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The impact of a stock listing on the determinants of firm performance

Frederiek Schoubben and Cynthia Van Hulle

DEPARTMENT OF ACCOUNTANCY, FINANCE AND INSURANCE (AFI)

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Frederiek Schoubben [*]

Cynthia Van Hulle [§]

ABSTRACT

Research on the question of what makes firms perform well has shown that product market competition, financial pressure and ownership or ownership identity are important performance drivers. Recently the issue of whether or not their impact is influenced by environmental or contextual characteristics has received increasing attention. In this paper we test, on a sample of Belgian firms, whether performance drivers behave differently in a non-quoted environment as compared to a quoted one. Our main result is that the impact of competition, financial pressure and family control does indeed depend upon whether the firm is quoted or not. Overall, for non-quoted companies the performance drivers do not enhance performance and in most cases are even detrimental. For quoted companies however the results are just the opposite. We find that this difference in driver functioning explains the better performance of quoted firms vis-à-vis their private peers.

JEL classification: G3; G32

Keywords: Firm performance, stock listing, competition, financial pressure, family firms.

* (Corresponding author) K.U.Leuven, Department of Accountancy, Finance and Insurance (AFI), Research Centre Finance, Naamsestraat 69, 3300 Leuven, Belgium; tel. +32 16 3267664; email: frederiek.schoubben@econ.kuleuven.be

§ K.U.Leuven, Department of Accountancy, Finance and Insurance (AFI), Research Centre Finance, Naamsestraat 69, 3300 Leuven, Belgium; tel. + 32 16 326734; email: cynthia.vanhulle@econ.kuleuven.be

Introduction

What factors affect corporate performance is an important issue in corporate finance. Since the innovative work by Nickell et al. (1997) a quickly growing literature investigates the link between productivity and performance drivers. Thereby product market competition, financial pressure and corporate control are reported to be important determinants of productivity (e.g. Palia and Lichtenberg, 1999; Nickell and Nicolitsas, 1999; Januszewski et al., 2002; Barth et al., 2005 among others**)**.

Although most studies indicate that overall these drivers tend to have a beneficial effect, some authors indicate that the impact of these forces may be affected by institutional and contextual characteristics. Several papers find that the development of stock markets and the national corporate governance systems influence the ownership performance relationship (e.g. Thomsen and Pedersen, 2000; Gedajlovic and Shapiro, 1998; Demirgüç-Kunt and Maksimovic, 1998). Also the identity of the owner rather than the level of ownership itself proves to have an important effect (e.g. Anderson and Reeb, 2003; Thomsen and Pedersen, 2000; McConaughty et al., 1998). Next, depending on the architecture of the legal and financial system, even the impact of leverage on company performance may differ across countries (e.g. Weill, 2001; Simerly and Li, 2000). Environmental dynamism has also been proven to influence the ownership performance relationship (Li and Simerly, 1998).

What is lacking research attention to date is the question of the impact of a stock market quotation on the functioning of performance drivers. This is surprising as the advantages and disadvantages of being a public firm is a matter of fundamental debate in the corporate governance literature (e.g. Myers 2000; Allen, 1993; Mayer and Alexander, 1991; Jensen, 1989) and the literature on IPO's (Pagano et al., 1998; Ehrhardt and Nowak, 2003)

This paper investigates empirically how the public stock market affects the functioning of the main determinants of firm performance, viz. product market competition, financial pressure and owner identity (family versus non-family controlled firm). This is realized by studying both quoted and unquoted firms. The present research contributes to the literature in several ways. It is the first paper to evaluate directly the impact of a stock listing on the functioning of performance drivers. In this way it sheds more light on how and through what channels a public stock market environment affects firms. Simultaneously it contributes to our

understanding of what circumstances positively or negatively influence the functioning of performance drivers. Looking at quoted and unquoted firms has the advantage that one can study the impact of contextual factors like differences in transparency, capital constraints and agency problems with outside shareholders within the same country. This allows for a relatively clean test as it avoids the problem of having to control for possibly many influencing institutional differences between countries. Finally, we study the impact of stock listing in a typical Continental European country, viz. Belgium. Notwithstanding a quickly growing literature, the impact of the stock market on companies in countries with less transparent and insider dominated financial systems is still far less understood.

Within our sample of quoted and non-quoted Belgian firms over the period 1992-2003, we find that the relationship between the determinants and performance does indeed depend on whether the company is quoted or not. Specifically, after controlling for the endogenous nature of several variables, we find for publicly quoted firms that competition, financial pressure (although not always significant) and family ownership have a positive impact on corporate performance. These results are similar to the literature where samples of mainly public companies are used. By contrast, competition, financial pressure and family ownership negatively influence performance in private firms. We also find that overall, public firms perform better, and that this improved performance may be explained by the different way in which drivers function in a quoted versus a non-quoted environment. Our results support the hypothesis that, as they amplify capital constraints, competition and financial pressure negatively affect non-quoted companies. These findings are in line with Povel and Raith (2004), Rajan (1992), Pagano et al. (1998), McConnell and Servaes (1995) among others, who indicate that competition or financial pressure may be harmful to cash strapped firms. Consistent with Anderson and Reeb (2003), Randoy et al. (2003), Maury (2006), our findings about family ownership indicate that lack of transparency and/or diversification opportunities, decreases the effectiveness of family firms as an organizational structure.

The remainder of this paper is organized as follows. In Section 1 we discuss the impact of a stock listing on the functioning of our performance drivers. Section 2 contains the sample description, methodology and univariate statistics. Section 3 presents and discusses the results, while Section 4 contains the conclusions.

1. The impact of stock listing on performance drivers

The extensive literature on corporate governance and on initial public offerings discusses many costs and benefits of going/being public (e.g. Allen, 1993; Jensen, 1989; Pagano et al., 1998; Faure-Grimaud and Gromb, 2004). These studies indicate that, from the perspective of the company, the benefits mainly reflect different aspects of two major advantages of being quoted: the information production/transparency in financial markets and the reduction in capital constraints. By contrast, Jensen (1989), Mayer and Alexander (1991), Myers (2000) among others, also show that the agency problem between insiders (management or controlling owners) and outside shareholders likely is the most important disadvantage. These properties of a stock listing create new opportunities and pressures that may influence the effectiveness of performance drivers.

1.1. The stock market and competition

Competition in the product market is generally considered to be beneficial for corporate productivity. Nickell (1996) and Nickell et al. (1997), among others, argue that there are three ways in which competition influences performance. First, it is easier for owners or the market to monitor managers in a competitive environment because there are more opportunities for comparison. Second, more competition is likely to raise the probability of bankruptcy and provides incentives for management to work harder to avoid this outcome. Third, due to the fact that demand elasticities tend to be higher under competition, the relative reward of a cost reduction is higher in a competitive environment, ceteris paribus. Clearly, preceding aspects of competition involve a reduction in free cash flow problems and a more efficient use of resources.

However, Cohen and Levin (1989), Aghion and Howitt (1998), Aghion et al. (2001) among others point out that, next to contributing to efficiency, competition also stimulates innovation, which in turn creates opportunities for new cash flow production. Specifically, the information production on innovation opportunities embedded in the possibility of comparison, is useful both for managers having to design innovative strategies and for monitoring owners. Next, non-innovative firms may be driven out of the market in a competitive environment, giving managers an incentive to work harder to avoid this outcome. For public firms, empirical tests

(Januszewski et al., 2002; Nickell et al., 1997; Grosfeld and Tressel, 2002; Rogers, 2004 among others) show indeed a positive relationship between competition and performance. The effectiveness of the preceding aspects of competition in improving performance may however be different for a non-quoted firm. Below we develop hypotheses about these issues.

As compared to a listed one, ceteris paribus, a non-quoted firm operates in a less transparent environment with less agency problems between management and shareholders (no or few outside shareholders) and more capital constraints. Even in a less transparent environment, in view of their concentrated ownership, the performance driving aspects of competition that involve a reduction in free cash flow problems and an increase in efficiency, are unlikely to add much to the performance of non-quoted firms. For large shareholders have an incentive to monitor and, furthermore, have opportunities to demand extra inside information from management. On top, capital constraints limit the maneuvering space of the latter. By contrast, also for private companies the information on innovation opportunities offered by a competitive environment remain useful both for managers and monitoring large owners. In fact, owners, understanding that non-innovating firms may be driven out of the market, have a strong incentive to monitor in order to avoid the loss of their investment. Nevertheless, in the presence of capital constraints, the innovation dimension of competition may loose effectiveness, and may even become a problem. Povel and Raith (2004) report that financially constrained firms have a tendency to under invest, therefore loose market share and overall suffer when competition amplifies the negative effects of financial constraints.[1] In sum, we do not expect competition to be very helpful in resolving free cash flow and efficiency problems in non-quoted firms; the innovation dimension may have positive effects, unless capital constraints prohibit managers to develop effective strategies to cope with the competitive pressures.

For quoted firms, the situation is very different. First of all, notwithstanding the transparency/information production in public markets, the presence of small outside shareholders creates conflicts of interest with insiders. In particular, although in Continental Europe ownership concentration remains substantial in public firms, the separation between ownership and control is likely to be more important in those

[1] Especially for smaller firms this may become a problem, as they likely have less deep pockets than larger companies.

companies as compared to unquoted ones. Furthermore, because of the presence of pyramidal structures where one company controls the next one in the line, managers exercise oversight over other managers. This may create a cascade of agency problems and weaken monitoring quality. Pyramidal ownership structures often also involve control over multiple firms and therefore stimulate the creation of conflicts of interest between large and small shareholders. For controlling owners are likely to take the perspective of the business group as a whole which may be at odds with the interests of one specific subsidiary. Following Jagannathan and Srinivasan (1999) we may argue that competition mitigates such problems because there are more opportunities for comparison. Furthermore Januszewski et al. (2002) and Allen and Gale (1999) find that even in the presence of weak governance, fierce product market competition causes increased survival pressure, forcing the decision makers in the firm to focus on efficiency. In fact, Rogers (2004) reports that competition boosts productivity only in an environment where agency costs are large. Also in the more transparent public market with its information production properties, the information on innovation opportunities offered by competition remains useful for managers and owners, while the threat of being driven out of the market, gives managers an incentive to work harder. Simultaneously, as quoted firms are less hampered by capital constraints, they have more opportunities to develop an effective response to the innovative strategies of competitors.

Summarizing, we would hypothesize that competition is more beneficial for publicly quoted firms as compared to non-quoted ones as for the former competition is less likely to exacerbate the negative effects of capital constraints and simultaneously also serves as a useful tool in solving conflicts of interest.

1.2. The stock market and financial pressure

Financial pressure may influence firm performance (Nickell and Nicolitsas, 1999; Nickel et al., 1997; Zingales, 1998; McConnell and Servaes, 1995 among others). First, Jensen's (1986) free cash flow argument implies that, as debt service payments reduce the amount of free cash flow at the disposal of management for over-investment, firm performance improves. Second, as the debt level increases, the probability of default mounts (Molina, 2005). Therefore managers are forced to exert a higher effort in order to avoid this outcome (Dessi and Robertson, 2003). A third,

but negative way in which leverage influences performance, may arise when firms are cash strapped. The constant worry of meeting interest and principal repayments, may force firms to pass up good investment opportunities (McConnell and Servaes, 1995). In line with this argument, Molina (2005) reports a strong impact of leverage on the ex ante costs of financial distress which can offset the benefits of debt. Furthermore, as analyzed in Rajan (1992), in the private debt market, lenders may even gain negotiation power over borrowers and extract rents. These effects are likely to increase for low solvency firms that have used up most of their debt capacity.

We hypothesize that financial pressure is not helpful in improving the performance of non-quoted companies; in fact it may even be harmful. In particular, the discussion above implies that the positive impact of financial pressure is likely to be confined to free cash flow/efficiency issues, ceteris paribus. However, we already argued that because of the concentrated ownership structure of non-quoted firms and the absence of small public shareholders, agency problems with management are expected to be limited. Therefore the positive properties of financial pressure are unlikely to contribute much to performance. By contrast, debt servicing and the lack of transparency may magnify capital constraints and negatively influence the firm's ability to make use of business opportunities. Molina (2005) indeed reports that financially constrained firms find it difficult to adjust their leverage. As a consequence, management may be left with limited financial resources to react upon opportunities and threats from the business environment. Especially for smaller firms such effects may be important, as they are the ones that likely depend on fewer sources of income from product markets and suffer most from asymmetric information.

We would expect financial pressure to be more beneficial to quoted companies as compared to non-quoted ones. Notwithstanding the transparency and information production in public markets, the presence of small outside shareholders causes conflicts of interest with insiders. The capacity of financial pressure to reduce free cash flow and increase bankruptcy risk is therefore likely to contribute to performance by mitigating agency problems and/or reducing the scope of expropriation by entrenched large shareholders (see also Jensen, 1986). In line with this argument, Ruland and Zhou (2005) show that the impact of leverage on company value is stronger for diversified companies, who are believed to suffer more from the agency costs of free cash flow and other agency problems. Furthermore, Rajan (1992),

Pagano et al. (1998), Carletti (2004) among others, have shown that access to the public market reduces the dependence on (private) debt. Hence, financial pressure is far less likely to exacerbate capital constraints to the point where it becomes harmful to the firm. In fact, one could even imagine that, especially for large quoted firms, access to financing becomes so easy that, if necessary, debt can be replaced by equity so that the threat implied by debt servicing on management and/or large shareholders becomes less effective.

1.3. The stock market and ownership identity

Since the early work by Berle and Means (1932), the question of whether or not and how ownership structure influences firm performance, is an ever returning issue in the literature (e.g. Demsetz and Lehn, 1985; McConnell and Servaes, 1990). More recently however, researchers like Thomsen and Pedersen (2000), McConaughy et al. (1998), Anderson and Reeb (2003), Barth et al. (2005), Maury (2006) among others, find evidence that the identity of owners may be more important in explaining company performance than the level of ownership itself. Following this line of literature, this paper focuses on family versus non-family ownership. There are several reasons for this choice. First, we use Continental European (i.e. Belgian) data. In such a sample the vast majority of firms - including the quoted ones - typically is controlled by a large shareholder or a syndicate of large owners. Hence, in view of the limited variation in this mode of control, it is more interesting to look at the identity of the owner. Second, everywhere in the world, family controlled companies make up an important category of firms. Anderson and Reeb (2003) show that this is true even for US publicly quoted firms where roughly 35% of the S&P 500 Industrials can be identified as family controlled businesses. In Continental Europe, family firms are an even more prevalent ownership structure. According to Faccio and Lang (2002) the majority of listed companies in countries like Germany, France, Italy and Belgium are family controlled.

Family control has both advantages and disadvantages relative to other types of owners (e.g. large corporations, institutional investors, business groups,…). The largest potential cost of family control is the incentive to benefit the family at the expense of firm performance. This is due to the entrenchment of the family management or the controlling family shareholder. Shleifer and Vishny (1997),

Mishra et al. (2001), among others, suggest that one of the largest costs controlling shareholders can impose, is remaining active in management, even if they are no longer competent or qualified to run the firm. This argument is confirmed empirically by Barth et al. (2005), who report for a sample of mostly non-quoted Norwegian firms that family owned and managed companies perform worse than family owned businesses managed by an outsider. A second major cost of family control is linked to lack of diversification in the controlling family's portfolio. Anderson and Reeb (2003), Randoy et al. (2003) among others, indicate that the resulting incentive to minimize risk distorts decision making in the company.

A major benefit of this mode of control is the family's strong incentive to monitor the firm more closely, so that agency conflicts with management are reduced (e.g. James, 1999; McConaughy et al., 1998; Schulze et al., 2002). One reason why families are such high quality monitors is the fact that their wealth is closely linked to the firm's value. Another reason lies in the long investment horizon that often characterizes this type of owners. Both James (1999) and Ehrhardt and Nowak (2003) point out that the will to pass on the firm to next generations, forces family firms to concentrate more on efficient long term investing. Finally, because of their emotional ties to the firm, family owners may opt for altruistic actions instead of personal considerations in order to preserve the firm through time. In Continental Europe, where concentrated ownership is prevalent, family ownership has the advantage that, contrary to other large owners like holding companies, venture firms, industrial owners etc., the wealth of the family members is directly involved. By contrast, in the case of corporate owners, managers exercise oversight over other managers. As discussed earlier, this may create a cascade of agency problems and weaken monitoring quality.

As compared to other large owners however, family oversight is more apt to be of lower quality in unquoted firms. In particular, we would expect that in such companies the weaknesses of family control are likely to be more prominently present. For the close ties between family members, and the often occurring lack of clear rules distinguishing between firm and family relationships, may lead to policies that serve the family but are detrimental to the company. In the non-transparent environment of unquoted firms, such behavior may more easily prevail. This may especially be true for the smaller firms, where limited organizational complexity more easily accommodates for less professionalism on the part of the owners. This

argument is supported by Mahérault (2000) who observes that family firms feel more reluctant to go public because of the necessity to reveal management policies rather than because of the possible loss of control. Furthermore, one would expect the capital constraints that are more likely to prevail in a non-quoted environment to exacerbate the family's diversification problem and bias investment decisions.

As in the case of the preceding two performance drivers, we hypothesize that family ownership has a better impact on listed firms as compared to non-listed ones. The increased transparency and information production in public markets pressures families to become professionalized and pay more attention to the interests of the firm as a separate entity. Furthermore, similar to Faure-Grimaud and Gromb (2004), Marchisio and Ravasi (2001) among others, we expect that the easy access to funding and the liquidity offered by the stock market enables family owners to reduce their stake in order to solve their diversification problem. Furthermore, as other large shareholders are worse in dealing with the typical problems created by listing – i.e., monitoring problems and, especially for business groups, conflicts of interest between large and small owners – family control is more likely to be a positive force in listed as compared to unlisted firms. Consistent with this hypothesis, Anderson and Reeb (2003) report for the U.S., and Faccio and Lang (2002) and Maury (2006) for a Western European sample, that family control needs well regulated and transparent financial markets in order to be an effective organizational structure.

2. Sample, variable measurement and univariate statistics

2.1. Sample

Our sample initially covers the 12 years 1992-2003 and contains all consolidated financial statements of Belgian firms. The data were gathered from the NBB (National Bank of Belgium) and Van Dijk Belfirst. Issuing consolidated statements only became a requirement in 1992 and then only for firms of sufficient size.[2] Quoted companies however are obliged to publish consolidated statements. As within our ultimate sample only 7 firms publish consolidated accounts because the latter

[2] Consolidation is obligatory when 2 out of the following 3 size thresholds are exceeded: turnover exceeds 50,000,000 euros, total assets exceeds 25,000,000 euros, the company employs more than 500 workers. From the year 2000 on, these criteria where relaxed to 25,000,000 ; 12,500,000 and 250 respectively.

obligation is binding, the impact of this difference in treatment is limited. Nevertheless within our robustness checks discussed later on, these firms were deleted from some sub samples. Since our measure of product market competition is only available as of 1996, our multivariate models are tested over the period 1996-2003. Nevertheless the data before 1996 remain useful, as they allow us to calculate firm specific lagged variables without further loss of data points.[3] We exclude all financial firms as well as all companies that are mere production entities from a large international parent. In order to identify these latter companies we used data from either Amadeus or from the firms' websites. Because of the pyramidal structures, the status of being unquoted requires special attention. Specifically, we exclude non-quoted companies that either have a quoted parent or a quoted subsidiary. Subsidiaries from parents that have to issue consolidated accounts do not need to issue these consolidated statements themselves, except for publicly quoted firms that always have to publish such accounts. Nevertheless within our sample 49 unquoted firms that satisfy the size requirements but have a consolidating parent, voluntarily consolidate. Initially we keep these companies in our sample, but evaluate the impact of voluntary consolidation later on. This way, over the period 1996-2003 we end up with a sample that contains 1956 firm-year observations corresponding to 467 non-financial firms that published consolidated statements at least in some of the years under consideration. For the period 1992-2003 this amounts to 2711 firm years and 486 firms[4].

46 firms in our sample change their (public) status between 1996 and 2003. 6 firms went private and ceased to publish consolidated accounts after this event. The 40 remaining companies went public during the same time span. 27 of these entered the sample after the event, implying that we only have consolidated data for the period before as well as after quotation for 13 firms. Overall we have 363 companies for which we have consolidated statements covering only non-quoted years, 91 firms covering only quoted years and 13 firms for which the sample includes both quoted and unquoted years.

Table 1 represents the sample composition. Panel A shows that the number of firms varies over the years with somewhat more companies issuing consolidated

[3] We also re-estimated the multivariate models over the period 1992-2003 with an extrapolation of our product market competition variable into the earlier years. Results are robust.

[4] There are 19 firms (10 unquoted and 9 quoted) for which we only have data during the first four years (1992-1995) of the sample period and are therefore not included in the multivariate models later on.

statements in the second half of the period under study. It is important to our sample that companies can enter or leave during the sample period in order to avoid selection biases. Panel B of table 1 gives an overview of the industry distribution for both quoted and unquoted firms over the 1996-2003 period. Servicing includes the largest number of firms (140), followed by manufacturing (136) and distribution (94). This distribution over sectors is representative for the Belgian economy as a whole. Panel C, which represents the industry distribution for the whole sample period (1992-2003), is of course very similar.

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2.2. Variables measurement

In order to measure firm performance we use Total Factor Productivity (TFP)[5]. TFP has been extensively used in a quickly growing literature (e.g. Palia and Lichtenberg, 1999; Nickell et al., 1997; Januszewski et al., 2002; Schoar, 2002; Barth et al., 2005 among others).[6] Commensurate with this research, the generic format of our regression equations is the empirical version of a Cobb-Douglas production function enhanced by performance drivers:

$$LNVA_i = \alpha LNNETAS_i + \beta LNEMPL_i + f(.) + e_i \qquad (1)$$

with $LNVA_i$ representing the output of firm i measured as (natural logarithm of) value added[7], $LNEMPL_i$ labor input measured as employment costs,[8] $LNNETAS_i$

[5] We use TFP instead of Tobin's Q to measure corporate performance because of comparability of findings with this quickly evolving literature and because Tobin's Q is not available for non-quoted firms.

[6] Unlike the literature on production functions, where the efficiency measure from Cobb-Douglas and its corresponding input factors are the issue of interest, we do not use correction methods for input factors like, for instance, the Olley-Pakes correction. As we use TFP solely as a relative performance measure, no corrections other than the random effect estimation, industry adjusting and lagging of input factors are made. Our approach is very similar to other studies in the ownership performance literature that use TFP (Palia and Lichtenberg, 1999; Nickell et al., 1997; Januszewski et al., 2002; Schoar, 2002; Barth et al., 2005 among others).

[7] Value added is defined as total sales less material costs. This way we implicitly allow for material costs as a third input.

capital employed measured as the accounting value of net assets during that year,[9] f(.) a function containing performance drivers and e_i an i.i.d. error term. TFP is the surplus of output relative to the output explained by the first two terms on the right hand side, and is assumed to be related to firm i's performance drivers through the function f(.). In our paper these performance drivers are competition, financial pressure and type of owner (family/non-family).

Rents from production typically proxy for the lack of product market competition. In order to avoid the problem that the more productive firms in an industry are assigned a lower competition measure than their peers, we do not calculate the rents on a firm level but on a peer group level (PEERRENT). Average peer group data based on trade description and size was constructed from the Amadeus database.[10] While our industry identification is based on double digit Nace codes, the trade description identification in Amadeus is much more detailed.[11] This way, problems of linearity between our industry identification and peer group data are avoided. Rents from production are defined as:

$$\text{PEERRENT}_t = \frac{\text{EBITDA}_t - \text{COC}_t}{\text{SALES}_t}$$

with average operating surplus (EBITDA) less average nominal cost of capital (COC) for the particular peer group of a firm. This is scaled by average sales (SALES) of the peer group. Like Lehmann and Weigand (2000) and Januszewski et al. (2002), we do not use balance sheet EBITDA as a measure of raw operating surplus, but employ sales less costs of materials and labor. In economic terms this definition is equivalent to the definition of EBITDA. The cost of capital is calculated as $r_t^K * K_t$, which is the cost of capital multiplied by capital (measured as average book value of net assets for the respective peer group). As in Nickell (1996) $r_t^K = d + r_t$, where d is the depreciation rate and r_t is the risk free market interest rate. The

[8] Due to data availability we proxy the number of employees by the total employment costs of the company. This is unlikely to cause problems because of the very high correlation between total cost of employees and number of employees.
[9] Following the literature on capital budgeting, net working capital is treated as part of invested assets.
[10] In the Amadeus database a peer group of a specific firm is defined as the group of (European) firms with the same trade description and of comparable size.
[11] For example: Imbev, a large Belgian beer brewer is identified with industry code 15 (manufacturers of food and beverages) while its peer group in Amadeus consists of large European brewers.

depreciation rate is considered equivalent to the market premium multiplied by beta, while the peer group rents (PEERRENT) are to be interpreted as an inverse measure of product market competition.

As in Dessi and Robertson (2003) and Weill (2001) amongst others, we use leverage to estimate the impact of financial pressure on performance. Leverage (LEV) is defined as total debt divided by total assets. Other authors e.g. Pagano et al. (1998), Huyghebaert and Van Hulle (2006), Denis and Mihov (2003) claim that not total leverage but bank debt may be a better proxy for financial pressure. Models were re-estimated using total bank debt to total assets as a financial pressure measure. This model adjustment did not alter our main findings.[12] Therefore, and since most of our hypotheses concerning financial pressure do not only relate to bank debt, we report the results with leverage as our proxy for financial pressure.

A last important driver of firm performance is ownership identity. A company is characterized as a family firm if the founding family still controls the business. The databases Belfirst and Amadeus do not contain ownership information on all non-quoted companies as the latter do not have to publish this information. The website of the individual firms typically has information on the identity of the main owners, but not always on the exact ownership distribution. To overcome this problem, and to be able to compare, we use a similar approach to the one used in Anderson and Reeb (2003). We first check whether or not the family controls the majority of the shares. If this is the case the company is classified as a family firm. When exact ownership data is not available, we check the board of directors. If at least two members of the founding family are board members, a company is also considered to be family controlled. Family firms are indicated by the dummy FAMIL.

Finally, variables may be interacted with the QUOTED dummy. This dummy is 1 when the firm is listed on the stock exchange in that year.

[12] We also used interests paid divided by sales as an alternative measure of financial pressure (as in Nickell et al. 1997). Results are not reported but are very similar to the estimates in this paper.

2.3 Univariate statistics

Table 2 contains summary statistics.[13]

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Panel A of Table 2 shows the mean and the median for the 3 key variables of the production function, as well as the top and lower quartiles. We observe that the average firm in our sample has annual value added of about 121 million euros, employment costs of about 69 million euros and net assets (tangible fixed assets + net working capital) of about 186 million euros.

These averages are influenced by a number of large companies, as shown by the median values that amount to respectively 32, 19 and 40 million euros. The difference between quoted and non-quoted is important. When looking at median values, we see that the median value added of non-quoted companies (26 million euros) is less than half of the median value added of quoted firms (62 million euros). Employment and net assets are also much smaller for non-quoted companies. Median values vary roughly proportionately to the median of value added of private and public companies, although quoted firms seem to have relatively more net assets and somewhat less employment costs. This may indicate that, as compared to non-quoted firms, productivity of capital is lower but labor productivity somewhat higher in quoted companies. Nevertheless the quartiles show an important overlap in the size distribution of quoted and unquoted firms.[14]

Panel B of Table 2 contains summary statistics on the performance drivers. Quoted companies seem to be confronted with higher rents in their corresponding peer group. This holds true both for the average and median value, although the quartiles show an important degree of overlap of both distributions.[15] Non-quoted firms are also facing significantly stronger financial pressure as compared to quoted

[13] The estimation methodology used in section 3 eliminates the need for correction for inflation.

[14] Although size issues are controlled for through the definition of the variables in the analysis of Section 3, the question of whether or not this difference in size between quoted and non-quoted firms may nevertheless have an impact on the structural relationship between firm performance and performance drivers is addressed separately in a robustness check later on.

[15] A comparable result was found using firm specific rents instead of the PEERRENT variable. Quoted companies earn significantly more rents in median terms (0.220) compared to their non-quoted counterparts (0.163). This could indicate that either non-quoted firms are located in more competitive industries or that these companies have less capacity to create rents.

companies. However the quartiles indicate that both groups contain highly levered as well as low levered firms. Finally, and comparable to the sample of Faccio and Lang (2002), about 50% of the companies in our sample are identified as family firms with a similar representation among quoted and non-quoted firms. The same holds true for the number of firm-year observations.

3. Determinants of firm performance

We first estimate the standard version of the general TFP-model in subsection 3.1.. Then we add the QUOTED dummy to observe the general effect of listing, while correcting for the possible endogeneity of the public/private status. In subsection 3.2. we analyze the interaction between a stock market quotation and the performance drivers to gain more insight into the impact of listing on performance. Finally in subsection 3.3. we perform robustness checks on the possible impact of the difference in obligation to consolidate between quoted and non-quoted firms and the possible biases due to the decision to consolidate voluntarily. As the discussion in section 1 indicated that the functioning of the performance drivers may also be influenced by size, we evaluate whether or not differences in firm size between the quoted and unquoted subsamples affects our results.[16]

3.1. How do performance drivers function on a general sample of firms (i.e. quoted and unquoted) ?

In order to construct a benchmark, we estimate the standard version of the general TFP-model as given by equation (1) on our sample of quoted and unquoted firms[17]:

$$\begin{aligned} LNVA_{ijt} &= \omega_j + \alpha_j LNNETAS_{ijt} + \beta_j LNEMPL_{ijt} + \delta_t \\ &\quad + \eta_1 PEERRENT + \eta_2 LEV + \eta_3 FAMIL + \varepsilon_{ijt} \end{aligned} \qquad (2)$$

[16] The difference in median rents and leverage between listed and unlisted companies is also addressed in a robustness check; see below.

[17] As in Palia and Lichtenberg (1999) we also estimate all models using 1 year lagged values of LNEMPL and LNNETAS but this does not substantially alter our results.

We test this model both with and without correcting for industry specific input elasticities. The inclusion of year effects (δ) eliminates the need to deflate any of the euro denominated variables (see also Palia and Lichtenberg, 1999; Wooldridge, 2002)[18]. We use fixed industry (2 digit Nace) effects (ϖ), but no fixed firm effects. Instead, we estimate all regressions using company random effects since fixed effects are not feasible in our setup as – typical for the ownership performance research – there is no (or very little) within company variation in the ownership and public status variables. Hausman tests comparing fixed, random and no effects show the appropriateness of the use of random effects within our sample. Hence, standard errors are adjusted to reflect the cross-correlation between observations of the same firm during the sample period due to common firm components. A similar approach is used by Baum and Thies (1999) and La Porta et al. (2002) among others. Since the random effects estimation allows for any unobserved firm heterogeneity that might influence performance, possible biases for omitted variables or unobserved firm characteristics are controlled for.

A second issue that has to be tackled is the endogeneity problem in our financial pressure variable (LEV) and in the firm's public status (QUOTED). Since financial pressure is a determinant of performance, a change in the former may affect firm performance. However, we may also argue that it is easier for well performing companies to attract more credit so that overall the ease with which debt is obtained, is in itself influenced by performance. Molina (2005) shows that ignoring the endogeneity of leverage leads to an underestimation of its impact. We try to solve this problem in two ways. First, as proposed by Wooldridge (2002), we use one year lagged values for the LEV variable. Second, we build a separate model for leverage, and use its predictions as our measure for financial pressure. Following Dessi and Robertson (2003) we include explanatory variables that significantly affect debt but do not significantly influence performance. Specifically, we use size, non-debt tax shields and tangible assets next to the lagged value of leverage in our auxiliary regression.[19] The QUOTED dummy is subject to a similar problem. Also here an endogeneity or reverse causality problem could occur since public status is, to some extend, affected by performance as well. For example, companies that are unable to

[18] As we use natural logarithms it is not necessary to deflate nominal values of the variables because the impact of inflation is absorbed by the year dummies.

[19] As a further robustness check TFP and LEV are estimated simultaneously. This does not affect the findings.

grasp the benefits of listing may change their public status through privatization. Again we try to mitigate this problem by first estimating the public status of a company and using the predictions as instruments for the QUOTED dummy.[20,21]

Panel A of Table 3 shows the results for the benchmark models. The left part of the Table (labelled "Lagged variables") shows the results of the estimation where the endogeneity problem of leverage and the public/private status of the firms is solved with the lagged variable. The right hand side of the Table (labelled "Instrumental variables") presents the findings with the instrumental variable approach. In the first and third column, only fixed industry effects are taken into account based on a double digit Nace code level. Columns 2 and 4 (Industry specific elasticities) of the Table present fixed industry effects models where, in addition, the coefficients for the input elasticities, α and β, are estimated for each broad industry category as given by Table 1, thereby correcting for industry specific elasticities of the Cobb-Douglas inputs.

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INSERT TABLE 3 ABOUT HERE
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All models show the normal positive coefficients for the standard Cobb-Douglas function with the input share of labor around 0.70 and the input share of capital around 0.30. The impact of competition is significantly negative (since PEERRENT can be interpreted as an inverse measure of competition). Also leverage proves to have a significant negative effect on productivity. These results are not in line with most of the literature (e.g. Nickell, 1997; Nickell and Nicolitsas, 1999; Januszewski et al., 2002 among others), where usually a positive influence of competition and financial pressure on productivity is reported. However, these latter results were obtained on samples of (mostly) publicly quoted firms. Also contrary to Anderson and Reeb (2003) who report a significant positive effect for their sample of quoted companies, we find a negative impact of family control on performance. By contrast,

[20] The instrumental variable for QUOTED is estimated with a logit model using as dependent variables return on assets, peer group investment opportunities, size and industry and year dummies.

[21] Another solution commonly used in the literature, i.e. Heckman 2 step, is not really appropriate for the problem at hand. Since we use all available quoted and non-quoted observations from the population of Belgian consolidated companies during our sample years (except for financial firms and mere production entities), sample selection problems are not an issue. The endogeneity (or reversed causality) problem however remains for which we use the instrumental variable technique as explained in the text.

Barth et al. (2005) find similar results to ours for family ownership on their sample of mostly non-listed firms.

Panel B of Table 3 shows the results of the models of panel A when the QUOTED dummy is included. All coefficients remain comparable to the previous findings, although family control looses significance in some of the model specifications. The QUOTED dummy is positive and significant, and indicates that quoted companies have a higher productivity level than non-quoted ones. The differences between the coefficients of QUOTED in the left and right hand side of the Table indicate that the effect of stock listing is enhanced when we control for endogeneity. This suggests that overall the properties of listing (i.e. transparency/information production, better access to capital but more conflicts of interest) have a positive impact.[22] However, our earlier analysis also suggests that the impact of performance drivers may depend upon whether or not the firm is quoted. Therefore the QUOTED dummy may pick up this (indirect) effect, rather than the direct impact of listing. Subsequent analysis looks into this matter.

3.2. How do performance drivers interact with the environment of the public capital market ?

To test our hypotheses from Section 1 we interact the (instrumented) QUOTED dummy with our three performance drivers. Furthermore, to control for possible differences in the productivity of the inputs, we also interact the employment and capital inputs from the Cobb-Douglas function with this dummy. The results are shown in Table 4. Except for the interaction terms with the QUOTED dummy, the same methodology as in Table 3 is used.

Concerning the Cobb-Douglas input elasticities and their interaction with QUOTED, Table 4 shows that, controlling for differences in competition, financial pressure and ownership identity, productivity of capital and labor is not significantly different between quoted and non-quoted companies.

As PEERRENT is an inverse measure for competition, its positive coefficient indicates that competition has a significantly negative impact on productivity for non-quoted companies. By contrast, the coefficient of the interaction between the

[22] Other studies that have included a dummy for public listing also find a positive effect (e.g. Barth et al., 2005; Lehmann and Weigand, 2000).

QUOTED dummy and PEERRENT (competition) is significantly negative (positive) and, moreover, sufficiently large such that the net impact of competition is significantly positive for quoted firms[23]. These findings are consistent with our analysis in Section 1. They indicate that, similar to the earlier mentioned proposition of Povel and Raith (2004), in an environment where capital constraints are important, competition may amplify these constraints and limit the reaction capacity of companies to competitive threats. The fact that for listed firms, the impact of competition is not just non-negative but strictly positive, indicates that either listed firms work under less constraints and are capable of making use of the information on innovation opportunities offered by competition and/or that also in a stock market where firms typically are controlled by large shareholders there is a problem of conflicts of interest between outside small shareholders and insiders (i.e. managers, large shareholders).[24]

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INSERT TABLE 4 ABOUT HERE
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Table 4 also shows that, similarly to competition, the impact of leverage differs depending upon whether the company is quoted or not. The coefficient LEV is statistically negative, implying that financial pressure hurts non-quoted companies. The coefficient of the interaction term with the QUOTED dummy is significantly positive but insufficient to create overall a significant positive effect for quoted firms. However after correction for endogeneity, the net effect of financial pressure becomes significantly positive for quoted companies. Again these findings are consistent with our hypotheses and indicate that, in our sample, the financial pressure and capital constraints that non-quoted firms face, are an unfavorable mix. By contrast, listed firms even benefit from financial pressure. This indicates that within our data set, debt is effective in reducing conflicts of interest created by the presence of shareholders from the public at large. These results are similar to Ruland and Zhou (2005). They find a negative impact of leverage on the value of low agency cost companies; by

[23] The net effect of PEERRENT, LEV and FAMIL on productivity of quoted companies is tested by re-estimating the models of Table 3A for a quoted subsample. F-statistics for the effect of the respective performance drivers for quoted companies are given in the bottom rows of Table 4.
[24] Models using firm specific rents instead of peer group rents yield comparable results.

contrast, for high agency cost firms, this effect is reversed, leading to a positive relationship between leverage and value in these latter companies.

The last determinant of performance is family control. Also here the results follow a similar pattern to those of the preceding two drivers. Family control has a negative influence on the performance of non-quoted firms. For quoted ones, the net effect is positive, and significant when endogeneity of stock listing is corrected for through instrumental variables. This does not only indicate that quoted family firms perform better than non-quoted family firms but also that, all else being equal, quoted family firms perform better than other quoted companies. Taken together with our analysis of Section 1, these findings suggest that the increased transparency of public markets and/or opportunities to diversify the family fortune is an important force in improving performance of family firms.[25] Furthermore, as families are (potentially) better monitors, possible threats of a stock listing like free cash flow problems or agency conflicts are kept in check, which results in a better performance relative to other quoted companies. In fact, in line with our findings, Anderson and Reeb (2003) report for the US that quoted family firms in the S&P 500 outperform the non-family firms. Apparently also for Belgian companies the advantages of having a controlling family outweigh the potential costs, at least for public firms.

Finally it is interesting to observe that in the models of Table 4, the significance of the QUOTED dummy is reduced and evaporates altogether once the endogeneity of listing is corrected for. This indicates that, at least in the present sample, the difference in the relationship between productivity and the performance drivers in a quoted environment as compared to private companies, explains the higher performance of public firms. Another interesting result from Table 4 is that overall, effects are more pronounced when endogeneity problems are solved. This indicates that ignoring possible endogeneity biases may lead to underestimation of the impact of stock listing on the relationship between performance and its determinants.

[25] Our dataset shows that in Belgian quoted family firms, managers are often external members not related to the family. The family is however heavily represented in the board of directors. This way, family directors can strongly monitor management. In non-quoted family firms there is less separation between management and family control.

3.3. Some robustness checks

In the present subsection we report two robustness checks. First, we investigate whether the difference in obligation to consolidate between quoted and non-quoted firms and voluntary consolidation affects our findings. Second, we evaluate the possible impact of size differences between the set of public and private firms.

To exclude possible biases either from the obligation to consolidate (for listed firms) or from possible a-selection due to voluntary consolidation, we exclude all firms that can not be considered as stand alone from the sample. We define a firm as a group member firm or a subsidiary when more than 50% of equity is directly controlled by another industrial company or group.[26] In view of the size of the remaining listed firms, none would escape the obligation to consolidate. Hence, we obtain a subsample of firms that are obliged to publish consolidated accounts, independent of their public or private status. Simultaneously we correct for possible biases due to the fact that group member firms may have less decision power as compared to firms that do not belong to a group.[27] It is also interesting to note that this subsample has the property that median rents do not significantly differ between quoted and unquoted companies. Preceding pruning excludes 18 quoted firms corresponding to 105 firm-year observations and 49 private companies with 173 firm-years. The left hand side of Table 5 reports the findings. These prove to be very comparable to those of Table 4. The coefficients of all performance drivers keep the same sign and remain significant. However, due to the pruning of the public group companies, the net effect of leverage on quoted firms looses impact. This is consistent with the earlier mentioned results in Ruland and Zhou (2005) who report that leverage functions best in environments with high agency costs. For as the firms that likely are most subject to conflicts of interest, and hence high agency costs, have been discarded, it is not surprising that the net effect of leverage is reduced. Likely for the same reason, as compared to the other quoted firms in this subsample, family control in public companies only keeps a marginal net positive impact. Finally, consistent with a tendency observable (but not significant) in the univariate statistics, within this

[26] We used direct ownership instead of ultimate ownership because data on the latter often is not always available for unquoted firms.

[27] This does not exclude the presence of large owners that control the firm. It only excludes the cases with one industrial company as a majority shareholder.

subset, relative to their private counterparts, quoted firms are relatively more efficient in their use of labor but less in their use of capital.

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INSERT TABLE 5 ABOUT HERE
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Next to pointing out global differences in the functioning of performance drivers between quoted and unquoted firms, the discussion in Section 1 indicated that within subgroups of firms, differences may also be present. In particular, due to possible extra exacerbation of capital constraints for the smallest non-quoted firms, the impact of competition and financial pressure could be worse than for the other companies. Also, the limited transparency and lesser organizational complexity of smaller firms exercise less pressure to professionalize family management. On the other hand the deeper pockets of larger quoted firms and their easy access to extra financing may influence the scope of performance drivers to mitigate free cash flow problems and/or conflicts of interest between large and small owners. Especially as the median size of the quoted and unquoted firms is different, the question arises to what extend findings may be influenced by these differences in size, even after the correction implied in the asset and employment variables. Therefore we report in the right hand side panel of Table 5 results for the case where the 20% smallest private and 20% largest public companies have been excluded. This subsample has the property that the non-quoted and quoted companies no longer differ in median size[28]. Also firms that have consolidated voluntarily prove to have been discarded by this pruning criterion. Overall it has cut 82 non-quoted firms with 238 firm-years and 30 quoted companies with 176 firm-years from the sample. Results are again very similar to those of Table 4 and those of the left hand side of Table 5. Just as in the latter case, the data show a decrease in significance of the net effect of leverage. Presently also the net effect of competition becomes insignificant. All this suggests that the largest firms benefit most from financial as well as competitive pressure. Finally, similar to the findings in the left hand side of Table 5, also within this subsample, relative to their private

[28] Median total assets of quoted (about 115 million euros) and non-quoted companies (about 95 million euros) is no longer significantly different (Wilcoxon Mann-Whitney Z statistic = -1.046 with a p-value of 0.296).

counterparts, quoted firms prove to be more efficient in their use of labor but less in their use of capital.[29]

4 Conclusions

In this paper we study the impact of product market competition, financial pressure and ownership on a sample of quoted and non-quoted Belgian firms. We find that, even in Continental Europe, with its concentrated ownership and less transparent capital markets, the stock market environment is beneficial to firm performance.

In particular, commensurate with earlier findings, public firms perform better than private ones. Also in line with earlier findings, competition, financial pressure and ownership type (family/non-family) prove to have a positive impact on total factor productivity. However, when these drivers are placed outside the public stock market, their effect reverses and becomes significantly negative. Within our sample, this difference in functioning explains why quoted firms perform better than unquoted ones.

Our results also show that (empirical) findings for public companies need not hold for private ones. For one thing, while for public firms optimizing debt structure may involve an increase in leverage, ceteris paribus, such optimization may involve a decrease in debt for unquoted firms. It also shows that quoted firms may be better able to withstand competition, and that it may be optimal for companies to seek a quotation, not only when they have growth opportunities but also to increase their ability to react upon competitive threats. Furthermore a public status supports improvements in management for family firms, leading to superior performance.

Finally, our results are in line with those of the IPO literature on the motives of going public. The product market motive, i.e. gaining strategic advantages relative to

[29] We also performed several additional robustness checks. One focuses on the impact of a change in public status on our results. As discussed in Section 2, 46 companies change their status from quoted to non-quoted or vice versa, while we only have consolidated statements before and after the change for 13 of them. In the years surrounding a change in public status, behavior may be a-typical. Although we have taken into account the endogeneity of the public/non public status, as a further check we have re-estimated the models of Table 4 on a subsample in which status changing firms were excluded for 2 years before and after the event. Results are similar to those reported. As a second additional check we estimated a cross sectional model with the variables of Table 4, whereby instead of yearly data, the average of each variable over the sample period is taken. Thereby the 13 companies with both quoted and unquoted observations were labeled as quoted. As a final additional check we discarded the 10% most highly levered unquoted firms and the 10% least levered public firms. Then leverage is no longer significantly different between quoted and unquoted companies. All estimations yield similar results to those reported.

(non quoted) rivals in the same market segment (Stoughton et al., 2001; Pagano et al., 2002; among others), is considered to be especially relevant for companies in industries where competitive dynamics are an important consideration for long-term success. This is consistent with our finding that a stock listing creates an environment where product market competition more easily enhances productivity and performance. The possibility to rebalance the financial structure and improve a company's position relative to its debt holders is found to be another important benefit of going public (Rajan, 1992; Pagano et al., 1998; among others). Again this motive is in line with our finding that for quoted companies, possibly after such a rebalancing, financial pressure has no longer a negative influence upon performance. Another well studied IPO-motive concerns ownership and control. Ehrhardt and Nowak (2003) and Pagano et al. (1998) point out that firms tend to opt for a stock listing when existing ownership and control structures no longer fit the company. In line with Anderson and Reeb (2003), our results provide empirical evidence supporting the validity of this perspective by indicating that family control becomes more effective in well regulated and transparent financial markets.

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Table 1
Sample composition and industry distribution

Panel A

Year	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	Total
Firms per year	168	207	196	184	172	208	230	262	279	301	281	223	2711

Panel B: period 1996-2003

Industry	Number of firms	Non-Quoted	Quoted
Food & Agriculture	45	35	10
Manufacturing	136	96	40
Construction	22	19	3
Distribution	94	74	20
Transportation	30	28	2
Services	140	111	29
Total firms	467	363	104

Panel C: period 1992-2003

Industry	Number of firms	Non-Quoted	Quoted
Food & Agriculture	45	35	10
Manufacturing	140	98	42
Construction	22	19	3
Distribution	95	74	21
Transportation	31	29	2
Services	153	118	35
Total firms	486	373	113

Companies that went public during the sample period and for which we have both quoted and unquoted data were added to the quoted sample in panel B and C.

Table 2
Descriptive statistics for quoted and non-quoted subsamples over the period 1992-2003

Panel A

		Full Sample	Non-quoted	Quoted	Test	p-values
Value Added	Mean	120,688	69,135	270,227	146.667***	0.000
	Median	31,765	26,469	61,833	-12.972***	0.000
	25th perc	14,950	14,044	22,295		
	75th perc	73,753	55,935	196,492		
Employ	Mean	68,820	41,688	148,049	136.991***	0.000
	Median	19,177	17,305	36,556	-11.659***	0.000
	25th perc	8,064	7,792	9,789		
	75th perc	45,623	34,424	97,513		
Net Assets	Mean	186,310	104,899	422,246	144.402***	0.000
	Median	40,437	34,830	83,096	-12.679***	0.000
	25th perc	20,034	18,301	28,702		
	75th perc	110,926	81,891	343,642		

Panel B

		Full Sample	Non-quoted	Quoted	Test	p-values
Peerrent§	Mean	0.298	0.287	0.326	5.15**	0.023
	Median	0.241	0.238	0.259	-2.12**	0.034
	25th perc	0.117	0.116	0.126		
	75th perc	0.399	0.386	0.448		
Lev	Mean	0.606	0.620	0.544	88.32***	0.000
	Median	0.618	0.643	0.560	-10.14***	0.000
	25th perc	0.479	0.492	0.433		
	75th perc	0.735	0.753	0.659		
Family	Firms	49.7%	49.6%	50.0%	0.006	0.941
	Firm-years	55.1%	56.3%	51.7%	4.411**	0.036

The F-test statistic for the means test and the Wilcoxon Mann-Whitney Z-statistic for the median test are given in the respective rows together with the corresponding P-value. The difference in proportion of family firms was tested using Pearsons Chi Square on firms as well as on firm-years.
Level of significance: ***1%; **5%; *10%.
§ Calculated over the 1996-2003 period.

Table 3
Benchmark models estimated over the period 1996-2003

Panel A: Determinants of firm performance

	Lagged variables		Instrumental variables	
	Fixed industry effects	Industry specific elasticities	Fixed industry effects	Industry specific elasticities
Intercept	0.6466***	0.4937***	0.6724***	0.4398**
	(4.46)	*(5.96)*	*(4.62)*	*(2.16)*
Lnnetas	0.2753***	0.2478***	0.2760***	0.2484***
	(24.09)	*(6.86)*	*(24.16)*	*(6.86)*
Lnempl	0.6889***	0.7340***	0.6890***	0.7333***
	(62.22)	*(14.22)*	*(62.16)*	*(14.18)*
Peerrent	0.1513***	0.1467***	0.1502***	0.1456***
	(5.29)	*(5.13)*	*(5.25)*	*(5.09)*
Lev	-0.1317**	-0.1504***	-0.1737***	-0.1937***
	(-2.53)	*(-2.89)*	*(-2.97)*	*(-3.32)*
Famil	-0.0449**	-0.0453**	-0.0458**	-0.0463**
	(-2.29)	*(-2.31)*	*(-2.33)*	*(-2.36)*
(Pseudo) R^2	0.926	0.930	0.927	0.930
N	1956	1956	1956	1956

Panel B: Determinants of firm performance; impact of stock listing

	Lagged variables		Instrumental variables	
	Fixed industry effects	Industry specific elasticities	Fixed industry effects	Industry specific elasticities
Intercept	0.6976***	0.4674**	1.2397***	0.6882***
	(4.81)	*(2.31)*	*(6.55)*	*(5.63)*
Lnnetas	0.2728***	0.2456***	0.2119***	0.2119***
	(23.94)	*(6.62)*	*(14.10)*	*(5.06)*
Lnempl	0.6865***	0.7299***	0.6959***	0.7366***
	(61.67)	*(14.00)*	*(57.56)*	*(14.28)*
Peerrent	0.1502***	0.1462***	0.1519***	0.1417***
	(5.26)	*(5.13)*	*(5.34)*	*(5.08)*
Lev	-0.1206**	-0.1377***	-0.1145*	-0.1277*
	(-2.32)	*(-2.65)*	*(-1.90)*	*(-2.16)*
Famil	-0.0429**	-0.0434**	-0.0173	-0.0236
	(-2.19)	*(-2.22)*	*(-0.85)*	*(-1.19)*
Quoted	0.0637***	0.0726***	0.7674***	0.5401***
	(2.79)	*(3.18)*	*(5.21)*	*(4.61)*
(Pseudo) R^2	0.927	0.930	0.930	0.933
N	1956	1956	1956	1956

The dependent variable in all models is the natural logarithm of value added (LNVA). Explanatory variables are as defined in subsection 2.2. In Columns 1 and 2 (lagged variable) a one year lagged value of LEV is used. Columns 3 and 4 use a predicted value of LEV and QUOTED based on instrumental variables as explained in Section 3.1. All models use random firm effects. Industry and year dummies are included in all models. Columns labeled "Industry specific elasticities" use industry specific factor elasticities. T-statistics in parentheses.
Level of significance: ***1%; **5%; *10%.

Table 4
Determinants of firm performance estimated over the period 1996-2003

	Lagged variables		Instrumental variables	
	Fixed industry effects	Industry specific elasticities	Fixed industry effects	Industry specific elasticities
Intercept	0.7287***	0.7037***	0.9040***	0.7683***
	(6.16)	*(5.84)*	*(6.10)*	*(4.79)*
Lnnetas	0.2650***	0.2477***	0.2268***	0.2073***
	(20.01)	*(6.14)*	*(13.22)*	*(4.59)*
Lnempl	0.6895***	0.7117***	0.7163***	0.7400***
	(53.81)	*(15.64)*	*(40.16)*	*(13.46)*
Q*Lnnetas	0.0297	0.0019	0.0813	-0.0029
	(1.25)	*(0.08)*	*(1.49)*	*(-0.04)*
Q*Lnempl	0.0052	0.0274	-0.0477	-0.0272
	(0.23)	*(1.17)*	*(-0.92)*	*(-0.46)*
Peerrent	0.2221***	0.2234***	0.1903***	0.1884***
	(6.93)	*(7.05)*	*(5.27)*	*(5.24)*
Lev	-0.1430**	-0.1315**	-0.2307***	-0.2321***
	(-2.49)	*(-2.34)*	*(-2.68)*	*(-2.70)*
Famil	-0.0575**	-0.0752***	-0.1125***	-0.1231***
	(-2.56)	*(-3.44)*	*(-3.69)*	*(-4.01)*
Quoted	-0.3967**	-0.3271*	-0.5477	-0.5638
	(-2.25)	*(-1.86)*	*(-1.37)*	*(-1.19)*
Q*Peerrent	-0.3505***	-0.3418***	-0.2373**	-0.2482**
	(-5.31)	*(-5.27)*	*(-2.26)*	*(-2.34)*
Q*Lev	0.1655	0.2033*	0.5103**	0.5302**
	(1.37)	*(1.70)*	*(1.99)*	*(1.98)*
Q*Famil	0.1226***	0.1244***	0.3308***	0.3531***
	(2.87)	*(2.97)*	*(3.72)*	*(3.83)*
(Pseudo) R^2	0.926	0.931	0.929	0.935
N	1956	1956	1956	1956
Peerrent + Q*Peerrent	6.39**	5.77**	9.35***	5.61**
Lev + Q*Lev	0.33	2.91*	6.07**	4.15**
Famil + Q*Famil	1.51	2.89*	4.56**	2.80*

The dependent variable in all models is the natural logarithm of value added (LNVA). Explanatory variables are as defined in subsection 2.2. Q*(variable) indicates interaction term with the dummy QUOTED. In Columns 1 and 2 (lagged variable) a one year lagged value of LEV is used. Columns 3 and 4 (instrumental variables) use a predicted value of LEV and QUOTED based on instrumental variables as explained in Section 3.1. All models use random firm effects. Industry and year dummies are included in all models. Columns labeled "Industry specific elasticities" use industry specific factor elasticities. T-statistics in parentheses. Total impact of PEERRENT; LEV and FAMIL on productivity of quoted companies is tested by re-estimating the models of table 3A for a quoted subsample, F-statistics for the effect of the respective performance drivers for quoted companies are given in the bottom rows of the Table. Level of significance: ***1%; **5%; *10%.

Table 5
Robustness checks estimated over the period 1996-2003

	Subsidiaries excluded		20% smallest non-quoted and 20% largest quoted excluded	
	Instrumental variables		Instrumental variables	
	Fixed industry effects	Industry specific elasticities	Fixed industry effects	Industry specific elasticities
Intercept	0.8091***	0.6556***	0.9255***	0.9785***
	(5.42)	*(4.24)*	*(4.12)*	*(4.03)*
Lnnetas	0.2744***	0.2675***	0.1641***	0.1482**
	(15.25)	*(5.13)*	*(6.76)*	*(3.86)*
Lnempl	0.6775***	0.6954***	0.7916***	0.8067***
	(38.55)	*(11.96)*	*(30.79)*	*(17.02)*
Q*Lnnetas	-0.0779	-0.1864***	-0.2189***	-0.2408***
	(-1.33)	*(-2.73)*	*(-3.41)*	*(-3.26)*
Q*Lnempl	0.1322**	0.2077***	0.2514***	0.2798***
	(2.36)	*(3.16)*	*(3.93)*	*(3.78)*
Peerrent	0.2458***	0.2449***	0.2230***	0.2398***
	(7.25)	*(7.29)*	*(5.70)*	*(6.04)*
Lev	-0.2300***	-0.2459***	-0.2084***	-0.2145***
	(-3.62)	*(-3.93)*	*(-3.51)*	*(-3.65)*
Famil	-0.1285***	-0.1400***	-0.1065***	-0.0913**
	(-3.89)	*(-4.27)*	*(-2.91)*	*(-2.45)*
Quoted	-0.6530*	-0.0277	-0.8789	-0.9762*
	(-1.72)	*(-0.07)*	*(-1.61)*	*(-1.69)*
Q*Peerrent	-0.4037***	-0.4327***	-0.3774***	-0.3786***
	(-5.87)	*(-6.38)*	*(-5.65)*	*(-5.65)*
Q*Lev	0.2314***	0.2602***	0.2450***	0.2500***
	(4.33)	*(4.98)*	*(5.29)*	*(5.38)*
Q*Famil	0.4220***	0.4429***	0.3187***	0.2753**
	(4.57)	*(4.72)*	*(3.02)*	*(2.53)*
(Pseudo) R^2	0.920	0.927	0.905	0.910
N	1678	1678	1542	1542
Peerrent + Q*Peerrent	7.23***	7.71***	2.99*	2.63
Lev + Q*Lev	0.15	0.13	0.32	0.46
Famil + Q*Famil	2.71*	2.73*	3.03*	3.87**

The left hand side represents the results for the subsample where subsidiaries are excluded; the right hand side shows the results for the subsample where 20% smallest non-quoted and 20% largest quoted are excluded. The dependent variable in all models is the natural logarithm of value added (LNVA). Explanatory variables are as defined in subsection 2.2. Q*(variable) indicates interaction term with the dummy QUOTED. All models are estimated with a predicted value of LEV and QUOTED based on instrumental variables as explained in Section 3.1. All models use random firm effects. Industry and year dummies are included in all models. Columns labeled "Industry specific elasticities" use industry specific factor elasticities. T-statistics in parentheses. Total impact of PEERRENT; LEV and FAMIL on productivity of quoted companies is tested by re-estimating the models of table 3A for a quoted subsample, F-statistics for the effect of the respective performance drivers for quoted companies are given in the bottom rows of the Table. Level of significance: ***1%; **5%; *10%.