

| Viktor Shevchuk

THE REAL AND NOMINAL EFFECTS OF LARGE DEVALUATIONS IN UKRAINE*

Abstract

Using monthly data for the 2000–14 period, this paper discusses the macroeconomic effects of large devaluations in Ukraine. Employing a time-varying parameter framework, the author shows that a nominal devaluation in “normal” times is associated with an increase in exports and a decrease in imports, an acceleration in consumption price inflation, and a contraction in industrial output (since 2014). However, a currency collapse is likely to be inflationary and contractionary in respect of exports, imports, industrial output, and retail trade turnover. The author shows that export dynamics is stimulated by higher world commodity prices and industrial growth abroad. Since the 2008–09 financial crisis, industrial output has become more strongly linked to the performance of the largest foreign trade partners.

Keywords: exchange rate, industrial output, foreign trade, inflation, the Kalman filter.

JEL Classification: E65, F31, F37.

1. Introduction

The steep downward realignments of the Ukrainian *hryvna* in November–December 2008 and February–November 2014 were associated with a sharp drop in foreign trade, industrial output, and retail trade, and were followed by a significant increase in consumer prices (Figure 1). A prompt fall in imports, and a slow response from exports to changes in relative prices, are both typical outcomes of large devaluations or currency collapses in low-income and middle-income countries (Alessandria et al. 2013; Burstein et al. 2005). There was a time when unfavourable developments in the

Viktor Shevchuk, Institute of Economics, Sociology and Philosophy, Cracow University of Technology, Warszawska 24, 31-155 Kraków, Poland, e-mail address: vshevchuk@pk.edu.pl.

* This paper is part of research project F-4/30/2014/DS. The financial support provided by the Cracow University of Technology is gratefully acknowledged.

foreign trade sector were aggravated by a contractionary output effect (Bahmani-Oskooee & Miteza 2006; Bebczuk et al. 2006; Chou & Chao 2001; Hutchison & Noy 2005; Pineres & Cantavella-Jorda 2010). In general, though, industrial economies respond to devaluation shocks by expanding, and developing economies respond to them by contracting (Ahmed et al. 2002). Studies of Central and East European countries have returned mixed findings in this respect, which have included detecting a contractionary effect (Miteza 2006) and returning results that allow no clear, country-specific conclusions to be drawn (Bahmani-Oskooee & Kutan 2008). The various exchange rate effects can be explained by heterogeneous factors, such as the business cycle, capital inflows, the dollarisation of domestic and external liabilities, export growth, openness to trade, overvaluation of the real exchange rate, and slow growth abroad (Bebczuk et al. 2006; Bussière et al. 2012).

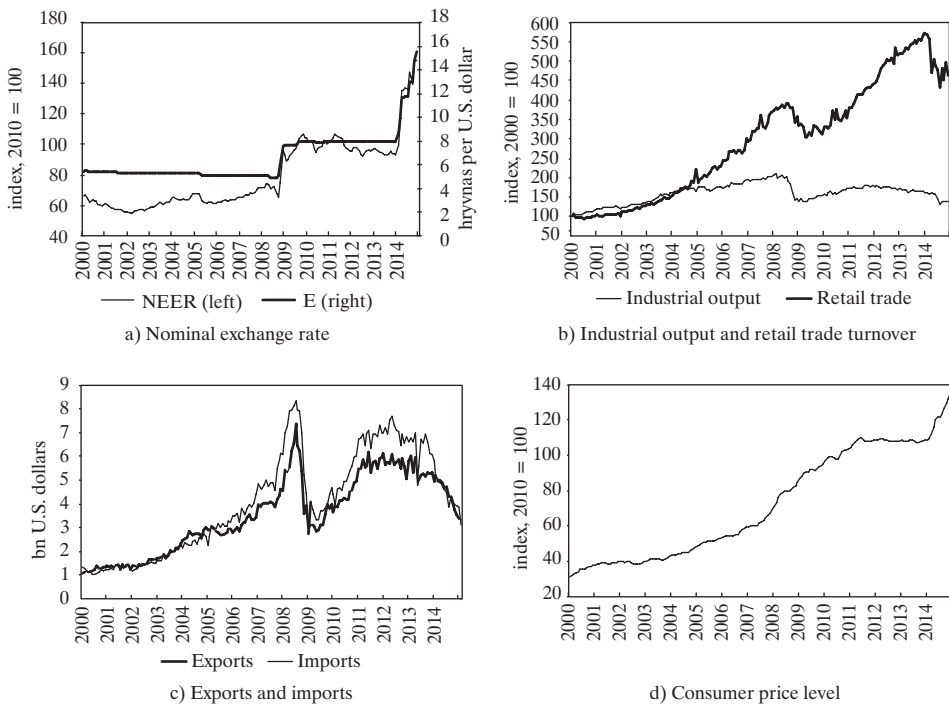


Fig. 1. Ukraine: Selected Macroeconomic Indicators, 2000–14

Source: IMF International Financial Statistics.

Although the unfavourable effects of large devaluations are well-documented, the possibility that output losses are materialised before the currency falls, so that the costs of a currency crash stem largely from the factors leading up to it, cannot be ruled out (Bussière et al. 2012). Ukraine's industrial output had, for example, been in gradual decline from the middle of 2011, almost two-and-a-half years before the currency collapse of 2014. The country's exports, meanwhile, recovered quite quickly from the middle of 2009, before stagnating in 2011–12 and going into decline from 2013. In a pattern similar to that of 2009, the large and fairly stable trade deficit of 2011–13 was ended by the large devaluation of 2014. The retail trade turnover, as a proxy for the measure of aggregate demand, rose very sharply in 2005–08 before declining in the wake of the 2008–09 financial crash. This was followed by a strong recovery. Unlike industrial output, retail trade turnover increased and showed no signs of slowing down until the very end of 2013.

The aim of this paper is to estimate the macroeconomic effects of a large devaluation and to separate the “pure” impact of exchange rate realignments from other potential effects of a currency crash, which may reflect pre-crisis developments unconnected with changes in the exchange rate. It is assumed for the purposes of this study that large currency devaluations occur where the change in the monthly exchange rate exceeds 10% against a backdrop of relative exchange rate stability over preceding periods¹. Having introduced the question, the paper now proceeds to a survey of the analytical issues in Section 2 before describing the data and statistical methodology in Section 3. The results of the estimation are discussed in Section 4, while Section 5 draws the disparate strands together in a number of concluding statements.

2. The Analytical Framework

Several mechanisms whose pronounced contractionary effects on foreign trade are well in excess of those implied by the change in relative prices are set in motion following large devaluations. G. Alessandria, J. Kaboski, and V. Midrigan (2010) attribute sharp drops in imports to delivery lags and economies of scale in the transaction technology. Importers respond to

¹ This assumption is in accordance with popular definitions of currency collapses. Bussière, Saxena, and Tovar (2012), for example, define a currency collapse as a case in which the change in the annual nominal exchange rate in any month during a given calendar year exceeds 15% and is at least 10% above that of the previous year. Finally, the annual change in the nominal exchange rate for the previous year must not exceed 10%.

unanticipated devaluations by reducing inventories, suspending imports and cutting mark-ups to speed up the sale of existing inventory. G. Alessandria, S. Pratap, and V. Yue (2013) argue that the costs of the entry decisions of non-exporters, and of the exit decisions of exporters, might explain why export recoveries are sluggish. It has been demonstrated that substantial export costs lead to a deeper initial contraction and a stronger future recovery in output, with the interest rate as the instrument influencing the future benefits of exporting. Where investment costs are high and consumers patient, which affects the speed of export expansion through the consumption-smoothing mechanism, the incentives to invest in exports are weaker.

Kristin Forbes' open economy model (2002) describes the effect devaluations have on capital to labour ratios and changes in the cost of capital. It is expected that the real sector will contract in economies that experience substantial interest-rate increases and have high capital to labour ratios. The potential for contractionary effects is also included in one variant of the Open Economy Financial Accelerator model (Delli Gatti et al. 2007), which offers the example of a decline in the net worth of domestic firms that leads to an increase in the domestic interest rate following devaluation. Contractionary effects can also be aggravated where interest rates are further increased in an effort to stabilise the exchange rate.

Besides the costs of structural adjustment and unfavourable interest rate developments, a simultaneous devaluation-driven decline in exports and output can also be explained by factors such as the negative wealth effect (a fall in the real value of money and in financial and other assets), the balance-sheet effect (an inverse relationship between the foreign currency debt and demand in the private and public sectors), capital outflows or strong inflationary pass-throughs (Blanchard et al. 2010; Kamin & Rogers 2000; Lizondo & Montiel 1988). The AD-AS model makes it possible to visualise these common devaluation-related issues. Despite its numerous shortcomings, such as an alleged lack of microeconomic foundations, inconsistent treatment of aggregate supply, uneven treatment of the counter-cyclical movement of the real wage and unsatisfactory treatment of dynamics, the AD-AS framework is both inherently consistent and well suited to incorporating important insights from behavioural economics and from the Keynesian and structuralist traditions (Dutt & Skott 2005)².

² The AD-AS framework explains the interaction between the "demand side" and the "supply side" of the economy using accounting identities, equilibrium conditions and behavioural and institutional equations (Dutt & Skott 2005). The "demand side" incorporates factors relating to the

This is illustrated by the following simplified static version of the AD-AS model (apart from the interest rate, all variables are expressed in logarithms)³:

$$y_t^S = s_0 + s_1(m_t - p_t) - s_2(e_t + p_t^* - p_t) + u_t, \quad (1)$$

$$y_t^D = a_0 + a_1(m_t - p_t) - a_2(debt_t + e_t) - a_3(r_t + \Delta) + a_4(e_t + p_t^* - p_t) + \varepsilon_t, \quad (2)$$

where y_t^S and y_t^D are aggregate supply and aggregate demand; m_t is the aggregate money supply; p_t and p_t^* are domestic and foreign price levels; e_t is the nominal exchange rate; $debt_t$ is the foreign debt; r_t is the real interest rate; Δ is the risk premium required by domestic lenders and u_t and ε_t are stochastic factors.

In equation (1), the aggregate supply (*AS*) is increased by the real money supply, $m_t - p_t$, and appreciation of the real exchange rate, $e_t + p_t^* - p_t$. Assuming a strong inflationary pass-through, the direct contractionary effect of devaluation (s_2) is likely to be strengthened by a negative financial effect (s_1), as an increase in the price level produces a decrease in the real money supply.

Equation (2) describes aggregate demand as a positive function of the wealth effect, $m_t - p_t$. Depreciation of the real exchange rate, the balance-sheet effect, $debt_t + e_t$, and a rise in the real interest all have a contractionary effect. Because it depends on the comparative strength of relative price and balance-sheet effects, the net effect of the exchange rate on demand becomes ambiguous. If the Marshall-Lerner condition holds and the balance-sheet effect is weak⁴ devaluation is expansionary in respect of aggregate demand. Otherwise the net effect of devaluation is to decrease demand.

Figure 2 presents an interpretation of devaluation effects. There is a downward sloping aggregate demand curve (*AD*) and an upward sloping aggregate supply curve (*AS*) in the price-output space. Initially, output is determined at Y_0 and price at P_0 (point *A*). Following an improvement in

demand for goods and assets, while the “supply side” is typically related to the output and pricing decisions of producers and factor markets. Though many of the criticisms made of the AD-AS model are valid, it remains a useful device for price-output determination (Docherty & Tse 2009).

³ As Blanchard, Faruquee, and Das (2010) state, the lack of dynamics can be justified on the grounds of focusing on the effects of the shocks immediately upon impact, with the direct effect of trade and capital flows dominating expectational effects.

⁴ The Marshall-Lerner condition states that there is an improvement in the trade balance if – given domestic and foreign output – the sum of export and import exchange rate elasticities is above unity. For the medium term at least, this is usually the case. To give an example, the Marshall-Lerner condition holds – mainly due to the high relative price elasticities of imports – in a study of 46 middle-income and emerging economies conducted in 1980–2005 (IMF 2006).

relative prices, which is the dominant devaluation-driven mechanism, there is a rightward shift in the aggregate demand from AD_0 to AD_1 – mainly through an increase in demand for exports combined with a decrease in imports. The traditional expansionary competitiveness effect leads to greater demand for tradeable goods and increased investment by the firms that have to meet this demand. The effect depends on how open the economy is and on the capital intensity of the output (Carranza et al. 2009). Consequently, the output increases to Y_1 (point B), though at the cost of a moderate increase in the price level to P_1 . The extent of the price increase depends on the price elasticity of aggregate supply.

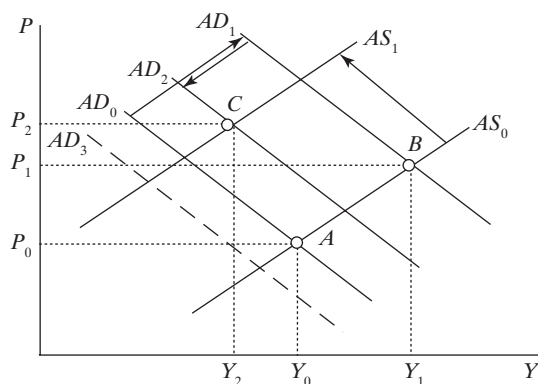


Fig. 2. Macroeconomic Effects of Devaluation

Source: author's own elaboration.

A contraction in the aggregate supply from AS_0 to AS_1 is, however, likely to reduce the expansionary effect. Even when devaluations are prompted solely by external shocks, there are several contractionary supply-side effects, including a reduction in real wages, erosion of the real money supply (in financially-constrained economies) and a higher financial cost of imported inputs and working capital (Kamin & Rogers 2000; Lizondo & Montiel 2003). Although imported capital goods become relatively more expensive, this should not offset the competitiveness effect as the firms in the tradeable goods sector increase investment to meet the greater demand for their output, which is precisely what generates the higher financial costs (Carranza et al. 2009). If there are strong contractionary mechanisms in aggregate demand, such as the balance-sheet effect, the redistribution of savings in favour of wealthier households or an increase in the interest rate, it is likely

that the leftward shift in the AD schedule will trigger a clear contractionary effect in the real sector. The new equilibrium will then be at lower output Y_2 and higher price level P_2 (point C). Following devaluation, the wealth effect implies a direct relationship between the real value of assets and private consumption. This is contractionary because higher inflation erodes the value of assets denominated in local currency. The outcome is ambiguous, though, if private holdings include assets denominated in foreign currencies. The net effect depends on whether any increase in the value of these assets is strong enough to outweigh the impact of higher prices.

Large devaluations may have an additional negative impact that extends beyond the “traditional” balance-sheet effect, which involves a situation in which the net worth of firms holding debt denominated in a foreign currency, but assets or income flows denominated in the domestic currency, instantly deteriorates (Carranza et al. 2009). Where small devaluations are concerned there is only a slight rise in the risk to the indebted firm. Meanwhile, the balance-sheet effect at debt-ridden and financially vulnerable firms will be highly intense when there is a large devaluation. The firms then have to liquidate their capital or go bankrupt because they have no access to credit, which leads to a “discrete” decrease in investments. Destabilisation due to currency mismatches between assets and liabilities is likely to be much more serious for firms in the non-tradeable sector that do not directly gain from the relative price (competitiveness) effect. Financial difficulties in Ukraine’s economy in the wake of the 2008–09 and 2014 currency crises were further aggravated by a severe deterioration in the net worth of local banks, which affected firms in both the tradeable and non-tradeable sectors. Assuming there are balance-sheet effects at firms and banks, the extent of the output slump is comparatively easy to explain. It should be borne in mind that increases in the value of foreign currency assets held by households can moderate falls in aggregate demand.

As Figure 2 makes clear, a fall in demand from AD_1 to AD_2 , which could be associated with the balance-sheet effect, is responsible for a lower inflation pass-through in the case of large devaluations. Referring to a panel of more than 100 countries with differing degrees of dollarisation, a team of researchers found that those with higher dollarisation experienced higher inflation pass-through, but that large depreciations tended to have a negative impact on the pass-through coefficient that was more intense when the economy’s dollarisation level was higher (Carranza et al. 2009).

Theoretical and empirical arguments are advanced in a further paper to argue that the contractionary effects of currency devaluation in the wake

of the 2009 world financial crisis can be explained by the balance-sheet effect. In this way, the higher the foreign debt, the larger is the increase in the real value of debt from a depreciation and the stronger is the adverse effect on output (Blanchard et al. 2010). If the Marshall-Lerner condition does not hold and the balance-sheet effect is strong, devaluation brings about a decrease in aggregate demand. This means that the schedule of aggregate demand can shift leftwards to AD_3 below the initial curve AD_0 . The contractionary effect is then attained even without any unfavourable supply-side developments. A fall in the price level is to be expected in the event of unfavourable supply-side developments.

These arguments are consistent with the empirical finding that where exports do not respond strongly to relative prices there will be a fall in output that can last as long as one-and-a-half years (Frankel 2005). The inverse relationship between devaluation and exports in Latin American countries is due to a combination of the balance-sheet effect, capital outflow and a decline in investments (Pineres & Cantavella-Jorda 2010). The dominant factor influencing lower demand for imports is output contraction. While downward realignments in exchange rates also exert an influence here, it is of much less importance (Calvo & Reinhart 2002).

Turning to a wider context, an increase in inflation can be harmful for both aggregate demand and aggregate supply. Krugman and Taylor (1978) were among the first to explain the importance of the inflation mechanism in a devaluation-driven decline in output. The redistribution of purchasing power in favour of wealthier households with a higher propensity to save leads to a simultaneous decrease in aggregate demand, output and imports. If there are *ad valorem* taxes on exports, or exporters dominate among taxpayers, as is the case in Ukraine, demand is further reduced by the budget surplus, as the government has a short-run saving propensity of unity. The higher the trade balance deficit at the moment of devaluation, the stronger the expected decline in output. As neither imports nor exports are very sensitive to relative price changes in the short-run, the primary favourable effects of devaluation on the trade balance, if any, come primarily through economic contraction rather than substitution effects related to aggregate demand. To prevent a sharp decline in output, it is suggested that devaluations should be accompanied by policies designed to encourage private investment, stimulate export or substitute for imports (subsidies, tariffs, preferential credit).

3. Data and Statistical Methodology

As all of the downward realignments in its currency have been sharp rather than persistent, it is easy to identify the large devaluation episodes Ukraine has experienced (Figure 1a). The falls in the *hryvna* exchange rate of 19% and 27.7% in November–December 2008 was preceded by a long period of exchange rate stability that began in 2000. The second devaluation episode began in February–March 2014, when the *hryvna* depreciated by 24.9% and 9.7%, respectively. The currency then proceeded to lose a further 12.5% of its value in August 2014 and an additional 15.6% in October 2014.

After Bussière, Saxena, and Tovar (2012), the dynamics of Ukraine's industrial output, ind_t (index, 2000=100); exports and imports, $exports_t$ and $imports_t$ (in millions of 2000 USD); retail trade turnover (in millions of 1996 *hryvnas*); and consumer prices (index, 2010=100) were linked to the nominal effective exchange rate, $neer_t$ (index, 2010=100), and to a set of exchange rate dummies which control for the timing of a large devaluation.

The following two equations give us our TVP (time-varying parameters) model:

$$x_t = \sum_{i=-m}^m \alpha_i D_{t-1} + \beta_{1,i} x_{t-1} + \beta_{2,i} neer_t + \beta_{3,i-1} neer_{t-1} + \beta_{4,i} \mathbf{K}_t + \varepsilon_t, \quad (3)$$

$$\beta_{j,t} = \beta_{j,t-1} + \xi_{j,t}, \quad j=1, 2, 3, 4, \quad (4)$$

where x_t is the dependent variable, i.e. ind_t , $retail_t$, cpi_t , $exports_t$ or $imports_t$; $neer_t$ is the exchange rate; \mathbf{K}_t is the vector of exogenous variables; ε_t is the stochastic factor; and D_t is the dummy for large devaluations. Specifically, D_t is equal to one if there is a large devaluation in period t , which is measured by a number of six-month intervals: up to 6 months ($T \pm 6$); from 7 to 12 months ($T \pm 12$); from 13 to 18 months ($T \pm 18$). Except D_t , all of the variables are used in the form of the first differences of logarithms, i.e. $y_t = \log Y_t - \log Y_{t-1}$, where Y_t is the level of a variable.

Equations (3) and (4) are respectively the measurement equation and transition equation. The disturbance terms, ε_t and $\xi_{j,t}$, are mutually uncorrelated and independently normally distributed. The majority of the time-varying parameters are recursively modelled ($\xi_{j,t} = 0$), but those modelled on lagged exports and consumer price inflation follow a random walk without drift.

The fixed coefficients α_i measure the effects of large devaluations as sharp realignments of a nominal exchange rate. In this context, the parameters $\beta_{2,i}$

measure a “pure” time-varying response to the nominal effective exchange rate devaluation on impact. Of the other components, parameters $\beta_{1,i}$ and $\beta_{3,i}$ measure the time-varying response to the lagged value of endogenous and exogenous variables respectively. The vector of exogenous variables includes the wholesale price level (index, 2010 = 100), wpi_t ; the lending rate, rl_t (in %); world prices for food, metal and industrial inputs, $food_t$, $metal_t$ and $pind_t$ (index, 2010 = 100); and the industrial output of the euro area and Russia, which are Ukraine’s two largest trading partners, $indeuro_t$ and $indruss_t$ (index, 2010 = 100). Most of the monthly series were obtained from the IMF’s International Financial Statistics database. The world price indexes were also taken from the IMF dataset.

The export and import series were expressed in terms of constant 2000 USD and deflated by the United States Consumer Price Index. The use of the data sample for the 2000:M1–2014:M12 period minimised the influence of the initial conditions used to begin estimating the TVP model. It is worth noting that the Ukrainian *hryvna* passed through a period of serious instability in 1998–99, which was only two years after its introduction in September 1996.

4. Estimation Results

The fixed coefficient estimates of the devaluation dummies are reported in Table 1. As given by the coefficient of the dummy variable with subscripts $T+6$, $T+12$ and $T+18$, no large devaluation was preceded by significant changes in either foreign trade or industrial output. The finding of Bussière, Saxena, and Tovar (2012) that countries experiencing a currency collapse experience output rates of growth below the equilibrium level was thus not confirmed. It was confirmed, however, that large devaluations reduce growth rates during the devaluation event (the coefficient on D_T was statistically significant at the 1% level), which is accompanied by a fall in both exports and imports. Statistically significant post-devaluation effects were identified for the dynamics of retail trade, for the first six months following devaluation, for exports and more than six months after the devaluation event. Consumer price inflation, which was still having a quite sustained impact up to one-and-a-half years after a large devaluation, was also among the statistically significant post-devaluation effects.

The filtered estimates for the time-varying parameters based on the information available up to time t are presented in Figures 3–7, along with their two standard-error bands. Exchange rate depreciation contributed to

an increase in exports on impact from 2005 (Figure 3), which suggested that the competitiveness effect of a weaker currency, the *hryvna*, was strong enough for “normal” times. It is worth noting that the statistical significance of the coefficients on $neer_t$ was much higher for the 2009–14 period. The same positive exchange rate effect with a lag of six months had been present until the beginning of 2009. However, given the coefficient on $neer_{t-6}$ was on a downward trend it gradually weakened, and has completely disappeared since.

Table 1. Direct Effects of Large Devaluations

Dummy variables	Dependent variables				
	Exports	Imports	Industrial Output	Retail trade	Consumer prices
D_{T+18}	-0.013 [0.015]	-0.002 [0.099]	-0.003 [0.006]	0.012 [0.010]	-0.001 [0.002]
D_{T+12}	0.003 [0.014]	0.012 [0.658]	0.003 [0.366]	-0.007 [0.013]	0.001 [0.003]
D_{T+6}	0.020 [0.006]	0.023 [0.020]	-0.007 [0.006]	-0.010 [0.015]	0.001 [0.002]
D_T	-0.091** [0.042]	-0.059** [0.028]	-0.035*** [0.008]	-0.006 [0.014]	0.001 [0.007]
D_{T-6}	-0.038 [0.025]	0.008 [0.023]	-0.002 [0.008]	-0.033** [0.014]	0.008** [0.003]
D_{T-12}	0.031* [0.018]	-0.008 [0.017]	0.001 [0.008]	0.001 [0.013]	0.002 [0.002]
D_{T-18}	-0.015 [0.017]	0.005 [0.015]	0.006 [0.006]	0.017 [0.012]	0.006* [0.002]

Notes: 1) Standard errors are in square brackets; 2) ***, **, and * denote 1%, 5%, and 10% statistical significance levels, respectively.

Source: author’s own calculations.

There was a strong relationship between Ukraine’s exports and world metal prices from 2003 and between Ukraine’s exports and food prices from 2006 with a spike at the end of 2008. The positive effects of industrial output in the euro area and Russia from 2009 tended to grow over time. The coefficients on $indeuro_{t-1}$ were thus in excess of those on $indrus_t$ from the beginning of 2011. There was some evidence of an inverse relationship between exports and the interest rate, which was consistent with the findings of Alessandria, Pratap, and Yue (2013).

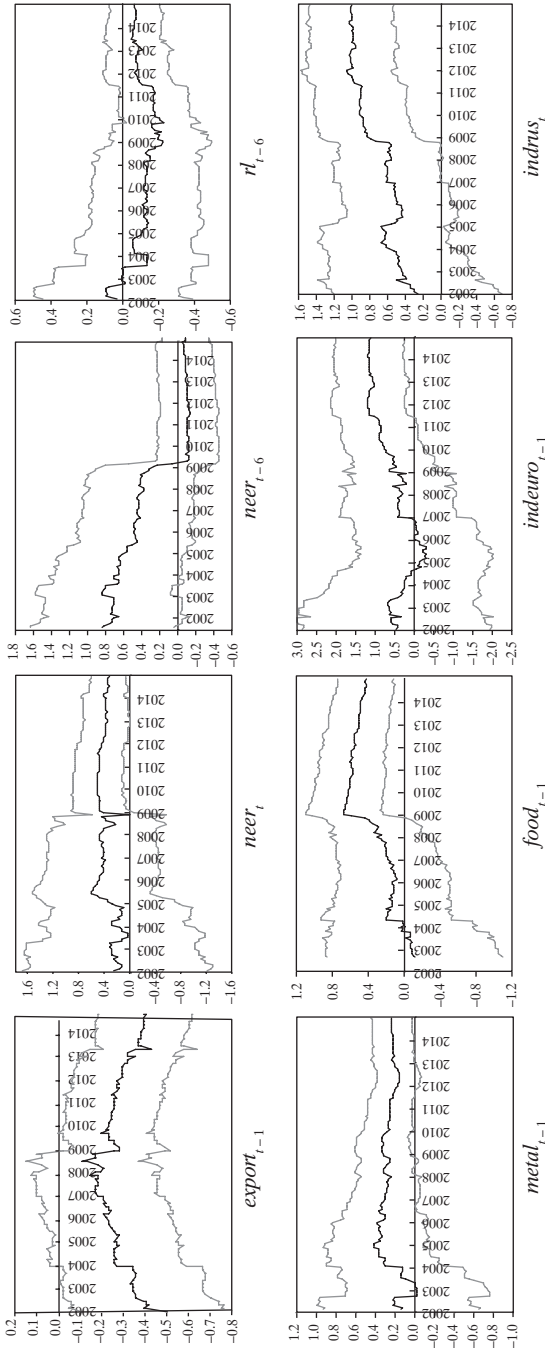


Fig. 3. Determinants of Exports

Note: The black line is the point estimate, while the grey lines represent a two-standard error confidence band around this point estimate; the estimated components begin in 2002:M1 because a two-year training sample is used to start up the Kalman filter.

Source: author's own calculations.

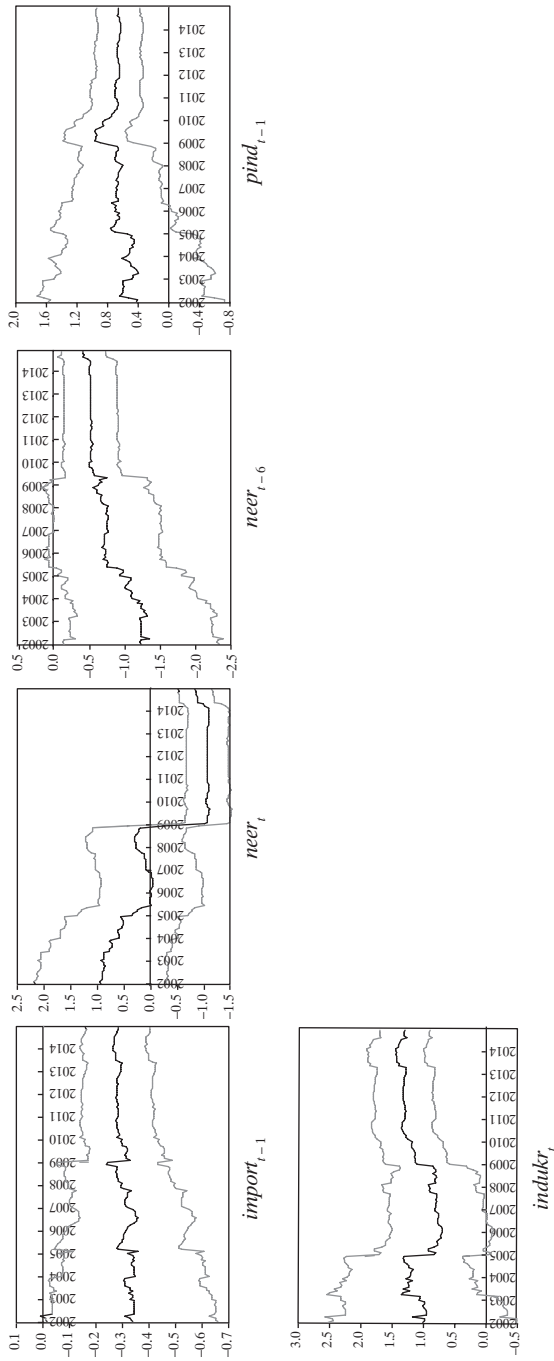


Fig. 4. Determinants of Imports

Note: The black line is the point estimate, while the grey lines represent a two-standard error confidence band around this point estimate.

Source: author's own calculations.

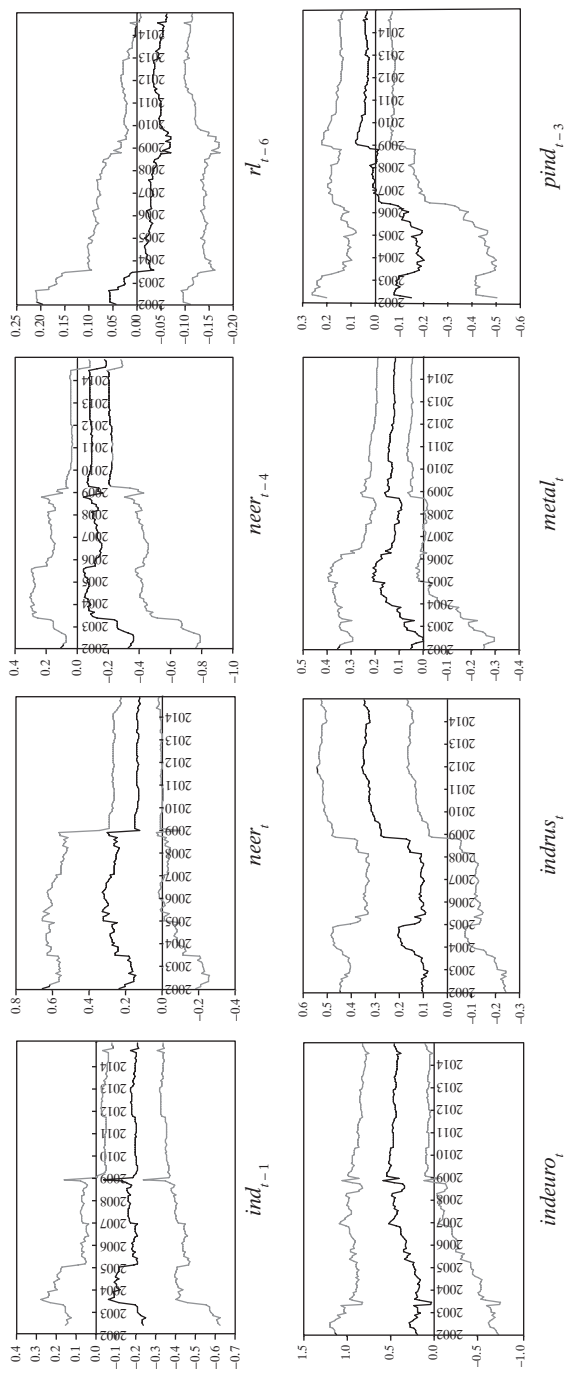


Fig. 5. Determinants of Industrial Output

Note: The black line is the point estimate, while the grey lines represent a two-standard error confidence band around this point estimate.

Source: author's own calculations.

Our results suggested that Ukraine's imports fell in the wake of exchange rate depreciation (Figure 4). The coefficient on $neer_t$ was in decline from the 0.9 level until around 2006 when it increased slightly to 0.3. It then dropped sharply to -1 in 2009 before remaining stable until the end of 2013. There was then a moderate increase at the end of the sample period. The lagged coefficient on $neer_{t-6}$ was on an upward trend in 2002–08 and remained relatively stable for a few years afterwards. Given that the coefficient on $indukr_t$ fluctuated between 1.51 and 0.85 over the sample period, there was a strong link between imports and industrial output. When higher prices are being paid for industrial inputs an increase in imports is expected (the coefficients on $pind_{t-1}$ became statistically significant around 2008). Import exposure to world crude oil prices displayed a steady tendency to grow from 2006, but the coefficients on $brent_{t-1}$ were much smaller when compared with those on $pind_{t-1}$.

There was a clear structural shift at the beginning of 2009 with regard to the exchange rate effects on industrial output with two lags (Figure 5). The coefficient on $neer_{t-2}$ fluctuated between 0.24 and 0.38 during 2002–08, which suggested a substantial expansionary effect. The response of industrial output to $neer_{t-2}$ became insignificant in 2009–14. Given the size of the confidence interval, the response to exchange rate depreciation with four lags appeared fairly neutral until the middle of 2009. Summing up the value of the coefficients on $neer_{t-2}$ and $neer_{t-4}$, the exchange rate effects were expansionary until 2008 but turned slightly contractionary for the rest of the sample period. The exchange rate effects had a stronger negative impact in the wake of the 2014 devaluation. Accounting for the exchange rate dummies tended to strengthen the dynamic response of industrial output to exchange-rate shocks.

There was a positive correlation from 2004 between Ukraine's industrial output and world metal prices and between Ukraine's industrial output and world industrial input prices from 2009, which hinted at links between demand and supply and exports and imports respectively. The positive effects of industrial growth were felt by both of Ukraine's biggest trading partners, that is, the euro area countries and Russia. A closer examination of the coefficients on $indeuro_t$ and $indrus_t$ revealed that the stimulus provided by euro area growth was stronger and remained stable over the final few years of the study period. The link between industrial output in Ukraine and Russia grew substantially weaker in 2005, but this situation had been reversed by 2009. The coefficient on $indrus_t$ gradually increased to an average of 0.34 in 2012–14 and stood at approximately 0.1 in 2005–07.

It is interesting to note that there was a local increase to 0.2 in the value of the coefficient on $indr_{it}$ in 2004, when there was a distinct reorientation of government policy towards Russia as Ukraine's main "strategic" partner. There was, however, no evidence that the annexation of Crimea and the military conflict in Donbas had any impact on the link between industrial output in Russia and Ukraine. With regard to the link between the two countries' industrial output, this had echoes of the results for 2005. The growing importance of euro area spillovers was illustrated by the upward trend of the coefficient on $indeuro_{it}$, which began in the middle of the last decade. The value of the coefficient on $indeuro_{it}$ oscillated within the narrow band of 0.38–0.50 from the post-crisis period onwards.

Retail trade turnover as a measure of domestic demand remained largely unaffected by exchange rate developments before the beginning of 2009. From that time, however, there was weak evidence of a positive relationship between devaluation and retail trade turnover with a three month lag (Figure 6). It was likely that this effect would strengthen in 2014. An important and positive wealth effect generated by large holdings of assets denominated in foreign currencies was identified⁵.

That retail trade turnover was closely correlated with the lagged money supply is unsurprising as it was a very strong and stable relationship over time. An increase in the money supply of 1% each month resulted in growth of 0.6% in retail trade turnover. The inverse relationship between the interest rate and retail trade we thought we might detect did not appear until relatively recently; the time-varying coefficients on rl_{t-4} did not reveal any shocks in 2014. Ukraine's retail trade was stimulated by higher world food prices, which reflected the important role of agricultural production in both exports and household income.

Our estimates of consumer price inflation suggested a moderate exchange rate pass-through (Figure 7). The exchange rate pass-through was relatively stable both on impact and with one and five month lags in 2009–13. Pass-through on impact strengthened in 2002–08, but then fell from the end of 2008. The exchange rate pass-through with a one-month lag, which picked up further strength from the beginning of 2014, was a relatively new post-crisis phenomenon. Though it had ceased to exist by autumn 2008, the exchange rate pass-through with a five month lag recovered to some extent after that time. Due to low inflation and expectations of exchange

⁵ With regard to the international investment position of Ukraine, the value of foreign exchange assets owned by its residents increased from USD 19 billion in 2005 to USD 92 billion in 2014.

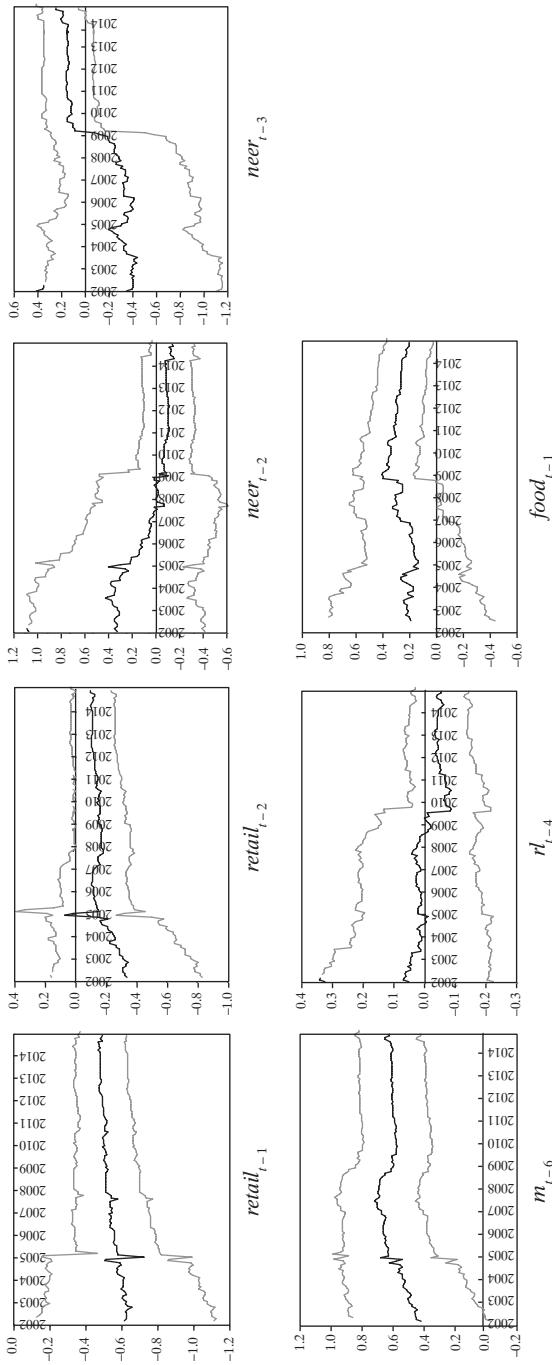


Fig. 6. Determinants of Retail Trade Turnover

Note: The black line is the point estimate, while the grey lines represent a two-standard error confidence band around this point estimate.

Source: author's own calculations.

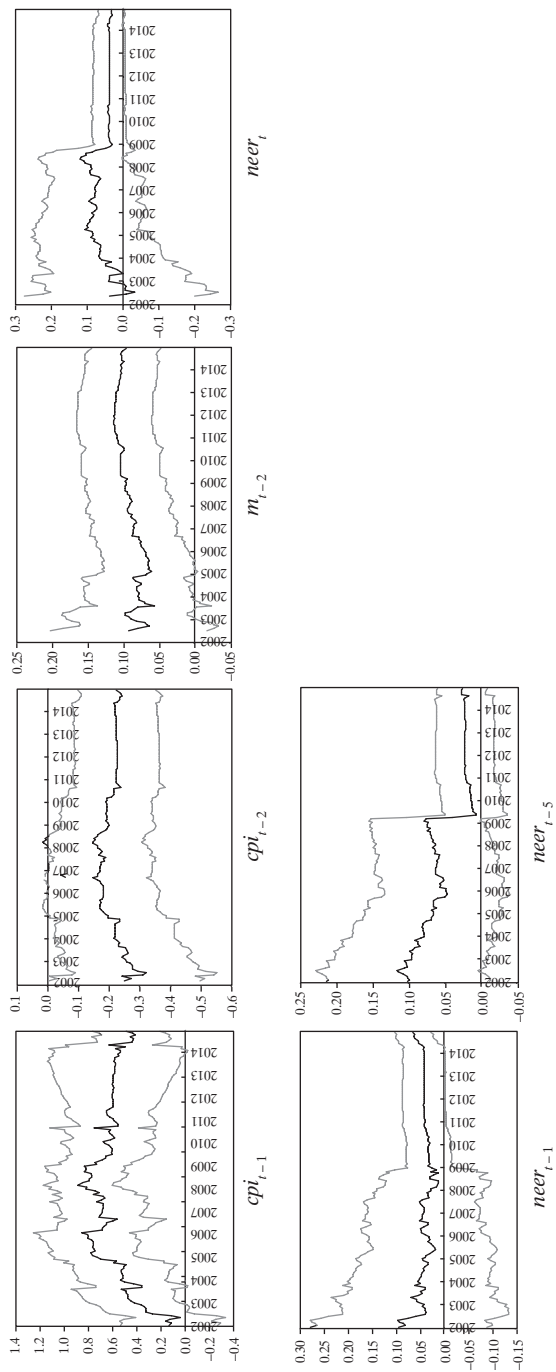


Fig. 7. Determinants of Consumer Prices

Note: The black line is the point estimate, while the grey lines represent a two-standard error confidence band around this point estimate.

Source: author's own calculations.

rate stability, the pass-through was generally relatively stable during the post-crisis period.

Consumer price inflation was closely correlated with the money supply measured by the money aggregate M2. The coefficient on m_{t-2} nearly doubled in 2005–12. There was no sign of the structural shift around 2008 that was obtained for the coefficients on exchange rate pass-through. The inflationary effect of the lagged money supply weakened somewhat from the beginning of 2012.

As suggested by the estimates for the autoregressive time-varying coefficients, which were modelled as a random walk with a one-month lag and as a recursive process with a two-month lag respectively, consumer price inflation in Ukraine was highly inertial. Regarding the post-crisis developments, the coefficient on cpi_{t-1} ranged between a value as high as 0.8 at the end of 2008 and as low as 0.40 in 2014. There was a downward correction of inflation with a two-month lag. The value of the coefficient on cpi_{t-2} oscillated around -0.22 throughout 2011–14 period, which represented a drop from its local peak of -0.14 in 2008.

5. Conclusion

Controlling for the timing of large downward exchange rate realignment, our results suggest that a nominal devaluation of the *hryvna* would improve the trade balance mainly through a fall in imports. The expansionary effect on industrial output fell away from the beginning of 2009, and there was weak evidence of a lagged contractionary effect in the wake of the severe devaluation of 2014. There was also faint evidence of a positive relationship between devaluation and retail trade turnover from 2008, which might argue for a positive wealth effect generated by domestic holdings of assets denominated in foreign currencies. Our estimates of consumer price inflation pointed to a moderate exchange rate pass-through, which was indeed detected and was relatively stable from 2009. The large devaluation itself, however, which was measured by the appropriate dummy, was likely to be contractionary in respect to exports, imports, and industrial output. A fall in retail trade turnover and accelerated consumer price inflation were likely outcomes.

It was found that world commodity prices and the industrial output of Ukraine's major trading partners supported the country's export dynamics. Imports were correlated strongly with domestic industrial output, which is a fairly standard macroeconomic relationship. Drawing impetus from the growth of its largest foreign trade partners, Ukraine's industrial output

became stronger after the 2008–09 financial crisis. Though retail trade turnover was stimulated by the money supply, expansionary monetary policy had serious inflationary consequences.

The policy implications of our study are clear. While a moderate depreciation of the *hryvna* could assist in improving the trade balance while avoiding significant losses in output, we would recommend avoiding large downward exchange-rate realignments as this tends to restrict either exports or industrial output. Once a large devaluation has become a matter of fact, however, it would be productive to reverse the downward trend with a local exchange rate appreciation as soon as possible.

Bibliography

- Ahmed, S., Gust, C., Kamin, S. and Huntley, J. (2002) “Are Depreciations as Contractionary as Devaluations? A Comparison of Selected Emerging and Industrial Economies”. *FRS International Financial Discussion Papers* 737.
- Alessandria, G., Kaboski, J. and Midrigan, V. (2010) “Inventories, Lumpy Trade, and Large Devaluations”. *American Economic Review* 100 (12): 2304–39, <http://dx.doi.org/10.1257/aer.100.5.2304>.
- Alessandria, G., Pratap, S. and Yue, V. (2013) “Export Dynamics in Large Devaluations”. *FRS International Finance Discussion Papers* 1086.
- Bahmani-Oskooee, M. and Kutan, A. (2008) “Are Devaluations Contractionary in Emerging Economies of Eastern Europe?”. *Economic Change* 41 (1): 61–74, <http://dx.doi.org/10.1007/s10644-008-9041-9>.
- Bahmani-Oskooee, M. and Miteza, I. (2006) “Are Devaluations Contractionary? Evidence from Panel Cointegration”. *Economic Issues* 11 (1): 49–64.
- Bebczuk, R., Galindo, A. and Panizza, U. (2006) “An Evaluation of the Contractionary Devaluation Hypothesis”. Inter-American Development Bank Working Paper 582.
- Blanchard, O., Faruqee, H. and Das, M. (2010) “The Initial Impact of the Crisis on Emerging Market Countries”. *Brookings Papers on Economic Activity* 41 (1): 263–323.
- Burstein, A., Eichenbaum, M. and Rebelo, S. (2005) “Large Devaluations and the Real Exchange Rate”. *Journal of Political Economy* 113 (4): 742–84, <http://dx.doi.org/10.1086/431254>.
- Bussière, M., Saxena, S. and Tovar, C. (2012) “Chronicle of Large Currency Devaluations: Re-examining the Effects on Output”. *Journal of International Money and Finance* 31 (4): 680–708, <http://dx.doi.org/10.1016/j.jimonfin.2012.01.008>.
- Calvo, G. and Reinhart, C. (2002) “Fear of Floating”. *The Quarterly Journal of Economics* 117 (2): 379–408, <http://dx.doi.org/10.1162/003355302753650274>.
- Carranza, L., Galdon-Sanchez, J. and Gomez-Biscarri, J. (2009) “Exchange Rate and Inflation Dynamics in Dollarized Economies”. *Journal of Development Economics* 89 (1): 98–108, <http://dx.doi.org/10.1016/j.jdeveco.2008.06.007>.

- Chou, W. and Chao, C. (2001) "Are Currency Devaluations Effective? A Panel Unit Root Test". *Economics Letters* 72 (1): 19–25, [http://dx.doi.org/10.1016/S0165-1765\(01\)00399-8](http://dx.doi.org/10.1016/S0165-1765(01)00399-8).
- Delli Gatti, D., Gallegati, M., Greenwald, B. and Stiglitz, J. (2007) "Net Worth, Exchange Rates, and Monetary Policy: The Effects of a Devaluation in a Financially Fragile Environment". National Bureau of Economic Research Working Paper 13244.
- Docherty, P. and Tse, H. (2009) "Re-evaluating the AS-AD Model as a Device for Teaching Intermediate Macroeconomics". *Australasian Journal of Economics Education* 6 (2): 64–86.
- Dutt, A. K. and Skott, P. (2005) "Keynesian Theory and the AD-AS Framework: A Reconsideration". Working Paper 2005–11. Amherst: University of Massachusetts.
- Forbes, K. (2002) "Cheap Labor Meets Costly Capital: The Impact of Devaluations on Commodity Firms". *Journal of Development Economics* 69 (2): 335–65, [http://dx.doi.org/10.1016/S0304-3878\(02\)00092-5](http://dx.doi.org/10.1016/S0304-3878(02)00092-5).
- Frankel, J. (2005) "Mundell-Fleming Lecture: Contractionary Currency Crashes in Developing Countries". *IMF Staff Papers* 52 (2): 149–92.
- Hutchison, M. and Noy, I. (2005) "How Bad Are Twins? Output Costs of Currency and Banking Crises". *Journal of Money, Credit and Banking* 37 (4): 725–52.
- IMF (2006) "Exchange Rates and Trade Balance Adjustment in Emerging Market Economies". Washington: International Monetary Fund.
- Kamin, S. and Rogers, G. (2000) "Output and the Real Exchange Rate in Developing Countries: An Application to Mexico". *Journal of Development Economics* 61 (1): 85–109, [http://dx.doi.org/10.1016/S0304-3878\(99\)00062-0](http://dx.doi.org/10.1016/S0304-3878(99)00062-0).
- Krugman, P. and Taylor, R. (1978) "Contractionary Effects of Devaluation". *Journal of International Economics* 8 (3): 445–56.
- Lizondo, J. and Montiel, P. (1988) "Contractionary Devaluation in Developing Countries: An Analytical Overview". International Monetary Fund Working Paper WP/88/51.
- Miteza, I. (2006) "Devaluation and Output in Five Transition Economies: A Panel Cointegration Approach of Poland, Hungary, Czech Republic, Slovakia and Romania, 1993–2000". *Applied Econometrics and International Development* 6 (1): 77–86.
- Pineres, S. and Cantavella-Jorda, M. (2010) "Short-run Effects of Devaluation: A Disaggregated Analysis of Latin American Exports". *Applied Economics* 42 (2): 133–42, <http://www.tandfonline.com/doi/abs/10.1080/00036840701579259>.

Abstract

Realne i nominalne efekty dużych dewaluacji kursu walutowego na Ukrainie

Wykorzystując dane miesięczne z okresu 2000–2014, oszacowano efekty makroekonomiczne dużych dewaluacji waluty ukraińskiej. Stosując podejście ze zmiennymi współczynnikami, zademonstrowano, że nominalna dewaluacja kursu walutowego powoduje standardowy wzrost wartości eksportu oraz zmniejszenie wartości importu, przyspieszenie inflacji oraz zmniejszenie wartości produkcji przemysłowej (od 2014 r.). Gwałtowne załamanie kursu walutowego jest jednak inflacyjne i powoduje zmniejsze-

nie wartości eksportu, importu, produkcji przemysłowej i handlu detalicznego. Eksport zwiększa się w przypadku wyższych światowych cen surowców, a także produkcji przemysłowej za granicą. Od czasu światowego kryzysu finansowego z lat 2008–2009 produkcja przemysłowa jest mocniej uzależniona od sektora przemysłowego największych krajów będących partnerami handlowymi.

Słowa kluczowe: kurs walutowy, produkcja przemysłowa, handel zagraniczny, inflacja, filtracja Kalmana.