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Authors: Tkalec Marina, Verbič Miroslav

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**A NEW LOOK INTO
THE PREVALENCE OF BALANCE SHEET
OR COMPETITIVENESS EFFECT
OF EXCHANGE RATE DEPRECIATION
IN A HIGHLY EUROIZED ECONOMY**

*Marina Tkalec
Miroslav Verbič*

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Marina Tkalec¹, Miroslav Verbič²

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1. Verbič, Miroslav

263502336

¹ Institute of Economics, Zagreb, Croatia, email: mtkalec@eizg.hr

² Faculty of Economics, University of Ljubljana and Institute for Economic Research, Ljubljana, Slovenia, email: miroslav.verbic@guest.arnes.si

Abstract

The article empirically tests the impact of exchange rate depreciations on sectoral performance proxied by investment or alternatively sales. It measures the balance sheet and the competitiveness effect in a country that records very high levels of liability euroization. Panel data methodology is applied on a dataset of twenty Croatian non-financial sectors combining macroeconomic and sectoral financial information. Results confirm there are strong negative liability euroization effects on both investment and sales. Negative balance sheet effects and very small positive competitiveness effects are found as well, adding up to a negative overall exchange rate depreciation effect on sectoral performance. Moreover, we find evidence that the corporate sector does not hedge against exchange rate exposure and that the domestic financial system is a constraining factor for corporate investment dynamics. We also find proof of size asymmetries related to bank lending relationships.

Keywords: balance sheet effect, Croatia, euroization, exchange rate, sectors.

JEL Classification: E22, F31, F41.

1. Introduction

One of the most dangerous threats to economies that record high levels of liability euroization (LE) is a negative balance sheet effect. The balance sheet effect occurs after enterprises that are highly indebted in foreign currency (with assets mostly denominated in local currency) experience real exchange rate depreciation that makes debt servicing more expensive (Céspedes *et al.* 2004). In case of exchange rate depreciation, the companies' net worth deteriorates and with increasing exchange rate risk, access to credit becomes scarce and more expensive. Therefore, the higher the LE level and the stronger the exchange rate depreciation, the negative balance sheet effect is larger. Opposite to the negative balance sheet effect stands a positive competitiveness effect that measures a positive reaction of firm's performance, which manifests itself after the exchange rate depreciates. This process decreases prices of export goods and services, resulting in a positive influence on international competitiveness of the companies in the tradable sector.

The role of these two effects rests on the price elasticities of exports and imports. Namely, if imports are highly inelastic to changes in relative prices, usually when inputs and capital goods are imported, a higher cost of inputs and capital goods can have a contractionary effect on output (Reif 2001). Depending on the strength of each of these effects, the total exchange rate depreciation effect is either positive or negative. Either way, exchange rate movements have a significant effect on firms' performance and investment decisions. Though there are numerous studies that measure the predominance of one effect over the other (Krugman 1999, Aghion *et al.* 2001), there is no consensus on the issue.

A vast body of literature presents theories favouring either competitiveness or balance sheet effects. The results are mixed, but the recommended approach for investigating that problem is straightforward. In order to detect which of the two effects dominates an economy, an empirical analysis on disaggregated data is the most suitable way to go. We apply sectoral level analysis that combines balance sheet data from Croatian non-financial corporate sectors with macroeconomic data in order to explore the influence of currency mismatches, a basic feature of LE on enterprise performance. The Croatian case is interesting, because Croatia suffers from a high degree of LE and therefore large currency mismatches. Those mismatches are pronounced particularly in the nontradable sector since this sector holds assets mostly in local currency and liabilities in foreign currency. Hence, the corporate sector in Croatia is a potential victim of balance sheet effects that can have adverse effects on business performance.

Using data from twenty Croatian economic sectors, we find evidence that economic performance, measured by investment or alternatively sales, in sectors with large foreign currency denominated debt holdings is adversely affected by exchange rate depreciation. We describe the influence of exchange rate depreciations on the performance of Croatian sectors and measure the prevalence of the two effects, i.e. the balance sheet and the competitiveness

effects. Besides, we detect if the relationship between banks and enterprises lies on asymmetric information.

The main contribution of this study is in providing completely new evidence on prevalence of either balance sheet or competitiveness effect for a European transition economy. To the best of our knowledge, there is no sector-level empirical research of that kind for any emerging European country with large inherent currency mismatches. This study will therefore improve our understanding of exchange rate depreciation effects that occurred in a number of Central and Eastern European countries in the last few years.

Results of this research should help policy makers understand the effects of adverse exchange rate changes and help them in creating competitiveness policies that will not destabilize sectors exposed to large currency mismatches. Sector-based evidence will also contribute to the current debate on whether Croatia should devalue the local currency, and to the issues related to domestic capital market development and promoting exchange rate hedge opportunities. Additionally, sectoral debt composition analysis provides insights into the relationship between banks and the corporate sector, revealing a presence of asymmetric information.

The remainder of the article is organised as follows. The next section presents an overview of the existing theoretical and empirical literature with an emphasis on studies for developing economies and research that uses data on a lower level of aggregation. Data and methodology are described in section three, while section four provides the results. The last section concludes the article.

2. Literature

The theoretical framework for exchange rate depreciation effects in countries that record high foreign currency debt is an open economy Bernanke-Gertler-Gilchrist (BGG) model (Bernanke and Gertler 1989, Gertler *et al.* 2007). The BGG model includes financial markets' imperfections and allows for multiple equilibria, and unexpected and strong currency depreciations. Krugman (1999), Aghion *et al.* (2004) and Céspedes *et al.* (2004) find the BGG model useful in the research of balance sheet effects. However, as emphasized by Céspedes *et al.* (2004), balance sheet effect is an empirical question that should be studied country-by-country. It is thus not surprising that most studies are empirical and, due to data availability considerations, usually done using aggregate indicators. Only a limited number of articles is available at the firm level.

Examination of empirical studies reveals that a company's decision on the debt currency denomination, i.e. in which currency to take a loan, primarily rests on the fact whether the firm's cash flows are in local or foreign currency. In case of the latter, firms hedge their foreign currency risks simply by borrowing in foreign currency (Goswami and Shrikhande 2001). Besides hedging, companies sometimes prefer to borrow in foreign currency if the loan costs are lower (Graham and Harvey 2001).

In line with that, Cowan (2002) builds a model, in which Latin American firms with more foreign cash flow that can take advantage of low exchange rate volatility or fixed exchange rates and higher interest rate differentials in their countries, also build higher levels of debt in foreign currency. Moreover, Cowan (2002) finds that companies with higher leverage have lower levels of liability dollarization. On the other hand, Luca and Petrova (2008) and Basso *et al.* (2011) explore the loan supply side, banks, and credit euroization in European transition countries, and assume that banks try to match their currency positions. In case banks' foreign currency supply (funded on international financial markets and by their parent banks abroad) increases, banks grant more loans in foreign currency regardless of true corporate needs.

Contrary to the European transition economies, studies on emerging Latin American and East Asian countries are not so scarce. For instance, Bleakley and Cowan (2008) made one of the first contributions to the balance sheet effects experiment for five Latin American countries during the nineties. They reported a positive balance sheet effect that can be explained by the finding that companies match the currency denomination of taken loans to their revenues. In line with that, firms from the tradable sector have higher liability dollarization and vice versa. In the case they explored, depreciations discriminate in favour of companies with higher levels of foreign currency debt, in the sense that they increase their investment. Those countries then experience positive competitiveness effects, manifested in profitability improvements.

On the contrary, Harvey and Roper (1999) studied the Asian crisis and found support for negative balance sheet effects. High levels of foreign currency debt, encouraged by exchange rate stability expectations, deepened the financial crisis aggravated by massive currency depreciations. Negative balance sheet effects prevailed and generated a contraction in investment. In general, studies for Asian and Latin American countries provide evidence for negative balance sheet effects on investment.

A number of studies for Latin America find that corporations partially match the currency of their revenues with the currency of their liabilities, supporting the hypothesis of export sectors being more exposed to exchange rate movements (Reif 2001, Benavente *et al.* 2003, Carranza *et al.* 2003, Gelos 2003, Pratab *et al.* 2003, Cowan *et al.* 2005, Agénor and Montiel 2008, Clark and Judge 2008). The case of Peru, explored in Carranza *et al.* (2003), is especially interesting, because Peru had one of the lowest levels of liability dollarization and smallest exchange rate movements among Latin American countries. In spite of that, Peruvian companies suffered greatly after real exchange rate depreciations, with investment and sales collapsing due to strong negative balance sheet effects.

As surveyed here, (at least to our knowledge) there is no research on the balance sheet effect in European transition countries or on the relationship between banks that grant loans, the currency denomination of those loans and the performance of non-financial corporate sectors. However, we present some partial findings and results that help us to understand the drivers behind high LE in emerging Europe. Those are panel data studies done for developing countries (Berganza *et al.* 2003, Calvo *et al.* 2008), firm level studies on credit euroization in the banking sector (Brown *et al.* 2009, Brown *et al.* 2011), and aggregate cross-country studies conducted in emerging Europe (Luca and Petrova 2008, Basso *et al.* 2011).

Results for balance sheet effects in European transition countries can be marginally found in Calvo *et al.* (2008), who used panel probit methodology and empirically studied the determinants of externally driven sudden slowdowns or stops in capital inflows into both developed and developing countries. They observe that a small supply of tradable goods, large potential changes in real exchange rates and liability dollarization are most important drivers of sudden stops in capital inflows for 110 countries in their sample. Similarly, Berganza *et al.* (2003) confirm that negative balance sheet effects significantly increase credit costs in a panel of 27 developing countries, out of which six are from emerging Europe.

On the banking or loan supply side, Brown *et al.* (2009) claim that under asymmetric information, banks grant more loans in foreign currency, while Brown *et al.* (2011) show that credit euroization in European emerging countries is driven by foreign currency revenues more than by lower interest rates abroad. Luca and Petrova (2008) and Basso *et al.* (2011) depict low exchange rate volatility and access to foreign funds as credit euroization drivers. Ivanov *et al.* (2011) explore credit euroization in Croatia using aggregate data, and report that it is affected by banks' currency matching behaviour and that it shows strong persistence.

3. Data and Methodology

We study the balance sheet effect caused by exchange rate depreciations for different non-financial economic sectors in a European transition economy that records high levels of LE. Investments and alternatively sales are the dependent variables, while different financial, sectoral and macroeconomic variables are used as regressors in the panel data models presented later on.¹

Our dataset consists of balance sheet data for twenty Croatian sectors over the period 2002–2009. Lack of firm level data forced us to use data on a higher level of aggregation, but still we were able to depict sectoral characteristics in fostering foreign currency loans in Croatia. The reason we do not use firm-level data is simply that they are not available, so instead we collect aggregated balance sheet sectoral data. The analysis initially covers the seven biggest sectors: mining and quarrying, manufacturing, electricity, gas and water supply, construction and real estate, wholesale and retail (trade), hotels and restaurants, and transport and storage. Manufacturing, the biggest and most diverse sector of the seven, is not used as an aggregate, but divided into 14 different subsectors, providing a total of twenty corporate sectors. Some smaller sectors are discarded due to their negligible share in total sales.

Indicators summarized in Table 1, with the corresponding statistics, are the variables used in the empirical analysis. As presented in Table 1, the average investment growth rate in the period between 2002 and 2009 was 0.16 percent. The growth rate was the highest in 2005 (2.07 percent), and the lowest two years later (-0.74 percent), both in the manufacturing sector. The highest volume of sales, our alternative dependent variable, was recorded in 2008 in the wholesale and retail sector (251.31 billion HRK²), while the lowest was recorded in the manufacture of leather (1 billion HRK) in the first year of our sample. Although the real exchange rate index was gradually increasing in the period 2004-2008, it surged in 2009 by 0.28 (or 2,800 pips) when compared to the previous period, suggesting that the strongest real exchange rate depreciation occurred in the last year of the sample.

The variable that measures the liability euroization is our central variable, and its dynamics was very similar in all of the sectors. It moderated in the period between 2002 and 2007, and recorded its lowest level in 2007 (73 percent) in the sector of manufacturing. However, in the next two years, it increased to levels very near or above the levels at the beginning of our sample. Although the lowest level of LE is very high (73 percent), the lowest export ratio is very low, only 0.4 percent (sector of electricity, gas and water supply), and ranging to 80 percent in the sector of leather manufacturing. Already from this, it is evident that the export ratio and liability euroization in Croatia are probably not correlated, implying that firms do not match the currency structure of their assets and liabilities. The leverage indicator shows that, on average, 56 percent of assets are indebted. The smallest leverage was

¹ Details about the definition and sources of all variables can be found in Table A1 of the Appendix.

² HRK is a conventional abbreviation for the Croatian kuna, official currency in Croatia.

recorded in 2003 in the manufacture of chemicals (22 percent) and the highest in the manufacture of transport equipment in 2007 (142 percent). The data also show that the Croatian corporate sector had more short-term loans, i.e. 60 percent of short-term loans in total loans.

Earnings before taxation amounted to 1.64 billion HRK on average; lowest in the manufacture of leather (0.04 billion HRK), and highest in the construction sector (10.62 billion HRK). Subscribed capital, labour costs and total assets were the highest for the construction sector in 2007, and the lowest for the manufacture of rubber and leather in 2002. These three indicators had very high standard deviations, implying that they differ notably between sectors. The average interest rate on credit to enterprises fluctuated mildly in the period under consideration, from the lowest 5.86 percent in 2005 to the highest 7.67 in 2009. The deposit euroization indicator followed the same dynamics as LE, with an average of 75 percent of foreign currency deposits in total deposits, while the exchange rate volatility indicator ranged from the lowest 0.30 in 2007 to the highest 0.86 in 2004.

Table 1: Summary statistics for all variables

Variable	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
Investment (in percent)	0.16	0.47	-0.74	2.07
Total sales (in billion HRK)	26.92	48.34	1.00	251.31
Real exchange rate index (in differences)	0.06	0.12	-0.06	0.28
Liability euroization	0.83	0.05	0.73	0.96
Export ratio	0.31	0.19	0.00	0.80
Leverage	0.56	0.20	0.22	1.42
Short-term liabilities	0.60	0.13	0.24	0.88
Turnover indicator	5.14	1.72	2.90	9.95
Earnings before taxation (in billion HRK)	1.64	2.37	0.04	10.62
Sectoral performance indicator	0.79	0.35	0.23	1.82
Own funding indicator	0.40	0.13	0.13	0.83
Subscribed capital (in billion HRK)	15.75	27.65	0.97	126.71
Labour costs (in billion HRK)	2.40	4.56	0.03	18.90
Total assets (in billion HRK)	41.40	63.54	2.99	320.63
Interest rate on credit (in percent)	6.75	0.67	5.86	7.67
Deposit euroization ratio	0.75	0.07	0.66	0.86
Exchange rate volatility indicator	0.60	0.19	0.30	0.86

Note: HRK – Croatian kuna.

Our sample is representative for the Croatian economy, as the twenty sectors account for 97 percent of total sales in the period 2002–2009. Instead of having a balanced panel of 160 observations (twenty sectors over the period of eight years), we build an unbalanced panel of altogether 128 observations due to missing data for some years and some sectors. Four sectors are exclusively nontradable (construction, trade, transport, and electricity, gas and water supply), two are mostly tradable (mining and quarrying, and hotels and restaurants),

while nine out of 14 manufacturing sectors have a large share of exports in total sales. Two tradable sectors make a small share of total sales (8 percent for the period 2002–2009) due to import orientation of the Croatian economy, and not because those sectors would have been underrepresented in our sample. This special characteristic will be accounted for when representing the results. Because of that, it is not surprising that we expect the balance sheet effect to surpass the potential positive competitiveness effect at the aggregate level.

Mathematically, we can write our model in this form:

$$I_{it} = q_0 + q_1 RER_t + q_2 Z_{it} + \eta_i + e_{it} \quad (1)$$

where I_{it} is the growth rate of gross fixed capital formation (and alternatively sales) of sector i in year t , RER_t is the variation of real exchange rate in differentials in year t , Z_{it} is a set of sector-specific variables, and η_i is the sector-specific effect. The coefficient q_1 captures the overall exchange rate effect, though Equation 1 does not disentangle between the competitiveness and balance sheet effects. Therefore, we transform Equation 1 by using two new variables, one that captures the balance sheet and the other that captures the competitiveness effect.

As discussed in Carranza *et al.* (2003), the total exchange rate effect, captured by the coefficient q_1 , can be written as a combination of the variables that take into account the balance sheet effect, $\beta EURO_{it}$, and the competitiveness effect, γEXP_{it} , respectively. Later on, we measure the balance sheet effect as a product of real exchange rate changes and the year-on-year growth rate of the share of foreign currency liabilities in total liabilities, while the competitiveness effect is defined as a product of real exchange rate changes and year-on-year growth rate of the share of exports in total sales. The exchange rate effect can therefore be written as:

$$q_1 = \alpha + \beta EURO_{it} + \gamma EXP_{it} \quad (2)$$

Plugging Equation 2 into Equation 1, we obtain:

$$I_{it} = q_0 + \alpha \times RER_t + \beta (EURO_{it} \times RER_t) + \gamma (EXP_{it} \times RER_t) + q_2 Z_{it} + \eta_i + e_{it} \quad (3)$$

In this representation, β captures the balance sheet effect and is supposed to be negative, while γ captures the competitiveness effect and is expected to be positive. The α coefficient is supposed to capture the pure real exchange rate effect (when the balance sheet and the competitiveness effects are excluded), but it actually reflects the overall macroeconomic conditions. The problem is that α is a common effect for all sectors, and in order to circumvent possible identification problems, we will substitute $\alpha \times RER_t$ with different macroeconomic variables.

When we include the LE and the leverage effect, together with some sectoral balance sheet indicators and macroeconomic variables, we arrive at the benchmark model that we will be using throughout this exercise:

$$I_{it} = q_0 + \beta(EURO_{it} \times RER_t) + \gamma(EXP_{it} \times RER_t) + \delta EURO_{it} + \phi LEV_{it-1} + q_2' Z_{it} + \eta_i + e_{it} \quad (4)$$

Besides the two interaction effects we are interested in, we try to capture the pure effect of liability euroization, $EURO_{it}$, by estimating the coefficient δ , and the lagged leverage effect, represented by the variable LEV_{it-1} , defined as a ratio of total debt over assets. However, other financial, sectoral and macroeconomic variables are added to the variables stated in Equation 4. In the case with investment as the dependent variable, the share of short-term liabilities in total liabilities, earnings before taxation, turnover, and interest rates on credit to enterprises are added as additional explanatory variables. In the alternative case with sales, additional regressors are the share of short-term liabilities, turnover, subscribed capital, labour costs, and lagged new investment.

To estimate the baseline model presented in Equation 4, we use econometric methods that fit regression models to panel data. All models are estimated by both fixed and random effects and then tested for correlation between individual effects and the regressors using the Hausman test. In case we reject the hypothesis of no correlation, the random effects estimator is inconsistent, but the fixed effects estimator is still consistent and thus preferred, though usually inefficient (less efficient).

Additionally, we add the lagged dependent variable in order to account for some dynamics, leading to the following equation:

$$I_{it} = \alpha I_{it-1} + \beta(EURO_{it} \times RER_t) + \gamma(EXP_{it} \times RER_t) + \delta EURO_{it} + \phi LEV_{it-1} + q_2' Z_{it} + \eta_i + e_{it} \quad (5)$$

Equation 5 is estimated using the generalized method of moments (GMM) estimator in differences developed by Arellano and Bond (1991) that solves possible endogeneity problems (arising from the correlation between regressors and the error term) and eliminates fixed effects (because time-invariant sector characteristics may be correlated with the

regressors). This additional, dynamic model is also a robustness check for the results obtained by fixed or random effects estimators. We also explore the debt composition of Croatian sectors by estimating the following equations:

$$EURO_{it} = \alpha ASSETS_{it} + \beta EXP_{it} + \gamma Z_{it} + e_{it} \quad (6)$$

$$SHORT_{it} = \alpha ASSETS_{it} + \beta EXP_{it} + \gamma Z_{it} + e_{it} \quad (7)$$

where $ASSETS_{it}$ is the log of total assets, EXP_{it} is the share of business revenues from sales abroad in total business revenues from sales, and Z_{it} is a vector of sector-specific and macroeconomic variables. To construct the dependent variables, we assume that sectors with LE or the share of short-term liabilities in total liabilities above the median value are “euro indebted” and “short-term indebted”, respectively, and are given value 1, while sectors below the median are allocated value 0 (dependent variables $EURO_{it}$ and $SHORT_{it}$, respectively). Since these dependent variables are binary, we use probit model to estimate the parameters of equations (6) and (7).

4. Results

The effects of real exchange rate depreciation on investment and sales are presented in Tables 2 and 3. Since the Hausman test suggests that fixed effects is the preferred estimator, we will focus on the results in the first (fixed effects estimates) and the third column (Arellano-Bond estimates). In the specification with investment (Table 2), the balance sheet effect is not statistically significant in either of the model specifications. The competitiveness effect, on the other hand, is positive and statistically significant in the dynamic model specification (0.028). To gain additional insight into whether the real exchange rate depreciations in Croatia have an adverse effect on enterprise performance, we now turn to the results from Table 3. Namely, when we change the dependent variable to sales, we find the balance sheet effect to be negative (from -0.21 to -0.16) and statistically significant, while the competitiveness effect is positive and much smaller than the balance sheet effect (though not significant in the linear case). Therefore, the overall effect is negative, implying that exchange rate depreciation has a negative effect on sales.

Table 2: Effect of exchange rate movements and LE on investment

Dependent variable	INVESTMENT		
	Fixed effects	Random effects	Arellano-Bond
Lagged dependent variable			-0.402** [0.037]
Main effects			
Liability euroization	-0.574* [0.059]	-1.132*** [0.001]	-1.137** [0.031]
Lagged leverage	-0.167 [0.364]	-0.342* [0.075]	-0.826 [0.128]
Interaction effects			
Balance sheet effect	-0.015 [0.676]	-0.009 [0.854]	0.027 [0.576]
Competitiveness effect	0.007 [0.210]	0.005 [0.492]	0.028* [0.050]
Controls			
Short-term liabilities	-0.395 [0.261]	-1.329*** [0.000]	-1.146 [0.269]
Earnings before taxes	0.214** [0.038]	-0.146*** [0.000]	0.324** [0.033]
Turnover indicator	0.215** [0.017]	0.267** [0.014]	0.169 [0.254]
Interest rate on credit	-0.006 [0.828]	-0.044 [0.207]	-0.029 [0.408]
Diagnostics			
Number of observations	108	108	88
Within R-squared	0.3307	0.1834	
Between R-squared	0.3517	0.5822	
Overall R-squared	0.3838	0.5990	
Hausman test	51.45*** [0.000]		
Sargan test			12.01 [0.678]
First order autocorrelation			-1.38 [0.167]
Second order autocorrelation			-1.11 [0.267]

Note: a constant is also included, but not reported; p -values presented in brackets; ***, ** and * represent statistical significance at 1 percent, 5 percent and 10 percent, respectively; time effects are not presented due to space considerations.

Another interesting result from these specifications is that the LE coefficient is negative (from -0.48 to -1.14) and highly statistically significant in all the models we estimated. Results show that foreign currency borrowing reduces both investment growth and sales. These findings are in line with Harvey and Roper (1999), Carranza *et al.* (2003) and Calvo *et al.* (2008), who claim that companies, driven by low exchange rate volatility expectations rather than by matching their currency structure, make foreign currency loans that in turn harm their business performance. Large currency mismatches in the Croatian corporate sector, created by assets in local currency and liabilities in foreign currency, have a deteriorating effect on corporate performance. Leverage is negative in the case with investment, but not statistically significant. On the other hand, it is positive (from 0.11 to 0.36) and significant in the alternative specification, i.e. with sales as a dependent variable, implying that leverage increases sales.

Short-term liabilities ratio is not statistically significant, while turnover appears positive (0.22) and statistically significant only in the linear model specification with investment as the dependent variable. This indicates that higher turnover drives investment growth and therefore affects corporate performance positively. Earnings before taxation positively affect investment growth, as their coefficients are positive and statistically significant in the linear (0.21) and in the dynamic model (0.32). Surprisingly, interest rates on credit to enterprises do not seem to affect investment growth (i.e. are not statistically significant), though the negative coefficient sign is in accordance with the theory. The finding that investment increases with respect to turnover and earnings, but does not seem to decrease with respect to interest rates, could be pointing to a possibility that the domestic financial system is a constraining factor for corporate investment dynamics.

Table 3: Effect of exchange rate movements and LE on sales

Dependent variable	SALES		
	Fixed effects	Random effects	Arellano-Bond
Lagged dependent variable			0.341*** [0.002]
Main effects			
Liability euroization	-0.789*** [0.000]	-1.676*** [0.000]	-0.488*** [0.001]
Lagged leverage	0.112* [0.094]	0.478 [0.106]	0.362** [0.048]
Interaction effects			
Balance sheet effect	-0.208*** [0.000]	-0.308 [0.162]	-0.160*** [0.001]
Competitiveness effect	0.000 [0.980]	-0.006 [0.556]	0.006* [0.062]
Controls			
Short-term liabilities	0.188 [0.119]	0.530 [0.317]	-0.129 [0.670]
Turnover indicator	0.011 [0.131]	0.051* [0.097]	0.000 [0.981]
Lagged investment	0.135*** [0.000]	0.304* [0.060]	0.033 [0.497]
Subscribed capital	0.267** [0.013]	0.093 [0.796]	0.767*** [0.003]
Labour costs	0.337*** [0.000]	-2.007*** [0.000]	0.206 [0.346]
Diagnostics			
Number of observations	108	108	88
Within R-squared	0.7984	0.0677	
Between R-squared	0.6269	0.7666	
Overall R-squared	0.6533	0.7951	
Hausman test	94.07*** [0.000]		
Sargan test			18.28 [0.147]
First order autocorrelation			-0.70 [0.483]
Second order autocorrelation			-1.25 [0.213]

Note: a constant is also included, but not reported; p -values presented in brackets; ***, ** and * represent statistical significance at 1 percent, 5 percent and 10 percent, respectively; time effects are not presented due to space considerations.

Besides the short-term liabilities ratio and turnover, the model with sales comprises three additional control variables: subscribed capital, lagged investment, and labour costs. In the linear specification, all three are positive and statistically significant, implying sales grow by hiring labour (0.34), issuing equity (0.27), and investing in new fixed assets (0.14, with one lag).³ Arellano-Bond estimation results corroborate these findings, especially the ones for subscribed capital.⁴

The lagged dependent variables are significant in both model specifications; negative for investment and positive for sales, respectively. Especially the latter result (0.34) is expected and implies that growing sales from a previous period lead to higher sales in the following period, while the former result (−0.40) implies that higher investment in the previous year leads to falling investment in the subsequent year. This seemingly unusual result could reflect either the nature of the investment dynamic in the Croatian economy or the fact that the dynamic GMM estimation loses some observations at the beginning of the sample, which in turn puts more weight on the recession years at the end of the sample.⁵

Since debt seems to have a high influence on Croatian economic sectors, we decided to further explore the debt composition of Croatian sectors by estimating Equations 6 and 7. Besides size, approximated by total assets, and the export ratio, we include different sector-specific and macroeconomic variables that are recognized in the literature as LE or short-term debt determinants. Apart from the sectoral performance, the own funding, and the leverage indicator, following Ivanov *et al.* (2011) we include deposit euroization and exchange rate volatility to the model specification with “high LE” (i.e. dummy variable $EURO_{it}$) as the dependant variable. In the model specification with the “high short-term ratio” as the dependant variable (i.e. dummy variable $SHORT_{it}$), we include a recession dummy as a macroeconomic determinant⁶.

³ A large number of other balance sheet and macroeconomic variables were included in the analysis, such as indicators of performance, illiquidity, tradability, GDP growth rates, a “recession dummy” etc. However, they did not appear to be statistically significant in explaining investment or sales dynamics. Therefore, those results are not presented in the article, but are available upon request.

⁴ Equations (4) and (5) were additionally estimated, using different sector-specific and macroeconomic variables as explanatory variables. When we exclude the competitiveness effect, and the interest rate variable from the specification with investment as the dependent variable, the signs and coefficients remain unchanged. Similarly, excluding the short-term debt ratio from the model specification with sales, does not affect our results either. Including different indicators of revenues, turnover, earnings, and capital obtained results very similar to those reported. This implies the results are robust.

⁵ The Sargan test and the autocorrelation tests indicate that the number of lags used in the dynamic panel data estimation were appropriate.

⁶ The recession dummy is defined as a variable that takes value 1 for a recessionary year, and value 0 otherwise. For the case of Croatia, value 1 is given for the years 2008 and 2009. The recession dummy variable is included in the model, as we believe that in a period of an economic downturn, companies find it rather difficult to borrow at longer maturities, because creditors opt for less risky loans with shorter debt maturity. Consequently, the companies’ short-term to total debt ratio increases.

Although we expected the export ratio to be significant, and assets to be only a control variable for size, the results contradicted our intuition. Nevertheless, these results are very robust, i.e. even when we include other explanatory variables and build different model specifications, the coefficient for assets is statistically significant while the exports coefficient remains to be statistically insignificant. Probit estimation results, presented in Table 4, show that size has a negative impact on foreign currency debt creation (-0.47), and a positive impact on short-term maturity debt creation (0.36), respectively. When compared to smaller firms, larger firms have less foreign currency debt in total debt, and are more likely to have higher shares of short-term loans in total loans, regardless of their exporting or non-exporting activity.

These results provide a useful insight into asymmetries of firm size, inherent in bank lending. Namely, in order to match their currency structure, banks in European transition economies grant loans in foreign currency mostly (Basso *et al.* 2011), and when they lend in local currency, they are more inclined to grant short-term loans (Brown *et al.* 2009). Therefore, large firms, that can obtain loans in local currency, will have smaller liability euroization but higher shares of short-term loans in total loans, due to banking behaviour specific for European transition economies. Moreover, we confirm previous findings (Ivanov *et al.* 2011), and show that LE increases with deposit euroization (12.09), and decreases with exchange rate volatility (-4.54) (Luca and Petrova 2008). The deposit euroization effect points to the fact that banks in Croatia match their currency structure, by granting more loans in foreign currency (increasing LE), when they observe a rise in deposit euroization. Therefore, higher deposit euroization in the economy, through banks' matching behaviour, leads to higher liability euroization of the corporate sector. Increasing exchange rate volatility, on the other hand, lowers LE in the sectors characterized by a currency mismatch of assets and liabilities, since it makes the repayments on the loans in foreign currency more volatile and therefore, less appealing than the loans in local currency. As can be seen from our case, higher exchange rate volatility (or more exchange rate flexibility) leads to a reduction in LE.

Table 4: Probit estimation

Variable	LIABILITY EUROIZATION	SHORT-TERM LIABILITIES
Total assets	-0.473*** [0.009]	0.361** [0.038]
Export ratio	-0.353 [0.871]	2.514 [0.168]
Sectoral performance indicator	-6.051*** [0.001]	5.525*** [0.001]
Leverage	-3.505 [0.142]	-2.256** [0.022]
Own funding indicator	-7.468** [0.014]	0.541 [0.648]
Deposit euroization ratio	12.090** [0.035]	–
Exchange rate volatility indicator	-4.538** [0.031]	–
Recession dummy	–	4.737** [0.015]
Number of observations	108	108
McFadden R-squared	0.6949	0.7390
Schwarz criterion	0.631	0.607
LR statistic	69.820*** [0.000]	92.865*** [0.000]

Note: a constant is also included, but not reported; p -values presented in brackets; ***, ** and * represent statistical significance at 1 percent, 5 percent and 10 percent, respectively.

Sectoral indicators, such as sectoral performance (measured by business revenues) and own funding (measured by subscribed capital), seem to be driving liability euroization down (–6.05 and –7.47). These results coincide with previous findings, as higher subscribed capital is associated with firm size (and we showed that larger firms have smaller shares of foreign currency debt), and better business performance seems to be supporting local currency borrowing. In line with the specificities of European transition economies described earlier, the sectoral performance variable positively affects the debt creation of shorter maturity (5.26), since better performance spurs local currency borrowing that is more oriented to short-term loans (Brown *et al.* 2009). Higher leverage works in the opposite direction (–2.26), reflecting the fact that long-term loans are usually much bigger in size than the short-term loans, and that therefore long-term debt has the bigger debt share in highly-leveraged firms. The recession dummy shows that in the period of decreasing economic activity and major economic uncertainties, short-term debt increases its share in total debt (4.74). This implies that it is rather difficult to obtain long-term loans, because banks opt for less risky loans with shorter debt maturity.⁷

⁷ For the sake of robustness, we ran several regressions with different model specifications, and confirmed that the results presented here are robust. When we exclude the export ratio variable, all the coefficient signs remain unchanged, and the coefficients themselves change by negligible amounts. Alternatively, when we substitute the export ratio variable for a tradability indicator, the signs and coefficients stay unchanged. We tried also including different variables, such as indicators of illiquidity, labour, and earnings, and the signs and coefficients remained unchanged to those reported here.

5. Conclusion

The article provides new sector-level evidence on the prevalence between the balance sheet and the competitiveness effect in Croatia, and contributes to the ongoing and recent de-euroization and exchange rate devaluation issues. The study confirms that exchange rate depreciation negatively influenced business performance of Croatian non-financial economic corporations for the period 2002-2009. The balance sheet effect turns out to be negative, just as in previous studies done by Harvey and Roper (1999), Krugman (1999), Aghion *et al.* (2001), Carranza *et al.* (2003), and Cespedes *et al.* (2004). Taking high liability euroization, widespread currency mismatches and financial constraints into account, it is no surprise that the balance sheet effect for Croatia is significant, strong and negative. Moreover, since the competitiveness effect is positive, but much smaller than the balance sheet effect, the total exchange rate depreciation effect is negative. This is aggravated by the result that liability euroization severely affects both sales and investment.

Another concerning result is that the investment dynamics depends on sectors' turnover and earnings, and does not seem to depend on market interest rates, indicating that the financial system might not be providing appropriate financing for the business sector. In line with this, we also show that due to high illiquidity in the system, leverage is used to increase sales instead of implementing some long run strategic goals through investment. Finally, asymmetric information between banks and firms affect the currency debt structure, ignoring the currency denomination of the firms' revenues.

In order to reduce the threat of a negative balance sheet effect, two steps should be made almost contemporaneously. Firstly, introduce wide scale reforms aimed at increasing real sector openness that will eventually promote exports and secondly, de-euroize the economy. Since deposit euroization is one of the drivers of credit euroization in Croatia, savings in local currency should be stimulated (Ivanov *et al.* 2011). That can be done by allowing higher interest rates on savings in local currency, and by issuing inflation-indexed government bonds.

In addition, foreign currency debt creation can be penalized for non-exporting firms and encouraged for exporting firms. In case of a larger exchange rate shock, the central bank should ensure solid banking liquidity and fight speculative attacks against the local currency. Fiscal policy can also add to overall macroeconomic stability by running a healthy countercyclical fiscal policy and by obtaining funds for the public sector financial needs in due time. Some other recommendations include fighting illiquidity, increasing transparency of smaller firms, and perhaps even providing incentives to reinvest earnings.

Further research should be done in order to make firm decisions about the overall effects of exchange rate depreciation and the threats of liability euroization. More specifically, a firm-level analysis that combines business data with macroeconomic and financial sector data would provide useful insights into the drivers behind corporate currency mismatches and

suggestions for de-euroization of the corporate sector. One of the possible extensions lies in the analysis of asymmetric information between banks and firms, as the results in this study reveal a dual structure of the corporate sector in Croatia. It would be of interest to explore whether there exist similar bank lending asymmetries for other European transition economies as well.

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Appendix

Table A1: Description of the variables

Variable name	Variable	Description
I_{it}	Investment	Year on year growth rate of gross fixed capital formation in new fixed assets. It includes new fixed assets like buildings, equipment, installations, patents, licenses, software, etc. In the specification with sales as the dependent variable, it is used as a lagged variable. Source: Croatian Bureau of Statistics.
RER_t	Real exchange rate index	The real exchange rate is the bilateral nominal average exchange rate between the local currency and the euro adjusted for the inflation differential between Croatia and the European Monetary Union (annual average index 2005=100). The variable is expressed in first differences. Source: Croatian National Bank and Eurostat.
EXP_{it}	Export ratio	The share of business revenues from sales abroad in total business revenues from sales. Source: Croatian National Bank.
$EURO_{it}$	Liability euroization	The share of foreign currency liabilities in total liabilities. All values are expressed in local currency. Source: Croatian National Bank.
LEV_{it}	Leverage	The ratio of total debt to total assets. Source: Croatian National Bank.
$SHORT_{it}$	Short-term liabilities	The share of liabilities with maturities less than one year in total liabilities. Source: Croatian National Bank.
Turnover	Turnover indicator	The ratio of turnover to total assets (case with investment) or alternatively to total claims (case with sales). Source: Croatian National Bank.
Interest rate	Interest rate on credit	Weighted year average interest rate on credit to enterprises (average of long- and short-term credit weighted by the share of such credit in total credit to enterprises). Source: Croatian National Bank.
Earnings before taxation	Earnings before taxation	The logarithm of earnings before taxation. Source: Croatian National Bank.
Capital	Subscribed capital	The logarithm of subscribed capital. Source: Croatian National Bank.
Labour	Labour costs	The logarithm of total labour costs. Source: Croatian National Bank.
$ASSETS_{it}$	Total assets	The logarithm of total assets. Source: Croatian National Bank.
Sales	Total sales	The logarithm of total business revenues from sales. Source: Croatian National Bank.
Deposit euroization	Deposit euroization ratio	The share of foreign currency deposits in total deposits. All values are expressed in local currency. Source: Croatian National Bank.

Exchange rate volatility	Exchange rate volatility indicator	Annual average of the daily exchange rate volatility, given by a ratio of standard deviation and average daily exchange rates, in four months prior to the observed period. Source: Croatian National Bank.
Performance	Sectoral performance indicator	The ratio of business revenues to lagged total assets. Source: Croatian National Bank.
Funding	Own funding indicator	Indicator of own funding, defined as ratio of capital to total assets. Source: Croatian National Bank.
Recession	Recession dummy	Dummy variable that takes value 1 for a recessionary year, and value 0 otherwise. Source: Croatian National Bank.

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