the perspective of its overall size, there is little noteworthy about the NBU's balance sheet between 2010 and 2013, apart from a fall in the overall size of the NBU's balance as a percentage of GDP, from 40% of GDP at the end of 2009 to 29% of GDP at the end of 2013. However, a closer look at the underlying balance sheet components reveals the emergence of imbalances within the Ukrainian economy. We focus on three of the most important:

▪ *An unsustainable exchange rate target and current account deficit:* In 2010, the NBU decided to fix the exchange rate close to the level of UAH 8 to the dollar, pausing a short but significant period of volatility in the hryvnia that had supported the economy's initial adjustment in 2008-2009. The decision to adopt an exchange rate target meant committing the NBU's FX reserves to a specific exchange rate level. Those reserves fell in USD terms from USD 26.5 billion to USD 15.5 billion between 2010 and February 2014 as weak demand for Ukrainian exports and higher imports pushed the current account deficit to 9% of GDP. This shows up in Figure 3 as a relative fall in the light blue swathe.

▪ *Imbalances in public finances:* The NBU's holdings of government bonds (green swathe in Figure 3) expanded from UAH 53 billion to UAH 168 billion between the start of 2010 and February 2014. Purchases of government bonds by the NBU supported the financing of the State's budget deficit and quasi-fiscal deficits through assistance of the national oil and gas company `Naftogaz' and the state owned banking sector. The NBU's presence in the market acted as a disincentive for the State to introduce necessary reforms to the energy and banking sectors, creating a vicious cycle of growing fiscal and quasi-fiscal deficits and further assistance by the NBU.[4]

▪ *A financial sector dependent on NBU support:* Besides supporting the State Budget and quasi-fiscal deficit, the NBU also provided further direct financial assistance to the commercial sector through refinancing loans provided during the 2008 crisis and providing new lending to banks. As the degree of support increased, the banking sector became increasingly reliant on the NBU, and by default, to its ultimate guarantor – the Ukrainian State.

By 2013, these imbalances were such that, in spite of an improvement in the headline economic numbers, the Ukrainian economy had become increasingly vulnerable to internal and external financial and economic shocks, perpetuating – rather than dealing with – the fragilities exposed during the global financial crisis of 2008. The unsustainability of these imbalances would be laid bare by the crisis of 2014-2015.

2014-2015: Financial crisis and normalization

During the period of 2014 and 2015, the NBU's balance sheet expanded significantly – from 29% of Ukrainian GDP at the end of 2013 to 43% at the end of 2015 - in response to the combined effect of the balance of payments, fiscal, and banking crisis. This so-called 'perfect storm' was triggered by a collapse in confidence in the economy, political turbulence, and military aggression in the beginning of 2014, even if the seeds had been sown by policies undertaken in previous years.

The crisis prompted a significant program of reform by the authorities to rebuild economic confidence and reform the financial sector, and with it, further changes in the size and composition of the NBU balance sheet.

Among the most important influences on the NBU's balance during this period were:

▪ *The move to a floating exchange rate regime:* The unavoidable decision to let the currency float in February 2014 – while painful to the real economy – led to a narrowing in the current account deficit and an easing of pressure on the NBU's foreign currency reserves, which had fallen below a level equivalent to three months of import coverage. Reserves stabilized at a low of USD 5.6 billion in February 2015 (from USD 17.8 billion at their pre-crisis level in January 2014). At the same time, the depreciation of the hryvnia by more than 300% (from UAH 8 per USD to more than UAH 27 per USD) led to a more than doubling of the hryvnia value of the NBU's foreign currency reserves, expanding the NBU's balance sheet, and increasing their share of the balance sheet (light blue swathe in Figure 3; Figure 4).[5]

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[4] By the end of 2013, the central government deficit had risen to 4.4% of GDP, and the deficit of State Energy company Naftogaz had risen to 2% of GDP.
[5] Freed from the need to maintain a fixed exchange rate, the NBU's foreign currency reserves could be used to support vital functions of the state, including securing gas imports, repayment of arrears, servicing government debt, and maintaining its foreign exchange market function.

Figure 4. UAH/USD exchange rate (right-hand axis) and gross international reserves (left-hand axis)
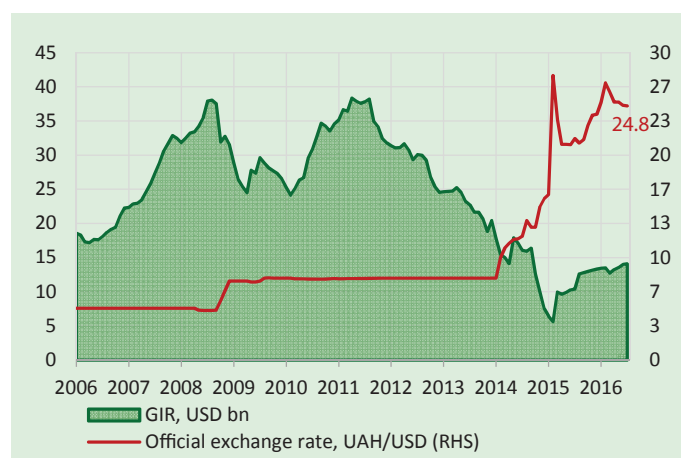
Source: NBU calculations.

- *External financial support by the international community:* The collapse in economic confidence and military aggression in eastern Ukraine led to a fall in exports (exports of goods and services in 2014 were down 20% relative to 2013 levels), reducing the economy's ability to produce foreign currency inflows and replenish its foreign currency reserves. In April 2014, Ukraine signed an agreement for official financing from international creditors, supporting its foreign currency reserve position.

- *Further support by the NBU to other State functions:* The crisis led to further increases in the NBU's government bond portfolio as the NBU provided assistance to the State energy sector and the compensation of customers of failed banks through Ukraine's Deposit Guarantee Fund (DGF).[6] Reform of the State energy sector and the reduction of Naftogaz's deficit over the course of 2015 eliminated the sector's need for additional NBU funding, but the reform of Ukraine's financial sector through 2015 made further injections of funding by the NBU into the DGF necessary to ensure the return of funds to depositors of insolvent banks.

- *Demand for cash:* Demand for notes and coins by the general public increased in the initial stages of the crisis in line with deposit withdrawals by the general public from Ukrainian banks. However, demand for notes and coins fell in the second half of 2014 and 2015 as a result of the combined effects of inflation, expectations of possible further devaluations, the reduction in the use of the hryvnia in the occupied territories, and initial successes by the NBU in promoting cashless payments.

- *NBU support to the financial sector:* Having expanded significantly in the initial stages of the crisis, the scale of NBU support to the financial sector – as measured by the amount of loans outstanding to banks – started to decline. At the same time, the commercial banking sector began to purchase increasing amounts of certificates of deposit issued by the NBU, allowing the NBU to absorb excess liquidity that had been created by its government bond purchases and the replenishment of its foreign currency reserves. The active use of certificates of deposit – which peaked in 2015 as demand for cash fell – allowed the NBU to actively manage interbank interest rates in order to fight inflation and further decrease pressure on the currency.

2016: Economic recovery

The recovery in the Ukrainian economy recovery gained traction in 2016, supported by the Ukrainian authorities' ambitious program of fiscal, monetary, and financial sector reforms. Ukrainian year-on-year GDP turned positive at the end of 2015 (Figure 5), with inflation down to 7.9% in July 2016 (Figure 6). Lending to the real economy remained weak, but metrics of financial resilience improved in the first half of 2016. Reduced downward pressure on the hryvnia allowed the NBU to start repurchasing foreign currency in domestic markets, replenishing its reserves from their 2015 lows.

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[6] In the period of 2014-2016, the NBU closed a total of 81 banks.

Figure 5. Ukrainian Real GDP growth, %
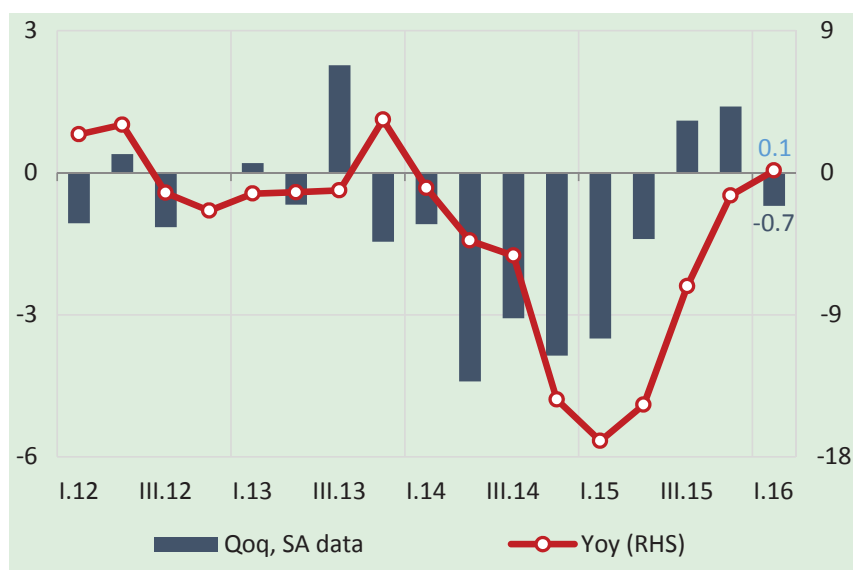
Source: State Statistics Service of Ukraine.

Figure 6. Ukraine inflation indicators, %
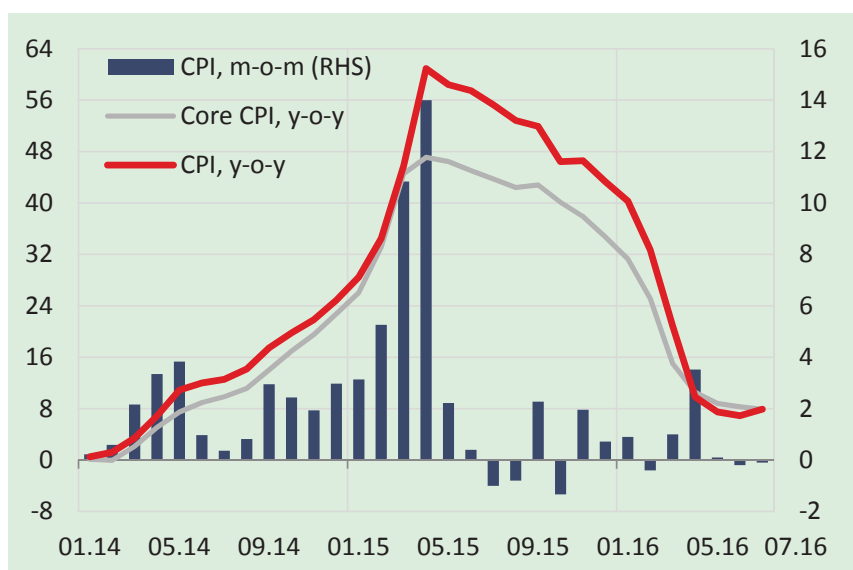
Source: State Statistics Service of Ukraine.

Reforms in the fiscal and quasi-fiscal (mainly energy) sectors and the clean-up of Ukraine's banking sector allowed the NBU to shift to a more conventional monetary policy framework based on simple, clearly defined objectives: the achievement of the NBU's inflation target and the accumulation of international reserves.

From the NBU's balance sheet point of view, the recovery of the Ukrainian economy meant that:

- The NBU's new monetary policy focused on the rebuilding of its international reserves and issuance of certificates of deposits as the primary tool for operationalizing monetary policy decisions on key policy interest rate.

- The reduction in fiscal dominance and a shift in the authorities' stance from crisis mode to a more conventional policy-setting mode meant that the NBU's holdings of government bonds started to fall for the first time since 2008, in line with repayments to the NBU of bonds previously used to support the State Budget and quasi-fiscal needs (Figure 7).

- The NBU's loans outstanding to the banking sector also fell as a result of the more positive outlook for the financial system, naturally offsetting against the sterilization requirements from NBU purchases of foreign currency (Figure 8).

Figure 7. Government Securities Held by NBU (as of 01.08.2016), UAH billion
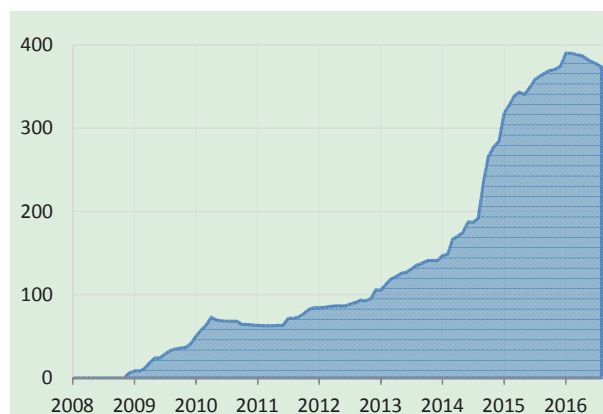
Source: NBU calculations.

Figure 8. The Stock of Refinancing Loans (as of 01.08.2016), UAH billion
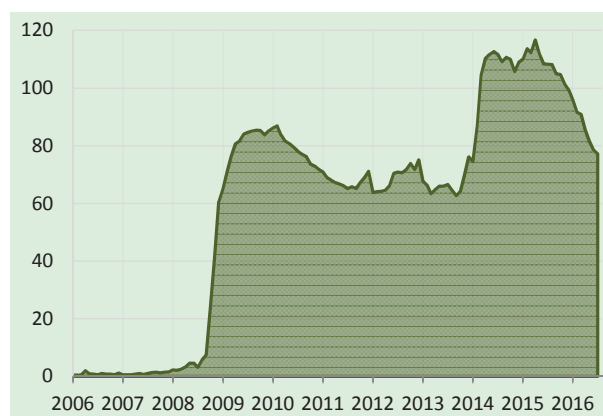
Source: NBU calculations.

The next section presents a simple simulation that maps the possible future evolution of the NBU's balance sheet over the next five years.

4. A SIMPLE SIMULATION OF THE FUTURE EVOLUTION OF THE NBU'S BALANCE SHEET: 2016-2020

Assumptions

Our simulation rests on the following assumptions:

▪ The Ukrainian economy follows a similar path to that of other economies that have transitioned from fixed exchange rate regimes to inflation targeting regimes (for example, the Czech Republic, Poland, and Israel);

▪ There are no economic, financial, or political shocks to the Ukrainian economy and no requirement by the State for the NBU to support its budget;

▪ The NBU's holdings of foreign assets increase in line with the recovery in the economy (increase in exports and foreign investment) and the NBU's objective of replenishing its international reserves;

▪ The NBU exercises an active interest rate policy in line with its price stability objective, with lower interest rates as the economy recovers;

▪ The primary instrument of monetary policy is through the issue of certificates of deposit;

▪ The NBU makes use of additional means of sterilization through redemption of government bonds, liquidation of collateral, and repayments of its loan portfolio;

▪ The amount of cash in the economy falls as a share of GDP in line with an increase in cashless transactions.

5. RESULTS

Figure 9 shows the NBU's balance sheet in absolute terms and as a share of nominal GDP, with the results of our simulation for the period of 2016-2020. The absolute size of the NBU balance sheet increases, but its size as a share of GDP falls from 41% at the end of 2016 to 35% at the end of 2020 as economic growth recovers.

Figure 9. NBU balance sheet in absolute terms and as a share of GDP
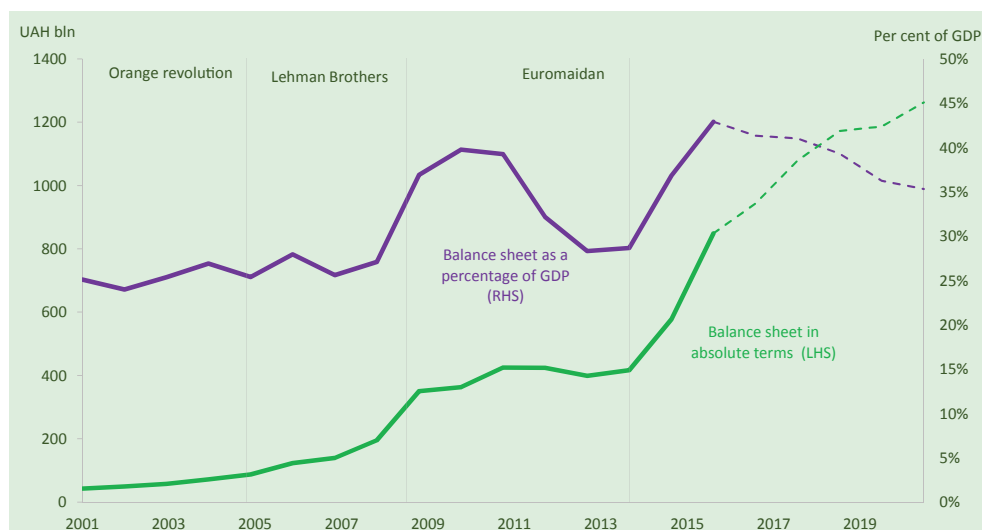
Source: NBU calculations.

Figure 10 and 11 below show the NBU's liabilities, equity, and assets while incorporating the results of our simulations covering the period of 2016-2020.

Figure 10. NBU liabilities and equity: absolute levels and as a percentage of total balance sheet size
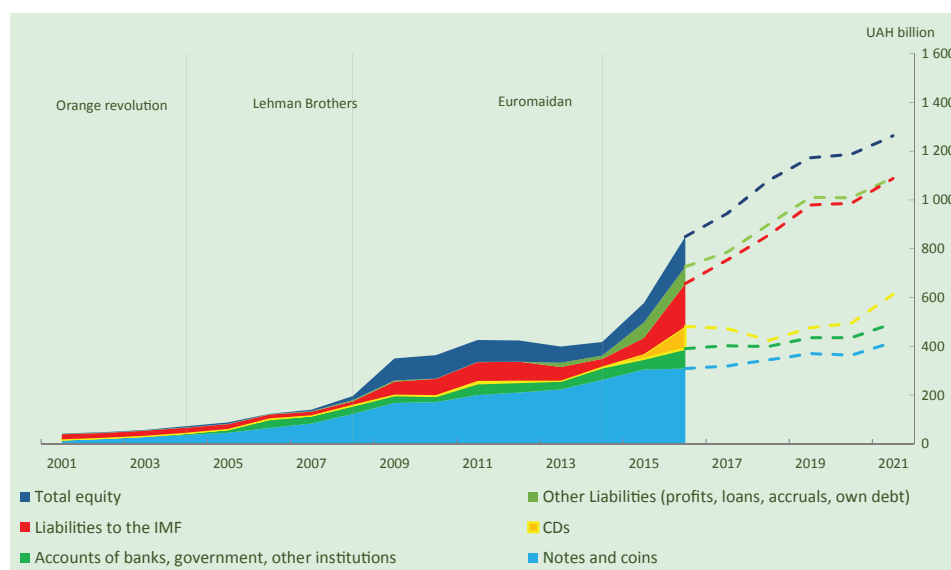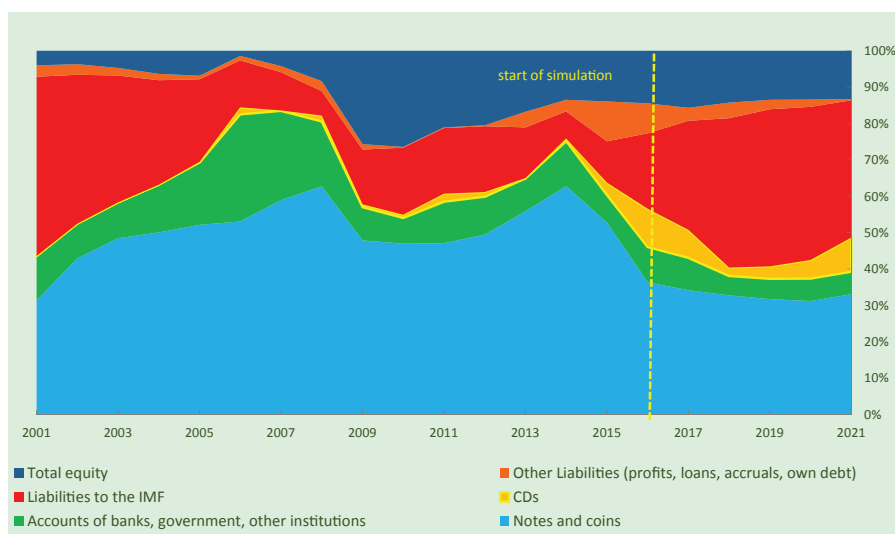
Source: NBU calculations.

Figure 11. NBU assets: absolute levels and as a percentage of total balance sheet size
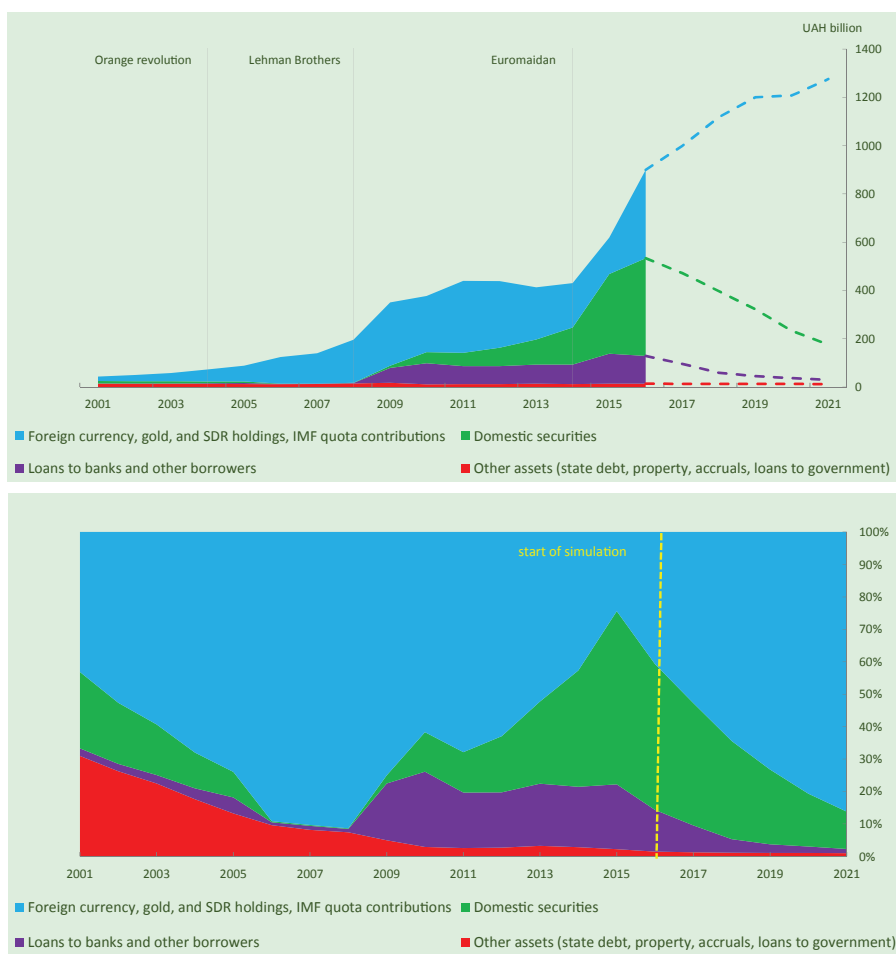
Source: NBU calculations.

The results of our simulation are consistent with the NBU's balance sheet trending back to its pre-crisis state, albeit with some salient differences.

- On the liabilities side, our simulation shows a reduction in the share of notes and coins (light blue swathe in Figure 10) consistent with the increase in electronic (i.e., cashless) transactions in the economy. The simulation also shows an increase in the amount of certificates of deposit issued by the NBU (yellow swathe in Figure 10) to sterilize excess liquidity in the system caused by accumulation of foreign exchange inflows into Ukraine as the economy gathers pace.

- On the assets side, the exercise shows a fall in the amount of outstanding NBU loans to the commercial sector (purple swathe in Figure 11) as it repays the NBU's financial assistance, a reduction in the NBU's holdings of government bonds (green swathe in Figure 11) as these are repaid back to the NBU, and an increase in the NBU's FX holdings (blue swathe in Figure 11) consistent with the increase in FX inflows as the economy recovers.

- On the equity side, our simulations are consistent with the NBU's profits falling significantly during our five-year forecast horizon. This is the result of lower income from the impact of the stability of the hryvnia on its foreign exchange reserves, the lower stock of bonds and loans outstanding to the government and banking sector, and the increased cost of monetary policy implementation through the issue of certificates of deposit.

More specifically, the likely fall (but not the complete elimination) in profits is consistent with a reduction in distributions into the NBU's own reserve fund, and a reduction in distributions to the State Budget. We discuss the policy implications of this for the NBU's independence in the next section.

6. POLICY CONCLUSIONS AND RECOMMENDATIONS

Our simulation exercise shows the NBU's capital stabilizing at a level of 13-16% of the NBU's balance sheet between 2016 and 2020. However, seen as a ratio to the NBU's domestic liabilities, the NBU's capital falls from 29% of domestic liabilities at the end of 2016 to 27% at the end of 2020.[7]

While there is no standard definition of what constitutes an adequate amount of central bank capital, we assume that, past a certain point, a fall in the capital of a central bank can be detrimental to its ability to fulfill its objectives in an independent way (Bindseil, 2004). Falling profits erode the financial strength of a central bank and its perceived and actual ability to fulfill its functions without requiring fiscal transfers from the State.

The amount of capital needed to ensure continued independent operational and policy capability is a function of a number of issues, including accounting mechanisms, and profit distribution and risk-sharing arrangements (Archer, 2013). The table below notes six considerations for ensuring independent financial strength, as noted in Archer (2016). For each condition, we note the current status vis-à-vis the NBU.[8]

Table 2. Considerations for ensuring financial strength vis-à-vis the current status of the NBU

	David Archer's principles	*National Bank position*
1	A good amount of starting capital.	The NBU's authorized capital is UAH 100 million (this can be increased by the NBU Council).
2	A dividend distribution policy that has as its first priority rebuilding the starting level of capital should equity fall below that.	The NBU is obliged to retain as reserves profits amounting to 10% of the NBU's domestic liabilities.
3	Some form of recapitalization commitment in law for situations where losses have been made in pursuit of objectives clearly inside the mandate.	The NBU is allowed to cover any losses from its reserves. The State is obliged by law to cover any losses exceeding the NBU's reserves.
4	Supplemental to that, arrangements that transfer financial risks to the treasury when non-standard policy actions are being undertaken.	The NBU does not have an indemnity system that passes on the risk of exceptional losses to the State.
5	Where a decision has been taken to mark-to-market the central bank's assets and liabilities, unrealized revaluation gains and losses should be excluded from the amount available for distribution as dividends.	The NBU does not book unrealized revaluations of gains and losses to profits.
6	Finally, as a safety net protection for the central bank's financial strength, a limit on the size of any one year's distribution to the government, aimed at preventing income volatility from distributions in and out of the central bank's coffers.	The NBU's distributions to the State in any one year must not exceed the profit for that year.

[7] Domestic liabilities are defined here as notes and coins plus accounts of government and banks, liabilities on profit distribution to the State Budget, and certificates of deposit issued by the NBU.
[8] These six conditions were set out by David Archer in his intervention at the National Bank of Ukraine's annual conference on Transforming Central Banking held in Kyiv on 19-20 May 2016.

Taking the table above into account, two key recommendations stand out:

1. It is clear that, in the NBU's case, it is the NBU's reserves and not the authorized capital that matters from the point of view of financial strength. While there is a maximum amount of profits that can be distributed to the general reserve in any given year (equivalent to 10% of the NBU's monetary liabilities), there is no minimum requirement for the reserve to be replenished by the State should it be depleted in a crisis – only an assumption that the NBU would replenish it from profits in subsequent years. If the NBU reserve is to truly serve as a buffer against financial crisis, it would be preferable to have a minimum required general reserve together with a recapitalization agreement for the State to replenish the reserve should it fall below its minimum level.

2. Separately, it makes sense for the NBU to think about how to put in place arrangements that would ensure that any losses – and also profits – from non-standard central bank operations can be transferred directly to the State Budget. This is especially important given the increasing share of the NBU's balance sheet represented by the government's foreign currency reserves. These arrangements could take the form of a ring-fencing of specific portions of the NBU's balance sheet, or an indemnity by the State to the NBU covering specific operations.

7. CONCLUSION

The balance sheet of the NBU is core to its mission of promoting price and financial stability and economic growth. Besides being an integral part of the NBU's toolkit, the NBU's balance sheet also serves as a window into the forces that shape the economy.

The 2014 crisis represented a significant expansion in the NBU's balance sheet. As the authorities' ambitious program of reforms bears fruit and the economy recovers, the NBU's balance sheet should fall as a share of GDP.

It is essential for the NBU to continue to reinforce its operational independence to ensure it can fulfill its objectives in a transparent and accountable manner. Crucial to this is the assignment of clear goals and operational independence by the relevant authorities. However, equally as important is the need for adequate capital and the right risk-sharing, profit distribution, and recapitalization arrangements, particularly as the economy stabilizes and the NBU's profits fall in the coming years. Reinforcing these arrangements will ensure that the NBU can continue focusing on its mission of fulfilling its objectives without recourse to the government during times of crisis.

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Economic Impact of the Recent Decrease in Social Security Contributions in Ukraine

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ABSTRACT

Social security contributions paid by firms were massively reduced in January 2016. We employ a state-of-the-art DSGE model to assess the effects of this measure on output, private consumption, and other key macroeconomic variables. We find that it significantly boosts GDP and consumption while reducing inflation, and that these effects are sizable both in the short-term and in the long-term. We also report that the short-term impact is significantly stronger under an inflation targeting regime than under exchange rate stabilization.

1. INTRODUCTION

At the beginning of 2016, as part of its reform of the tax code, Ukraine significantly reduced the social security contribution (SSC) paid by firms. Ukraine is in good company here, as similar reforms have been undertaken by many European countries in the past. The payroll tax rate was massively reduced from an average of 44% to 22%. The idea behind this reform is to reduce labor costs so that firms become more competitive, thus boosting exports, investment, and real wages. This poses the question of what the economic implications of this reform will be in Ukraine. In this article, we present the results of our projections using a state-of-the-art economic model.

For our analysis, we employ a New Keynesian Dynamic Stochastic Equilibrium Model (DSGE), i. e. a mainstream macroeconomic model, which has been specifically tailored for analyzing the macroeconomic effects of a reduction in the payroll tax rate. Models of this class are quite good in capturing the short- to medium-term dynamics of the most important aggregate variables, but less so for long-term growth dynamics.

The massive reduction in the social security contribution will lead to significant revenue losses (up to UAH 100 billion, or more that 4% of 2016E GDP, see the Dragon Capital Report Ukrainian Economy: Tax Changes and 2016 Budget: An Eminent Step Forward of 11 January 2016), which will be only partially compensated for by revenue-increasing measures (e.g., the salary cap on which SSC applies was increased). We assume that a resulting revenue shortfall of 3% of GDP is fully offset by a corresponding reduction in government spending to keep the deficit unchanged. We use the model to simulate the impact of the cut in the SSC rate under three scenarios that differ with regard to the monetary policy stance of the National Bank of Ukraine (NBU). In the first scenario of strict inflation targeting, the cut in social security contributions leads to a steep depreciation of the exchange rate and boosts output by roughly 3.3% on impact. If the NBU stabilizes the nominal exchange rate – the second monetary policy stance under consideration – the induced expansion is considerably milder: the output increase is gradual and reaches its peak of about 0.6% after one year. A third scenario considers an intermediate case. The crucial role of monetary policy for the impact of tax reform is a central finding of our analysis.

Section 2 of this article provides an overview of the model, and Section 3 discusses the simulation results. Section 4 concludes our findings.

2. MODEL DESCRIPTION

This article employs a model presented in detail in Engler et al. (2014). It is a model of the New Keynesian Dynamic Stochastic General Equilibrium (DSGE) class comprising two economies (Ukraine and the rest of the world) that trade goods and bonds with one another. We deviate from that model in that we assume the exchange rate to be flexible between the two countries. It is governed by the uncovered interest rate parity condition. The two economies' central banks influence their respective economies by changing the nominal interest rate, which affects real rates of interest (because prices react slowly to any kind of shock), which then in turn affect the savings and consumption decisions of households. Furthermore, terms of trade are affected by monetary policy via its impact on prices and via its impact on the nominal exchange rate. Changes in the terms of trade bring about consumption-switching effects between goods produced in the two economies.[1]

This article considers three different monetary policy regimes. In the first, the NBU aims at stabilizing domestic inflation, but has a neutral stance towards fluctuations in the nominal exchange rate. The second policy regime represents the opposite case, in which the central bank is only interested in stabilizing the exchange rate. The third regime is an intermediate case, in which both aims are weighted.

There are two types of households in the model that we must consider in order to understand how monetary policy affects inflation.[2] The first type of households are "capitalists" who own the firms in their respective economy and are able to make explicit consumption and savings decisions that depend on a) their wealth and b) the real rate of interest. An increase in wealth results in an increase in consumption. A reduction in the real rate of interest incurs a reduction in savings and an increase in consumption. This increase in consumption increases aggregate demand for goods so that firms, who are assumed to use labor as their only input to production, need to adjust their labor input to serve that additional demand. The firms need to pay higher wages to be able to increase hours worked, which drives up their marginal costs so that they increase their prices therefore driving up the rate of inflation. This is the basic transmission mechanism through which a central bank affects the business cycle and inflation when they reduce the real rate of interest.

The second type of households are "hand-to-mouth" consumers who do not save at all but immediately use all of their income for consumption. Because in the scenario just described the real wage and hours rise, their consumption rises too, giving an additional boost to aggregate demand.

As domestic and foreign firms produce differentiated goods, any change in relative prices affects the relative demand for those goods. For example, when domestically produced goods become relatively cheaper than imported goods (i.e., the domestic terms of trade deteriorate), domestic and foreign consumers switch demand away from foreign goods and towards domestic goods. A central bank can deteriorate the terms of trade when it reduces the interest rate because this incurs a depreciation of the nominal exchange rate.

In the steady state of the model, the government levies taxes to pay for expenditures worth 37 percent of the gross domestic product. As common in the literature, government expenditures are defined as plain waste and, unlike private consumption, only consists of domestic goods. Revenue is generated through a payroll tax on wages which is paid by firms, a value added tax, income taxes, and a payroll tax paid by households. Any revenue the government does not need is returned to households in the form of lump-sum transfers.

Table 1 in the appendix depicts the calibration of the model.[3]

3. SIMULATION RESULTS

On 1 January 2016, the Ukrainian payroll tax rate was reduced from an average value of 44% to 22%. As the payroll tax base was broadened, it is not exactly clear to what extent firms' effective payroll tax rate was reduced. We therefore assume that the payroll tax revenue was reduced by 3% of GDP. In our experiment, we assume that this is fully financed by a reduction in government spending.[4]

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[1] The model does not account for the impact of exchange rate adjustments on firms' balance sheets. Balance sheet effects are potentially important and worth additional research. However, accounting for the latter in a DSGE framework would go beyond the scope of this analysis.

[2] We abstract from firms' capital accumulation, which is also instrumental in determining the effects of monetary policy on the real economy. However, the basic insights do not change much when we concentrate on consumption decisions.

[3] One key parameter for the effect of the reform is the substitution elasticity between domestic and foreign goods, since it governs the strength of consumption switching effects. The literature does not provide clear guidance on its size, with estimates ranging from 1 to 3. We choose a value of 1.2, which is at the lower end of empirical estimates and below the value used in Engler et al. (2014). We use a small value for the sake of a conservative modelling approach. A higher substitution elasticity would boost the effect of the fiscal reform under consideration, so the presented results can be interpreted as a lower bound.

[4] This reduction in government expenditures is not to be understood as a reduction in the size of government. As we assume spending to be wasteful, i.e., not adding to households' well-being or serving as an input to production, our assumption can be understood as an increase in the efficiency of aggregate spending.

Note that the government also abolished a 3% social security contributions rate paid by households, and introduced a general income tax rate of 18% (instead of levying 15% or 20% depending on the income). Both changes affect household income in opposite directions: The reduction in social security contributions increases disposable household income, while the unified income tax rate effectively works like a tax hike because most households initially paid 15%. Since the net effect of both changes is not certain – but can be expected to be small, as both changes work against each other – we exclude these two tax adjustments in our experiment.

This fiscal policy is analyzed under the three different monetary policy regimes introduced in the previous section.

3.1. Inflation targeting

Figure 1 shows the impact of the fiscal policy reform under strict inflation targeting. Horizontal axes denote quarters after the implementation of the policy. Immediately after the payroll tax reduction and the government spending reduction, output and consumption increase by 3.3% and 2.1% respectively, and the trade balance relative to GDP improves by 1.6%. The nominal exchange rate depreciates by about 5.9% and the GDP deflator falls by 2.4%. The nominal interest rate declines by 3.4 percentage points. In the figure, one can see that the necessary reduction in government spending to render the payroll tax reduction budget neutral is about 2.4% of GDP. After several quarters, the rate of inflation and the nominal interest rate return to the long-term values and thereby the supporting effects of central bank action fades. However, output remains elevated by about 0.5% and consumption by 1.4%.[5] The net asset position relative to GDP increased permanently by about 1.3%.

Figure 1. Impact of the fiscal policy under inflation targeting
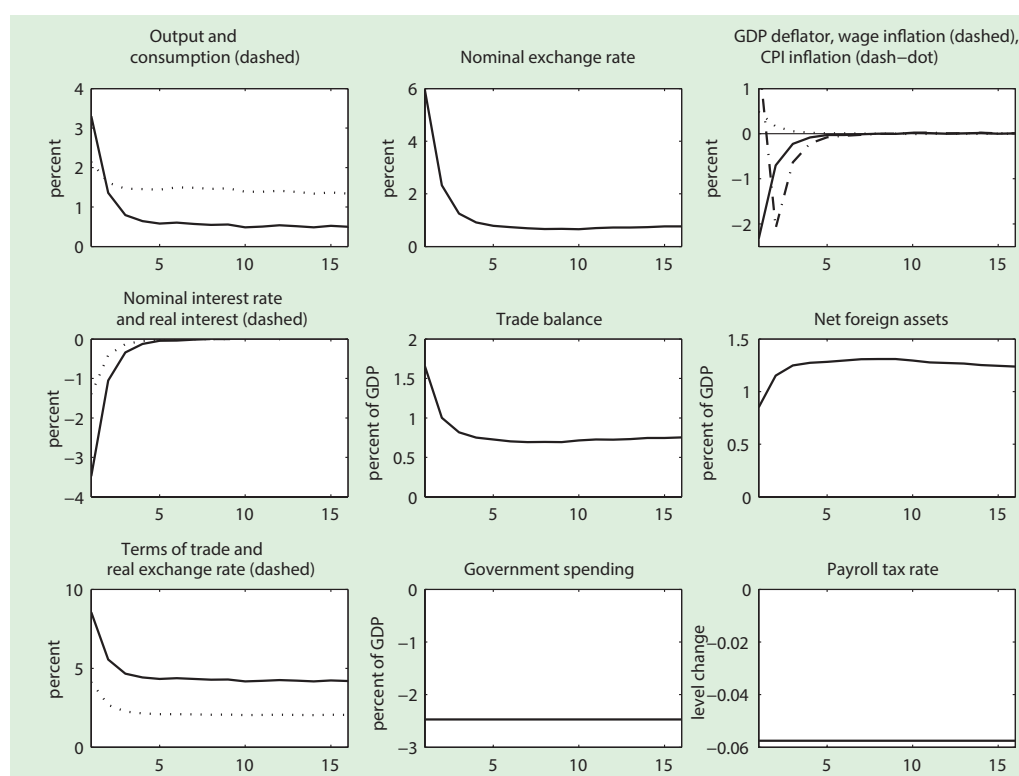
In the model, the payroll tax reduction reduces firms' production costs, which induces them to reduce prices to the extent that they face price competition, therefore incurring a fall in aggregate prices. Please note that this constitutes a fall in inflation below the average inflation rate of zero which we assume in the model, but which is clearly below the inflation rates observed in Ukraine. However, our results can be interpreted as a fall below the rate of inflation observed in the absence of the tax cut.

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[5] As discussed in the conclusion, the model is designed to project short-term macroeconomic fluctuations, but not for a long-term analysis of the tax reform. The result of elevated long-term consumption is in a way trivial, since wasteful government consumption is permanently reduced, in line with permanently lower taxes.

The tax cut implies an increase in Ukrainian firms' profits and a rise in real wages so that "capitalists" and "hand-to-mouth" consumers increase consumption and thereby boost aggregate demand for domestically produced goods. Furthermore, the deflationary pressure implies a reduction in the nominal and the real rate of interest (due to the central bank's reaction), which causes the nominal exchange rate to depreciate.

This lower real rate encourages consumption, while lower prices and the depreciated exchange rate cause a switching away from foreign towards domestic goods. Aggregate output and the trade balance thus rise. The additional demand for labor incurs an increase in the real wage so that hand-to-mouth households can increase consumption too. This increase in labor costs partially reverses the fall in firms' costs and aggregate prices fall somewhat less.

The reduction in government spending causes its own dynamics. Ceteris paribus, it reduces aggregate demand, the demand for labor, marginal costs, prices, and the real wage. A central bank reacts by reducing the nominal rate enough to reduce the real rate, which boosts private consumption, thereby partially replacing government spending (referred to as "crowding-in"). Because crowding-in is partial, aggregate demand is lower due to the spending cuts so that the net effect on prices is negative. Furthermore, the reduction of the interest rate depreciates the nominal exchange rate. Taken together, the price reduction and the fall in the currency's value depreciate the terms of trade and incur an expenditure switching away from foreign and towards domestic goods so that the trade balance improves.

Figure 2 provides a stylized overview of the impact of the fiscal reform.

Figure 2. Stylized effect of fiscal policy
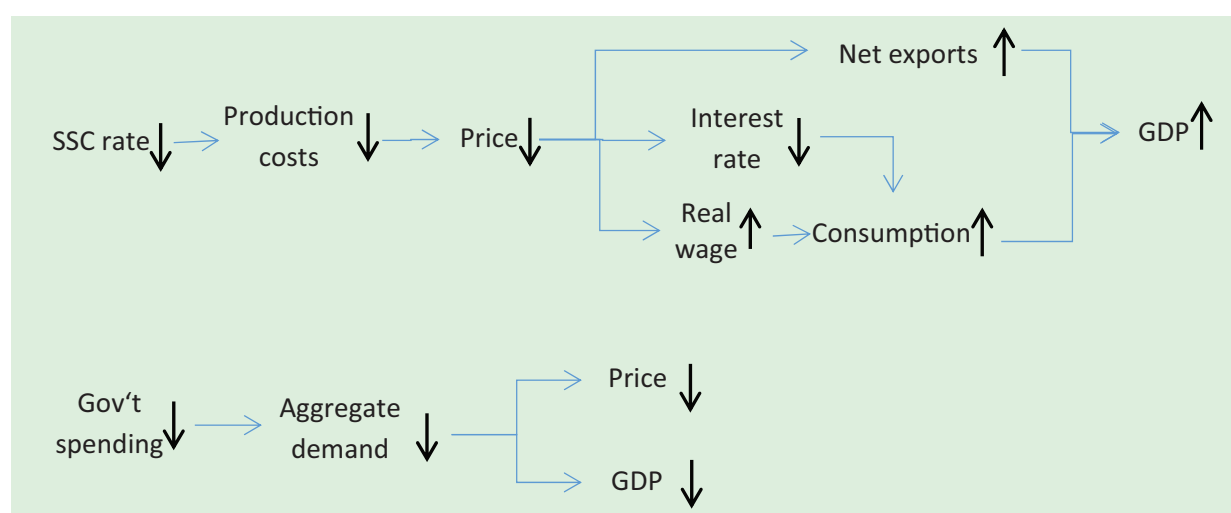
3.2. Exchange rate stabilization

Figure 3 shows the impact of the fiscal reform when a central bank stabilizes the nominal exchange rate (black lines). To facilitate comparison with the adjustment under the previous monetary policy regime of strict inflation targeting, blue lines replicate the adjustment shown in Figure 1. We observe that output and consumption drop slightly when the reform sets in. However, this drop is only short-lived as both variables gradually increase until differences between the adjustments under both monetary policy regimes have vanished after roughly four quarters. At that time, all firms adjusted prices in response to the tax cut, so there is no more deflationary pressure and the nominal interest rate under inflation targeting reverts to its long-term level. This means that the nominal interest rate is not different from its value under exchange rate stabilization, in which it never deviated from the long-term level. This explains why the impact of the fiscal reform is the same in both monetary policy regimes after roughly 5 quarters: monetary policy actions are in line, and the fiscal reform is the same.

Figure 3. Impact of the fiscal policy under exchange rate stabilization
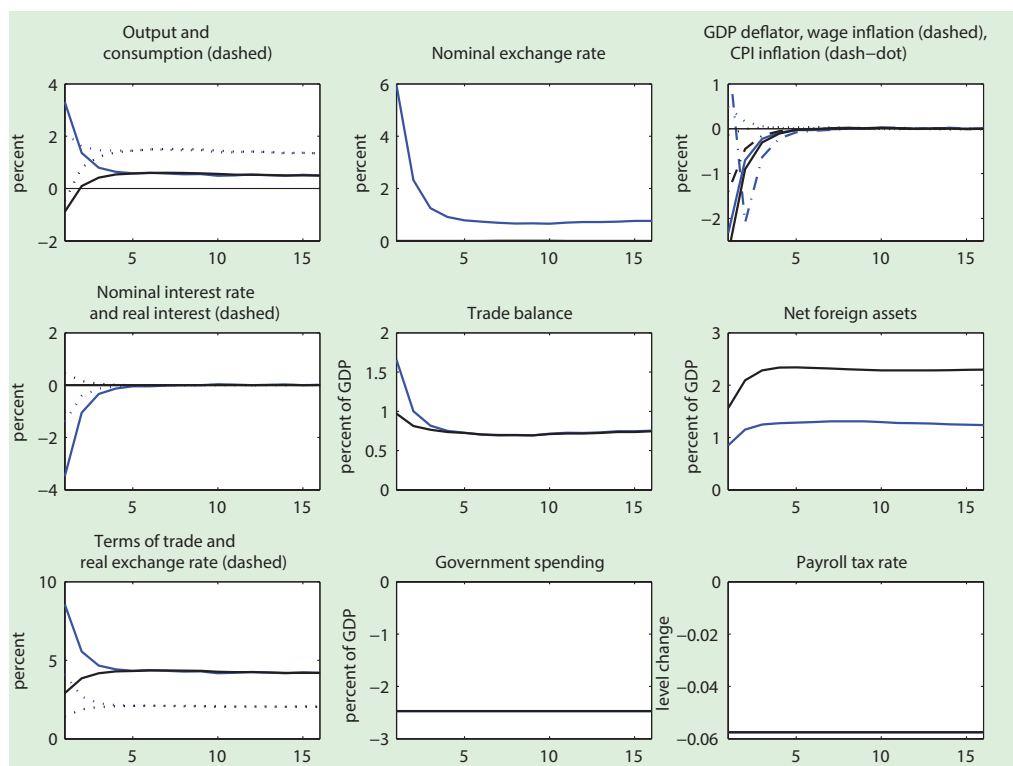
Stabilizing the nominal exchange rate requires keeping the nominal interest rate constant at the level of the foreign interest rate. The reason is that interest differentials would cause adjustments in the nominal exchange rate, since the latter is governed by the uncovered interest rate parity condition. The constant nominal interest rate has two implications that both reduce output relative to the scenario of inflation targeting. First, the real rate mildly deviates positively in the year after the implementation of the tax cut, because prices decline while the nominal rate is constant. This leads, ceteris paribus, to a reduction in household consumption in the short-term. Second, since there is no exchange rate depreciation, the deterioration in terms of trade is weaker than in the case of inflation targeting. This in turn leads to weaker expenditure switching, and mitigates the expansionary effect on output in the short-term.

It is surprising that the decline in prices is only slightly stronger than under inflation targeting: the GDP deflator declines by 2.3% under inflation targeting, and by 2.7% under exchange rate stabilization. The reason is that pricing decisions are based on a forward-looking calculus under Calvo-type price rigidity, while the differences between the adjustment under both monetary policy regimes is short-lived and fades out after roughly one year.

From a general point of view, expansionary monetary policy – which a central bank embarks on under inflation targeting in response to declining prices – is not feasible under exchange rate stabilization. As a result, a stimulating monetary policy impulse is absent, and the increase in aggregate demand exclusively stems from the deterioration of the terms of trade and the resulting expenditure switching effects.

3.3. Intermediate monetary policy

Figure 4 shows the impact of the fiscal reform when monetary policy follows an intermediate regime, i.e., puts equal weights on the stabilization of domestic prices and the foreign exchange rate. To allow a comparison with the inflation targeting regime, the model adjustment in the latter case is again depicted in blue lines.

Figure 4. Impact of the fiscal policy under mixed monetary policy
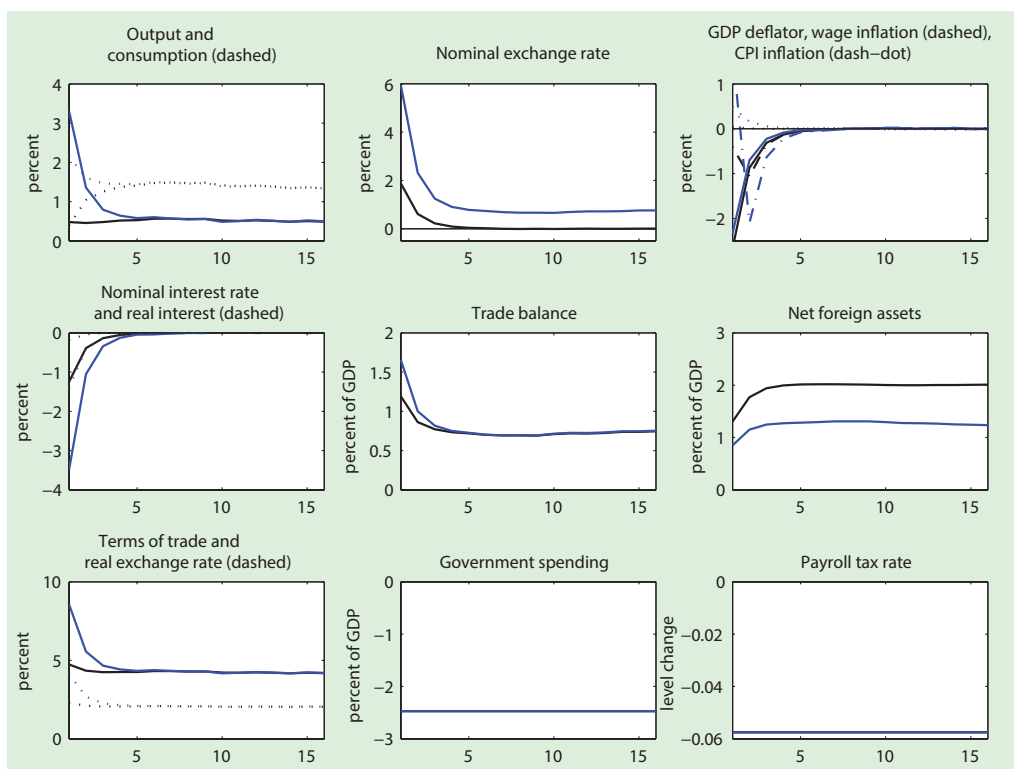
We observe that the strength of the immediate expansion in output and consumption lies in the middle of the two previously considered policy regimes: output and consumption increase on impact by about 0.5%. This result is not surprising, given that a central bank conducts mild expansionary policy – weaker than under pure inflation targeting – in response to a decline in prices. The comparable modest reduction in the nominal interest rate (it declines by 1.2% on impact, as opposed to 3.4% under inflation targeting) leads to muted depreciation of the nominal exchange rate: the latter depreciates by 1.8%, which is roughly half as much as under inflation targeting.

4. CONCLUSION

Our analysis, which should not be confused with a forecast, shows that there are a number of likely economic benefits associated with the recent cut in the payroll tax rate. While the model is not able to capture all the specifics of Ukraine's economy in full detail, it generally lends support to a reform that targets the high burden of labor taxation in Ukraine. In particular, we find that under inflation targeting, the reduction in payroll taxation leads to a sizable expansion in the short-term. Under exchange rate stabilization, when the NBU does not accommodate the measure with expansionary monetary policy, the short-term impact is considerably weaker. However, in both scenarios, the model predicts a significant increase in output in the medium-term and long-term.

A note of caution is needed: The model we employ is well suited to model short- and medium-term dynamics, but it is not designed to model long-term growth dynamics. For that reason, the long-term effects should be taken with caution. However, as it is quite plausible that a reduction of wasteful government activity and distortionary taxes is able to boost private enterprise, our long-term results for output and private consumption are likely to underestimate the true effects.

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Appendix

Table 1. Parametrization of the model

Size Ukraine	0.01
Size rest of the world	0.99
Share hand-to-mouth consumers	0.7
Substitution elasticity between domestic and foreign goods (also for rest of the world)	1.2
Discount factor	0.99
Intertemporal elasticity of substitutions	1
Labor supply elasticity	1
Elasticity of subst. between Ukrainian goods	9
Elasticity of subst. between labor types	9
Prices are re-set on average	every two quarters
Wages are re-set on average	every two quarters
Consumption tax rate	0.2
Firms' payroll tax rate	0.44
Households' payroll tax rate	0.03
Households' income tax rate	0.15

Quasi-Competitiveness of the Audit Services Market in Ukraine: The Aspect of European Integration

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ABSTRACT

In the context of European integration processes and transformations in the banking sector, a study of the concentration of the audit services market in Ukraine, one of the most regulated markets, was held. The authors applied a number of methods for evaluation of concentration: the traditional methods of determining the level of market competition and the Kruskal-Wallis test to confirm market heterogeneity. The results allow for a conclusion that there is a high level of regional market concentration, which necessitates a competitive market environment for the implementation of audit services.

1. INTRODUCTION

A professional audit opinion on the financial statements of companies in the real sector, banking sector, and intermediaries of the financial markets is not only the basis for economic decision making for investors, shareholders, and other stakeholders, but also a guarantee of the stable functioning of these particular economic agents and related sectors in general.

For example, during the large-scale transformation in the banking sector of Ukraine accompanied by the withdrawal from the market of a number of banks, the interests not only of shareholders, but also of ordinary depositors, were threatened, given the discrepancy of the real solvency of banks' data specified in their audited financial statements. However, questions arise as to the adequacy of positive audit reports given for these institutions and where proper audit regulation was ensured.

Despite some attempts to reform approaches to the regulation of the audit profession in the context of the implementation of the provisions of Directive 2014/56/EU and Regulation (16 April 2014), and with the adoption of legislation projects by the Ministry of Finance of Ukraine On the Audit of Financial Statements and Audit Activity of 17 August 2015 and On Auditing of 10 June 2015, certain regulations in the sector of public enterprises and financial intermediation, on our opinion, have a destructive effect on the competitive environment in the audit services market e 640 On Approval of the Maintenance of the Register of Audit Firms and Auditors to Conduct Audits of Financial Institutions (26 February 2013), which ratifies discriminating conditions or registration of auditors and audit firms that can conduct audits of financial institutions and Law No. 390 of the Cabinet of Ministers of Ukraine of 4 June 2015 On Some Issues of Financial Statements Audit of Public Sector Companies, which approved the criteria which involve an accounting firm's audit of the financial statements or the consolidated financial statements of some large public sector companies.

The stated Resolution and Act introduce artificial restrictive conditions for the audit of public companies and major financial institutions only by major players in the audit market, including the Big 4 firms and other international networks.

The discriminatory nature of these documents and the conditions they set appear in the artificial restriction of access to auditing by medium and small audit firms to financial institutions because of the need for additional expensive training and the introduction of explicit preferences for international audit brands (especially the Big 4[1]), which demonstrate a unique matching to the specified criteria and conditions to test public companies.

For example, Law No. 390 of the Cabinet of Ministers of Ukraine On Some Issues of Financial Statements Audit of Public Sector Companies of 4 June 2015 divides public companies in terms of assets into two groups. Depending on the membership of one of these groups, audit firms involved in the audit must comply with certain restrictive covenants (the number of employees who are directly involved in providing audit services must have a certificate as an independent auditor of Ukraine

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[1] The four largest companies in the world providing auditing and consulting services: Deloitte, Ernst & Young, PricewaterhouseCoopers, and KPMG.

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or a document certifying a full program of independent certification, the amount of annual income of the audit firm during the past three years, and the availability of an insurance contract to third parties for a certain amount). Thus, the implementation of these covenants obviously favors only Big 4 firms and other major international networks.

By supporting the importance of normalization procedures for audit of financial institutions and public companies in restructuring audit activities, it should be noted that narrowing market competition with the adoption of these documents shall have a primarily negative effect on the possibility of equal access by audit companies, which operate in different market segments to individual customers.

However, authoritative studies, including ACCA (2011), show that the basis of the development of competitive markets and audit services, as well as new entrants to these markets, is the cancellation of these discriminatory covenants.

The development of such opinions is included in a report by the Commission on competition, Competition Commission (2013) UK, which is studying the experiences of audit companies of the FTSE 100 and FTSE 250. It concluded that 31% of FTSE 100 companies and 20% FTSE 250 companies had the same auditor from Big 4 companies for over 20 years, and 67% of FTSE 100 companies and 52% of FTSE 250 companies for over ten years. In this regard, requirements for auditor rotation to ensure market competition are vital. Now, according to the Commission, the establishment of discriminatory covenants in favor of Big 4 companies must be forbidden, though for middle tier audit companies (BDO, Grant Thornton,) the following criteria in investment or credit agreements are not insurmountable.

Moreover, in the context of harmonization of national legislation with the provisions of Directive 2014/56/EU and Regulation (16 April 2014), according to Article 21 Professional Ethics and Skepticism, Article 22b Preparation for the Statutory Audit and Assessment of Threats to Independence, and Article 27 Statutory Audit of Consolidated Financial Statements, questions of competition based on price or willingness to compromise in a contractual relationship with the client, but not quality assurance, has a significant importance in the context of auditor independence, the quality of services, and restoration of confidence in financial reporting and audit in general.

Approaches to the study of competition in the audit services market in the world vary in terms of direct impact on the market concentration on key parameters: price, quality assurance, methods for determining such concentrations, and levels of study. As for Ukraine, it is worth noting that the lack of systematic research in the field of competition of audit services is embodied in the lack of a unified strategy of the Auditing Chamber of Ukraine and the Ministry of Finance of Ukraine as for its further development and reforms necessary at this stage in the context of the implementation of EU standards on regulation of audit and protection of the interests of users of audited financial statements.

The hypothesis put forward by the authors on the nature of the quasi-competitive market for audit services in Ukraine according to the volume of services provided and cost parameters seems to be obvious at first glance. The calculation results indicate the presence of two segments in the audit services market in Ukraine: a competitive segment of national audit practices and a highly concentrated segment of the world's largest audit networks. The proof for the hypothesis is based on the results of calculations of certain indicators of market power and systematic tests of homogeneity of the market environment.

The structure of the paper provides an overview of research sources and regulatory materials in the next section, Section 3 includes data definitions and the methodology of the study of market concentration, Section 4 reveals empirical results, and Section 5 contains conclusions and recommendations.

2. SCIENTIFIC SOURCES REVIEW

2.1. Regulatory initiatives to promote competition in the audit services market

Research of competition for audit services is subject to the attention of regulators around the world because of the undeniable importance that the quality of audit financial statements is systemically important for companies and financial institutions, it is in the interests of users of accounting and audit firms, and they have an actualization role in maintaining the transparency and stability of their economies in a post-crisis period.

Thus, the European Commission released a "Green Paper" (EC Green Paper, 2010), in which the question of "systemic risk" is associated with the concentration of audit services in the Big 4 segment and the possible conversion of the four largest companies to three which occupy a prominent place. In 2014, the issue of competition in the audit services market received legislative confirmation in the provisions of Directive 2014/56/EU and Regulation (16 April 2014), which complements the requirements of Directive 2006/43/EU.

The Oxera study (2006) provides evidence that an increase in the concentration of audit firms can raise fees for rendered services. However, it was also proven that audit committees are focused primarily on the quality and reputation of audit firms, rather than on price parameters. In addition, it is difficult to distinguish between the impact of market concentration on price and other regulatory requirements.

Requests to the Office of Fair Trading on the state of competition in the audit services market and the dominance of the Big 4 were carried out by the Economic Affairs Committee of the House of Lords. The final report of the House of Lords (2010) did not confirm a direct link between lower quality audit with increasing concentration of audit firms, but much criticism has resulted in certification of audit companies concentrated in the UK Financial Services segment during the last financial crisis.

These initiatives also emerged in the USA. Specifically, the oversight board for public companies (Public Company Accounting Oversight Board) and the US Senate are working on the current model of professional auditing activities and its role in preventing new financial crises, and the implementation of mandatory rotation of audit firms to ensure proper audit independence in the interests of shareholders.

The issue of concentration of the audit industry in the US in the context of its efficiency, sustainable development, and audit of large public companies is also the subject of US Treasury (2006) and Securities and Exchange Commission (2005) studies.

Reports by the Government Accountability Office (GAO, 2003, 2008) also paid great attention to the concentration of firms providing professional services and confirmed the hypothesis that a tight oligopolistic market structure creates conditions for the existence of price competition. In addition to the previous report in 2008, management (GAO, 2008) indicated that the increase in the concentration in the audit industry has a significant impact on the compensation paid to the auditors of the largest public companies.

A supranational organization that brings together highly qualified specialists who provide professional services (ACCA, 2011) also highlights the benefits of the extension of competition and the abolition of barriers for smaller audit firms on audit services. However, its representatives have warned that artificial intervention in the market environment with installation requirements for the restructuring of large audit firms cannot be positively evaluated.

The professional organization of UK specialists in management accounting (CIMA, 2010) examined a number of factors that contributed to the significant concentration of audit firms (complexity of audit standards, requirements for global coverage, significant infrastructure of global investments, and reputational risks for clients when attracting an auditor not from the Big 4).

Moreover, its experts say that despite these factors, the market for audit services is competitive. However, further reductions among major market players could lead to a catastrophic reduction in competition and conflicts of interest, and thus is undesirable.

The Organization for Economic Cooperation and Development (OECD, 2009, 2010) encourages promotion of competition in statutory audit and encourages expansion of intermediate accounting networks.

As you can see, the importance of competition in the audit services market is in the interests of key stakeholder groups keenly discussed by regulators in individual countries and at the supranational level. However, at the regulatory level, there is no consensus on the possibility of achieving free competition in these markets and the impact of existing market concentration on key parameters of audit services.

2.2. Approaches to the study of the market concentration of audit services in the academic literature

Existing approaches of scientists and official regulators are also polar. A large amount of scientific sources are dedicated to the study of the concentration of large firms in particular and competition in the audit services market in general, and can be structured in the following directions:

1. The study of the relationship between competition and different variables: fees for audit services, the quality of audit services, mandatory rotation of auditors;

2. Further consolidation of audit firms and changes in the competitive environment associated with changes from 5 to 4, 4 to 3;

3. Distribution of scientific works by level – local sector, country level;

4. The study of methodologies to measure market concentration and market volume.

As to the first direction, it should be emphasized that the study of competition in the audit market is generally conducted in works of Doogar and Easley (1998), and is consistent with the GAO opinion on the possibility of the existence of competition in an oligopolistic market structure.

It is also worth noting that Petrakov (2013) has a similar trend by using market analysis of audit services in Ukraine with the theory of quasi-competitive (industry) markets, which was developed by Baumol W.J. et al. (1982).

However, quasi-competitive markets in the works of Petrakov (2013) and Ohorodnikova (2013) are referred to as markets, which are a small number of large firms created under conditions that cause them to act competitively. In addition, these markets can combine high concentration of services in certain segments of certain features of other competitive markets.

The significant concentration of audit firms and audit order value differentiation in regional markets in the context of the overall analysis of the audit services market was also stated in the study of Redko (2009).

While acknowledging the qualitative analysis of competition in the audit services of Ukraine held by the last two authors, it is important to note that quantifiable statistical tests of concentration in this market were not taken.

In the context of the study of the relationship (both negative and positive) between the level of market concentration of audit services and audit of key parameters, it necessary to emphasize the considerable range of differences of scientific results since the studies were conducted by different authors, as well as in one study.

Thus, the results of studies of the effect of concentration of audit firms on the quality of information on corporate profits, which are checked, Francis et al. (2013), were as follows:

1) The quality of this information was positively related to the size of the total share of the Big 4 in the country compared with the share of non-Big 4 auditors;

2) A further increase of the concentration of Big 4 companies, especially with the dominance of one or two of these companies, leads to an increase in accrued reserves (provisions) in the accounts of clients tested, a low probability of their advertising, and delayed their recognition. According to the authors, it was discovered that regulators should focus not only on the extent of the Big 4 market, but also on the qualitative structure of this share.

As in previous work, Boone et al. (2012) suggest that increased concentration in the audit market leads to a lower quality of audit.

The work of Casterella et al. (2004) proved that there is a negative impact of competitive pressures on the performance of auditors from the position of their client regarding concepts of continuity and quality of income on an accrual basis and quality of audit.

In a positive meaning, the focus on local audit services markets is revised in the works of Numan and Willekens (2012) and Newton et al. (2013): The higher the concentration, the lower the fee for audit services and the fewer adjustments and corrections of errors there are in financial statements.

Similar conclusions about the connection between the growth of competition in the audit services market and reduced fees for audit older periods appear in the works of Maher et al. (1992) for the period 1977-1981., and Saunders et al. (1995) for the period 1985-1989.

In the context of further concentration of the supply of audit services due to the reduction of the largest accounting firms in the research of Dunn et al. (2013) and Gerakosand Syverson (2015), they proved that, with the growth of the overall market concentration, the Big 4 have a more equal share of the market than the Big 5 in the consolidation at all levels of analysis. They also established that the introduction of compulsory rotation of auditors or withdrawal from the market of one of the major players will result in an increase in fees for audit services.

As for the analyzed works on geographical identity, the existing research comprehensively considers the problem of competition in the audit services market at all levels. At the country level, the outlined problem was studied by Francis et al. (2013).

At the level of individual industries and local markets, often by the Fama-Frenchten classification approach, the audit competition problem was highlighted in the research of Hogan and Jeter (1999), Carson (2009), Mayhew and Wilkins (2003), and Numan and Willekens (2012). In particular, in recent work it is emphasized that a high concentration of audit services for the sectoral structure will not necessarily match the low intensity of competition.

At the level of cities and municipalities, the competition in the audit market was studied by Sanders et al. (1995), Francis et al. (2005), cities, and industrial cities – Dunn et al. (2011).

Regarding the research methodology, the majority of analyzed articles on the statistical description of market concentration has used traditional indicators for the market power of companies (market share of Big 4 and non-Big 4 auditors, the Herfindahl-Hirschman Index, and the Gini coefficient).

Concentration proposals of dominant Big 4 companies and the Herfindahl-Hirschman Index, based on total sales of customers that are checked by each of the four companies, is used in the works of the Francis et al. (2013). The Herfindahl-Hirschman Index is calculated for a specific audit services market used in the logistics regression of Casterella et al. (2004). The Herfindahl-Hirschman Index was calculated in terms of payment for audit and calculated by the number of customers in the works of Gerakos and Syverson (2015).

Some authors use market concentration ratios, which are calculated on cumulative market share of the largest auditors in the field, in the works of Hogan and Jeter (1999).

Of particular note is the approach outlined in the work of Dunn et al. (2011), in which authors for the analysis of competition in the audit services market, in addition to traditional Ginny coefficient, also applied in the works of Quick and Wolz (1999), Abidin et al. (2008), and the Herfindahl-Hirschman Index adjusted in accordance with methodology of Minyard and Tabor (1991), also suggest using a new measure of the diversification of auditors according to the four largest customers in every industry.

In the context of the analyzed papers, it is necessary to emphasize the need for an integrated approach to the study of competition and its measurements in audit markets that are in their development stage, including Ukraine. The defining feature that characterizes the level of competition is the fact that companies entering the Big 4 market became a reason for its development toward a quasi-competitive market with a highly concentrated segment of the world's largest accountancy network, serving the needs of the largest companies in Ukraine, and a relatively competitive segment of national audit activity cooperating with its smaller companies.

Regarding the level of research, we propose that Ukraine choose the principle structuring of the audit market on geographical (administrative-territorial) units. The said principle corresponds not only to regions in terms of audit, which corresponds with the general level of economic activity and investment attractiveness, but also allows for distinguishing between segments of the market controlled by international audit companies and domestic companies.

In particular, a distinction of audit firms based on residence, the volume of services provided, and market position can be made clear at the regional level. Thus, Big 4 companies and international audit firms have major offices in Kyiv, unlike other regions and cities dominated by Ukrainian audit entities.

In addition, these companies are dominant in the audit services market. According to the Audit Chamber of Ukraine (2015), in 2015, the 13 largest audit firms by volume of services provided for over UAH 10,000 accounted for 64.8% of the market.

A comparison of the competitive structure of the audit services market in Ukraine with other countries is generally consistent with a typical example of quasi-competitive markets where there are a significant concentration of Big 4 market representatives. Francis, Michaels, and Seavey. (2013) present data on market shares of Big 4 companies calculated by the number of customers in 42 countries. The maximum market share of Big 4 companies was recorded in Hungary at 93.0%, and a minimum of 30.0% in Poland. The majority of EU countries had a very high market share of audit services owned by Big 4 companies: Norway – 74.0%; Italy, Spain – 86.0%; Luxembourg – 78.0%; Denmark - 83.0%. Meanwhile, the research of Gerakas J. and Syverson C. (2015) shows that the US market share of companies that do not belong to the Big 4, calculated in terms of audit compensation for 2000-2010, ranged from 3.15% to 6.09%.

Regarding the research methodology of market concentration seen in previous scientific works, it should be noted that there is a need to expand, especially with the number and positions of the indicators that characterize it.

3. DATA AND RESEARCH METHODOLOGY

Research was conducted based upon Audit Chamber of Ukraine data (http://www.apu.com.ua/pro-apu) over the period of 2007-2015. To assess competition on the Ukrainian audit market, the authors used the following indices by regions (26 Ukrainian regions were objects of research, including the temporarily occupied territories as far as the research period requires these data as well):

- number of reports submitted to the Audit Chamber of Ukraine (ACU);
- number of orders;
- actual volume of services provided;
- average costs of one order;
- number of orders per one entity;
- average income of one entity.

Values of these figures, generalized according to a simple average method (see Table 1), attest to a geographical imbalance of the audit services market. In particular, the figures of Kyiv and Kyiv Oblast exceed the results of the other regions several times, since international audit companies and their most economically active customers are concentrated there. It relates to such figures as number of orders; actual volume of services provided; average cost of one order; and average income of one person.

Table 1. Average data as to growth indices of the Ukrainian audit services market over the period of 2007-2014

Region	Number of reports, submitted to the ACU	Number of orders, pcs	Actual volume of services provided, thousand hryvnias	Average costs of one order, thousand hryvnias	Number of orders per one entity, pcs	Average income of one entity, thousand hryvnias
AR of Crimea	38.5	1,981.8	6,805.4	3.9	50.3	192.2
Vinnytsia Oblast	29.0	681.6	4,402.2	7.3	23.3	165.3
Volyn Oblast	15.3	623.9	2,214.4	4.1	40.3	148.3
Dnipropetrovsk Oblast	120.3	3,493.3	65,961.8	20.1	29.1	587.7
Donetsk Oblast	113.8	3,721.3	32,021.3	10.1	31.5	296.8
Zhytomyr Oblast	26.4	910.8	4,476.6	6.1	32.9	178.6
Zakarpattia Oblast	20.9	445.4	3,749.1	9.3	21.1	185.1
Zaporizhia Oblast	76.4	2,208.8	18,854.9	9.2	28.9	260.7
Ivano-Frankivsk Oblast	21.4	860.1	4,132.3	4.9	41.0	204.9
Kyiv and Kyiv Oblast	730.1	22,650.3	888,343.3	41.0	31.2	1,254.0
Kirovohrad Oblast	16.5	469.1	2,524.5	6.4	27.6	159.5
Luhansk Oblast	40.5	1,113.4	5,138.1	5.0	27.3	131.9
Lviv Oblast	70.5	3,039.3	25,087.1	8.4	43.6	369.0
Mykolaiv Oblast	41.3	586.9	4,429.1	8.5	14.1	118.8
Odessa Oblast	84.4	1,730.4	20,696.4	13.0	20.4	256.8
Poltava Oblast	49.4	1,358.3	6,296.5	6.2	26.5	143.4
Rivne Oblast	28.9	983.9	4,104.7	4.8	33.9	146.1
Sevastopol	15.5	680.8	3,711.2	6.7	50.3	391.7
Sumy Oblast	35.1	646.9	4,349.5	7.6	18.2	134.5
Ternopil Oblast	13.0	534.5	2,106.8	4.3	41.1	166.9
Kharkiv Oblast	149.6	4,190.9	40,562.6	11.8	26.9	289.6
Kherson Oblast	26.8	989.1	6,071.6	6.6	37.8	252.1
Khmelnytskyi Oblast	21.8	661.9	3,860.6	6.6	30.5	184.8
Cherkasy Oblast	40.1	721.6	5,682.4	8.8	17.6	146.6
Chernivtsi Oblast	12.1	479.1	2,344.9	5.5	38.8	195.8
Chernihiv Oblast	20.6	590.4	3,628.6	7.6	27.4	186.8

Source: calculated by the authors according to Audit Chamber of Ukraine data.

Based on this data, the following hypothesis, tested in this research, results: The Ukrainian audit market is quasi-competitive, i.e., demonstrates elements of high concentration in the segment of large audit companies and low competition among small – entities by regions.

Various methods and techniques of statistical analysis and assessment were applied in this research.

The first stage is a statistical confirmation of a hypothesis about the quasi competitiveness of the Ukrainian audit market. In order to prove affiliation of data groups to different general arrays, parametric and non-parametric methods are applied in statistics depending on whether or not data comply with normal distribution.

As far as the analyzed data do not comply with the normal distribution law (proved by Pearson's chi-criterion and Kolmogorov-Smirnov test, see Appendix A), it is appropriate to use only non-parametric methods. Given the peculiarity of the data array (26 groups), the Kruskal-Wallis test will be applied in the work.

Upon the condition of demonstrating that analyzed data groups (each region has its own data array) belong to different general arrays, we get indirect confirmation that the Ukrainian audit services market is not free-competitive. Respectively, in such a case we get confirmation of the basic hypothesis.

While the previous statistical evaluations attest in favor of the hypothesis for the quasi competitiveness of the Ukrainian audit market, the next stage is quantitative assessment of the competitiveness level. For this purpose, it is suggested to apply not only the most important indices (concentration ratio, Herfindahl-Hirschman Index, Gini coefficient, and Lorentz curve), but other indices of market shares of companies that are not used very often in the study of the competitiveness of foreign audit services markets (Rosenbluth index, Lerner index, industry concentration coefficient, and entropy index).

Short characteristics of the given indices and their calculation formulas are given below (see Table 2).

Table 2. Main indices for assessment of market concentration

Index name	Calculation	Characteristics
Concentration ratio	$$CRn = \frac{R_1 + R_2 + \cdots + R_n}{R},$$ Where CR_n – partial concentration ratio; n – number of the largest market participants; R_i – market share controlled by i participant; R – market volume.	Characterizes inequality on the market, reflecting position of the largest companies. Depending on the value of four-firm concentration ratio (CR4) markets can be divided into 4 groups: 1. Clear monopoly (CR4 ≈ 100%). 2. Dominant companies (40% <CR4 <60%). 3. Limited oligopoly (CR4> 60%). 4. Effective competition (CR4 <40%)*.
Herfindahl-Hirschman Index (HHI)	$$HHI = \sum_{i=1}^{n} \left(\frac{R_i}{R}\right)^2$$	Used to assess level of industry monopolization. Varies within the range of [0; 1]: 1) 0 – minimum concentration; 2) from 0 to 0.1 – low concentration level; 3) from 0.10 to 0.18 – mean concentration level; 4) over 0.18 – high concentration level**.
Lerner index	$$L = \frac{P-MC}{P},$$ P – price per product unit; MC – marginal costs, related to manufacturing of additional product unit.	Calculation of a value, by which the price exceeds marginal costs, can provide the information on degree of market monopolization. The more the gap is between P and MC, the higher the market monopolization degree is. Lerner index varies within the range of [0; 1]. The more Lerner index value approaches to 1, the higher the market monopolization degree is. Accordingly, perfect competition implies a Lerner index being equal to 0.
Rosenbluth index	$$I_R = \frac{1}{2 \times \sum_{i=1}^{n}(i \times R_i) - 1}$$	Enables consideration of a range of market participants when assessing its concentration. Rosenbluth index value varies within the range of [1/n; 1]. The more the coefficient is, the more market monopolization is.
Industry concentration coefficient	$$CCI = R_1 + \sum_{i=2}^{n} R_i^2 \times (1 + (1 - R_i))$$	Enables assessing the correlation between market share fluctuation and absolute significance of the largest market entity's share. Industry concentration value varies within the range of [0; 1]. The more the coefficient is, the higher the market monopolization is.
Entropy index	$$E = \frac{1}{n} \sum_{i=1}^{n} R_i \times ln \frac{1}{R_i}$$	This index, by means of reducing the significance of market shares of large market entities, enables increasing the significance of market shares of small market entities. The more the entropy index is, the higher economic uncertainty is and the lower the probability is to establish monopoly or oligopoly.
Gini coefficient	$$G = \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} |R_i - R_j|}{2n^2 \bar{R}}$$	Gini coefficient is a quantitative interpretation of Lorentz curve. It varies within the range from 0 to 1. The larger the Gini coefficient, the larger the inequality of distribution of market shares between market participants is and, thus, the concentration level on the market is higher.

*division is based on the calculations Naldi, Flamini (2014), p. 5.

** division is based on the calculations Hirschey (2008), p. 529.

In addition, for a visual (graphic) interpretation of the inequality level a Lorentz curve is used – a diagram of cumulative shares of the companies on the market (axis X) and cumulative market volume (axis Y).

In theoretical terms, absolutely equal market distribution is characterized by a bisector coming out of the coordinate origin point. The higher the deviation of empiric distribution is from the theoretical one, the higher the degree of inequality available on the market is.

4. EMPIRICAL RESULTS

Kruskal-Wallis test

The results of the Kruskal-Wallis statistical test are outlined in Appendix B.

According to calculation results, analyzed data belong to different general aggregates, which is indirect evidence in favor of the hypothesis of the quasi-competitiveness of the Ukrainian audit market.

Concentration indices

The results of concentration indices analysis (Concentration ratio (CR1), Concentration ratio (CR4), Herfindahl-Hirschman Index (HHI), Rosenbluth index, Industry concentration coefficient (CCI), Entropy index, Gini coefficient, and Lerner Index) are given in the Appendix C.

The degree of inequality in the Ukrainian audit market is represented in a graphic by means of a Lorentz curve based on the selected data (Appendix D).

Table 3 was developed to generalize the results obtained.

Table 3. Generalization of results of concentration indices analysis of the Ukrainian audit market (as of the end of 2014)

Parameter	Number of reports submitted to the ACU	Number of orders	Actual volume of services rendered, thousand hryvnias
Concentration ratio (CR1)	Dominant companies	Dominant companies	Dominant companies
Concentration ratio (CR4)	Dominant companies	Dominant companies	Dominant companies
Herfindahl-Hirschman Index (HHI)	High concentration level	High concentration level	High concentration level
Rosenbluth index	Low monopolization level	Low monopolization level	Moderate monopolization level
Industry concentration coefficient (CCI)	Moderate concentration level	Moderate concentration level	High concentration level
Entropy index	High probability of monopoly or oligopoly	High probability of monopoly or oligopoly	High probability of monopoly or oligopoly
Gini coefficient	Moderate concentration level	Moderate concentration level	High concentration level
Lorentz curve	Fundamental inequality on the market	Fundamental inequality on the market	Fundamental inequality on the market
Lerner index	High level of market monopolization		

According to the results of the analysis, which implied a number of indices of market concentration and Kruskal-Wallis test regarding Ukraine's audit services market in regional aspects, Ukraine's audit market is non-uniform in terms of its structure. Available audit entities are combined into two segments: a highly concentrated segment of large companies, represented by the leading audit companies and a few representatives of Ukrainian audit business, registered in Kyiv and Kyiv Oblast, as well as by a segment of small national audit entities activity broadly represented in other regions.

Dominant companies on the market, considering national and international legal and ethical norms, market conjuncture, and customers' needs, have to demonstrate certain signs of competitive actions with a view to adherence to the correlation: 'quality of services – labor input of services – audit reward – reliability of confirmable financial statements.'

Small audit companies, aimed at servicing needs of medium and small businesses, first of all, demonstrate signs of price competition regardless of the quality of the services rendered.

In addition, analysis of Ukraine's audit services market, considering the combination of high-level concentration in its most profitable segment with separate signs of competitive behavior, allows for it to be regarded as quasi-competitive. Accordingly, the suggested hypothesis can be assumed as proved.

5. CONCLUSIONS AND RECOMMENDATIONS

The issue of studying fair competition in the audit services market becomes relevant during a post-crisis period for the purposes of ensuring qualitative audits of financial statements of systemically significant companies along with maintenance of audit practice transparency and prevention of its further consolidation. The importance of these issues is emphasized by the respective regulatory bodies all over the globe: European Commission (EC Green Paper, Directive 2014/56/ЄC), Competition Commission and House of Lords Economic Affairs Committee, CIMA UK, Public Company Accounting Oversight Board, US Government Accountability Office, and supranational organizations like ACCA and OECD.

Contributions of scientists in the area of audit competition is diverse both in terms of research (establishing relationships between the level of market concentration and parameters of rendering audit services) and chosen methodology and research level.

Research by geography (regions) provides the possibility to compare the competition level in the audit services market with the level of development of audit activity and general economic activity of Ukrainian regions, as well as to differentiate them in terms of a residency feature of audit entities.

In addition to traditional methods of studying market concentration (concentration index, Gini coefficient, Lorentz curve, Herfindahl-Hirschman Index), a number of additional indices were calculated (Rosenbluth, Lerner indices, industry concentration coefficient, and entropy index) in terms of the number of reports submitted to the ACU, the number of orders, the actual volume of services rendered, the average costs of one order, the number of orders per one entity, and the average income per one entity.

In addition, the Kruskal-Wallis test made it possible to prove that the analyzed data arrays based on figures by region belong to different aggregates, which is an indirect confirmation of the non-uniformity of the Ukrainian audit services market.

The results of applying nonparametric methods conforms to the calculations of the given coefficients and make it possible to prove the hypothesis of the quasi-competitive nature of the Ukrainian audit services market with the prevalence of a highly concentrated segment of the largest global audit networks (concentrated in Kyiv and Kyiv Oblast), which serve the needs of the largest companies of Ukraine, and a relatively competitive segment of national audit entities that cooperate with smaller companies.

Along with that, a controversial situation occurs in the field of governing audit activity with limiting conditions, established by subordinate legislation of the Cabinet of Ministers of Ukraine and its departmental bodies in favor of a separate category of audit entities, only proves the results obtained of calculations and requires urgent measures.

Based on the quasi-competitive nature of the Ukrainian audit services market and destructive conditions that restrict its development, the following recommendations are given for its regulators (the Ministry of Finance of Ukraine and the Audit Chamber of Ukraine) in the context of European integration processes as to stabilize the market and increase the level of competition in the market:

▪ Cancel existing discriminatory conditions of engaging audit companies into fulfillment of tasks of providing justified and limited confidence according to key International standards of quality control, audit, inspection, other provision of confidence, and related services (primarily in the segments of the largest state companies and companies providing financial services);

▪ Prohibit state administration bodies (Cabinet of Ministers of Ukraine, National Commission for State Regulation of Financial Services Markets) to establish limiting covenants and providing preferences (obvious or not) in favor of separate participants of audit market services, especially international audit companies, and separately of the Big 4 segment, which already have reputational and infrastructural privileges given the global scale of requirements for audit. In this regard, activity of the Audit Chamber of Ukraine requires reformation as to:

▪ Expand its powers in the field of control and supervision on the audit services market, especially in the context of rendering them in separate industries and fields of activity (state sector, financial markets, banking systems);

▪ Develop coordination activities of the Audit Chamber of Ukraine as to ensuring a competitive environment on the audit services market with respective industry regulators (National Bank of Ukraine, National Commission for State Regulation of Financial Services Markets, National Securities and Stock Market Commission, Anti-Monopoly Committee of Ukraine);

▪ Promote fair tenders for audit committees of audit companies' customers. The Audit Chamber of Ukraine and industry regulators should develop recommendations as to the procedure of conducting such tenders when engaging auditors to perform tasks based on the principles of transparency and openness, the goal of which to limit unfair price competition, price dumping, avoidance of rotation of audit companies, and conflict of interests according to the procedure specified by the International Federation of Accountants, Directives 2014/56/EC and Regulations (16 April 2014);

▪ Strengthen control of the Anti-Monopoly Committee of Ukraine over audit entities by developing legislative mechanisms and efficiency of its regulatory activity on the audit services market. Moreover, activity of the Anti-Monopoly Committee of Ukraine on the audit services market should be necessarily adjusted to the measures of an independent body of civil supervision of audit entities, establishment of which is urgent based on the necessity for fulfilling requirements of Directive 2014/56/EC and Regulation (16 April 2014);

▪ Contribute to the development of the national audit services market with an emphasis on improvement of the quality of audit services, the level of qualification and education of their employees according to the standards of audit activity (International standards of quality control, audit, supervision, other provision of confidence and related services), the Code of Ethics of Professional Accountants, and the International Standards of Education of Professional Accountants of the International Federation of Accountants. In particular, the actualization of education programs for preparing auditors and qualification programs for their examination and training need to be required to be in line with the requirements of the documents mentioned above. Distribution of international certification programs in the system of preparing auditors can be singled out into a separate direction of developing and maintaining an appropriate level of qualification of the national auditors and absolute quality of services rendered.

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Appendix A

Table A1. Check of input data to correspond the normal distribution

Parameter	Number of reports provided by ACU	Number of orders, units	Actual volume of provided service, thsd UAH	Average costs per order, thsd UAH	Number of orders per subject, units	Average income per subject, thsd UAH
Xi - square	361.60	509.76	644.49	112.69	17.68	136.65
Critical value of Xi − square distribution (p=0.95)	5.99	11.07	7.81	11.07	7.81	5.99
Null hypothesis	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected
d Kolmogorov-Smirnov	0.3036	0.309	0.3975	0.1866	0.054	0.1929
Critical value of Kolmogorov-Smirnov criteria (p=0.95, n=208)	0.0943	0.0943	0.0943	0.0943	0.0943	0.0943
Null hypothesis	Rejected	Rejected	Rejected	Rejected	Not rejected	Rejected
Conclusion	Data is not normally distributed					

Appendix B

Table B1. Results of Kruskal-Wallis test

	Number of reports provided by ACU	Number of orders, units	Actual volume of provided service, thsd UAH	Average cost per order, thsd UAH	Number of orders per subject, units	Average income per subject, thsd UAH
Corrected H	260.30	232.56	262.04	161.35	210.77	177.02
Degrees of freedom	24	24	24	24	24	24
Volume of P:	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Critical value	36.41	36.41	36.41	36.41	36.41	36.41
Null hypothesis	Rejected	Rejected	Rejected	Rejected	Rejected	Rejected

Appendix C

Table C1. Concentration Indexes
(using Number of reports provided by ACU index as an example)

Parameter	2007	2008	2009	2010	2011	2012	2013	2014
Concentration ratio (CR1)	35.15%	37.02%	38.25%	39.36%	41.24%	41.14%	41.67%	44.34%
Concentration ratio (CR4)	57.46%	58.08%	59.15%	59.77%	61.38%	60.91%	61.64%	63.99%
Herfindahl-Hirschman index (HHI)	0.15	0.16	0.17	0.18	0.19	0.19	0.20	0.22
Rosenbluth index	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.12
Sectorial Concentration index (SCI)	0.41	0.42	0.43	0.44	0.46	0.46	0.46	0.49
Entropy index	9.81%	9.67%	9.55%	9.46%	9.28%	9.30%	9.23%	8.87%
Gini coefficient	0.44	0.44	0.45	0.45	0.47	0.46	0.47	0.50

Table C2. Concentration indexes (using Number of orders index as an example)

Parameter	2007	2008	2009	2010	2011	2012	2013	2014
Concentration ratio (CR1)	34.83%	39.12%	37.21%	38.36%	43.37%	43.36%	44.81%	47.82%
Concentration ratio (CR4)	58.01%	60.90%	59.78%	58.14%	61.21%	61.41%	62.78%	65.04%
Herfindahl-Hirschman index (HHI)	0.15	0.18	0.17	0.17	0.21	0.21	0.22	0.25
Rosenbluth index	0.10	0.10	0.10	0.10	0.11	0.11	0.12	0.13
Sectorial Concentration index (SCI)	0.41	0.44	0.43	0.43	0.48	0.48	0.49	0.52
Entropy index	9.82%	9.45%	9.57%	9.61%	9.02%	8.99%	8.79%	8.46%
Gini coefficient	0.44	0.46	0.46	0.46	0.48	0.49	0.51	0.53

Table C3. Concentration indexes
(using Actual volume of provided service index as an example)

Parameter	2007	2008	2009	2010	2011	2012	2013	2014
Concentration ratio (CR1)	68.01%	74.77%	77.84%	76.18%	76.25%	75.33%	74.74%	79.39%
Concentration ratio (CR4)	82.13%	86.61%	88.14%	87.73%	87.92%	87.65%	88.53%	89.54%
Herfindahl-Hirschman index (HHI)	0.47	0.57	0.61	0.59	0.59	0.57	0.57	0.64
Rosenbluth index	0.25	0.32	0.36	0.35	0.36	0.35	0.37	0.42
Sectorial Concentration index (SCI)	0.70	0.76	0.79	0.77	0.78	0.77	0.76	0.80
Entropy index	5.72%	4.78%	4.32%	4.53%	4.48%	4.61%	4.58%	3.99%
Gini coefficient	0.67	0.72	0.75	0.74	0.74	0.74	0.75	0.77

Table C4. Lerner index

Year	2007	2008	2009	2010	2011	2012	2013	2014
On average, in Ukraine	0.94	0.92	0.90	0.90	0.91	0.92	0.91	0.91

Appendix D

Figure D1. Lorenz curve based on the Number of reports provided by ACU parameter

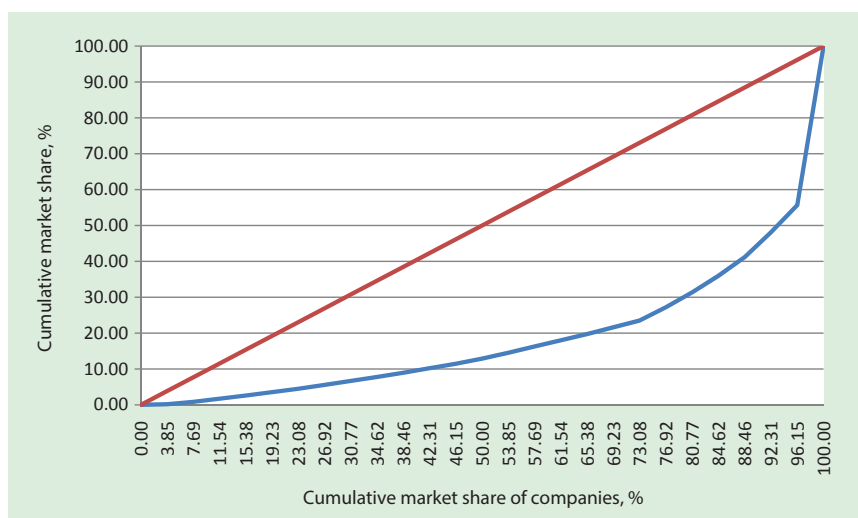**Figure D2. Lorenz curve based on the Number of orders parameter**
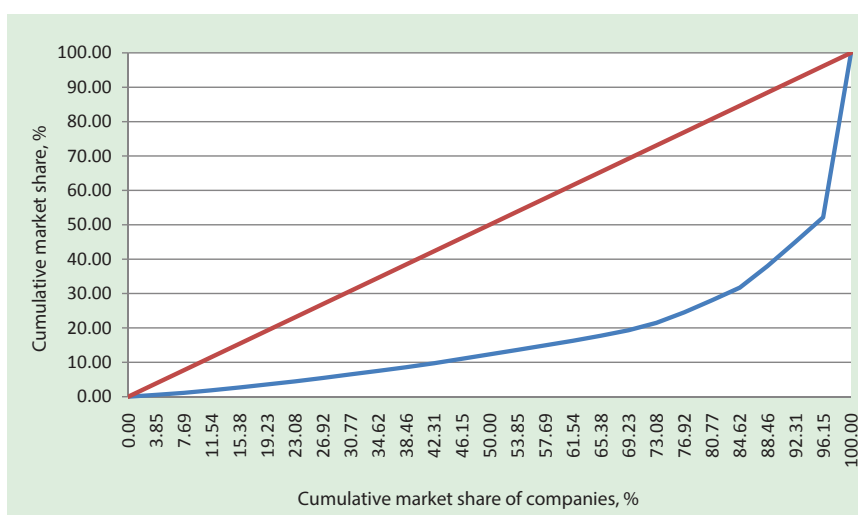

Figure D3. Lorenz curve based on the Actual volume of provided service parameter