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What Determines a Firm's Debt Composition – An Empirical Investigation [1]

by

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Abstract

We look at the debt composition of industrial firms, using a unique micro-level database, and find that the share of foreign currency debt in total debt depends on its relative price and on the currency composition of income and expenses in the firm's balance sheet. In particular, the share of foreign currency debt increases with export income. This evidence of substitution between local and foreign currency debt indicates that the transmission of monetary policy is only partial.

We find that the currency composition of the firms foreign currency debt has become more difersified during sample years, with a decline in the share of dollar denominated debt. We also find that real activity and financial considerations are important in determining foreign debt currency composition.

1 Introduction

The Israeli financial markets went through an extensive process of liberalization in the 1990's. Restrictions on financial intermediation and on foreign exchange markets were gradually lifted during those years, making the financial markets more competitive.[1] This process loosened constraints affecting firms' financial decisions and allowed economic considerations to play a major role in corporate decisions, in particular decisions concerning the composition of a firm's assets and liabilities.

One of the most significant monetary developments during the 90's was the shift in the composition of non-directed bank credit to the business sector towards a larger share of foreign currency (FC hereafter)[2] credit. This development was induced by the liberalization process mentioned above, which allowed firms to move from a sub-optimal debt structure bounded by restrictions on financial conduct, to a better composition of debt. However, this process was also supported by tight monetary policy, reflected in relatively high local-currency interest rates accompanied by the willingness of the central bank to buy the excess supply of FC, therefore allowing the private sector to increase its FC liabilities.

The purpose of this study is to identify, using a unique micro-level database compiled for Israeli publicly traded manufacturing firms, the factors that affected the composition of firm debt. In particular we examine the proportion of FC debt in total debt. This may help us understand whether the trend towards FC credit evident in the macroeconomic data was "rational", that is, consistent with a firm's optimal behavior in view of the possible consequences of shocks to the exchange rate. If firms acted "rationally", or according to economic optimization, the shift to FC debt would be expected to lower their exposure to exchange rate risks. If the decision to hold FC debt contradicts exposure concerns, shocks to the exchange rate could cause firms financial distress, and have a dangerous macroeconomic effect.

This analysis is important in relation to macro-economic financial stability - which has become a central issue for many countries. The magnitude of exposure of firms to exchange rate risks is crucial to the question of how

[1] An extensive description of the financial liberalization in Israel may be found in Blass and Yosha (2002) and in Gottlieb and Blejer (2002).

[2] Here and throughout the paper the term "foreign currency" (FC) refers to assets or liabilities denominated in- or indexed to foreign currency.

they will be affected by unexpected shocks to the exchange rate, but is also important for the aggregate performance of the business sector, the financial sector, and the economy as a whole.

Our analysis will also help us understand the effect of monetary policy, namely the Bank of Israel's short-run interest rate, on firms' behavior, and hence the efficiency of this policy with regard to the sector we are analyzing - the manufacturing firms. A key question is the degree to which local currency and FC credit are substitutes. If they are close substitutes, then tight monetary policy will induce firms to increase the share of FC credit in their total debt, but will have a minimal effect, if any, on economic activity.[3]

In the second part of our analysis we take a closer look into the composition of firms' debt and analyze the factors that affect the currency composition of the FC debt, and in particular what determines the share of dollar-denominated debt relative to other currencies. The general approach in our analysis of currency composition is similar to the one we employ in the first part of the paper.

The paper is generally related to the literature that discusses what type of debt firms should issue after they have decided how much to borrow. For example, Stohs and Mauer (1996) show that firms with a preponderance of short term assets tend to issue short term loans. Barclay and Smith (1995) also look at the determinants of the maturity structure of a firm's debt. They find that firms that have few growth options, are large or are regulated have more long-term debt in their capital structure. Shamshtein (2002) studied the determinants of leverage and debt maturity of Israeli industrial firms. It is also related to the literature that deals with the management of risk by corporations and hedging. The currency composition (local or foreign) of corporate debt in relation to a change in the exchange rate regime was studied by Martinez and Werner (2002), using data on Mexican firms before and after the shift from a fixed to a floating exchange rate in 1995. They find that, contrary to their expectations, after 1995 there was an increase in the share of foreign debt and that the only significant variable in explaining the share of FC credit after the crisis is the firm's share of exports. They also show that larger firms maintain a higher proportion of FC debt.

[3]Ber, Blass and Yosha (2001) found, looking at firm level data of publicly traded manufacturing firms in Israel, that the investment of exporting firms tends to be less affected by tight mnetary policy because they have better access to foreign currency debt.

The results of our empirical analysis show that firms do not face any practical barriers to accessing the FC credit market, and that the decision about the share of FC in total credit is consistent with the maximization of the firm's market value. Generally the share of FC depends on its relative price and on the currency, i.e., local currency or foreign currency, of income and expenses in the balance sheet. The most evident result is that the share of export income in the balance sheet has a significant positive effect on the share of FC debt, and that its influence has grown during the years of the sample, although not dramatically. We also find that the currency composition of FC credit has become more diversified through the years, with a decline in the share of dollar denominated debt, and that both real activity and financial considerations play a role in determining the currency composition of FC debt. In addition to the effect of the relative price of dollar debt, we find that firms with a larger share of exports tend to have less dollar debt, possibly because they are generally more sophisticated financially. As expected, the share of exports to the US is positively correlated with the share of dollar denominated debt.

The rest of the paper is organized as follows. In the next section we present a theoretical framework for the analysis of the composition of debt with regard to the share of FC debt in total debt. We examine this issue empirically in the third section, and the currency composition of FC debt in the fourth section. Section five concludes the paper.

2 Theoretical Framework

We assume that publicly traded firms want to maximize their market value. We also assume that firms choose the composition of their finance in two stages. First, the firm chooses between debt and equity, and given this choice, which we will assume is exogenous to our analysis, decides on the composition of the debt, particularly its currency composition.

We should first ask whether firms would be interested in matching their liabilities (in terms of currency or duration) with their assets or future cash flows. Firms that match their assets and liabilities are effectively hedging against currency risk. It is not inherently obvious, however, that publicly traded firms should be expending resources in order to insure against currency risk, since shareholders with diversified portfolios could presumably

organize their portfolios to insure against such risk. More generally, we should ask whether different mixtures of liabilities are likely to maximize market value. It is well known that Modigliani and Miller's Proposition I (1958) argued that capital structure is irrelevant (to value) as long as investment decisions are given. The MM Proposition, however, is premised on the existence of perfect capital markets. It is not clear however, that markets are perfect and that investment decisions are independent of financing. In particular, creditors might require investment decisions to be matched (currency-wise). Another possibility is that bankruptcy costs (or more accurately the costs of financial distress) are non-negligible in Israel and elsewhere. Indeed, if it were not for bankruptcy costs, a firm's value would increase with leverage, since corporate debt is accorded a tax shield (i.e. interest expenditures are deductible) whereas equity is not. According to this view, firms that do not match their assets and liabilities are more likely to become financially distressed. Financial distress is costly if it leads to the breakup of the firm. Moreover in financially distressed firms, conflicts of interest between lenders and shareholders are more likely to lead to opportunistic behavior. In such circumstances it would therefore be efficient for firms to match their assets and liabilities. As a simplifying assumption we assume that profit variability is a proxy for financial distress; our analysis is set up accordingly.

We assume that for a given composition of debt and equity, the firm's expected profits and their variability are sufficient to determine its market value. We assume that profit variability is at least in part "systematic" and so firms that experience higher profitability have higher β's and consequently higher required rates of return. Consequently, for a certain expected stream of profits, investors will always prefer less variability. This is because with higher variability profits are discounted at higher rates of return. Therefore, profit variability will enter the firm's objective function with a negative sign. The mean-variance approach is a common framework for analyzing the firm's decisions about the components of its balance sheet or activity when the maximization of its value is assumed to be its objective. This kind of general framework is presented, for example, in Stevens (1974), Kawai (1980) and Giraldi and Hamaui (1991). It is consistent with the maximization of the investor's utility if this utility is assumed to be quadratic or if all the probability distributions are normal.

The decision about the debt composition in relation to exchange-rate volatility or risk is associated with the term "exchange rate exposure", which is the "sensitivity of real domestic currency values of assets, liabilities, or operating incomes to unanticipated changes in exchange rates".[4] This exposure is usually broken down into two main components. The first one is economic exposure which is the sensitivity of the firm's value to exchange rate surprises, and it arises from the direct effect of exchange-rate changes on existing contracts with future cash flows and the indirect effect of changes in the exchange rate on the producer's and consumers' economic behavior. The second component is accounting exposure, i.e. the exposure of financial statements to exchange rates. An example of a theoretical analysis of this issue is that by Goswami and Shrikhande (2001), who show that the economic exposure of non-financial firms play an important role in their long-term debt financing choice. They also quote several recent empirical papers that examine this issue for some of the industrial countries. Similarly, Allayannis and Ofek (2001) show that S&P non-financial firms tend to use foreign currency derivatives and debt as the ratio of foreign total sales increases.

Assuming, for the sake of simplicity, that profits are uncorrelated over time, we can write the firm's objective function in terms of only one time period. The objective function V is therefore:

$$V = E(\pi) - bVar(\pi) \tag{1}$$

where the firm's profits are:

$$\pi = p_y Y + \sum_i s_i A_i - \sum_i (\alpha_i L) r_i - \sum_i q_i X_i. \tag{2}$$

p_y is the price of the good Y the firm produces, s_i is the yield on asset A_i, L is the total debt, α_i is the relative weight of liability i, with the cost of r_i, and q_i is the price of input X_i. We consider here only the optimization of α_i, assuming the decisions about production and the total stock of assets and liabilities are independent of the structure of the debt. At the beginning of each period, when the firm decides on the composition of its liabilities, prices are still unknown and are therefore regarded as random variables,

[4]Quoted from Levi (1990) in Friberg (1999), where an extensive discussion of this issue may be found.

with their expectation and variance known to the firm. We also assume that the firm is a price taker in all markets, including the credit market.

The price of each type of credit the firm demands, is endogenous and is determined by the lender[5]. We assume the lender may differentiate between borrowers according to their characteristics, namely their risk and the elasticity of their demand, so that the price of credit the firm faces may be written as:

$$r_i = c_0 + c_1\overline{r} + c_2(bs\_risk) + c_3(cur\_risk) + \varepsilon_i \tag{3}$$

r_i, the interest rate on type i credit (to the firm) is a function of the risk-free interest rate in the market, $\overline{r}$, the business risk of the firm, bs_risk, and the currency risk, cur_risk, associated with credit to the specific firm. Because the business risk is the same for all types of credit, we may ignore this term when considering the credit structure, i.e. the share of different types of credit the firm demands, given the total volume of credit. The expectation of the credit cost, μ_{r_i} is equation (3) excluding the noise ε_i.

Substituting (2) into (1) the firm's problem is to maximize V by choosing the α_is, under the condition that their sum equals unity. As we are only interested in one of the α_is, (that of FC debt) we omit the Lagrange multiplier and get:

$$\begin{aligned} V \;=\; & \left(Y\mu_{p_y} + \sum_i A_i\mu_{s_i} - \sum_i L\alpha_i\mu_{r_i} - \sum_i X_i\mu_{q_i}\right) \\ & -b\left(Y^2\sigma^2_{p_y} + \sum_i A_i^2\sigma^2_{s_i} + \sum_i L^2\alpha_i^2\sigma^2_{r_i} + \sum_i X_i^2\sigma^2_{q_i}\right) \\ & -2b\left((Y\sum_i A_i\sigma_{p_y,s_i} - YL\sum_i \alpha_i\sigma_{p_y,r_i} - Y\sum_i X_i\sigma_{p_y,q_i}\right) \\ & -2b\left(-L\sum_i\sum_j A_i\alpha_i\sigma_{s_i,r_i} - \sum_i\sum_j A_iX_i\sigma_{s_i,q_i} + L\sum_i\sum_j X_i\alpha_i\sigma_{r_i,q_i}\right) \end{aligned} \tag{4}$$

Where for any price z, (yield or cost) μ_z is its expectation, σ^2_z=$Var(z)$

[5]We assume, for simplicity that the price of a unit of credit does not depend on the quantity the firm chooses to borrow. This maybe reasonable as long as the volume of credit does not exceed some threshhold.

and $\sigma_{v,z}$=$Cov(v,z)$. The optimal share of debt of type i, α_i, is attained by equating to zero the following expression.

$$\frac{\partial V}{\partial \alpha_i} = -L\mu_{r_i} - 2b\left(\alpha_i L^2 \sigma^2_{r_i}\right) - 2b(YL\sigma_{p_y,r_i} + L\sum_j A_j\sigma_{s_i,r_i} - L\sum_j X_j\sigma_{q_j,r_j}) = 0 \quad (5)$$

and we get:

$$\alpha_i = \frac{-\mu_{r_i}}{2bL\sigma^2_{r_i}} + \frac{1}{L\sigma^2_{r_i}}\left(Y\sigma_{p_y,r_i} + \sum_j A_j\sigma_{s_j,r_i} - \sum_j X_j\sigma_{q_j,r_i}\right) \quad (6)$$

Incorporating the supply side, substituting for μ_{r_i} according to equation (3) we get:

$$\alpha_i = \frac{-(c_1\overline{r} + c_3(cur\_risk))}{2bL\sigma^2_{r_i}} + \frac{1}{L\sigma^2_{r_i}}\left(Y\sigma_{p_y,r_i} + \sum_j A_j\sigma_{s_j,r_i} - \sum_j X_j\sigma_{q_j,r_i}\right) \quad (7)$$

As expected, a higher cost μ_{r_i} of type i debt will result in a smaller share of this debt in total debt, in order to increase expected profits. Higher costs may be a result of a higher basic risk-free interest rate, or because of higher currency risk associated with this credit, at least as it is perceived by the lender. It is reasonable to assume that in addition to the effect of macro variables, like the variability of the exchange rate, the firm-specific component of the cur_risk is highly correlated with the covariance of this credit's cost with the firm's income and expenses, as is described hereinafter.

Assuming that the share of type i debt is positive, a higher variability of its cost will tend to reduce its share in the debt in order to reduce the variability of profits. A higher correlation between the cost of this debt and the firm's output price, σ_{p_y,r_i}, will increase α_i. A higher correlation between the expected cost μ_{r_i} and the yield on asset j, and lower correlation with the price of input j, increase α_i. In other words, firms will tend to reduce

debt with a cost that is positively correlated with their other expenses and negatively correlated with their other revenues. If the correlation between the yield on asset A_j and the expected cost μ_{r_i} is positive, a larger stock of this asset in the firm's balance sheet will increase α_i, if it is negative, α_i will decrease with A_j. In the same manner, (but in opposite directions) – higher values of an input X_j increase α_i when $\sigma_{q_j,r_i} < 0$, and decrease it when the correlation is positive. All these correlations have a direct effect on the firm's decision, as seen in the term in the large brackets, and an indirect effect by influencing the currency risk of the firm, as it is seen by the lender, and therefore the cost of this credit.

Our interest is in studying the share of foreign-currency debt in the firm's total debt. The expected cost of this kind of debt depends on the interest rate in FC terms and on the expected evolution of the exchange rate - the latter contributing the major part of variability and uncertainty to the cost of this kind of debt. According to the above analysis, firms that produce tradeables and are exporters, or more generally, the added value of their products is linked to FC, observe a positive correlation between their revenue and the cost of FC debt. Therefore, the larger the ratio of exports is in those firms' total sales, the larger will be their share of FC debt. Firms with more assets that yield revenues that are exchange-rate dependent (e.g. equipment and machinery) will tend to have a higher proportion of foreign-currency debt. Moreover, firms with a larger share of local-currency expenditures (e.g. salaries or managerial expenses), which are less correlated with the exchange rate are expected to have a larger proportion of this kind of debt. All these considerations of the firm will also be part of the lender's assessment of the firm's financial risk associated with FC debt and will influence the price of FC debt offered to the firm. Their effect on the supply side is in the same direction as the effect resulting from the firm's considerations, and therefore even if empirically we will not be able to separate the demand side effects from the supply side effects, we can learn about their mutual effect on the share of FC debt in total debt.

If the suggested theoretical model is not valid for the firms that we study, the correlation between the structure of a firm's revenues and expenditures, or liabilities and assets and the share of FC credit it chooses to have will be low. For example, firms which that do not export might engage in foreign currency speculation for reasons of moral hazard in order to expropriate

bank wealth but not to minimize profit variability. Thus, if the transaction provides a gain, the shareholders (and only the shareholders) gain, but if the transaction fails, then the banks share in the losses. The empirical investigation will allow us to check the validity of our null hypothesis.

3 Empirical Analysis

3.1 The Data

The data are collected from two sources. Most of the data were compiled manually from published annual balance sheets (financial statements) of manufacturing firms, and include mainly information about firms' debt structure by currency, duration and type. The remaining data are taken from financial statements, mostly from a *Compustat*-type data base ("Dukas") compiled by the TASE from annual reports and including information such as the share of foreign sales in overall sales.

	Unindexed		**CPI indexed**		**Foreign Currency ***		**No. of firms**
	A	B	A	B	A	B	
1993	35.6	34.4	26.9	18.3	37.4	47.3	190
1994	34.7	37.3	25.1	18.2	40.1	44.4	204
1995	30.8	32.6	22.2	16.3	47.0	51.1	205
1996	30.3	31.5	19.1	14.3	50.5	54.1	200
1997	33.2		20.5		46.3		208
1998	32.1		22.7		45.2		201
1999	39.4		19.2		41.4		174
2000	41.0		19.2		39.8		164
Total	34.4		22.0		43.6		1,546
* In foreign currency and indexed to foreign currency.							

Table 1: A: Micro-data: Loans to firms in the sample, excluding loans with unknown indexation and bonds (Average share in total debt, by firm), B: bank loans to the manufacturing sector according to the Supervisor of Banks, by currency (share in total), and number of firms in our sample.

The gross database we use includes 1546 observations for the years 1993-2000, about 200 observations/firms per year. It represents all the publicly traded manufacturing firms, listed on the TASE[6], and accounts for roughly

[6] We omit from our analysis industrial holding companies and firms with negative equity.

35% of sales of all manufacturing firms in Israel. The publicly traded firms are not an unbiased sample of all manufacturing firms in the economy as a-priori, they are expected to be the larger and more sophisticated firms. If we find that these large firms do not behave according to the economic considerations described above, we may assume that smaller, private firms as well do not behave according to our hypothesis. On the other hand, if we find that the publicly-traded firms act according to our hypothesis we cannot immediately conclude that smaller firms' economic behavior is identical and our findings should therefore be considered generally valid only to this sector of firms we analyze, which in itself is an important component of the manufacturing sector and the business sector as a whole.

Industry	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
No. of firms in 1993	25	22	36	55	14	34	19	205
Average age in 1993	29.3	29.0	27.1	18.0	30.7	31.7	24.4	25.9
No. of firms in 2000	47	14	25	49	8	29	16	188
Average age in 2000	32.7	36.6	32.2	27.0	34.8	38.3	31.7	32.3
Balance sheet $^{+}$in 2000	315.6	272.5	168.6	508.6	273.8	1342.6	174.4	481.0
Ratio of sales' costs$^{\#}$	0.15	0.13	0.05	0.09	0.09	0.11	0.06	0.10
Ratio of management costs$^{\#}$	0.10	0.07	0.08	0.09	0.09	0.08	0.08	0.09
Ratio of inputs costs$^{\#}$	0.56	0.49	0.44	0.33	0.33	0.38	0.44	0.42
Ratio of wage costs$^{\#}$	0.11	0.16	0.15	0.16	0.12	0.10	0.16	0.14
Ratio of export income$^{\#}$	0.15	0.44	0.12	0.29	0.02	0.27	0.09	0.22
% firms w/ forex credit >0	0.78	0.76	0.75	0.73	0.71	0.75	0.77	0.75
% FC in total credit - total	0.31	0.39	0.33	0.44	0.16	0.47	0.29	0.37
in exporting firms	0.32	0.46	0.47	0.47	0.24	0.55	0.28	0.45
in non-exporting firms	0.30	0.26	0.23	0.38	0.14	0.25	0.29	0.28
in small firms **	0.25	0.36	0.28	0.37	0.15	0.35	0.30	0.32
in large firms	0.34	0.41	0.40	0.52	0.16	0.56	0.28	0.42

1=food, 2=textiles, 3=steel, 4=electronics, 5=building materials, 6=chemistry, 7=wood.
* If not specified, data are the average for 1993-2000.
+ Balance sheet value in 2001 millions of real shekels.
# Ratios are relative to total balance sheet value.
** small firms - balance sheet less than 100 million 2001 real shekels.

Table 2: Some data statistics

The average size of a firm, measured by the size of its balance sheet, varies between industries, from an average of NIS 169 million (in real 2001 terms) in the steel industry, to about NIS 1.3 billion for firms in the chem-

istry industry.[7] Firms in the electronics industry are the youngest, with an average age of about 27 years in 2000, while chemistry firms are on average 38 years old (Table 2). Management costs, sales costs, and wage expenditure are a relatively small ratio of the balance sheet and do not vary much between the industries. Expenditure on raw materials (inputs) constitute as much as 42 percent of the balance sheet on average and are relatively low in the building materials and electronics industries, and about double the size in the food industry. Export volume is about 44% of the balance sheet (and about the same ratio in income - not shown in the table) in the textile industry, 26-29% in electronics and chemistry, and negligible, as expected, in the building materials industry.

The proportion of firms in each industry that have some amount (greater than zero) of FC debt is about 0.75 and is not statistically different between industries. However, the share of FC credit in total credit was found to be (statistically) significantly different between industries[8]. As expected, in the building materials industry its share is lower than in the other industries. Foreign currency credit is about 40-50 percent of total credit in the electronics and chemistry industries which are considered to be high-tech industries and have a large share of exports in their sales. The ratio of foreign credit is about 40% in the textiles industry too, where income from exports accounts for a relatively large share of the balance sheet. The high and similar rate of exposure to FC but the varying proportion of this credit in total credit between the industries may suggest that firms are not constrained and can participate in the FC credit market and choose the volume of FC debt according to other considerations and characteristics of their activity. The analysis in the next section confirms this view. The table also shows that in almost all industries exporting firms and larger firms tend to have more FC debt.

A closer look at the percentage of FC credit in total credit in each firm reveals a U-shape distribution - a relatively larger weight at the extreme points with a very low or very high proportion of FC credit, and apart from these extremes a uniform distribution. (Table 3)

[7]The average exchange rate in the period 1993-2000 was 3.43 NIS/Dollar.

[8]Including firms without foreign currency debt.

Proportion	Percentage
0	26.9
0-0.2	18.4
0.2-0.4	12.6
0.4-0.6	10.8
0.6-0.8	10.7
0.8-1	20.5

Table 3: Distribution of ratio of foreign currency credit in firms

3.2 Preliminary Tests

3.2.1 Accessibility of firms to foreign currency credit

Table 2 shows that over 70 percent of the firms have some FC liabilities. Moreover, only 4 percent of the firms had no FC credit during the 8 years of our sample. (10 percent of the firms had FC debt during 2 years or less of the sample). On the other hand, about 55 percent of firms had some FC credit during all these years. This suggests that this credit was accessible for most firms, but not all firms choose to include it in their portfolio. In order to learn what differentiates firms that chose to hold FC debt from other firms, we look at various characteristics of the firms in our sample according to this grouping, and check for the existence of a statistical difference between them. We use the t-test statistic, assuming a possibility of different variances between the 2 groups. The results are presented in Table 4.

	No foreign currency credit	Some foreign currency credit	P-value for no difference
Balanace sheet *	232.0	426.1	0.000
% Sales costs #	0.098	0.097	0.851
% Management costs #	0.085	0.086	0.911
% Input costs #	0.406	0.421	0.448
% Wage costs # +	0.124	0.142	0.001
% Export income #	0.140	0.248	0.000
Dummy for R&D	0.200	0.281	0.000
* Millions, real 2001 new shekels + Wage costs refer to wages paid to production workers and not sales and management personal. # Ratios are relative to total balance sheet value.			

Table 4: Firms with and without foreign currency credit

The table reveals that there are some differences between firms which do and do not have FC credit (in a given year). A higher proportion of firms which are larger, have high wage costs, and greater share of export income has some FC debt. We also checked whether there is a significant difference in the proportion of firms which do not have any FC credit between the 7 different industries and between the years. For both classifications - by industry or date - the test indicates that there is no significant difference with a P-value of about 0.6-0.7.

We conclude from this analysis that a preferred specification is a general one, which includes zero FC credit with other positive ratios of this credit as an outcome of a decision about the amount of foreign credit which is dependent on the same variables as a decision on some positive amount of this credit.

3.2.2 The composition of expenditures

Some of the main variables are expected to have an effect on the composition of debt are those describing the distribution of expenditures. As was shown above, we assume that a larger share of local-currency oriented expenditures will induce a higher share of FC debt. Similarly, FC oriented expenditures will tend to decrease the share of this debt. Before attempting to include these variables in our estimation we check the simple correlation between these variables, the correlation with the share of exports in the balance sheet and the correlation with the share of FC debt in total debt. The results are presented in Table 5.

	Management costs *	Raw Mate--rials costs *	Wage costs *	Export income *	Foreign curr--ency debt **
Sales costs *	0.301	0.098	-0.096	0.122	-0.028
Management costs *		0.112	0.366	0.011	-0.052
Raw materials costs *			0.063	0.039	-0.069
Wage costs *				0.179	0.055
Export income *					0.386
* Ratio of total balance sheet. ** Ratio of total debt.					

Table 5: The correlation between expenditures, exports and foreign currency debt, all firms and years (1037 obs.)

Share of FC	1993	1994	1995	1996	1997	1998	1999	2000
in total credit	0.31	0.33	0.41	0.43	0.40	0.40	0.35	0.34
in exporting firms	0.38	0.39	0.49	0.52	0.48	0.48	0.42	0.44
in non exporting firms	0.23	0.26	0.32	0.32	0.31	0.29	0.24	0.20
in small firms *	0.26	0.29	0.39	0.40	0.38	0.32	0.23	0.19
in large firms	0.37	0.39	0.44	0.46	0.42	0.46	0.42	0.41
* small firms - balance sheet less than 100 million 2001 real shekels.								

Table 6: Share of foreign currency credit in total credit, by date, export and size

It is very clear from the table that export income and FC debt are highly correlated, and that the correlation between FC debt and different expenditures is very low. We also find that higher management costs (as a ratio of the balance sheet) are correlated with higher sales costs and wage costs. In addition, wage costs and expenditure on raw materials are negatively correlated. These results hint that the fuller econometric analysis may show that the composition of expenditures does not significantly affect the rate of FC debt. Due to the high correlation between the different expenditures we can expect to include only a partial set of these variables in our regression, if at all.

3.2.3 Macroeconomic variables (or time trend)

As the macroeconomic background is shared by all firms in all industries, looking at the variability of the share of FC over time may indicate the effect of macro variables.

Table 6 shows a general trend of increase in the share of FC in total credit until 1998. This is true for all firms, whether exporting or non-exporting firms, large or small. This kind of preliminary examination overlooks other factors that may affect the decision about the share of FC, and does not identify what has changed through the years, but it may still be supposed that two major macroeconomic developments have affected this ratio. The first is the process of liberalization which took place during those years, with the easing of restrictions on foreign currency transactions. The second development is the tightening of monetary policy with the adoption of inflation targeting. Real short-term interest rates rose from negative values to about 6 to 7 percent in 1998-2000. As a result, the interest rate differential

Variable	Expected sign	Underlying assumption
Export share	+	Exports are denominated in foreign currency
Raw material intensity	-	Raw material prices are positively correlated with exchange rate
Marketing and General Expenses	+	Expenses in local currency - proxy for high added value.
Fixed capital	+/-	Machinery tends to be imported, so that collateral values are tied to FC. Conversely rental values are tied to FC. (See comment on raw materials).
Leverage	+	Likelihood of financial distress is high - the benefits of FC are enhanced.
R&D intensity	+	Proxy for future export earnings. See comment on Marketing and General Expenses.

Table 7: Summary of a-priori expected signs of coefficients

between local and foreign borrowing widened[9].

3.3 The estimation

We have shown in the previous section that FC debt is expected to be positively correlated with FC income and assets and local currency expenditures and liabilities. It is expected to be negatively correlated with FC expenditures and liabilities and local currency income and assets. Table 7 summarizes our a-priori expectations as to the signs of the coefficients as they related to risk reduction. We test these hypotheses empirically, using our micro-level data set.

We estimate the proportion of FC debt in the total (financial) debt of a firm. Other types of financial debt are in local currency – indexed to the CPI or non-indexed. As our data is bounded between 0 and 1, we transform our dependent variable - the share of FC credit (X) - to a logarithmic ratio

[9]The (expected) cost of foreign currency credit includes the expected change in the exchange rate.

$\ln\left(\frac{X}{1-X}\right)$which is unbounded $(-\infty, +\infty)$, and estimate a panel data (cross-sectional time-series) random effects model[10]. The estimation results are presented in Table 8.

The clearest and most noticeable effect seen in our results is the tendency of exporting firms to hold more FC debt. The effect of the share of exports on the ratio of FC debt increases through the periods observed. According to the specification chosen, this tendency increases by about 0.2 percentage points between the two sub-periods 1993-1994 and 1995-2000 for a firm with FC debt ratio equal to the sample mean (0.37).[11] This result indicates that as the capital account liberalization progresses, firms increase their reliance on FC debt, relative to their export share.[12] This effect is beyond the possible effect that liberalization might have on the relative price of FC debt, which is included as a separate explanatory variable.

As was already indicated by the simple correlation tests, the variables describing the structure of the firm's expenditures (wages, management, raw materials and sales expenditures) were found to be insignificant. Firms with more fixed capital relative to the size of their balance sheet will tend to rely more on FC debt. This is in accordance with our model if, as it is reasonable to assume, fixed capital is principally a tradable good, whose price will depend, among other things, on the exchange rate, and is consistent with the collateral explanation. (See Table 7) . Firms that have more equity (as a proportion of their balance sheet will tend to rely less on FC. Firms that pay more dividends (as a proportion of their balance sheet) will tend to rely more on FC debt[13]. We found that smaller firms, as indicated by the size of their balance sheet, or by a dummy variable indicating a small firm, have a smaller share of FC credit[14]. The logarithmic specification of the firm's size indicates a non-linear effect of the size of the firm on its debt

[10]Using the XTREG procedure of the STATA software.

[11]Due to the Logit specification, the effect of a change in an explanatory variable on the ratio of FC debt depends on the value of the dependent variable and is symmetric around the middle value 0.5 of the dependent variable. If $\log(\frac{x}{1-x}) = a_0 + a_1 y$, where x is the FC debt ratio, $\frac{\partial x}{\partial y} = a_1 x(1-x)$.

[12]This anticipated result of a positive relationship between exports and FC credit was also found in a similar analysis for Mexican firms conducted by Lobato, Pratap and Somuano (2003).

[13]It could be that dividend payments are a proxy for high liquidity and cash flow stability and therefore reflect mitigated FC risk.

[14]This finding, of a positive correlation between the size of a firm and the share of FC credit was found by Benavente, Johnson and Morandé (2003) for Chile and by Lobato, Pratap and Somuano (2003) for Mexico.

	Estimation Results				Transformed coeff.
	1	**2**	**3**	**4**	**4***
Constant	-1.75	-7.78	-2.75	-3.74	-0.88
i_data	7.58	7.24	10.89		
if_data	-28.77	-25.45	-18.41#		
i_data-if_data				12.31	2.88
dbasket	0.41+				
exp_ income_bs	1.97	2.03			
export_income_bs*d9394			1.13	1.40	0.33
export_income_bs*d9500			2.24	2.16	0.51
fixed_ capital_bs		2.75	2.40	2.40	0.56
equity_bs			-1.19	-1.07#	-0.25
dividend_bs		1.83+			
log(balance_sheet)		0.46			
dum_small			-0.57	-0.54	-0.13
value/capital		-0.11	-0.08	-0.08	-0.02
dum_R&D			0.86	0.82	0.19
d_building_materials		-2.11	-1.77	-2.00	-0.47
d_chemistry			0.96	0.88	0.21
no. of obs.	1615	1525	1546	1546	
no. of groups	259	253	255	255	
R^2 within	0.009	0.028	0.028	0.025	
R^2 between	0.132	0.204	0.261	0.262	
R^2 overall	0.088	0.126	0.155	0.155	

Insignificant in 5%. + Insignificant in 10%.

_bs - The variable as a ratio of the total balance sheet value.
i_data - local currency average rate in data on non-indexed short-term bank credit by year and industry; if_data - average FC interest rate in data, by year and industry; d9394 - Dummy variable = 1 for 1993-1994; d9500 - Dummy variable = 1 for 1995-2000; dum_small - Dummy var. =1 for firms with balance sheet up to 1 mill. NIS (2001 prices) dum_R&D - Dummy var.=1 if R&D expenditures greater than 0.
* For a firm with the sample mean ratio of FC/debt (0.37).

Table 8: Share of foreign currency debt in total debt

composition. A possible explanation may be that larger firms have better access to the international market and the foreign banking market. However, this argument is only partially relevant because a large proportion of the FC taken by the business sector in these years was from local banks. Firms with high market equity ratios will tend to hold less FC debt. Firms that perform R&D, as indicated by a dummy variable for positive R&D expenditures, hold more FC debt. The mean value of this variable is significantly higher in the electronics industry and may therefore be interpreted as a dummy variable for the electronics industry, which is expected to have a higher ratio of its earnings and/or expected earnings in- or linked to foreign currency. It should be noted that the effect of the R&D variable is significant although the export earnings ratio is also included as an explanatory variable. The only industry dummy variable which was significant is for the building materials industry which, has a much lower rate of FC credit than other industries. (Table 2). Again, this variable contributes to the estimation above and beyond the export ratio variable. Other explanatory variables we tested and found to be insignificant were the age of the firm and a dummy variable for the geographic area.

The firm's decision as to which kind of debt to choose, given the structure of its income and expenses, will also depend on the relative price of each kind of debt. We represent the price of local currency and FC credit using the interest rates the firms in our sample actually paid. In order to avoid possible endogeneity of this price, for each firm each year, we included in the regression the average FC interest rate over all firms in the same industry branch in that year. Table 9 presents the average sample interest rates and the aggregate macro-economic figures. As shown in the table, the level and the evolution over the years of the sample interest rates are different from the macroeconomic data for the Israeli economy. Several reasons may explain this.

First of all, our sample contains only a specific fraction of the business sector - publicly traded manufacturing firms. It is reasonable to assume that the prices these firms face will differ from the average price in the market (which includes all firms and households). Second, the interest rate we see in our sample is the average price on the stock of debt the firms hold, which is different from the simple average over the year of the price of new debt of the same type. According to our estimation the interest-rate differential

	Unindexed		**CPI indexed**		**Foreign currency**	
	Sample	Macro	Sample	Macro*	Sample	Macro**
1993	0.132	0.165	0.049	0.030	0.052	0.045
1994	0.167	0.174	0.047	0.031	0.059	0.046
1995	0.158	0.202	0.048	0.043	0.047	0.053
1996	0.157	0.207	0.045	0.046	0.050	0.046
1997	0.147	0.187	0.047	0.041	0.049	0.049
1998	0.150	0.162	0.053	0.051	0.046	0.049
1999	0.122	0.164	0.062	0.056	0.052	0.045
2000	0.098	0.129	0.056	0.060	0.053	0.055
* 5-year yield on CPI indexed government bonds. ** Currency basket weighted 3-months Libid.						
Source of macro-data: Bank of Israel Annual Reports.						

Table 9: Cost of credit, by currency according to sample and to Macro-data

between local and FC debt is significant with the expected positive sign. In addition to the interest rate differential, the cost differential depends on the (expected) rate of the change in the exchange rate. However, the ex-post depreciation rate of the Shekel vs. the dollar or vs. the currency basket entered the regression with the wrong positive sign and was insignificant, and so it was omitted from the specification. It is apriori clear that including an indicator for the expected change in the exchange rate is very problematic. Although it is reasonable to assume rational expectations, we know that in practice the deviations of actual rate of change in the exchange rate and the expected rate are large and therefore the actual depreciation could not serve as a good indicator of the firm's considerations when deciding on the structure of its debt.[15]

The results suggest that there is substitutability between FC debt and local currency debt and that firms react to changes in relative prices in their debt structure. Because the dependent variable is specified in relative terms (the ratio of FC debt to total debt), we cannot identify whether the increase in this ratio results from an increase in FC debt with or without a fall in the volume of local currency debt, or whether this is the result of a

[15]We also tried to include the lower slope of the exchange rate band as a different proxy for expected devaluation, but it also was insignificant. The interest differential between CPI indexed and FC debt was insignificant in several alternative specifications. In order to represent, to some extent, the volatility or uncertainty of the exchange rate we tried to include the actual standard deviation of the exchange rate during the year - but with no success.

decline in local currency debt with no change in the FC debt. In addition, we cannot know to what extent the firm's total debt reacted to a change in local interest rates, or monetary policy.

Still, we can learn from our results that the transmission of monetary policy is only partial because firms react to changes in relative prices of debt in alternative currencies. As the liberalization process progressed, against the background of exports being the major growth engine of the economy, this substitutability between local and foreign currency debt was enhanced.

4 Choice of Currency

The analysis of the *currency* composition of the foreign currency debt a firm chooses to hold is similar and parallel to the approach we employed when we discussed the share of foreign currency debt in the total debt. Because a firm acts to minimize the variance of its profits, we will expect the share of dollar currency to increase, as its relative cost declines. We will also expect it to be positively correlated with dollar denominated income and negatively correlated with dollar denominated expenses. Before estimating the contribution of these considerations to the currency composition, we show some simple statistics concerning the composition and cost of the debt and the composition of exports.

4.1 Some statistics

Table 10 shows that the proportion of dollar denominated debt (in local currency terms) declined during the sample years, while debt in all other currencies (including "other" - which is debt in known currencies other than the seven specified in the table) has grown. Most impressive are the changes in the share of Swiss franc debt to more than 10 percent of total foreign currency debt in 1998 and the increase in the share of Yen denominated debt in reaction to the very low interest rates on this currency.

According to Table 11 the percentage of firms (per year) not holding dollar denominated debt grew over the period, while the share of firms holding only dollar debt shrank. Table 12 shows that the nominal interest on the stock of dollar debt has risen during most of the period relative to its 1993 level, while the interest rates on European currency credit, excluding the pound, declined significantly.

	Dollar	Pound	German Mark	French Franc	Swiss Franc	Euro	Yen	Other	obs.
1993	.864	.020	.112	.001	.001		.0004	.001	71
1994	.879	.015	.084	.002	.000		.018	.001	85
1995	.825	.020	.091	.008	.011		.031	.014	98
1996	.822	.018	.076	.015	.020		.038	.011	104
1997	.762	.043	.073	.025	.055		.031	.010	103
1998	.659	.042	.105	.031	.121		.025	.017	101
1999	.773	.042	.049	.021	.034	.011	.041	.010	80
2000	.715	.038	.054	.004	.011	.032	.100	.010	73

Table 10: Distribution of foreign currency credit (In local-currency terms) for firms that fully specify currencies of debt.

	No dollar debt	Only dollar debt	Total no. of obs.
1993	5.2	49.0	96
1994	3.7	56.0	109
1995	4.8	49.2	126
1996	6.2	53.5	129
1997	6.8	42.9	133
1998	8.9	35.0	123
1999	7.3	44.8	96
2000	13.5	41.6	89
Average	6.9	46.5	901

Table 11: Proportion of firms with zero or only (more than 99 percent) foreign currency debt)

In order to evaluate the relative cost of debt in each of the currencies which was relevant at the time of the decision on the currency composition we need to know what the ex-ante expectations were for changes in the exchange rate. However, we do not have this information, certainly not for the individual firms. Alternatively we may examine the cost ex-post, which is the multiplication of the gross interest rate and exchange rate depreciation (vis-a-vis) local currency during the year[16]. It is very clear that in 1995-1997 for the Yen and in 1996-1997 for the Swiss franc, the increase in the share of these currencies in the foreign currency debt was consistent with their relatively low cost, which apparently was expected by the firms. The increase in the share of the pound and French franc denominated debt is

[16]We used the average exchange rate for December each year, although the balance sheet is in terms of a single day - December 31^{st}.

	Dollar	Pound	German Mark	French Franc	Euro	Swiss Franc	Yen
1993	.057	.080	.077	.090		.062	.049
	78	10	24	4		3	1
1994	.068	.081	.074	.074		.060	.031
	101	9	26	4		3	4
1995	.069	.078	.060	.075		.033	.017
	115	12	28	6		5	8
1996	.068	.083	.052	.046		.039	.018
	118	12	29	5		8	10
1997	.071	.080	.055	.048		.033	.033
	113	15	27	11		14	13
1998	.069	.081	.054	.045		.030	.020
	107	16	36	15		28	13
1999	.070	.070	.044	.049	.042	.037	.023
	89	15	21	9	12	14	9
2000	.076	.065	.065	.058	.055	.050	.015
	76	11	17	5	16	10	12

Table 12: The average interest rate on foreign currency credit (no. of observations in smaller font)

not justified by the ex-post cost of this debt. (Table 13).

The decline in dollar denominated debt and increase in other currency debt cannot be primarily accounted for by the change in the geographical distribution of goods exports, which, as Table 14 shows, was fairly stable during those years[17]. In particular we looked at the proportion of sales to America[18] and the proportion of dollar debt, and the proportion of sales to the far east in relation to yen denominated debt (Table 15)[19]. As the table shows, there does not exist a strong positive correlation between the real activity of the firm - the destination of its exports - and the currency distribution of its debt. Table 16 shows a positive but low correlation between

[17]We cannot check the change in export distribution in our sample because for these firms we only have information on the distribution of exports only in years in which the firm issued stock and published a prospectus. There is a possibility that the macroeconomic data shown in Table 14 do not accurately represent the conduct of the firms we examine, and that actually there was a siginificant change in the export distribution of these firms.

[18]Includes the US and other countries in America. See Table 14.

[19]We have information on the exports by destinations only for the year corresponding to the IPO (Initial Public Offering). Therefore the data on exports is constant for all the years we analyze. Based on Table 14 we assume that the distribution of exports in our sample did not vary significantly during 1993-2000.

	Dollar	Pound	German Mark	French Franc	Euro	Swiss Franc	Yen
1993	.164	.144	.098	.107		.136	.304
1994	.087	.144	.184	.176		.183	.145
1995	.103	.100	.198	.214		.222	.037
1996	.121	.228	.026	.040		-.042	-.043
1997	.155	.163	-.007	-.004		.027	-.022
1998	.264	.287	.327	.313		.290	.333
1999	.074	.038	-.095	-.091		-.106	.173
2000	.047	-.061	-.081	-.087	-.090	-.042	-.096

Table 13: Ex-post cost of credit (Interest rate+actual exchange rate depreciation)

	USA	America -other	Europe	Japan	Asia other	Other
1993	0.27	0.04	0.42	0.02	0.08	0.16
1994	0.27	0.05	0.41	0.03	0.09	0.15
1995	0.26	0.05	0.46	0.03	0.10	0.10
1996	0.26	0.05	0.46	0.03	0.11	0.09
1997	0.26	0.06	0.45	0.03	0.11	0.10
1998	0.27	0.06	0.45	0.02	0.09	0.11
1999	0.27	0.06	0.44	0.03	0.10	0.12
2000	0.30	0.05	0.39	0.02	0.14	0.10

Table 14: Geographic distribution of goods exports (excluding diamonds). Source: Bank of Israel Annual Report, 1999.

the destination and the currency of debt - 0.3 for America and Europe, and only about 0.1 for the Far East.[20]

The simple statistical analysis in the above tables supports the notion that changes in the currency distribution of foreign currency debt is not due mainly to changes in the real activity of the firms, but rather to financial considerations. In particular, it is reasonable to assume that interest rate differentials are a major consideration. The financial liberalization and the increasing sophistication of firms regarding the management of their debt, which was evident in the increase in the share of currencies other than the dollar in the composition of foreign currency credit, were also significant.

[20] A study by Einy (1997) shows that the share of dollar denominated exports is much higher than the share of exports to the US. (See Tables 1 and 2 there).

Industry	Prportion of sales to America *	Proportion of dollar debt	Proportion of sales to far east *	Proportion of Yen debt
1	0.247	0.716	0.124	0.063
2	0.410	0.659	0.093	0.012
3	0.443	0.733	0.000	0.043
4	0.551	0.829	0.036	0.034
5	0.020	0.841	0.000	0.013
6	0.391	0.666	0.011	0.024
7	0.477	0.710	0.000	0.006
Average	0.428	0.735	0.041	0.032
1=food, 2=textiles, 3=steel, 4=electronics, 5=building materials, 6=chemistry, 7=wood * Data is available only for the year corresponding to IPO.				

Table 15: The proportion of sales to America and the Far East and the proportion of dollar and yen debt out of foreign currency debt

Export destination *	America	Europe	Far East
Dollar	0.261		
European ˆ	-0.251	0.307	
Yen	0.066	-0.071	0.041
* Data is available only for the year corresponding to IPO.			
ˆIncludes English Pound, German Mark, French Franc, Euro (from 1999) and Swiss Franc.			

Table 16: Correlation between distribution of export destinations and foreign credit currency

4.2 Estimation

We estimate the effect of economic factors on the proportion of dollar denominated debt in the foreign currency debt a firm holds. We chose to look at the dollar debt for two reasons. The first is that this debt constitutes on average more than 3/4 of the foreign currency a firm holds. The second reason is technical. Not all firms specify the full currency composition of their foreign currency debt, but more firms specify the amount of dollar debt even if they do not specify the currency composition of the rest of the debt. Therefore, we may include these firms in our sample although we do not have full information about the currency distribution of their debt[21].

[21] About a quarter of the firms specify only the dollar denominated share of their foreign currency debt.

	Estimation Results					Transf. coeff.
	1	**2**	**3**	**4**	**5**	**2***
Constant	7.21	7.39	5.99	3.45	341.1	1.44
ddol_dbasket	-0.06^{+}		-0.05^{+}			
int_dol	-78.74$^{\#}$	-79.53$^{\#}$				-15.50
int_dol_mar			-16.72$^{\#}$	-19.12		
std_ddol		-5.54		-6.24	-4.29	-1.08
date					-0.17$^{\#}$	
fixed_capital_bs				2.52$^{\#}$	2.48$^{\#}$	
raw_materials_bs			-0.52^{+}			
export_income	-1.94	-1.25	-1.43		-0.68^{+}	-0.244
salary_expend_bs				-4.20	-3.82	
R&D_expend_bs				11.88^{+}		
export_share_america	2.34	2.80				0.545
log(age)			-0.80			
total_debt_bs			0.03			
dum_electronics	2.34	2.21	1.14^{+}	1.41$^{\#}$	1.94	0.430
dum_chemistry				-1.76	-1.54	
dum_wood		-2.85				-0.556
no. of obs.	281	229	779	646	643	
no. of groups	59	58	176	174	174	
R^2 within	0.010	0.020	0.037	0.049	0.051	
R^2 between	0.278	0.307	0.027	0.091	0.069	
R^2 overall	0.177	0.233	0.059	0.092	0.095	
# Insignificant in 5%. + Insignificant in 10%.						
_bs - As a ratio of the total balance sheet value. ddol_dbasket - (change in dollar-shekel exch.rate)/(change in basket-shekel exch.rate); int_dol - dollar interest rate in sample (by year); int_dol_mark - difference between dollar and DM interest rate in sample (by year); std_ddol -std of dollar-shekel exch.(by year);						
* For a firm with the sample mean ratio of (dollar debt)/(FC debt) (0.73)						

Table 17: Share of dollar-denominated debt in total foreign currency debt

Generally, we expect two kinds of factors to affect a firm's decision about its currency distribution: the cost of debt in alternative currencies and the currency composition of its income and expenses. We expect the share of dollar currency to increase as its relative cost declines, and also to be positively correlated with dollar denominated income and negatively correlated with dollar-denominated expenses. The main variable we consider in this context is the share of the firm's exports to the US[22]. Industry dummies may also represent differences between industries regarding their export destinations. As has been done with regard to the ratio of foreign debt, we estimate a log transformation of the share of dollar debt (X). The transformed dependent variable is the logarithmic ratio $\ln \frac{X}{1-X}$.We estimate a panel data (cross-sectional time-series) random effects model. The results are presented in Table 17.

The interest rate on dollar debt enters the estimation in the specifications we present with the expected negative sign. It is specified in absolute terms or relative to the interest rate on German Mark denominated debt, which is the second most important debt during most of the period. In order to avoid endogeneity we use the annual average of the actual interest rate paid by the firms in our data set. The negative sign on the date variable in the last specification shown in the table may represent the upward trend in the relative price of dollar debt, but may also represent the tendency to diversify the debt as the liberalization progressed.

Because the total cost of the debt depends on both the interest rate and expectations regarding the exchange rate development, we tried to include in the specification the actual change in the exchange rates of the relevant currencies, as an indicator of these expectations. The actual rate of change in the exchange rate of the dollar relative to the currency basket was has a negative sign, as expected, but it is insignificant. One major reason for this is that, as we know, actual changes in the exchange rate are not a good indicator of expected change. The standard deviation of changes in the dollar exchange rate have a significant negative sign, indicating that higher uncertainty regarding the relative price of dollar debt will induce firms to decrease the share of dollar denominated debt.

The share of export income in a firm's income has a negative effect on the share of dollar denominated foreign currency debt. The reason for this

[22]We have information only about exports to America, not specifically to the US.

may be better knowledge of and experience with foreign currency credit, originating from real activity and enabling those firms to diversify their debt between currencies. A larger share of exports to America[23] tends to increase the share of dollar debt. A similar correlation between the real activity of a firm and its debt currency-composition was also found by Giraldi and Hamaui (1991) for Italy. They found that the distribution of invoice currencies is very similar to that of the firm's loans. The share of fixed capital has a positive effect. This may indicate that the value of fixed capital is viewed by firms as being linked to the European currencies rather than to the dollar.[24] We also included industry dummies - a dummy for the electronics industry has a positive effect which consistent with this industry's larger share of exports to the US (America). (See Table 15). The dummies for the chemistry and wood industry have a negative sign although these industries' exports to the US are not exceptionally low. Although the share of exports to the US of the food industry is relatively low, the effect of a dummy variable was not found to be significant. The share of R&D expenses has a positive (although insignificant) effect on the share of dollar denominated debt, indicating that these expenses tend to be dollar-linked, but it may also represent the differential behavior of different industries.[25]. We also found that older, (better established) firms tend to hold a smaller share of dollar denominated debt.

5 Concluding Remarks

The paper investigates the factors that influence a firm's decision regarding the composition of its debt, both at the level of local currency versus foreign currency debt and at that of the currency composition of the FC debt. The analysis is based on a unique micro-level database compiled from the balance sheets of publicly traded manufacturing firms in Israel for 1993-2000. We find that firms generally behave according to what is expected in a framework where a firm maximizes its market value taking into account both the mean and the variance of its expected profits. We also find some

[23]Including this variable in the regression reduces the sample to 208 instead of about 650-800 observations in the other specifications.

[24]The share of imports of machinery and electrical equipment from Europe is larger than the share of imports from the US.

[25]R&D expenses are exceptionally high in the electronics industry and low in the textile and construction industries.

evidence of adjustment in the behavior of firms during the sample years, presumably as a result of the process of financial liberalization undergone by the Israeli economy.

Our results indicate that the transmission of monetary policy is only partial because firms react to changes in relative prices of debt in alternative currencies. With the progression of the liberalization process, against the background of exports being the major growth engine of the economy, this substitutability between local and foreign currency debt is expected to be enhanced.

The results of our empirical analysis show that firms do not face any barriers to accessing the FC credit market, and that the decision about the share of FC is consistent with the maximization of the firm's market value. Generally the share of FC debt is dependent on its relative price and on the currency (local or foreign) of the income and expense components of the balance sheet. The most evident result is that the share of export income in the balance sheet has a significant positive effect on the share of FC debt, and its effect has grown during the years of the sample. We find that the currency composition of firms' FC credit has become more diversified through the years, with a decline in the share of dollar denominated debt, (albeit still dominant) and that real activity and financial considerations play a role in determining the currency composition of FC debt. In addition to the effect of the relative price of dollar debt, we find that firms with a larger share of exports tend to have less dollar debt - possibly because they are generally more sophisticated financially. Finally, as expected, the share of exports to the US is positively correlated with the share of dollar denominated debt.

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