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Survey Evidence on the Exchange Rate Exposure of Hungarian SMEs

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Abstract

Currently, one of the greatest risks faced by the Hungarian banking sector is the expansion of foreign exchange lending. In the past, however, a detailed analysis of this issue has not been possible in relation to corporate lending on the basis of the data available on bank loan stocks. Firms may have different foreign exchange (FX) positions and they may hedge their exposures, in respect of which we did not have any information. Therefore, a survey was conducted in the autumn of 2005 on indebtedness, exchange rate exposure and the management of exchange rate risks at small and medium-sized enterprises. A significant number of the companies surveyed had direct foreign exchange exposure, but only few of them were aware of the risk or provide hedging for exchange rate exposure. The survey indicated that shifts in the exchange rate can produce an unexpected negative effect on domestic small and medium-sized enterprises (SMEs). This holds true particularly in relation to companies which are indebted in foreign exchange vis-à-vis resident banks.

1. Introduction

It is widely acknowledged that in an open economy, the exchange rate constitutes the most important price. Nevertheless, this fact and the potential effect of exchange rate changes are not obvious in several cases. The existence of exchange rate exposure, if realised too late, can be very painful as examples from several emerging economies have shown.

This paper was motivated by the increasing role of foreign exchange debt in financing small and medium-sized enterprises. FX debt, if not hedged, exposes firms to depreciation, which may result in losses for the banking sector as well. Nevertheless, there are other channels through which the credit risk of corporations is also influenced by exchange rate changes. Financial crisis and exchange rate exposure literature is reviewed to highlight the significance of this issue.

In Hungary, FX borrowing by micro SMEs has raised financial stability concerns for several reasons, including the rapid growth of banks' exposure to SMEs, the weak export activity of these firms, the position of the exchange rate in the intervention band and its potential volatility, as well as the well-known reliance of SMEs on domestic financial institutions. This indirect foreign exchange risk borne by financial institutions is what makes exchange rate exposure important from a financial stability perspective.

Aggregated data are often not enough to be able to analyse these aspects. Data from the individual level are more suitable for the purposes of analysis, but are rarely available. One of the methods used to investigate exchange rate exposure is to carry out a survey of firms, in order to collect missing data and reveal firms' behaviour patterns. To this end, a survey was conducted in the autumn of 2005, within the framework of which data and information was collected on the behaviour of SMEs in three specific areas: 1) indebtedness, 2) exchange rate exposure and 3) management of exchange rate risks. The questionnaire served the objective of investigating the impact of possible exchange rate changes on SMEs and thereby the repayment of SMEs' debts vis-à-vis domestic banks.

In the first chapter, I provide a brief overview of the literature on exchange rate exposure. I then proceed to review the potential methods of measuring exchange rate exposure and describe other surveys. In the third chapter, I present some stylised facts about the topic. Following this, I describe the survey and analyse the data using descriptive statistics and probit regressions. The conclusion summarises the main findings and provides some points of departure for further research.

2. Exchange Rate Exposure from a Financial Stability Perspective

The literature on exchange rate exposure started to grow rapidly in the wake of the financial crises in the 1990s. These crises made it clear that exchange rate changes may have significant real economy effects. Accordingly, the majority of papers analyse the macro effects of exchange rate changes and the reasons why these effects differ from country to country. Another group of papers concentrates on exchange rate exposure and its management at the micro level.

2.1 Sources of Exchange Rate Exposure in the Corporate Sector

Exchange rate exposure (or FX exposure) exists if changes in the exchange rate influence the net value of certain items of economic agents. By contrast, *exchange rate risk (or FX risk)* is the product of the probability of an exchange rate change and exchange rate exposure (Douch, 1996) (see chart 1). It can be stated that if there *is* exchange rate exposure, but the exchange rate cannot change (to a significant degree), then exchange rate risk is insignificant. I will come back to the importance of this distinction later.

Chart 1: Exchange Rate Risk and Exchange Rate Exposure

		Exchange rate exposure				Exchange rate changes
Exchange rate risk	=	Net value of items exposed to exchange rate changes	*	Sensitivity to exchange rate changes	*	Probability of exchange rate changes
ρ	=	V	*	$\dfrac{\delta V/V}{\delta X/X}$	*	$p(\dfrac{\delta X}{X})$

According to the literature, there are different sources of exchange rate exposure (Schafer and Pohn-Weidinger, 2005; Nydahl, 1999; etc.). These are considered according to the "items" influenced by exchange rate shifts. The main sources or types of exchange rate exposure are as follows:

- *translation exposure*: the possibility that accounting positions may change as a result of different denomination of assets and liabilities and/or income and expenditures. In other words, translation exposure is the currency mismatch in the balance sheet or income statement of enterprises (and also that of households);
- *transaction exposure* arises from the possibility that the future cash flow (from external trade contracts, foreign investment, etc.) may change as a result of exchange rate changes;
- *operational exposure* refers to the possibility that market position of a firm may change through the effect of exchange rate changes on competition, relative prices, quantities, demand;
- *contingency exposure* refers to a potential revaluation of future possible liabilities (for example in the case when a company submits an offer on a tender); and
- finally, total *or economic exposure,* which is often defined as a result of exchange rate changes through all of the above channels on the profit or value of a firm.

The last three channels pertain to all enterprises, even if they have no FX denominated items in their balance sheets or income statements. However, the first

two types are present only at enterprises with currency mismatch. As a whole, *currency mismatch* means that net assets or net income are exposed to exchange rate changes as a result of different denomination (Goldstein and Turner, 2004). There are two types of currency mismatch: stock currency mismatch can be measured by net FX assets, while flow currency mismatch is measured by net FX income or their exchange rate sensitivity. Exchange rate sensitivity can, however, be measured by using time series data, and it is possible to examine open positions in a cross-sectional aspect.

Through the aforementioned channels, the position of the corporate sector may change as a result of exchange rate changes. In the event of a devaluation of the domestic currency, output may increase or decrease, and in extreme cases of the latter situation, an exchange rate crisis may lead to a banking crisis and recession, causing macro costs. In theory, appreciation of the currency also may result in different (sometimes extreme) results.

Based on theories of corporate finance, we expect that optimising enterprises assess their exchange rate exposure and attempt to decrease it, thus maximising the value of the enterprise and the utility of stakeholders. Nevertheless, from an individual point of view it may also be rational to bear the risk, for example if the risk is low and hedging is more costly, or if economic agents speculate. However, it is important to highlight that bearing exchange rate risk increases systemic risk, in case enterprises underestimate their risk. This occurs when moral hazard arises as a result of low exchange rate volatility. If this is true, it may be rational to accept the risk over the short run from an individual point of view, but unexpected exchange rate changes may increase systemic risk and result in real economic costs.

The financial sector may have indirect exchange rate exposure if it finances economic agents with currency mismatches. In the event of an exchange rate shock and significant exchange rate exposure enterprises may become unable to service their loans and in extreme cases banks (and other financial institutions) may go bankrupt (of course, this depends on several other factors as well). This is the reasoning behind the examination of exchange rate exposure from a financial stability point of view.

The second reason of why a central bank is interested in FX indebtedness is that monetary policy may face a trade-off. If the ratio of FX debts is high, monetary policy may want to prevent exchange rate depreciation and to raise the domestic interest rate. In such a case, loans denominated in domestic currency will become more expensive relative to FX loans and thus FX indebtedness will be stimulated further. Pass-through of monetary policy decisions is also influenced by the denomination of assets and liabilities.

2.2 What Can We Learn from the Experience of Emerging Economies?

In the aftermath of financial crises in emerging economies, the number of analyses on the link between currency mismatches and financial fragility has increased. These papers are based on the fact that the liability dollarisation of emerging countries has increased steadily, simultaneously with an increase in the frequency and costliness of financial crises. The problem is aggravated by the fact that liability dollarisation is more present in the retail (household and SME) sectors, which are more vulnerable to shocks than large enterprises.

Dollarisation means that foreign currency is used for some monetary functions instead of the local currency. The connection between dollarisation and currency mismatches is not symmetrical: It is probable to be dollarised without currency mismatch, but in the event of liability dollarisation assets or income are often not dollarised, which leads to currency mismatches.

The connection between currency mismatches and financial stability is not straightforward. Liability dollarisation may increase fragility to international flows of capital, but it may have positive effects as well, mainly in liquidity restrained, underdeveloped economies. Potential positive effects include the following: financial dollarisation facilitates the deepening of intermediation, it may alleviate contractionary effect of shocks (for example through its effect on risk management by banks and enterprises) and "*financial dollarisation may allow a greater integration with international capital markets and a richer menu of financial instruments, which may imply efficiency gains for financial intermediation*" (Arteta, 2003, p. 5.).

Goldstein and Turner (2004) emphasise that currency mismatch is the most important reason behind financial crises and that this can be cured only in case economic policy problems are solved. *Claessens, Djankov and Xu* (2000), based on the examination of firms' performance in the East-Asian crisis found that financial fragility of firms contributed to depth and severity of crises, thus also pointing out the importance of individual firms' examination.

As a whole, empirical works highlight the above mentioned double-edged feature of dollarisation. Most researchers find that currency mismatches contribute to the probability, costliness and length of financial crises, but that it is also positively connected to economic growth (see Table 1). To summarise, dollarisation makes rapid financial growth and integration possible, resulting in the lessening of liquidity constraints and also a high level of risk-taking, rendering the economy more fragile. According to some authors, however, economic policy and institutional factors may play at least as important role as dollarisation.

*Table 1: Empirical Papers on the Connection between Financial Stability
and Dollarisation*

	Liability dollarisation	**Dollarisation of deposits**	**Currency mismatch**
Probability and costliness of financial crises	No connection *(Arteta, 2003)* Positive connection *(Yeyati, 2005)*	Positive connection *(De Nicoló – Honohan – Ize, 2003)*	Positive connection *(Goldstein – Turner, 2004)*
Financial development	Positive connection *(Arteta, 2003)*	Positive connection *(De Nicoló – Honohan – Ize, 2003)*	–
Monetary policy trade-off	–	–	Positive connection *(Goldstein – Turner, 2004)*
Flexibility of exchange rate	–	–	Negative connection *(Goldstein – Turner, 2004)*
Economic growth	Positive connection *(Arteta, 2003)* Negative connection *(Yeyati, 2005)*	–	–

3. Methods for Measuring Exchange Rate Exposure

There are several questions worth examining in relation to exchange rate exposure. To what degree are enterprises exposed to exchange rate changes and what corporate characteristics explain this exposure? Do enterprises assess their exposure and are they able to determine its degree? Do they manage their exchange rate risk, and if not, what is the reason? What determines exchange rate risk management techniques?

We found two main methods[1] to examine the above questions: the first one is based on an examination of the reaction of market returns to exchange rate changes (based on the CAPM model). Papers using this methodology measure total exchange rate exposure and explain this by company characteristics. One advantage of this methodology is the availability of long time-series data. Nevertheless, as market returns are influenced by many factors, there is uncertainty in this methodology and – mainly in case of emerging countries – the data available are not representative for the whole economy.

The second method is to use surveys to obtain information on exchange rate exposure. With surveys, one can obtain a cross-sectional view on the accounting or cash-flow exposure of enterprises. One advantage here is that this method can be used on a representative sample, and currency mismatch can be directly analysed.

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[1] There are other methods, for example: estimations on accounting data (ECM, VAR (Clarida, 1997)), general equilibrium or partial equilibrium models (Tornell and Westermann, 2002) These are not possible to carry out because of the lack of data.

Information on risk awareness, hedging activity and other characteristics can also be gathered. However, exchange rate exposure cannot be examined in time-series, and thus total exposure is left unexplained.

We used papers with CAPM methodology to present international evidence on how exchange rate exposure is influenced by different company-specific and country-specific characteristics. The main findings are that exchange rate exposure is

- not constant over time;
- not linear – it depends on the magnitude of the exchange rate changes; and
- not symmetrical: a depreciation and an appreciation of the same magnitude may have effects of different magnitude.

This makes forecasting difficult, mainly because based on a period with low exchange rate volatility nothing can be said on the possible effects of an exchange rate shock.

There are, however, works concentrating on shock periods, while others focused on normal periods. All the surveys we found belong to the latter category. The majority of the papers examined exchange rate depreciations because of the relevance to financial crises. Works on appreciation or symmetry of exposure are quite rare. Moreover, exchange rate exposure literature is not connected to the literature on currency mismatches.

Table 2: Surveys on Exchange Rate Exposure

Author, date	Countries examined	Sample size	Focus	Data analysis
Norges Bank, 2004	Norway	128 enterprises from sectors exposed to exchange rate changes	FX risk management	Descriptive statistics
Alkeback – Hagelin –Pramborg, 1996 and 2003	Sweden	134 listed enterprises	Usage of derivatives	Descriptive statistics
Pramborg, 2003	Sweden and Korea	130 Swedish, 60 Korean listed enterprises	Comparison of FX risk management	Descriptive statistics, frequency analysis, logit regressions
Aabo, 2003	Denmark	52 listed enterprises	FX loan as an alternative of foreign currency derivatives	Descriptive statistics, ordered probit regressions
Keloharju – Niskanen, 2001	Finland	44 Finnish listed enterprises	Causes of enterprises borrowing in foreign currency	Descriptive statistics, probit regressions
Reserve Bank of Australia and statistical office, 2001	Australia	232 foreign trader enterprises	Sectoral analysis of exchange rate exposure	Descriptive statistics
Loderer – Pichler, 2000	Switzerland	96 multinational, listed enterprises	FX risk management	Descriptive statistics
Bodnar – Marston – Hayt, 1998	USA	399 listed enterprises	Usage of derivatives, risk management	Descriptive statistics
Bodnar – Gebhardt, 1995 and 1997	USA and Germany	197 American, 126 German large or listed enterprises	Usage of derivatives, risk management	Descriptive statistics
Magyar Nemzeti Bank (MNB), 2005	Hungary	580 non-financial SMEs	FX borrowing, exchange rate exposure, FY risk management	Descriptive statistics, probit and ordered probit regressions

The surveys summarised in table 2 concentrated on a segment of the corporate sector. The enterprises examined primarily included listed or large enterprises, or in some cases enterprises participating in foreign trade; SMEs were disregarded. The majority of papers focused on risk management by enterprises (not exclusively

on exchange rate risk management). The main conclusions of these were the following:

- enterprises are unable or unwilling to hedge their total exposure (Loderer and Pichler, 2000);
- enterprises which hedge, only hedge part of their exposure (Loderer and Pichler, 2000; Bodnar, Hayt and Marston, 1998);
- exchange rate risk is hedged more often than other types of risk (interest rate, equity risk, product risk) (Bodnar, Hayt and Marston, 1998);
- as far as exchange rate risk is concerned, mainly translation exposure is hedged and enterprises hedge over the short term;
- enterprises in small, open economies hedge more often as they are more exposed to exchange rate changes;
- enterprises in more developed countries hedge more often as a consequence of more developed financial markets;
- due to the fixed cost of introducing exchange rate management tools, large enterprises are more willing to use sophisticated exchange rate management tools; and
- there are several potential reasons for not using derivatives: the exposure is to small to hedge, speculation, underestimation of risks or use of on-balance sheet tools (Alkeback, Hagelin and Pramborg, 2003; Loderer and Pichler, 2000).

Borrowing in foreign exchange may also be a tool for FX risk management. We found two papers on this topic. Aabo (2006) used a survey examining Danish firms and found that FX loans are used mainly to hedge longer term, more uncertain exchange rate movements or the activity of foreign subsidiaries. Keloharju and Niskanen (2001) examined the borrowing decisions of Finnish listed companies, with special emphasis on their decision on the denomination of loans. They mention three motives for borrowing in foreign exchange: it provides hedging for foreign exchange exposure; it may cost less than borrowing in the domestic currency; and there may also be speculative reasons, including the case that they do not expect the International Fisher Effect (unhedged interest rate parity) to hold.

Table 3: Surveys in CEE Countries: Main Results

Country, year (author)	Sample	Focus, main results
Latvia, 2001 (Strelcova)[1]		Usage of derivatives: derivatives are not popular as a result of demand problems (lack of knowledge about hedging tools), except for enterprises exposed to exchange rate changes to a large degree.
Poland, 1999 (Central European)[1]		FX risk management: as a result of low liquidity, underdeveloped market, and demand problems derivatives are not popular. Demand of firms and banks is correspondingly low.
Lithuania, 2003 (Jonuska – Samenaite)	28 large enterprises, banks, brokers	FX risk management: export firms hedge their FX risk by cash-flow management. Derivatives are not widespread; the reasons for this include high costs, underestimation of risks and lack of knowledge.
Hungary, 2001, 2002, 2003 (Tóth – Szabó)	196 exporting enterprises	How exchange rate appreciation affected exporting companies: FX risk was hedged by 31.4% of enterprises in 2003 by financial operations, while in 2001 this ratio was 12.5%. Appreciation of the exchange rate had a negative effect on most enterprises; profit or export revenues decreased for 80% of surveyed firms.
Hungary, 2004 (Tóth)	1461 enterprises	Effect of central bank rate on loan demand and investment activity of enterprises: In April 2004, 29% of enterprises had FX debt, 7% of which had exclusively FX debt. EUR-denominated current assets loans were more characteristic of larger enterprises. More than half of enterprises exporting at least 2/3 of their output and 3.4% of non-exporting enterprises had EUR-denominated current asset debt. A positive relationship was found between ratio of foreign ownership and FX current assets debt, as well as between export revenue and FX current assets debt. Only 2% of enterprises operating on the domestic market had exclusively FX loans. As a whole, exporting firms are more willing to raise debt. 35% of firms with long term debt had FX debt; EUR-denominated loans are more popular among larger enterprises.

[1] Quoted by Jonuska and Samenaite (2003). pp. 9–10 (methodology, sample size, sample description is not known).

In the period examined (1985–1991), Finnish interest rates were significantly higher than foreign interest rates and corporate leaders did not expect exchange rate depreciation. Additionally, competition between banks and non-bank financial intermediates was so fierce that on average the interest rate margin of the Finnish marka was negative and it was more profitable to grant foreign currency loans. It was mainly large enterprises which accumulated FX debt, partially from abroad, in connection with their foreign trade activity and their access to international capital

markets. The denomination of the foreign currency debt was more or less the same as the FX income structure of the enterprises: both were dominated by US dollars, while the ratio of German mark was also significant. Hedging exchange rate exposure played an important role in borrowing decisions.

As far as CEE countries are concerned, there are only a few papers on the exchange rate exposure or risk management of corporations. In these countries, derivatives are not popular among non-financial enterprises, which can be explained by both demand and supply factors. Demand side factors include lack of knowledge, high costs and underestimation of FX risk, while supply factors are undeveloped markets and regulatory problems, as highlighted by the few surveys which have been conducted.

4. Stylized Facts

This chapter analyses some aggregated facts in relation currency mismatch. One sign of currency mismatch is an increasing FX debt ratio in the balance sheet of the Hungarian banks, simultaneously with a decreasing ratio of FX deposits. FX borrowing is prevalent in all sectors, which can be explained by several factors.

In a historical context, amongst large enterprises (which are mainly foreign owned and/or exporting companies) borrowing in FX has been wide-spread since the mid-1990s. Lending to the retail sector was restricted both in domestic and in foreign currency until the turn of the millennium. By that time the market of lending to large enterprises had become saturated and growth potential on this market decreased.

From 2001, lending to households was stimulated by a government subsidy scheme which decreased housing loan interest rates well below the market rate by paying interest rate subsidies to banks. The subsidy scheme was tightened in 2003, leaving banks with high growth and profitability plans and expectations from foreign owners. As a result of high domestic interest rates, these plans were unrealistic based on Hungarian forint lending. By that time, financial enterprises financed car purchases in foreign currency, with a good track record, which suggested to banks to do the same in respect to housing and consumer loans. At the same time, standard products for small and micro enterprises were developed, in line with their improving financial situations, subsidy schemes and EU support.

Chart 2: Interest Rate Differential and FX Loans Granted by Hungarian Banks to Enterprises
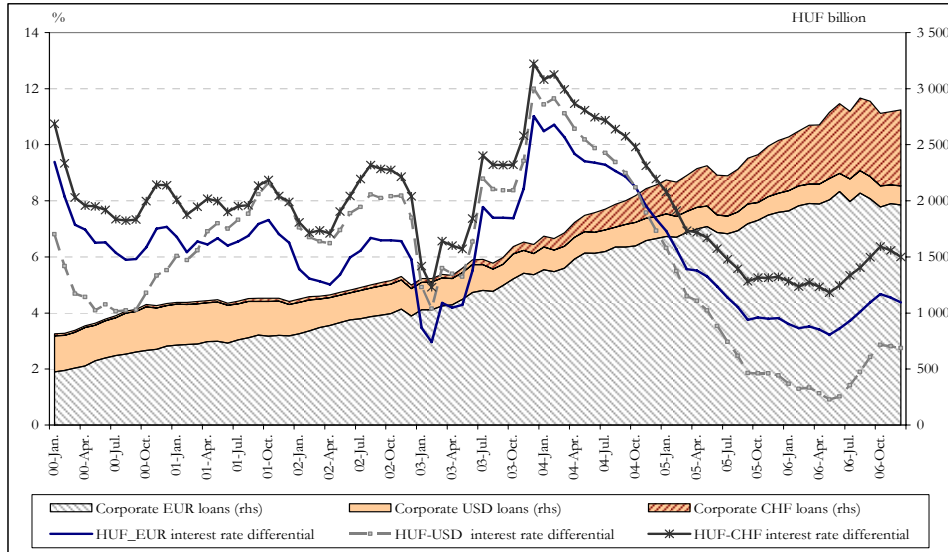
Source: Central banks' homepages, MNB.

Chart 3: Exchange Rates 2000–2005 (Monthly Averages)
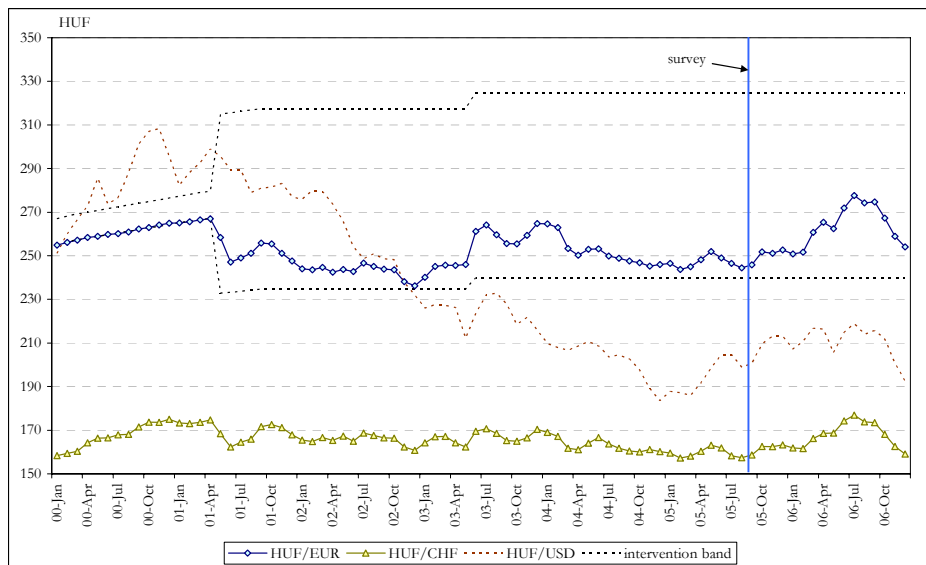
Source: MNB.

In addition to the aforementioned two factors – supply by banks and the high interest rate differential – the low historical volatility of the exchange rate also supported FX borrowing. Despite the broad intervention band (30%), the nominal EUR/HUF exchange rate was very close to the stronger edge (see Chart 3). This made borrowing in foreign exchange more risky, as the repayment ratio can only increase from this point. EUR and CHF interest rates were also at historical lows when FX borrowing started to grow.

As a result of banks' loan supply, FX lending and other possible financing sources, it can be said that liquidity constraints have eased to a large degree in recent years for SMEs.[2] Their significance in the economy has also increased, and particularly micro and small enterprises have gained in both economic weight and in relevance to the banking system. This sector employs about 60% of the labour force and produces roughly half of Hungarian GDP. On the other hand, SMEs primarily operate on the domestic market, which makes them highly vulnerable to the domestic economic climate. They produce only 20% of total export revenue, a ratio positively depending on firm size.

It is an additional, general characteristic of the SME sector that their access to external funds is more limited than that of large enterprises. This is effectively reflected by the fact that large enterprises draw major amounts of funds from abroad, as well, while SMEs generally rely on domestic banks. In addition, these enterprises are more sensitive to monthly repayments than large enterprises, which is why they prefer FX loans to domestic currency debt. For this same reason, however, they are more exposed to shifts in the exchange rate.

As the industry and size categories and foreign trade activity are not independent – namely, manufacturing enterprises are foreign traders and are much larger, while the majority of SMEs operate in the service sector on the domestic market – and industry data are more detailed, it is worth looking at industry-level data. With regard to domestic bank loans, both the tradable and non-tradable[3]

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[2] Act XXXIV of 2004 on Small and Medium-sized Enterprises and the Support Provided to Such Enterprises defines small and medium-sized enterprises (SMEs), as follows:
 "3. § (1) An enterprise is deemed to be an SME which *a)* employs a total of less than 250 employees, and *b)* its annual net sales revenue does not exceed the corresponding HUF amount of 50 million euro, or its balance sheet total does not exceed the corresponding HUF amount of 43 million euro. (2) Within the SME category, an enterprise is deemed to be a small enterprise which *a)* employs a total of less than 50 employees, and *b)* its annual net sales revenue or its balance sheet total does not exceed the corresponding HUF amount of 10 million euro. (3) Within the SME category, an enterprise is deemed to be a micro enterprise which *a)* employs a total of less than 10 employees, and *b)* its annual net sales revenue or its balance sheet total does not exceed the corresponding HUF amount of 2 million euro."
[3] Tradable sectors are manufacturing, agriculture, mining and energy sectors while all services as well as construction industry were taken as non-tradable.

sectors raise FX debt; the highest FX debt ratios are found in the non-tradable sectors (see Chart 4). The FX debt exposure of the domestic banking sector is the highest in the real estate sector followed by the manufacturing and trade sectors.

*Chart 4: Industrial FX Debt Volumes as a Ratio of FX Loans to Corporates from Domestic Banks*
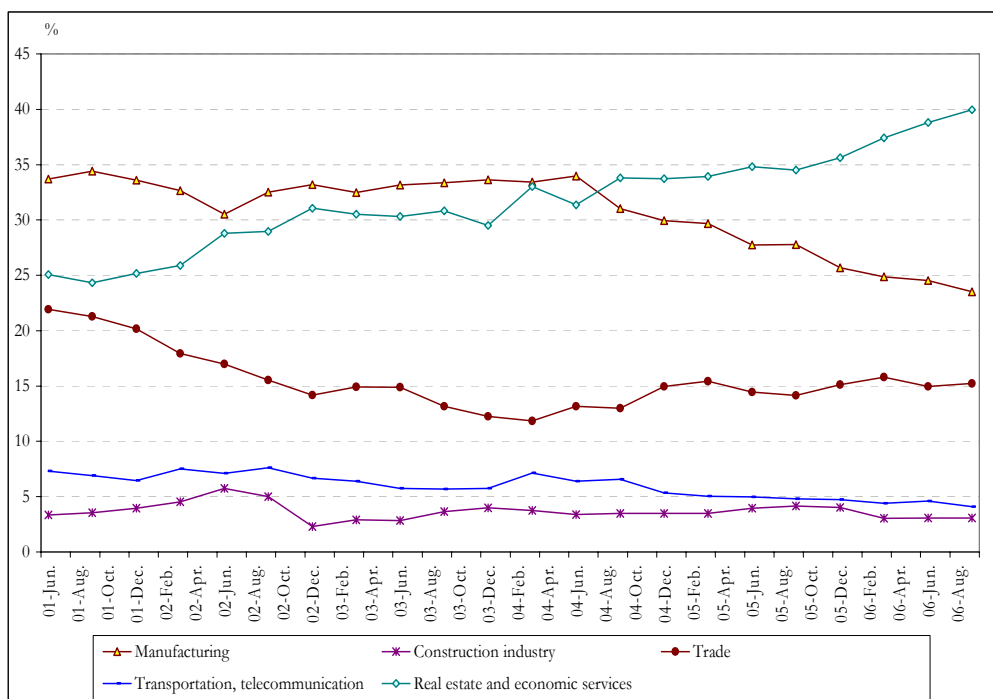
Source: MNB.

As a proxy of FX income at the industry level, I examined net export revenues and compared these with FX debt data, to gain a picture of industry-level currency mismatches. In this regard, it should be mentioned that enterprises may have non-export revenues in foreign exchange (for example, at real estate agencies and in tourism) and because of this, currency mismatch is over-evaluated. Based on this comparison, natural hedging of domestic FX debt is present on the aggregate level in tradable sectors, while net export revenue is negative in non-tradable sectors with an increasing ratio of FX debt.

In summary, as a result of rising loan demand and supply, the stock of resident bank loans to SMEs has increased significantly over recent years, and currently almost exceeds that of large enterprises. Hence, the banking sector is exposed to SMEs to the same degree as to large enterprises. An increasing proportion of SME

loans, however, are granted in foreign exchange, while the share of SMEs in exports is quite low. The above implies that − although easier access to loans reflects a positive development − growing foreign exchange lending has led to a considerable exchange rate exposure of SMEs.

Chart 5: Industrial Net Export and Domestic Debt Volumes
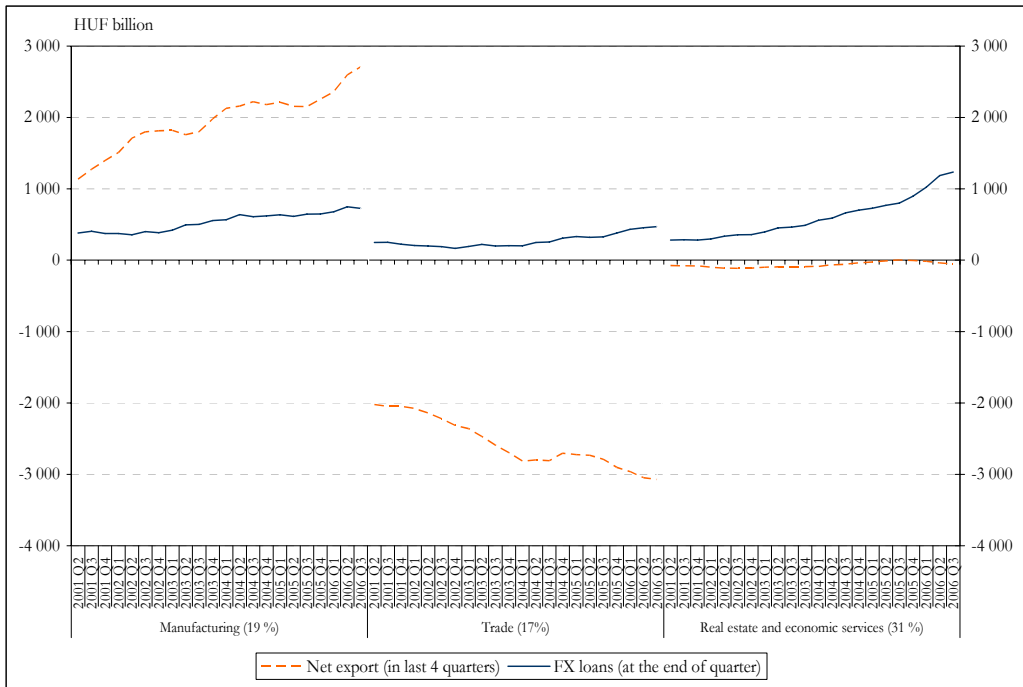
Source: MNB, KSH (Central Statistical Office).

5. Survey Results

5.1 Sample Description and Methodology

The data used for the analysis was collected in a survey conducted in September and October 2005; the questions are related to 2004 data and developments. The questionnaire was filled in by resident, predominantly privately-owned non-financial corporations which were in operation in 2004, or for at least one financial year prior to the survey, had external funds and kept double-entry accounting. Data was recorded by data collection staff in the form of personal interviews. Inquiries

were sent to about 2,000 enterprises, but the willingness to reply was quite low, at roughly 20% to 25%.

The survey contained questions on accounting exchange rate exposure, "exposure awareness" and on FX risk management. The aim was both to collect data and to examine the behaviour of enterprises. In the final database 580 SMEs were analysed. Data were re-weighted to represent industries and size categories (see Appendix 3).

Analysis of the data was conducted with a focus on three topics: indebtedness of enterprises, exchange rate exposure and risk management. In the last two points, the total sample and the sub-sample of FX debtors were examined separately. The analysis is based on descriptive statistics and probit and ordered probit regressions. Regression results are presented in Appendix 5. Explanatory variables used in the regressions are collected both intuitively and based on the relevant literature. The following table contains explanatory variables and the expected sign of the estimated parameters.

Table 6: Variables in Probit Regressions and the Expected Connection

Explained variables:	FX borrowing	Exchange rate exposure*	FX risk management
Output of the enterprise:			
- tradable	positive relationship	positive relationship	positive relationship
- non-tradable	no relationship	no relationship	not straightforward
FX risk management tools			
- derivative tools	not straightforward	positive relationship	
- FX debt		positive relationship	
Company size	positive relationship	positive relationship	positive relationship
Profitability	positive relationship	positive relationship	positive relationship
Indebtedness	negative relationship	negative relationship	no relationship
Foreign owner	positive relationship	positive relationship	positive relationship
Exchange rate exposure*	positive relationship		positive relationship

*Note: * Exchange rate exposure (or currency mismatch) is taken without hedging activity.*

FX debt and hedging tools may be alternatives, but it is also possible that a firm hedges its exposure from FX debt. This is why their connection is not straightforward. We postulated that company size is positively related to all explained variables: as foreign trade is positively related to firm size, exchange rate exposure should be higher, FX borrowing is more motivated and as introduction of

FX risk management has fixed costs, large enterprises may be more willing to use these tools (and also they may incur larger losses). The same argument underlies the expected positive sign of foreign trade activity and tradable sector dummy. In the case of profitability and indebtedness, the table contains the sign of the relationship which is considered positive from a financial stability point of view.

## 5.2 Indebtedness of Surveyed Enterprises

In this section, I analyse the denomination of corporate debt and the type of sources SMEs borrow from. Enterprises were asked to provide detailed data as well as explain the main factors influencing their decisions.

As far as the denomination of debt is concerned, approximately one quarter (27%) of the total debt of the companies examined is denominated in foreign exchange. Foreign loans (corresponding to 13% of total debt) are almost exclusively denominated in EUR. The HUF is dominant in relation to domestic debt, but the surveyed companies also draw loans from financial institutions denominated in EUR and CHF. A sharp difference is observed among companies with foreign exchange debts: only foreign trade companies and companies in foreign ownership draw loans abroad, while this does not apply to many enterprises raising FX debt from domestic sources. Thus, foreign trade companies or foreign-owned companies have easier access to funds from abroad. In addition, enterprises usually do not combine loans in various denominations (in different currencies), i.e. most of their debts arise in the same foreign exchange. In the case of FX debtors it means that usually the ratio of FX debt is over 80%.

In the regressions FX indebtedness is explained by foreign ownership, company size and foreign trade activity (both in probit and ordered probit regressions). If the left hand side variable is FX debt from domestic sources, the explanatory power of foreign trade activity disappears.

In line with expectations, the enterprises surveyed are mainly indebted to domestic banks. Approximately 80% of domestic debt (including trade credit) is borrowed from banks, while more than one third of foreign debt comes from foreign banks. Bank loans are followed by loans from the owner, mainly foreign parent companies.

Chart 7: Characteristics of Corporate Debt by Company Size
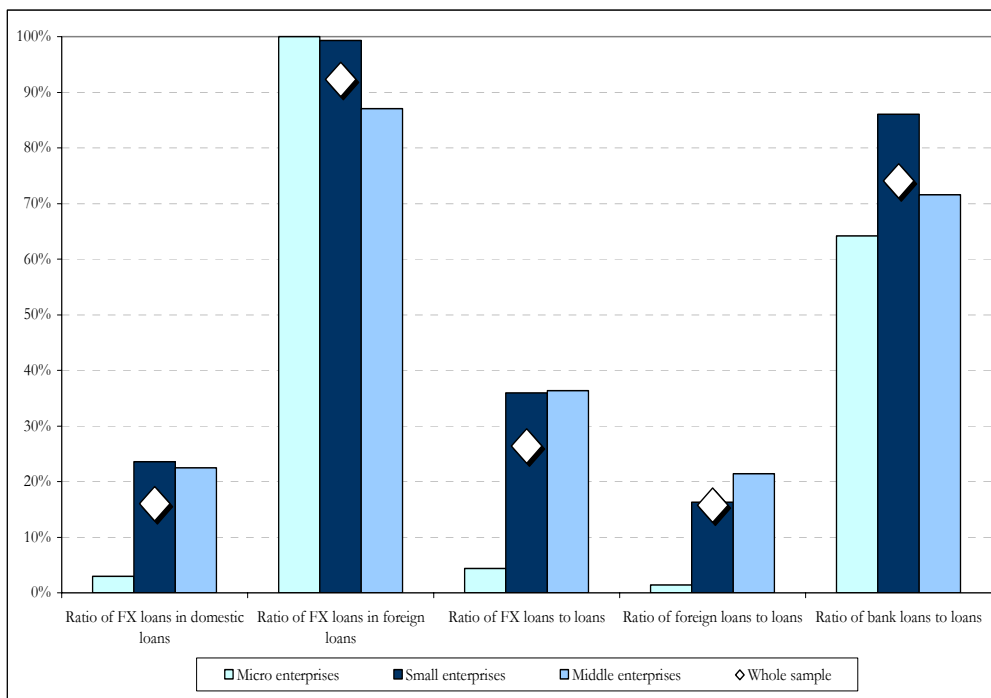
Source: Survey on the Exchange Rate Exposure of Hungarian SMEs.

Enterprises were asked about the factors they consider when choosing between HUF and FX loans and domestic and foreign sources. There was no difference in the ordering of the main aspects. SMEs base their debt decisions on the following factors: interest rate level, actual repayment ratio, their relationship with the lender, domestic prospects and interest rate differential. All enterprises without exception said interest rate was important in the borrowing decision which may be a sign of being liquidity constrained and also of FX loans easing these constraints.

Among enterprises with FX debt, 46% of respondents did not mention that the exchange rate level played a role in their decision and the ratio is 61% with regard to exchange rate volatility. Some 26% did not mention either of these factors, and thus it can be assumed that these firms did not take their potential exchange rate risk into account at the time of borrowing.

On the other hand, two thirds of enterprises without FX loans mentioned the exchange rate level and/or volatility as one of the five main factors in loan decisions. Half of the enterprises which regarded matching inflows and outflows important had no exchange rate exposure at all. It can be assumed that these

enterprises consciously avoid borrowing in foreign exchange despite its cost-advantage.

5.3 Exchange Rate Exposure

This chapter focuses on the ratio and characteristics of enterprises which are exposed to exchange rate changes and also endeavours to carry out a kind of stress-test. As defined earlier, I examine the sign and measure of the net FX assets and net FX income based on the data provided by the enterprises. Firms were also asked about their opinion on their exchange rate exposure and expectations.

Unfortunately, there are distortions in the data which could not be corrected. As firms are not obliged to register the denomination of items in their books by the accounting system, the volume of FX items may be larger than reported. Firms are required to count export revenues and import expenditures, however, they may have FX income or expenditure from non-foreign trade type activity or they may have FX balance sheet items. This distortion is higher for FX assets and liabilities than for income statement items.

Enterprises were asked to state whether they had contracts with domestic partners in which prices were fixed in foreign currency. In several cases if they had such contracts they did not provide detailed data on such. Because of these reasons exchange rate exposure may be higher than measured by the questionnaire.

On the other hand, the exchange rate exposure perceived by firms is underestimated as a result of low volatility of the exchange rate in the period before the survey. It may easily be the case that firms projected this situation into the future, and thus felt they had no exchange rate risk at all.

5.3.1 Enterprises Exposed to Exchange Rate Changes

Let us turn to an examination of the stock and flow exchange rate exposure of the surveyed SMEs. Accounting exposure or currency mismatch (CM) is defined as follows:

Stock CM = HUF value of FX assets – HUF value of FX liabilities
Flow CM = HUF value of FX income – HUF value of FX expenditures

In the case of a negative currency mismatch, depreciation of the domestic currency would have negative effect, while appreciation would influence the net position positively. Enterprises may have exchange rate exposure even if currency mismatch is zero, if the scheduling of inflows and outflows differs. Nevertheless, because of yearly data, this kind of exposure is disregarded.

Some 40% of enterprises have non-zero stock of flow currency mismatch. As far as stock CM is concerned, two thirds of enterprises have neither FX income nor FX expenditure. In the total sample enterprises with negative net FX assets are in

the majority; average stock exposure is about –8% of the balance sheet total (sum of net FX assets/sum of balance sheet totals).

Chart 8: Foreign Exchange Assets and Foreign Exchange Liabilities of Companies
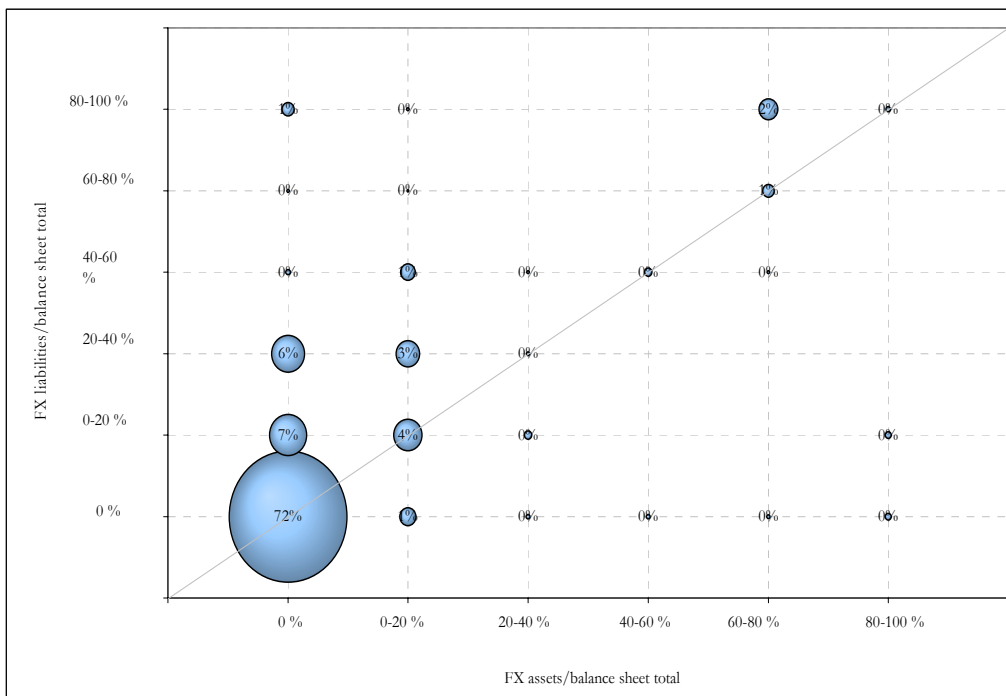
Source: Survey on the Exchange Rate Exposure of Hungarian SMEs.

Note: The size of circles indicates the ratio of the balance sheet total in the given category compared to the total sample.

The average flow currency mismatch is –2% (sum of net FX incomes to incomes) and it amounts to –19% of net income. However, the variance of flow CM is much higher than it was in the case of stock CM. According to their ratio of balance sheet total, 68% of enterprises have income or expenditures in foreign exchange. As a whole, there are more enterprises with positive flow CM than with negative flow. In terms of company size, in the micro segment firms with negative CM are in the majority, while in the other two size categories there are more positively exposed enterprises.

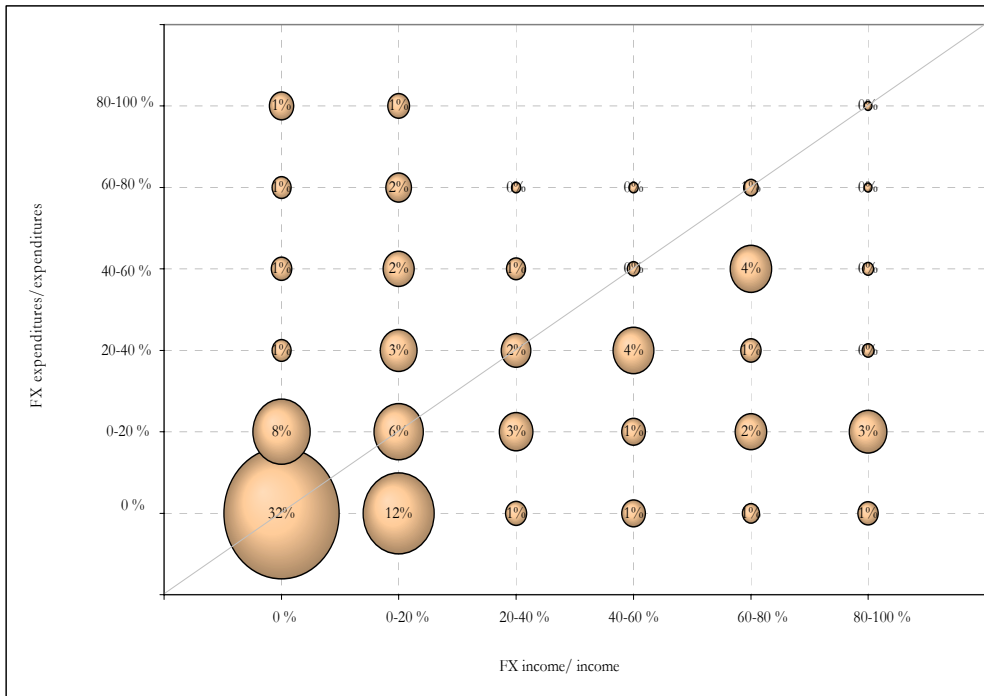*Chart 9: Foreign Exchange Revenues and Foreign Exchange Expenditures
of Companies*

Source: Survey on the Exchange Rate Exposure of Hungarian SMEs.

*Note: The size of circles indicates the ratio of the balance sheet total of companies belonging to the
given category compared to the total sample.*

Regressions indicated that the exchange rate exposure of a firm is positively related
to firm size, foreign ownership, foreign trade activity and FX indebtedness. In
terms of sectors, the highest the ratio of firms exposed to exchange rate changes is
found in the manufacturing sector, but in transportation and trade sectors the ratio
is also higher than average.

5.3.2 Are Firms Aware of Their Exchange Rate Exposure?

The majority of companies interviewed are not prepared for changes in the
exchange rate. On the basis of their answers, most of SMEs with exchange rate
exposure do not assess their exchange rate exposure or deal with its magnitude, and
generally believe that they have no exchange rate exposure or that it is negligible.
Accordingly, the vast majority (50–75%) of respondents maintain the view that
changes in the exchange rate do not affect their financial position or

competitiveness.[4] Among those who believe that shifts in the exchange rate do have an impact on them, there are more who judge a weaker rate to be negative, rather than a stronger one.

As noted above, foreign exchange debt, as a means of natural hedging, may reduce exchange rate exposure, but if foreign exchange indebtedness is motivated by the reduction of costs (i.e. payment of lower interest rates upon borrowing, for example), the exchange rate exposure of the enterprise will grow. Our analysis implies that foreign exchange debt among the surveyed companies is rarely motivated by the hedging of foreign exchange revenues. Half of foreign exchange debt is held by companies with FX revenues, while the other half arises in relation to companies without positive net FX revenues. By limiting the examination to resident (mainly bank) foreign exchange debt, the rate of naturally unhedged debt is even higher, reaching two thirds of the stock of debt (chart 4). Thus, nothing offsets the negative impact of the exchange rate on foreign exchange debt in relation to the above rate of foreign exchange debt and foreign exchange debtor companies. We also observed that many companies have positive net foreign exchange revenues, suggesting that they would be better off with debts in foreign exchange than forints, yet they do not make use of this opportunity.

A large number of companies with foreign exchange debt disregard the potential effects of exchange rate shifts. This is supported by the fact that 70% to 80% of companies with foreign exchange debts claim that an exchange rate shift would not affect their debt burdens. The rate is similar in relation to companies with debt only in domestic currency. Thus, the denomination of debt does not account for any variation in assessing the expected impact of exchange rate changes.

Several questions were posed in connection with assessing exchange rate exposure, expectations regarding the potential impact of the exchange rate on profitability, income, costs, debt and competitive position. Enterprises were asked to express their expectations on both the effects of appreciation and depreciation, as exchange rate exposure may be asymmetrical (see Chart 10).

Half of firms with non-zero CM gave answers, based on which it is clear that they are not aware of the existence of exposure or deem it to be insignificant. About 50% of these firms do not expect the exchange rate to affect any of the aforementioned variables. The other half of this group said they had exposure, but they do not manage it or the answers are contradictory. For example, firms answered that they had no exposure but expected they would be influenced by a change in the exchange rate.

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[4] Enterprises were asked to consider a change in the exchange rate which they consider to be significant, and examine the impact of a change of a similar rate in relation to strengthening and weakening.

Firms which did not expect the exchange rate to influence their profitability or competitive position were in majority in the sample.[5] In the case of the different variables, the ratio of those who did not expect any influence of exchange rate changes was between 53 and 81%. This ratio was highest in respect of debt burden (81%), and most enterprises expected the exchange rate would influence their profitability. 39% of firms said that none of the variables mentioned would be affected by exchange rate changes.

Chart 10: Expectations of Enterprises in Case of a Potential Exchange Rate Change
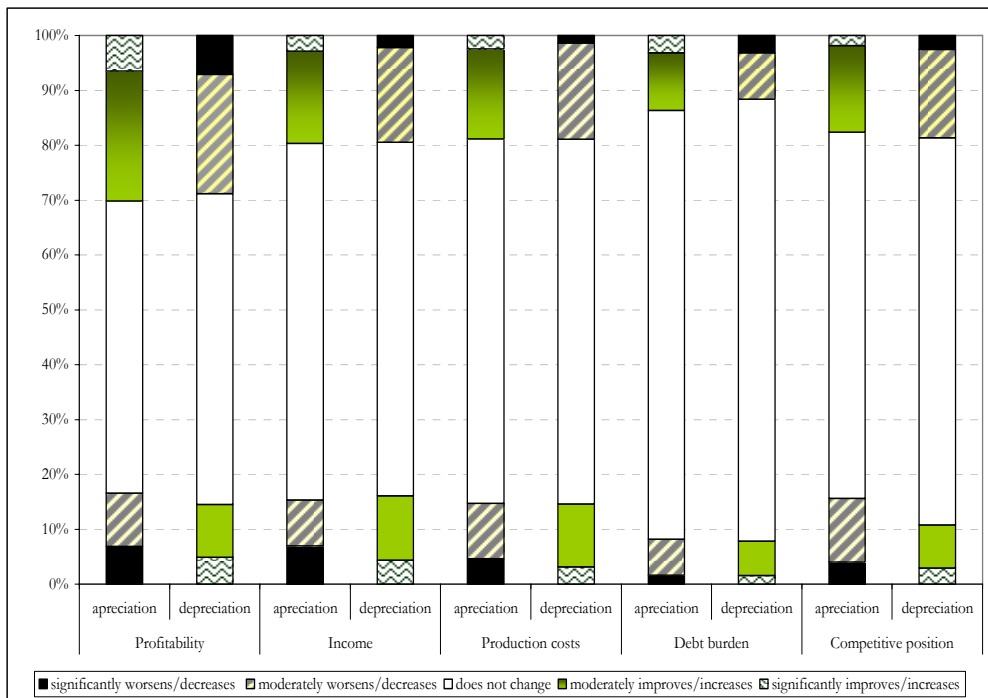
Source: Survey on the Exchange Rate Exposure of Hungarian SMEs.

The expectations of firms were examined according to sector and the presence and sign of the currency mismatch. There was no difference between tradable and non-tradable sectors, but some distinctions could be made on the basis of CM numbers. The ratio of firms which expected that appreciation (depreciation) would negatively affect their profitability and competitive position was higher among those with positive (negative) net FX income than in the whole sample.

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[5] We asked firms to think about an exchange rate change they think would be significant and that this should be the same in the case of appreciation and depreciation.

*Chart 11: Expectations of Firms with Positive Net FX Income on the Effect
of Potential Exchange Rate Changes*
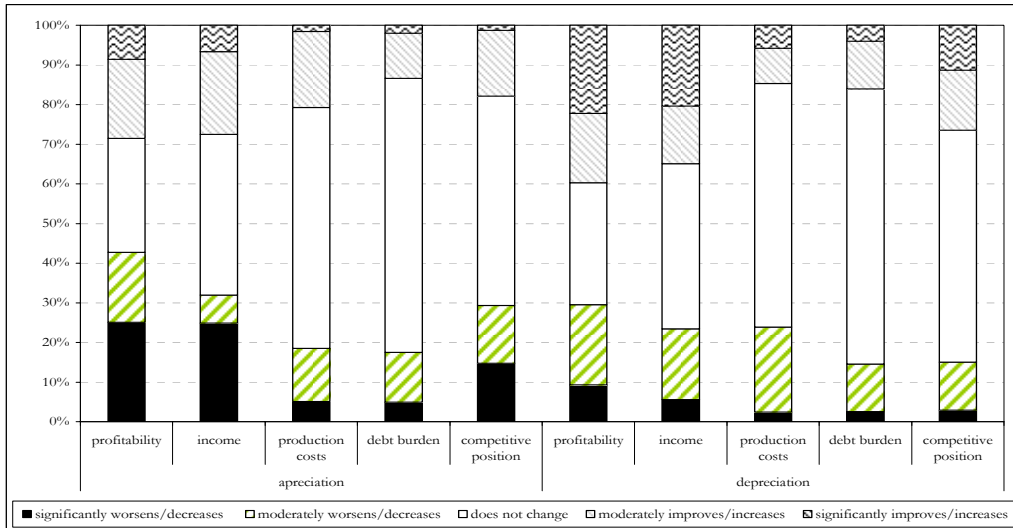
Source: Survey on the Exchange Rate Exposure of Hungarian SMEs.

*Chart 12: Expectations of Firms with Negative Net FX Income on the Effect
of Potential Exchange Rate Changes*
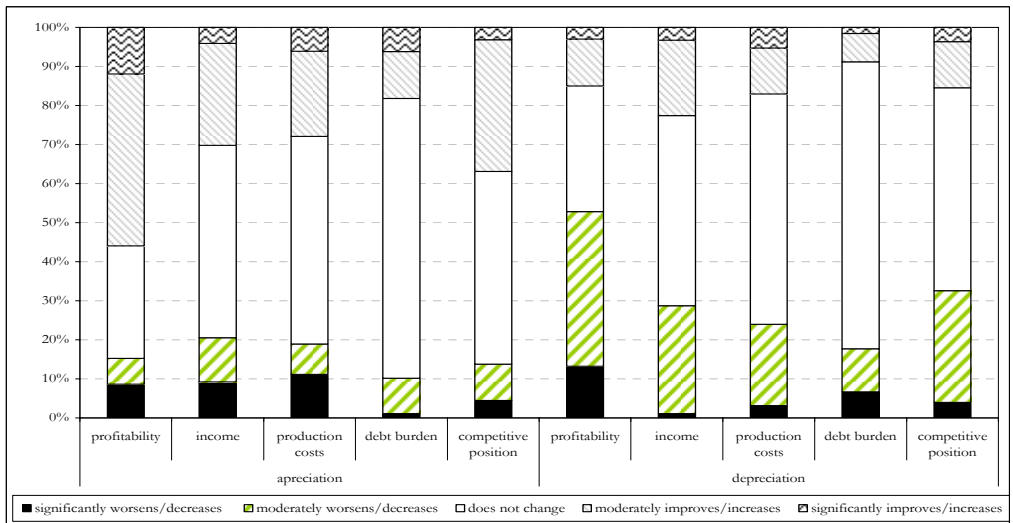
Source: Survey on the Exchange Rate Exposure of Hungarian SMEs.

Nevertheless, the ratio of those which did not expect any change was still very high in these sub-samples.

The survey contained questions on both appreciation and depreciation because exchange rate exposure may not be symmetrical. At the individual level, it seems that firms regard their exposure to be symmetrical: enterprises which expected a negative effect from appreciation also forecasted a positive effect from depreciation. The correlation between answers on exchange rate changes in different directions is highly and negatively correlated. The correlation is highest in the case of profitability and low in the case of production costs and debt burden.

At the aggregate level, however, exchange rate exposure is asymmetric: there are more enterprises which would be negatively affected by depreciation than by exchange rate appreciation. However, this also stems from the sign of the average currency mismatch. Nevertheless, it should be stressed that the real symmetry of exchange rate exposure can be examined in time-series data. In case of the questionnaire, taking into consideration the low exchange rate volatility before the survey was carried out, the uncertainty of the answers and the conclusions reached are high.

Chart 13: Expectations of Firms with FX Debt on the Effect of Potential Exchange Rate Changes
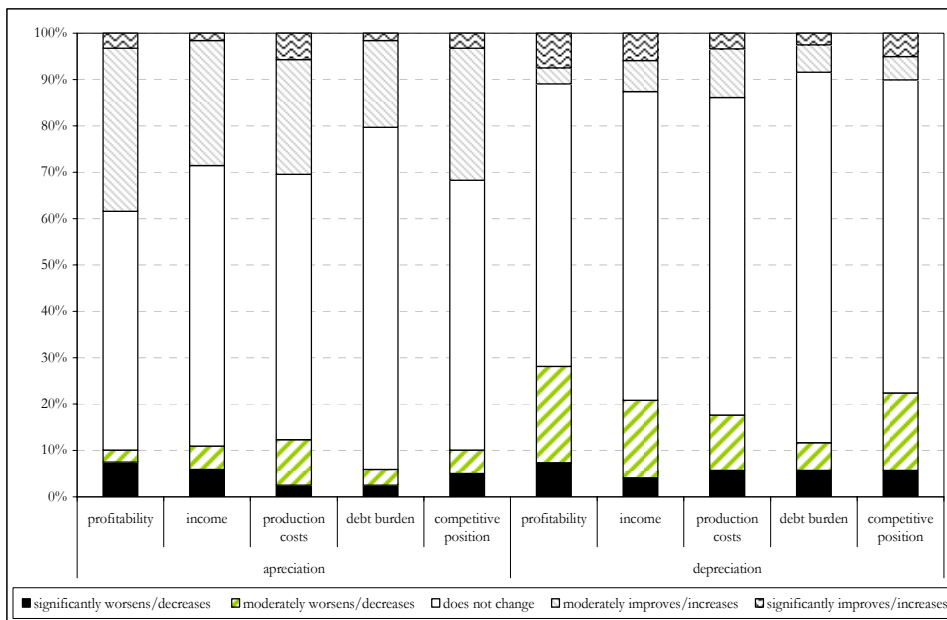
Source: Survey on the Exchange Rate Exposure of Hungarian SMEs.

The majority of companies with foreign exchange debt disregard the potential effects of exchange rate shifts. This is supported by the fact that 70 to 80% of companies with foreign exchange debts claim that an exchange rate shift would not affect their debt burdens. The rate is similar in relation to companies with debts only in domestic currency. Thus, the denomination of debt does not account for any variation in assessing the anticipated impact of exchange rate changes.

5.3.3 Exchange Rate Sensitivity

Under stringent assumptions and irrespective of the current exchange rate system, we attempted to numerically determine the effects of a possible exchange rate shock based on the data. Our analysis aimed to determine the share of companies participating in the survey which would incur losses as a result of exchange rate shifts of various degrees and directions, i.e. cases in which the added costs would exceed the added gains.

Since net foreign exchange revenue is a negative value for the whole sample, a possible weakening of the forint would negatively affect more companies than strengthening. The expectations of companies and the calculations also support this premise. In the basic state, 14% of the surveyed companies were unprofitable; this rate increased in response to both a strengthening and a weakening of the rate, although a weaker exchange rate led to losses in the case of more enterprises than a stronger rate. It is noteworthy that the effect of the exchange rate change is non-linear: a relatively larger jump was observed in response to a smaller shift in the exchange rate (5%, 10%), than was the case in response to additional changes in the exchange rate. In other words, a larger number of companies would become unprofitable in response to a 5%-shift in the exchange rate than those which would produce losses due to a further 5%-shift in the rate.

We also analysed exchange rate sensitivity using the above method in relation to the sub-group of foreign exchange debtors. In this case, the variation between foreign exchange debtors with natural hedging and non-hedged debtors could be clearly distinguished. For companies with no foreign exchange revenue the negative impact of a weaker exchange rate was clearly established, while companies with natural hedging were favourably affected by a weaker rate.

Chart 14: Ratio of Sample Enterprises Producing Losses upon Different Changes of the Exchange Rate
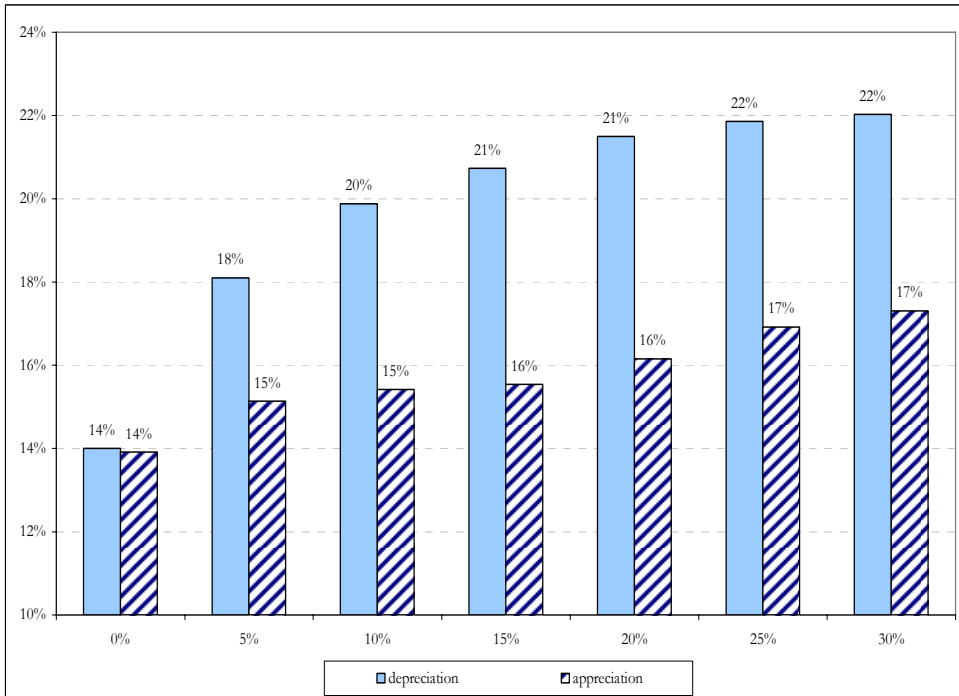
Source: Survey on the Exchange Rate Exposure of Hungarian SMEs.

It must be highlighted, however, that these calculations and the assertions derived from them are conditional. Companies' reactions, their bargaining position and rescheduling of debt is not taken into account; furthermore it is not taken into account that in some cases foreign exchange revenues and expenditures, and repayment of foreign exchange debt is not fully repriced in reaction to a change in the exchange rate. In addition, we did not consider adjustments of hedging activity. Therefore, the calculations overestimate exchange rate sensitivity. We also ignored the impact of the changing exchange rate on competitiveness, as this can modify the above results in either direction, and the possible effect of shifts in the exchange rate on domestic yields, producing a negative effect on forint debtors. For the above reasons, actual exchange rate sensitivity may vary in either direction from the rates calculated for the sample.

5.4 FX Risk Management

This chapter examines the use of natural and artificial hedge instruments and the possible reasons for the lack of FX risk management. All data are based on balance sheet weighted statistics.

Enterprises were asked how important they think exchange rate exposure is and whether they manage their exposure. Although the majority of enterprises consider management of exchange rate risk to be important, they do not measure their risks regularly. It can be presumed that SMEs do not have sufficient resources in this area. It also can be said that micro enterprises ascribe the lowest degree of importance to exchange rate exposure.

Only a small fraction of enterprises answered that they used FX risk management instruments; the majority of them used natural hedging. Among these on balance-sheet methods matching inflows and outflows was the most common. Only 7 enterprises answered they were intending to borrow in FX to hedge exchange rate risk.

In analysing natural hedging activity, it is important to distinguish between conscious and unconscious hedging. Many companies which have both revenues and expenditures in foreign exchange replied to the questionnaire that they do not apply any hedging techniques. These answers may imply that the companies are unaware that this can be a form of natural hedging. In many cases, the scheduling of inflows and outflows varies, and for liquidity reasons, the companies are indeed unable to apply natural hedging instruments. On the above grounds, in such cases I considered the answers of the companies to hold true, that is, I classified the respondents among non-hedgers.

SMEs apply artificial hedging even to a lesser extent than natural hedging instruments. On the basis of the share in the balance sheet total, 4% of companies applied artificial hedging instruments. This result is in line with the results of surveys conducted in other countries. To a large extent, this can be explained by the composition of the sample, for in relation to most SMEs, the size of the company or the degree of exposure does not reach a level at which it is reasonable to invest in FX risk management methods or the establishment of organisation units dealing with such.

In the case of not using hedging tools, enterprises argued that they had no exposure or risk. However, according to my definitions, in fact they did. There may be two reasons behind these answers: first, they may not expect an exchange rate change, or they are unaware of their exposure. To a certain degree, the lack of conscious hedging can be explained by the sample as in case of SMEs company size or the measure of exposure is below the threshold above which it is worth it to invest in risk management. Nevertheless, as there is no need for investment to introduce on-balance sheet tools, the lack of these tools may be a sign of low risk-awareness.

It is of special interest to examine hedging activity of FX debtors, as FX debt can be a tool for natural hedging. Nevertheless, if the aim of FX borrowing is cost-reduction, FX debt increases currency mismatch. In this case, exposure is never hedged as the cost advantage would thus be lost. To put it differently, the lack of hedging activity by FX debtors may be a sign of borrowing in FX in order to reduce costs, and these firms may consider the saved costs to be higher than the potential losses on FX risk.

In the sample, half of the FX debt volume is not hedged naturally (see Chart 15). In respect of domestic FX debt accumulated by Hungarian banks, the ratio reaches two thirds of the debt volume. Among FX debtors, the ratio of enterprises which do not hedge at all is about 80%: they do not think they are exposed to exchange rate changes or think that hedging is too costly. Altogether, it seems as if the ratio of risk-aware enterprises is lower among FX debtors than in the whole sample.

Chart 15: Importance of Managing Exchange Rate Exposure and Frequency of Assessing Exposure
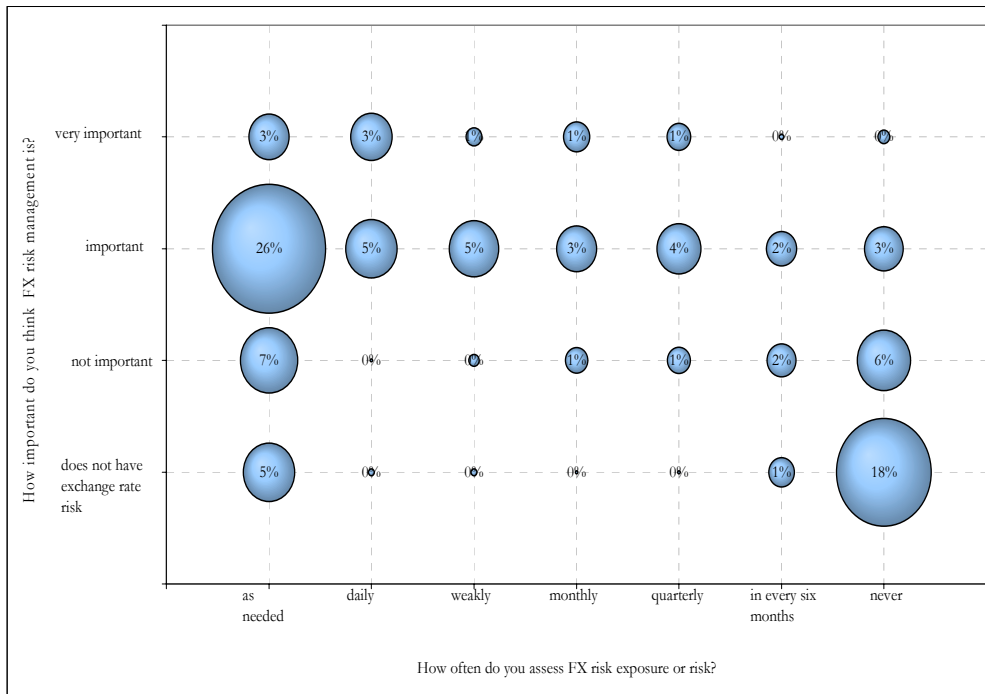
Source: Survey on the Exchange Rate Exposure of Hungarian SMEs.

Note: The size of circles indicates the ratio of the balance sheet total of companies belonging to the given category compared to the total sample.

Finally, I examined whether there are firms which borrow in domestic currency despite having FX income. The ratio of these enterprises – thus the share of firms denying both the possibility of hedging and of borrowing cheaper – is as high as 31% (weighted with the balance sheet).

Chart 16: Characteristics of Companies Based on Exchange Rate Exposure and Hedging Activity
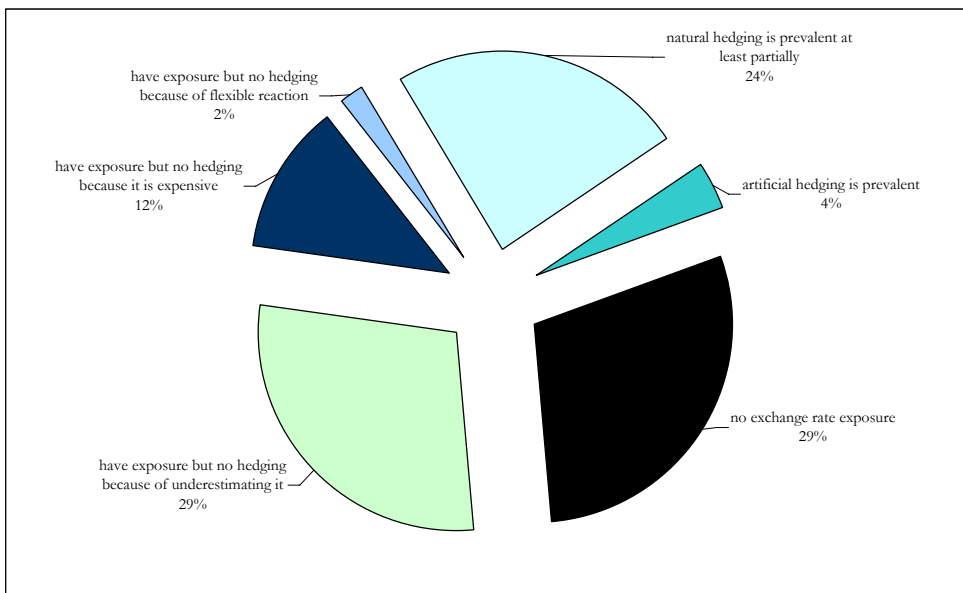
Source: Survey on the Exchange Rate Exposure of Hungarian SMEs.

Note: On the basis of share in the balance sheet total.

Chart 17: Ratio of FX Debt to Total Debt and Natural Hedging
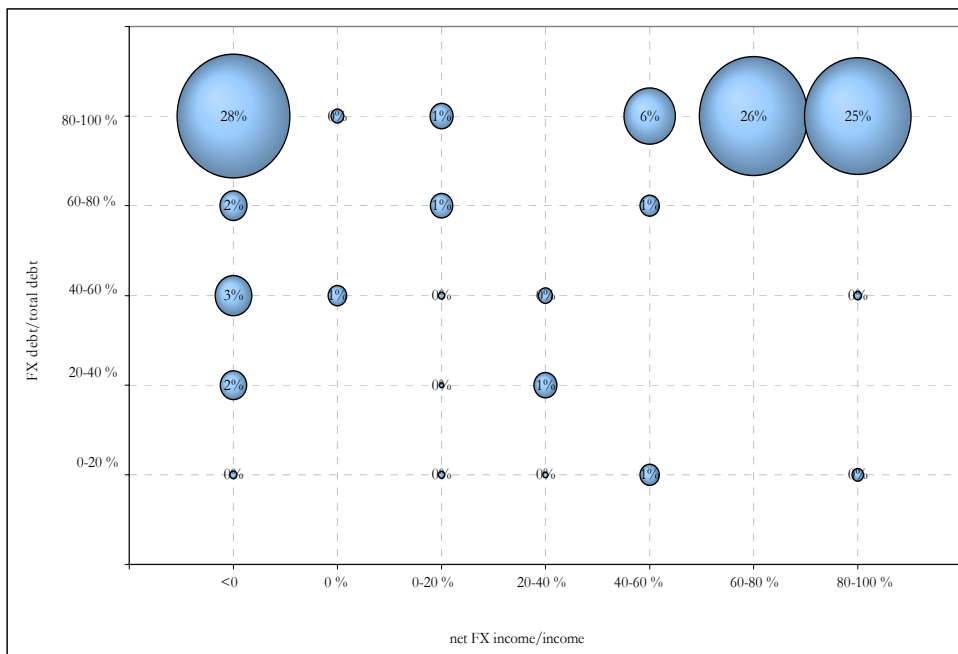
Source: Survey on the Exchange Rate Exposure of Hungarian SMEs.

Note: The size of circles indicates the ratio of the balance sheet total of companies belonging to the given category compared to the total sample.

*Chart 18: Rate of Domestic Foreign Exchange Debt within Domestic Debt
and Natural Hedging*
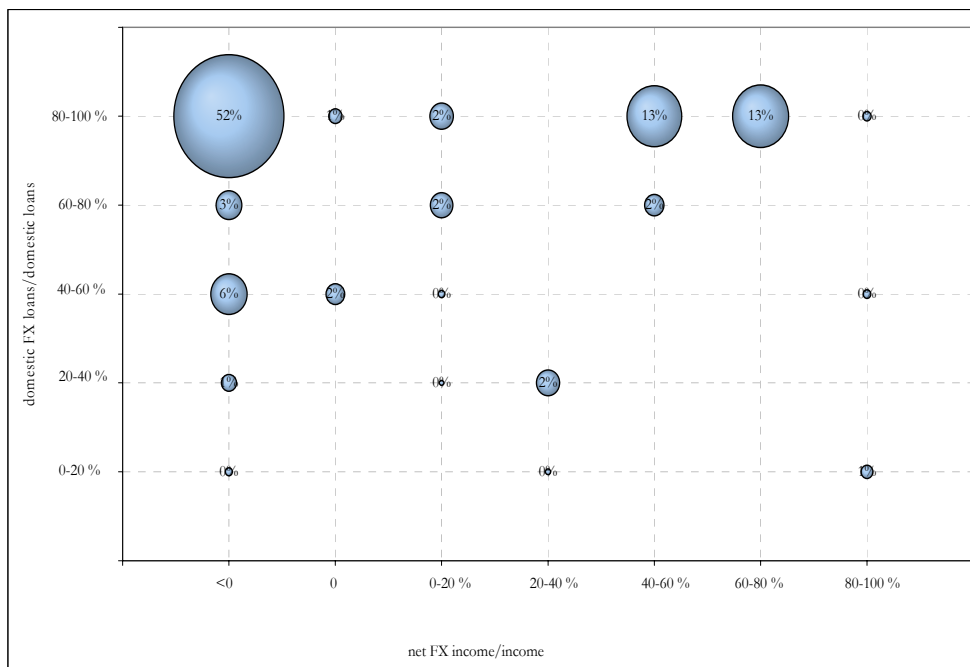
Source: Survey on the Exchange Rate Exposure of Hungarian SMEs.

*Note: The size of the circles indicates the ratio of foreign exchange debt of companies belonging to
the given category compared to total foreign exchange debt.*

6. Conclusions

On the basis of the review of literature of financial crises, it can be said that small
open economies are more exposed to exchange rate changes, and that in emerging
countries devaluation often has negative effects. One of the main reasons behind
this is dollarisation leading to currency mismatches. As in Hungary dollarisation of
liabilities is increasing not only in case of exporting large firms but also in the
retail sector, an examination of the potential risks was prepared.

A survey was carried out on the SME sector in the interests of conducting a
detailed, micro-level analysis of the potential risks deriving from increasing FX
lending by domestic banks, and in parallel, the risks of increased lending to SMEs.
On the basis of the survey data, the characteristics of SMEs' indebtedness,
exchange rate exposure and exchange rate risk management were analysed. When
examining indebtedness, the dependence on domestic funds and bank sources can
be established, and owner financing related to foreign-owned companies also

reached a high rate. two factors motivating indebtedness in foreign exchange were analysed: hedging of foreign exchange revenues and cost reduction through the use of interest rate differences. The results of the questionnaire suggest that foreign exchange debt rarely functions as a hedging instrument, and that few companies are aware of the impact of the exchange rate on foreign exchange loans.

When analysing exchange rate exposure, I examined net foreign exchange assets and net foreign exchange revenues in numbers and their sensitivity to exchange rate shocks, as well as the expectations of companies. I observed that, on the basis of all aspects of analysis, a weakening of the domestic exchange rate would produce a negative effect as a whole, while a strengthening would produce a positive effect. Upon the comparison of the answers, we concluded that a large number of respondents underestimate their exposure to the exchange rate, or disregard such risks, which may be explained by their limited resources available for these purposes. However, the stability of the exchange rate in the period preceding the survey is likely to have played a role in determining the results.

A significant number of companies surveyed have direct foreign exchange exposure, but only few of these are aware of the risk or provide hedging for exchange rate exposure. Although natural hedging would be available in many cases, companies generally do not apply it consciously. Artificial hedging instruments are only employed in a few cases. The hedging of foreign exchange debt is also quite rare, particularly if we limit the analysis to foreign exchange debt granted by domestic banks. Most companies with foreign exchange debts from abroad are naturally hedged.

The credit risk of the banking system may be indirectly derived from the above results. The survey indicated that a shift in the exchange rate can produce an unexpected effect on domestic SMEs through two channels: directly through foreign exchange debt and indirectly through other foreign exchange items. The majority of companies underestimate their foreign exchange exposure and do not use any conscious risk management techniques. This holds true in particular in relation to companies which are indebted in foreign exchange vis-à-vis resident banks. The analyses did confirm, however, that a possible weakening of the exchange rate would generally adversely affect the SME sector. In addition to the rising credit loss of the banking system, this would likely result in a significant fall in aggregate credit demand and demand for foreign exchange loans.

As further research, a new survey will be carried out. This is motivated by three facts: first, in 2006 the volatility of the exchange rate increased to high levels, which could change behaviour of firms. Second, large enterprises should be included in the survey and their average behaviour should be compared to that of SMEs. The new survey would also aim at disclosing the reasons behind the low risk-awareness of firms: to what extent it is linked to low financial culture, exchange rate expectations, firms' other (e.g. liquidity) problems, or banks'

behaviour. Finally, besides the potential effect of exchange rate on non-financial firms, its indirect effect on banking system portfolio should also be estimated.

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APPENDICES

Appendix 1: Empirical Works on Exchange Rate Exposure Based on CAPM Model

Author	Countries examined	Country-specific factors	Industry-specific factors	Firm-specific factors	Note
Jorion 1990	USA 1971–1987			Ratio of foreign sales to total sales	Time-variant exposure
Bodnar – Gentry 1993	Canada, Japan, USA 1979 (from 1983 for Japan) – 1988	Small open economies are more exposed	Industry-specific factors play important role in explaining exposure, diversification may decrease exposure	–	–
Bartov – Bodnar 1994	USA 1978–1989	–	–	–	Explains the underestimation of exposure by mispricing of investors, explains the underestimation of risks by restrained information about risks
Friberg-Nydahl 1997	Austria, Belgium, Denmark, France, Netherlands, Japan, Germany, Italy, Sweden, USA 1973–1996	Exposure is larger in larger countries	–	–	–

Appendix 1 Continued: Empirical Works on Exchange Rate Exposure Based on CAPM Model

Author	Countries examined	Country-specific factors	Industry-specific factors	Firm-specific factors	Note
He – Ng 1998	Japan	–	–	Export revenues and proxies of hedging incentives explain exposure	–
Nydahl 1999	Sweden 1992–1997	Small open economies are more exposed	–	Usage of derivatives decreases exposure while exposure is positively related to ratio of foreign sales	
Bodnar – Wong 2000	USA 1977–1996	–	–	–	Methodology paper, examining the effect of portfolio choice, macro factors and firm size
Ihrig 2001	USA 1995–1999	–	–	Exchange rate exposure is a function of the number of countries a company operates in	Differentiates between normal and shock periods
Dominguez – Tesar 2001	Chile, United Kingdom, France, Japan, Germany, Netherlands, Italy, Thailand 1980–99	–	–	Smaller and internationally operating firms are more exposed to exchange rate changes	Change of exchange rate influences exposure

Appendix 1 Continued: Empirical Works on Exchange Rate Exposure Based on CAPM Model

Author	Countries examined	Country-specific factors	Industry-specific factors	Firm-specific factors	Note
Doige – Griffin – Williamson 2002	Australia, Belgium, Denmark, United Kingdom, France, Netherlands, Hong Kong, Japan, Canada, Germany, Italy, Switzerland, Singapore, USA (1975–1999); Malaysia (1980–1999), Spain (1987–1999) New Zealand (1988–1999)	–	–	Firm size and ratio of foreign sales correlates negatively with exposure.	Non-linear exposure
Hagelin – Pramborg 2002	Sweden 1997–2000	–	–	International operation, usage of derivatives	Examines abnormal volatility periods
Koutmos – Knif 2003	Finland 1992–1998	–	Type and measure of exposure changes by industry.	Firm size explains type and measure of exposure	Asymmetrical, non-linear exposure
Chue – Cook 2004	Brazil, Chile, South Africa, India, Indonesia, Columbia, Korea, Mexico, Morocco, Pakistan, Philippines, Taiwan, Thailand, Turkey, Venezuela	Depreciation has negative effect in emerging countries	–	FX debt increases fragility of firms	
Priestley – Odegaard 2004	USA 1979–1998	–	–	–	Methodological paper

Appendix 1 Continued: Empirical Papers with Other Methodolgy than CAPM

Author	Countries examined	Country-specific factors	Industry-specific factors	Firm-specific factors	Note
Clarida 1997	USA 1975–1993	–	–	–	Asymmetric exposure, differentiation between valuation and quantity channels
Forbes 2002	Argentine, Australia, Austria, Belgium, Brazil, Chile, Czech Republic, Denmark, South Africa, South-Korea, United Kingdom, Finland, France; Philippines; Greece; Netherlands, Hong Kong, India, Indonesia, Ireland, Israel, Japan, Canada, China, Poland, Hungary, Malaysia, Mexico, Germany, Norway, Italy, Pakistan, Portugal, Spain, Switzerland, Sweden, Singapore, Taiwan, Thailand, Turkey, New Zealand, USA 1997–2000	Small open economies are more exposed	–	After depreciation performance correlated positively with foreign exposure, negatively with size and production of tradable products while the connection was not straightforward with production structure, debt ratio and profitability	–

Appendix 2: Questionnaire

Filtering questions

Is the company majority privately owned, i.e. its majority owner is not the government or a municipality?

    Yes

    No

Did the company operate during 2004 / has it closed at least one financial year?

    Yes

    No

Does it have credit, loan, other liability (e.g. trade credit, ownership loan, bond, etc.)?

    Yes

    No

Company data

A1 Please give the code of the main activity of the company

A2 Please give the statistical ID number of the company

A3 Please give the starting date of the business year

A4 Please give the legal form of the company
   - a. limited partnership
   - b. merger
   - c. limited corporation
   - d. general partnership
   - e. joint company
   - f. joint-stock company
   - g. co-operative society
   - h. other corporation with legal entity
   - i. other corporation without legal entity

A5 Please give the number of employees on 31 December 2004
……………

A6 What is the ratio of foreign ownership in the company?
       ……………%

A7 Please state the balance sheet total for 2004:
       ……………HUF

A8 Please state the own capital for the end of 2004
       ……………HUF

A9 Please state the gross income of 2004
       ……………HUF

A10 Please state the gross expenditures of 2004
       ……………HUF

A11 Please state the after-tax profit of the companies for 2004
       ……………HUF

A11a Does your company have a subsidiary / subsidiaries?
       a. yes
       b. no

A11b If the firm has a subsidiary / subsidiaries:
Are the subsidiaries located abroad, in Hungary or both?
       a. abroad
       b. in Hungary
       c. both abroad and in Hungary

**A12 What proportion of income did the company derive from the main
activity in 2004?   …%**

Financial questions

B1 Please state the ratio of the balance sheets, off-balance sheet items, income and expenditure denominated in different currencies as a percentage according to the following table (assets, liabilities, off-balance sheet items: stock at end-2004, income and expenditures: 2004).

	Assets	Liabilities	Off-balance sheet items		Income	Expenditures
			Assets	Liabilities		
HUF						
EUR						
USD						
CHF						
Other, pls. specify: _____						
Other, pls. specify: _____						
Other:						

B2 Please give the following data for end-2004 in million HUF:
- Stock of HUF cash
- Stock of FX cash
- Granted loans to domestic companies (included associated and holding companies, both long and short-term loans), in HUF
- Granted loans to domestic companies (included associated and holding companies, both long and short-term loans), in FX
- Receivables from delivery of goods and services to home buyers (including associated and holding companies)
- Receivables from delivery of goods and services to foreign buyers (including associated and holding companies)
- Liabilities from delivery of goods and services from home deliverers (including associated and holding companies)
- Liabilities from delivery of goods and services from foreign deliverers (including associated and holding companies)

B3 What ratio of the value of inputs used in your firm is imported?
…%

B4 What ratio of the value of outputs is exported?
…%

B5 What was the ratio of export income to gross income in 2004?
…%

B6 In what ratio of the contracts concluded with domestic partners in 2004 are prices fixed in FX?
…%

B7 How important does your firm think FX risk management is?
a. there is no FX risk
b. FX risk management is not important
c. FX risk management is important
d. FX risk management is very important

B8 How frequently does your firm value the FX risk or exposure of the company?
a. as needed
b. on a daily basis
c. on a weekly basis
d. on a monthly basis
e. quarterly
f. annually
g. never

B9 Does your firm hedge the FX risks deriving from the currency mismatch of income and expenditures and/or assets and liabilities?
a. yes
b. no
c. there is no FX risk

B10 Does your company hedge the FX risk of foreign subsidiaries?
a. yes
b. no
c. there is no FX risk at the subsidiary
d. no subsidiary

B11 If your company does hedge your own or the subsidiary's FX risk, please answer B11 and B12. Otherwise please continue with B13.
What methods does your company use to hedge FX risk?
   a.   derivatives
   b.   FX borrowing
   c.   FX depositing
   d.   granting FX loan
   e.   matching inflows and outflows
   f.   exchange rate fixed in the clause of sales contracts
   g.   inter-company cash-pooling or other contracts
   h.   other, please specify: …………………………………………….

B12 If your company uses derivatives:
What kind of derivatives do you use to hedge FX risk?
   a.   future contracts
   b.   forward contracts on the interbank market
   c.   FX options
   d.   other, please specify ………………………

B13 If you do not hedge the FX risk of your own company or that of the company's subsidiary. Otherwise please continue with question B14.

If your firm does not hedge its own exchange rate risk or that of the subsidiaries, what is the reason behind this?
   a.   there is no exchange rate exposure or it is very low
   b.   the costs of hedging exceed the expected benefits
   c.   if the exchange rate risk were realised, my firm would be able to react in a flexible way
   d.   the parent company manages my firms' exchange rate risk
   e.   other, please specify:
   ………………………………………………………………….

B14 The following question is related to the loans and credits of end-2004 raised from domestic partners.
Please give the following data (in the given currencies; in HUF if the currency is not given).

		HUF	EUR	USD	CHF	Other, please specify:
From domestic bank	With maturity more than one year					
	With maturity less than one year					
From domestic, non-bank financial institution	With maturity more than one year					
	With maturity less than one year					
From domestic commercial partner	With maturity more than one year					
	With maturity less than one year					
From domestic parent company	With maturity more than one year					
	With maturity less than one year					
From other domestic partner (included bonds issued)	With maturity more than one year					
	With maturity less than one year					

B15 The following question is related to the loans and credits of end-2004 raised abroad. Please give the following data (in the given currencies; in HUF if the currency is not given).

		HUF	EUR	USD	CHF	Other, please specify:
From foreign bank	With maturity more than one year					
	With maturity less than one year					
From foreign, non-bank financial institution	With maturity more than one year					
	With maturity less than one year					
From foreign commercial partner	With maturity more than one year					
	With maturity less than one year					
From foreign parent company	With maturity more than one year					
	With maturity less than one year					
From other foreign partner (included bonds issued)	With maturity more than one year					
	With maturity less than one year					

B16 What kind of loan did your company raise or plan to raise from domestic or foreign sources in 2005?

	HUF	Foreign currency, please specify: … … …
From domestic sources	With maturity more than one year With maturity less than one year	
From foreign sources	With maturity more than one year With maturity less than one year	

B17 From the list below, which aspects are most important for you in your decisions concerning borrowing? Please rank the five most important aspects!

	Borrowing in HUF or foreign currency	Borrowing from domestic or foreign sources
Bank connections		
Actual installment amount		
Interest rate level		
Interest rate differential		
Actual and expected level of foreign currency		
Volatility of the exchange rate		
Domestic economic expectations		
Foreign economic expectations		
Financing foreign investments		
Matching the denomination of inflows and outflows		
Matching the denomination of assets and liabilities		
Commitments towards parent company and/or holding company		
Other, please specify		

B18 Please give the potential effect of HUF appreciation (against the EUR) on your company's…

	considerably worsens / decreases	somewhat worsens / decreases	does not influence	somewhat improves / increases	considerably improves / increases
A. profitability					
B. HUF income					
C. production costs					
D. debt burden					
E. competitive position					

B19 Please give the potential effect of HUF depreciation (against the EUR) on your company's…

	considerably worsens / decreases	somewhat worsens / decreases	does not influence	somewhat improves / increases	considerably improves / increases
A. profitability					
B. HUF income					
C. production costs					
D. debt burden					
E. competitive position					

B20 Please hand in a copy of your not consolidated balance sheet of 2004 (with basis figures on 2003)

Appendix 3: Cleaning and Modification of Survey Data

1. Statistical code, foreign ownership, balance sheet total, equity, pre-tax profit, income, expenditures, import and export ratios, indebtedness:
Correction of data was based on comparison with tax agency data basis and examination of balance sheet and income statement identities.

2. Denomination of balance sheet and income statement items:
Income statement items were corrected with export revenue, import expenditures and FX debt data when stated.

3. Representativeness:
Since the ratio of value added in size and industry categories in the sample did not fit to those in the macro-economy, sample was re-weighted. The difference between the unweighted sample and macro data is described in the following table:

Macro-economy		Agriculture and mining	Manufacturing	Services	All sectors
Size	Micro enterprises	1.2%	12.5%	16.7%	30.3%
	Small enterprises	1.1%	11.5%	15.3%	27.8%
	Medium-sized enterprises	1.6%	17.3%	23.0%	41.8%
	Whole sample	3.8%	41.2%	54.9%	100%
Unweighted sample					
Size	Micro enterprises	0.4%	1.6%	8.9%	11.0%
	Small enterprises	1.5%	9.6%	23.0%	34.1%
	Medium-sized enterprises	2.3%	11.9%	40.8%	54.9%
	Whole sample	4.2%	23.1%	72.7%	100%

Note: Size ratios were counted on the basis of 2001 Ecostat data, while the industrial value added ratios are based on MNB sources. The corresponding ratios in the sample are based on balance sheet total numbers.

Appendix 4: Correlations

	Export ratio	Import ratio	Balance sheet total	Profit margin	Debt to balance sheet total ratio	Ratio of foreign ownership	Net FX assets to balance sheet total	Net FX income to balance sheet total	Ratio of FX debt to total debt	Ratio of bank loans	Ratio of foreign loans
Export ratio	1	0.14	0.16	-0.09	0.03	0.29	-0.01	0.2	0.23	0.08	0.13
Import ratio	0.14	1	0.01	-0.02	-0.04	0.24	-0.12	-0.35	0.13	-0.07	0.18
Balance sheet total	0.16	0.01	1	-0.01	-0.06	0.15	-0.07	0.03	0.05	0.12	0.01
Profit margin	-0.09	-0.02	-0.01	1	-0.18	-0.01	0	-0.02	-0.08	-0.1	-0.11
Debt to balance sheet total ratio	0.03	-0.04	-0.06	-0.18	1	0.06	-0.01	-0.04	0.13	0.03	0.39
Ratio of foreign ownership	0.29	0.24	0.15	-0.01	0.06	1	-0.16	-0.01	0.3	-0.02	0.45
Net FX assets to balance sheet total	-0.01	-0.12	-0.07	0	-0.01	-0.16	1	0.09	-0.23	0.04	-0.33
Net FX income to balance sheet total	0.2	-0.35	0.03	-0.02	-0.04	-0.01	0.09	1	0	0.1	-0.05
Ratio of FX debt to total debt	0.23	0.13	0.05	-0.08	0.13	0.3	-0.23	0	1	0.09	0.21
Ratio of bank loans	0.08	-0.07	0.12	-0.1	0.03	-0.02	0.04	0.1	0.09	1	-0.13
Ratio of foreign loans	0.13	0.18	0.01	-0.11	0.39	0.45	-0.33	-0.05	0.21	-0.13	1

Appendix 5: Regressions

Probit regressions

Dependent variables:	FX indebtedness			FX indebtedness towards domestic banks			Exchange rate exposure			FX risk management		
	Variable	Frequency	Dummy	Variable	Frequency	Dummy	Variable	Frequency	Dummy	Variable	Frequency	Dummy
	FX debtor	10%	1	FX debtor	10%	1	Exposed to exchange rate changes	41%	1	Hedge	14%	1
	No FX debt	90%	0	No FX debt	90%	0	Not exposed to exchange rate changes	59%	0	No hedge	86%	0
Parameter estimations												
Constant		-1.6***			-1.77***			-0.63***			-1.57***	
Tradable dummy								0.25***			-0.08	
Export dummy		0.57***			0.58***						0.025	
Import dummy		0.24*			0.40***							
Company size (no. of employees)		0.0036*			0.005***			0***			0	
Profitability		-0.223			0.10			-0.315			0.38*	
Indebtedness		-0.00006			0.00			-0.05				
Foreign ownership		0.01***			0.00			0.02***			0.006**	
Exchange rate exposure											0.78***	
FX debt								2.15***			-0.3*	
Hedging								0.89***				
Pseudo R2:		**0.1451**			**0.1142**			**0.2354**			**0.1006**	

| Explanatory variables | | | | |

Ordered probit regressions

Dependent variables		FX indebtedness			FX indebtedness towards domestic banks			Exchange rate exposure		
		Variable	Frequency	Dummy	Variable	Frequency	Dummy	Variable	Frequency	Dummy
		No FX debt	89%	1	No FX debt	91%	1	Negative	22%	1
		FX debt ratio is 0-80%	5%	2	FX debt ratio is 0-80%	4%	2	Zero	60%	2
		FX debt ratio is over 80%	6%	3	FX debt ratio is over 80%	6%	3	Positive	18%	3
		Parameter estimations								
Explanatory variables	Export dummy		0.53***			0.59***			2.33***	
	Import dummy		0.33*			0.41***			-2.24***	
	Company size (no. of employees)		0.0037**			0.005***			0	
	Profitability		-0.25			0.10			-0.2*	
	Indebtedness		-0.00006			0.00			0	
	Foreign ownership		0.008***			0.00			-0.006***	
	Exchange rate exposure									
	FX debt								-0.28**	
	Hedging					0.032				
Pseudo R2			0.1263			0.1053			0.2829	