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Bernardo Bortolotti, Frank De Jong,
Giovanna Nicodano and Ibolya Schindele

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Bernardo Bortolotti, *University of Turin and FEEM*
Frank De Jong, *Finance Group, Universiteit van Amsterdam*
Giovanna Nicodano, *University of Turin*
Ibolya Schindele, *Finance Group, Universiteit van Amsterdam*

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Summary

Share issue privatization – i.e. privatization on public equity markets – is often claimed to foster stock market development. In this paper, we provide an empirical assessment of this claim, testing the role of privatization on two market liquidity measures in a panel with monthly data of 19 developed economies. Privatization is shown to be key in improving domestic stock market liquidity, controlling for other economic, financial and institutional determinants. Results do not appear to be driven by reverse causality or non-stationarity of the data.

Keywords: Privatization, financial market development

JEL: L33, G14

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Address for correspondence:

Bernardo Bortolotti
Fondazione Eni Enrico Mattei
Corso Magenta, 63
20123 Milano
Italy
Phone: +02+52036931
Fax: +02+52036946
E-mail: bernardo.bortolotti@feem.it

1. Introduction

Financial market development is among the objectives of share issue privatization (SIP) programs around the world. A remarkable wealth of evidence has shown the correlation between financial market development and privatization. For instance, stock market capitalization (turnover) in developed countries outside the US grew from over 3 (.364) in 1983 to over 24 (.85) in 1998 $US trillion, while massive privatization plans were in progress (Boutchkova and Megginson, 2000). However, stock markets develop also in the absence of privatization. Indeed, the US experienced an exponential growth in capitalization and turnover over the same years with only limited privatization.

This paper tries to make a step forward in understanding the role of privatization in financial market development, by isolating the impact of SIP on stock market liquidity (and thus indirectly on efficiency), controlling for other potential determinants identified by the theoretical literature. The study, which is based on a panel data set of nineteen OECD countries over the 1985-2000 period, complements the existing evidence concerning emerging economies (Perotti and Van Oijen, 2001).

Market development can be measured by both capitalization and liquidity. In this paper, we focus on the latter, since liquidity is directly linked to growth and efficiency. Empirical studies have shown that the initial level of stock market liquidity is a robust predictor of economic growth and capital accumulation, while initial capitalization is not – its significance being attached to a few outliers and to the omission of liquidity in the regression (Levine and Zervos, 1998; Levine, 1997). Furthermore, market liquidity – rather than its size – provides incentives for information acquisition by financial analysts. Their private signals are in turn aggregated and partially mirrored in stock prices. This positively affects corporate performance and growth because it makes possible to design stock-based managerial

incentive schemes (Hölmstrom and Tirole, 1993). Finally, both larger and more liquid equity markets result from improved risk sharing associated with greater investors' participation (Pagano, 1989). Indeed, a privatization policy aimed at fostering stock market liquidity can therefore be rationalized in terms of social welfare and economic growth.

We proxy market illiquidity by the average ratio of absolute return to dollar volume. This measure has recently been proposed as a proxy for the price impact (Amihud, 2002), which is the conventional notion of market thinness in the literature. The price impact coincides with the price response associated with a unit trade in auction markets (Grossman and Stiglitz, 1980; Kyle, 1985) and with the effective bid-ask spread in dealer markets (Glosten and Milgrom, 1985; Biais, 1993; Dennert, 1993). The computation of these indicators requires transaction data which are not always available. Moreover, market microstructure varies across countries, making transaction data hardly comparable. These difficulties are circumvented through the use of the Amihud index. We also analyze the effect of privatization on turnover, i.e. the ratio of trading volume to capitalization, that has been widely adopted as a proxy for market liquidity by previous cross-country empirical studies of financial development (Levine, 1997).

We measure the extent of privatization on equity markets over time through several indicators, aimed at capturing the effects of both IPOs and seasoned equity offerings. We also assess whether the impact of privatization on liquidity is affected by some features that typically distinguish share issue privatization from other stock issues. For instance, privatization often brings into the market new industries (especially telecommunication and utilities) thus potentially increasing domestic investor's diversification opportunities, which in turn affect liquidity. Moreover, major privatization sales – especially in the telecom industry – have been global offerings with the cross-listing of stocks. This privatization strategy may enlarge the participation of foreign investors and overcome informational

barriers to foreign investment. Thus floating SOEs on foreign markets could boost liquidity in home markets.

Our empirical results show that privatization is a key determinant of financial market development. Particularly, we document the positive role of SIP in increasing liquidity, while accounting for other potential determinants set forth in the literature, such as the enforcement of insider trading regulation, political and country risk, and capital markets liberalization. More precisely, the free float of privatized companies as a share of total capitalization is positively correlated with both the Amihud index and the turnover ratio. SIPs in the energy, telecom and utility industries also increase both liquidity and turnover. Privatization in the telecommunications industry – which have been global SIPs – and privatization combined with the cross-listing of stocks significantly increases domestic liquidity without affecting turnover. Importantly, we also show that the improvement in market liquidity is not only due to the higher liquidity of privatized stocks. On the contrary, a large scale privatization program based on SIP generates important positive externalities on the liquidity of private companies as well.

In the next section we discuss why and how privatization is expected to affect equity markets. Section 3, 4, and 5 present our data, model and empirical results. Section 6 reports some robustness tests, and section 7 concludes.

2. Privatization and market liquidity: theory.

In this section, we review the theoretical arguments explaining how SIP may affect liquidity. An asset is less than perfectly liquid when sell (buy) orders are filled at a price below (above) the risk-neutral one, even if these orders are motivated by liquidity needs rather than private information (see O'Hara, 1995). Such price premium is the compensation for risk-averse traders who satisfy other investors' liquidity needs. Indeed this usually implies

a temporary deviation from their optimal holdings, which in turn results in excess risk taking. Hence market illiquidity is related to the risk-premium.

Stock markets can be trapped in a low liquidity-high risk premium state due to a coordination failure among firms and investors. The number of IPOs may be lower than optimal in equilibrium because each entrepreneur bears the full listing costs but does not internalize all the benefits. This argument is related to risk diversification in Pagano (1993). If its return is uncorrelated with that of other securities, the initial public offering of an asset increases risk diversification opportunities for investors. In other words, investors can construct better diversified and hence more liquid portfolios only if many entrepreneurs decide to list their companies. Thus investors do not enter the equity market if they anticipate too few IPOs, and this increases the cost of capital. In this case a small and volatile stock market is obtained. A privatization policy, which exogenously increases IPOs of state-owned enterprises (SOEs), can move away the equilibrium from this under-development trap.

A similar effect on stock market liquidity results when agents receive on-the-job costless information concerning their own companies' payoff, as in Subrahmanyam and Titman (1999). Opportunities to profit from such "serendipitous" information increase when the firm goes public, since it may not be possible for an investor to trade shares of private firms. In turn, a going public firm benefits from a larger number of informed investors in the stock market. They indeed require a lower risk premium, because their information enables them to forecast more precisely future firm payoff. This increases both underwriting prices and liquidity. But there may be a low-welfare-low-liquidity equilibrium when agents correctly anticipate too few IPOs, and firms do not consequently list their shares. In this circumstance we expect market liquidity (and market size) to be positively related to the number of privatization IPOs, as these induce both informed investors and other firms to enter the stock market.

Improved diversification opportunities and information trading – leading to deeper and more liquid markets – can stem from any private IPO. But the IPO of privatized SOEs should in principle have an even larger effect, as often SIP involves the floating of companies in industries that were not previously traded. Indeed, in most European countries, telecommunications, energy, and utilities were entirely under state ownership before privatization.[1]

Improved liquidity can also stem from the use of the fixed-price offer method in SIPs, which gives rise to demand cascades that increase participation in the offer (Benveniste and Busaba, 1997). Some privatization programs have indeed been explicitly aimed at attracting a large number of investors through a relatively high underpricing. This originates excess demand, which is absorbed by resorting to a rationing allocation scheme (Jones at al., 1999). Indeed, this privatization method has been successful in spreading share ownership at the time of the issues. Almost two-thirds of the 54 non-US firms with over 500.000 shareholders are privatized companies. Moreover, companies privatized through SIP have a far larger number of stockholders than their private counterparts in the same country (Boutchkova and Megginson, 2000).[2]

Market participation is limited by costly information acquisition, as investors are willing to trade only stocks they know about (Merton, 1987). Awareness is a precondition for investors to process and trade on the basis of detailed information about the firm. The SIP of large state-owned enterprises is usually performed through an investment bank with broad distribution ability and accompanied by advertising in the press. If this induces new investors

[1] Most of the effects mentioned in this section obtain only when domestic investors cannot fully diversify internationally due to transaction costs such as international taxes or information costs. Home bias of domestic portfolios has been widely documented (Lewis, 1999) and may be associated with inefficient risk diversification.

[2] It is possible to rationalize this goal as an attempt to not only to trigger investors' entry into stock markets, but also please the median voters for political purposes (Biais and Perotti, 2002).

to follow the stock, then the liquidity of the stock of the privatized company can be higher than that of the average (private) listed company. As more SIPs are advertised and implemented, market liquidity increases.

Privatization often involves the cross-listing of stocks, especially for larger SOEs, so that shares are traded both at home and on one (or more) major foreign exchange. Foreign participation in the domestic market may increase as a result of road-shows that are performed in connection with the listing in international exchanges, in order to help investors obtain information not only about the firm on sale, but also about its home country.[3] Such participation will also benefit the liquidity of shares that are traded only locally, if the returns of the privatized and the local companies are positively correlated. Indeed, increased foreign participation reduces risk bearing by domestic investors and the associated required risk premium (Chiesa and Nicodano, 2000). These effects of cross-listing on liquidity have also been studied by Hargis and Ramanlal (1998). In a model encompassing inter-market information sharing and order flow migration, they show that the overall impact of international cross-listing on domestic liquidity and traded volume is positive.

Privatization may impact on market participation and liquidity also through its effect on political risk. Investors may be discouraged from entering a market as they are fearful of being expropriated. A sustained privatization policy allows a government to gain credibility, thus lowering the risk premium and the associated stock illiquidity (Perotti, 1995; Perotti and Laeven, 2001).

[3] "Governments have discovered that privatization through a global equity market placement created an unmatched opportunity to get the attention of investors around the world and to tell the country's story. No investment mission has the impact of a global equity roadshow". Jeffrey R. Shafer, Salomon Smith Barney, in *Privatisation International Yearbook*, 2000.

3. Data

We collect stock market and privatization data for countries that (1) had OECD membership in the beginning year of our sample period, 1985; (2) were covered by conventional data sources; (3) did not have restrictions on foreign ownership.

We focus on OECD countries since we want to restrict the analysis to developed economies. While we sacrifice some observations, the panel data restrictions – concerning equal sensitivity of liquidity to explanatory variables across countries – are less extreme in our relatively homogeneous sample. Indexes or trading volume data are not systematically available for small markets – such as Luxembourg, Iceland and Ireland. Turkey and Greece are excluded given the presence of foreign ownership restrictions, as well as countries that obtained OECD membership later than 1985. Some of the latter were involved in economic transition (such as Poland, Czech Republic, Hungary, and the Slovak Republic).

The resulting sample contains data for 19 economies, for which we assembled a panel with monthly observations over the January 1985 to November 2000 period. For some countries, however, reliable data on the value of shares traded start later than January 1985. Table 1 lists the exact starting date of the sample period for each country.

3.1 Measuring liquidity

We first measure liquidity over time in each market with the turnover ratio. This is a standard indicator of market development in the macro-finance literature (Levine, 1997), although it captures volume rather than market depth. In a liquid market the price impact of a unit trade is small, i.e. a buy (or sell) order causes a small price increase (decrease) [4],

[4] The orders we refer to are submitted by uninformed traders. The price impact of information-based orders can be large even in an infinitely liquid market.

irrespective of turnover. We therefore rely also on a measure of price impact proposed by Amihud (2002), ILLIQ[5], which relates the *absolute* change in price to trading volume. This variable is a proxy for the (implicit) bid-ask spread that is the usual measure in (auction) dealer markets.

In order to construct the turnover ratio, we collect from Datastream the daily total market capitalization (MVALUE) and the total value of shares traded (TVOLUME). The (daily) turnover for day *d* in month *t* [6] is equal to the volume scaled by market capitalization:

$$TURNOVER_{dt} = TVOLUME_{dt}/MVALUE_{dt}$$

Monthly turnover is constructed by dividing the total trading volume over a month by the average market value during that month. We construct a monthly measure of ILLIQ measure once a month using daily data. Amihud's definition of this variable is:

$$ILLIQ_t = D^{-1} \sum_d \{|R_{dt}|/TURNOVER_{dt}\}$$

where $|R_{dt}|$ is the absolute daily return and D is the number of trading days in month *t*. Market returns are calculated using the Datastream Market Index for the 19 economies in our sample. This index does not include all the companies in a market. It selects the most important companies by market value and changes them to reflect current market conditions. The approximate number of stocks ranges from 50 (Austria, Greece, Portugal, Denmark and Finland) to 1000 (US, Japan). The scale of ILLIQ measure is such that, for example, a value of 3 indicates that the absolute return is 3% on a day where 1% of the market value is traded. The price impact is thus *inversely* related with turnover. We use the monthly *median* of daily absolute return-turnover ratio instead of the average in order to mitigate the impact of outliers, caused by both extreme returns and days with extremely low turnover. So, our definition of ILLIQ is

[5] We are especially grateful to Gabriella Chiesa for suggesting us the use of this liquidity measure.

$$ILLIQ_t = \text{median}\{|R_{dt}|/TURNOVER_{dt}\}$$

Figure 1 graphs the time series of illiquidity and Table 1 provides summary statistics. In the early years of the sample, up to 1994 approximately, the turnover figures in some countries were low, and the resulting Amihud measures were very high. In the later years the Amihud measure is both more stable in time and more similar across countries, although the countries with a relatively high capitalization to GDP ratio (Germany, Netherlands, UK and USA) have higher liquidity than the others. In all markets, the Amihud measure is declining over time, indicating an improvement of liquidity, accompanied by a marked increase in turnover.

3.2 Privatization and financial market development: descriptive analysis

Our main source for privatization information is *Privatisation International*, which is part of *IFR-Platinum Database* of Thomson Financial from 1998 onwards. This source is widely used in the empirical literature (see Jones et al., 1999; Megginson *et al.*, 2001). It reports qualitative and quantitative information about all privatization transactions (public offers, asset sales, and concessions) worth more than US$500,000, with a worldwide coverage over the 1977-2000 period. This low cut-off allows us to include virtually the whole population of privatizations implemented by governments through public offerings over the sample period.

In this paper, we define privatization as an issue of common stock of a State-owned enterprise on a public equity market. This definition thus includes both IPOs and secondary offerings. We collect data about issue dates, company industry, the target markets (domestic and international), and the percentages of capital sold in each privatization sale. We then follow the history of these companies during the sample period in order to track the changes of names, the de-listings, and M&A activity, using *SDC Platinum*, *World Wide Mergers &*

[6] For notational convenience the country subscript has been suppressed.

Acquisitions Database, and the company websites. If the privatized company merged with or was acquired by a private company, and was consequently de-listed or listed with shares registered under a new name, we consider as a "privatized company" either the newly created company or the acquirer of the privatized company itself, provided their shares trade on the stock market where the privatized company was initially floated. For example, British Petroleum (BP) was initially privatized in 1977. After two other share issues (1983 and 1987) BP merged in 1998 with Amoco, a US oil company. BP-AMOCO is considered as a privatized company also from 1998 onwards. Similarly, Credit Communal de Belgique was privatized in 1996. In the same year, the company merged with Credit Local de France, creating the DEXIA group, with shares listed in EURONEXT. Therefore, DEXIA is considered as a privatized company from 1996 onwards. The relevant information concerning de-listings and M&A activity is contained in an Appendix which is available from the authors upon request.

The sample includes 228 privatized State-owned enterprises (SOEs). Figure 2 and 3 report the number and cumulative number of privatized companies over the 1985-2000 period. Figure 2 shows the existence of some privatization cycles in the countries in our samples, with the years 1987, 1994, and 1999 associated with a more intense privatization effort in terms of companies privatized. Figure 3 highlights the relatively stable increasing trend in privatization. As widely known, the UK was largely involved in privatization boasting 33 companies privatized over the period. France and Italy follow, with 27 and 26 companies, respectively. Only 2 major privatizations are reported in Belgium, Denmark, and Switzerland. The geographical distribution of privatization reveals that European countries have 79 percent (181) of privatized SOEs, followed by America, Australasia, and Japan with 21, 20 and 6 companies respectively.

As Table 2 shows, in some countries (such as Portugal, Austria, Ireland, and Finland) privatized companies range from 23 to 14 percent of (end of period) total number of listed companies. The data on capitalization are also striking. Privatized companies account on average for 21.2 percent of total market capitalization at the end of our sample period. However, there is also a large cross country variability within our sample, with France boasting 83 percent (59 percent if we only consider the free float) while the USA a bare 0.03 percent. Among European countries, Spain, Portugal, Austria, and Italy exhibit high values ranging from 53 to 40 percent. New Zealand ranks in prominent positions, with privatized companies accounting for 30 percent of total market value.

Privatized SOEs are equally distributed in the financial, manufacturing, and utility industries, with each industry accounting for approximately 25 percent of the companies. Eleven percent of the companies are telecommunications operators while approximately 7 and 5 percent belong to energy and services, respectively.

It has been documented that SOEs are often the largest companies in the economy, and as such they are typically sold in several tranches. This sequencing of sales has been ascribed to several reasons, ranging from the absorption capacity of domestic stock markets to the building of reputational capital by the privatizing government (Megginson and Netter, 2001). We have 338 share issues in the sample, and about a half of these are IPOs (50.3 percent). At the company level, the average number of issues is 1.48. The average cumulative percentage of capital privatized (accounting for the various tranches) is 61.4 per cent, and the median is 50 percent.

The international profile of these issues is also worth noticing. It has been claimed that privatization has been a key factor in international financial markets integration, as major sales were often implemented through global offers. The Appendix (available from the authors) also provides detailed information about the geography of privatized stocks. The

majority (62.3 percent) of the 228 privatized companies are listed only in the home market. However, 55 companies (24.1 percent) are dual-listed (i.e. listed at the home and in a foreign exchange), and 28 (12.3 percent) companies are instead cross-listed in two or more foreign exchange. Global stocks are defined as those listed in at least three continents. A few companies in our sample meet these stringent criteria. With one exception, these are all telecommunications companies: Deutsche Telecom, Telefonica de Espana, British Telecommunications (BT), BP, and Nippon Telegraph and Telecom (NTT). Finally, two Canadian (PetroCanada and Canadian National) and a Dutch company (Elsag Bailey) are listed on foreign markets only.

3.3 Measuring privatization on public equity markets

We collect the daily series of stock prices, capitalization, and value of trades for each privatized company (all expressed in local currency) from Datastream. We then construct monthly series at the country level for the privatization variables that we describe below.

A simple indicator of privatization IPOs is the cumulative number of privatized firms PRIVANUM, scaled by total number of listed firms (per year and per country). The latter is drawn from FIBV (International Federation of Stock Exchanges) publications. This measure is motivated by the analysis of Pagano (1989,1993) where the number of firms listed in a market is a proxy for investors' diversification opportunities. Another indicator is the market value of privatized firms divided by total market capitalization (PRIVAMV).

These two variables do not fully capture the time series variation in privatization. Indeed, both increase as a SOE is privatized in a given country, but they do not change when secondary offers occur. In order to capture secondary offerings also, we construct the variable PRIVAFLOAT. This is the product of the capitalization of the privatized company

and the *cumulative* percentage of capital floating in the domestic market, taking into account multiple tranches implemented through seasoned offers, scaled by the total market capitalization. This variable thus includes only the shares targeted to domestic retail investors, and excludes the market value of the government's residual stake, and of the stakes owned by institutional investors, which are instead included in PRIVAMV. Table 2 reports the (end of period) value of the free float divided by total market capitalization for each country. The float of French privatized companies accounts for more than a half of total market capitalization (59 percent), followed by Portugal and Spain, with 30 and 29 percent, respectively.

We also disaggregate the market value of privatized companies by industry and construct four series, all scaled by total market capitalization: one for telecommunications (PRIVATLC), one for energy (oil and gas, electricity generation, PRIVAENR), and one for utilities (gas and electricity distribution, transports, water and sewerage, PRIVAUTL). These series allow us to test whether specific industries contribute more to market liquidity by improving on portfolio diversification.

Finally, we use the information about the target market in order to distinguish between companies floated only domestically, and companies listed also in one or more foreign stock markets. We take into account direct listings in major exchanges, such as the NYSE, the LSE, or major European bourses, but also listings in upstairs markets such as the PORTAL, where Qualified Buyers trade shares registered under SEC Rule 144 (see Karolyi, 1998). Share trading in the SEAQ International in London is not accounted for, as it does not entail any share issue on that market. The series PRIVABROAD is the sum of the capitalization of privatized companies, which are listed at home and in one or more foreign exchanges, again scaled by total market capitalization. This series is used to test the effect of the increased foreign market participation resulting from privatization share issues.

4. Empirical model

The dependent variables are the (log of) monthly turnover ratio and the monthly Amihud measure for the price impact (ILLIQ). We take logarithms of turnover in order to reduce both cross-country heteroskedasticity and the impact of outliers. The independent variables are the privatization indicators discussed in the previous section and several control variables. We also include country specific dummies (fixed effects) in our panel regression.

The control variables that we use have been suggested in previous literature, and account for volatility, market size, country risk, market liberalization and insider trading.

Volatility. Monthly price volatility is the average absolute return:

$$VOLATILITY_t = D_t^{-1} \sum_d |R_{dt}|$$

Volatility is included in order to correct for month-to-month fluctuations in liquidity that are not related to other explanatory variables, such as information flows that change investors' expectations. These typically increase both price volatility and turnover, but decrease market depth; see Amihud (2002) for a similar approach.

However, the Amihud ratio and the volatility measure are based on the same data. Furthermore, they are shown to be jointly determined in several equilibrium models. Because of this concern about simultaneity, we run all the regressions that have ILLIQ as the dependent variable with lagged volatility.

Market size. It is known that the higher the number of participants in the market, and especially non-informed traders, the higher the liquidity of the market itself. Furthermore, as shown by Pagano (1993), under certain assumptions the number of firms listed is a good proxy for diversification opportunities in the market, which in turn affects liquidity. To capture the "size effect" we use (the log of) the country's beginning-of-month

total market capitalization CAP – converted to dollars – as a control variable. Using market value scaled by GDP as a proxy gives very similar results.

Country risk. We also add control variables to proxy for changes in the country risk assessment and the institutional environment. These variables are motivated by the work of Perotti (1995), Perotti and Van Oijen (2001) and Lombardo and Pagano (2000). Perotti and Van Oijen argue that the effect of privatization on market development may be indirect: privatization leads to a gradual improvement in the country risk ratings, which implies lower risk for investors and therefore more intense market development. Lombardo and Pagano (2000) show that the legal and institutional environment has a significant impact on the expected returns: the more stable the institutional environment, the lower the cost of capital. The proxies for the institutional environment are a set of indicators collected by the ICRG, namely political risk, risk of expropriation and repudiation, the quality of bureaucracy, rule of law, corruption, and ethnic tensions. These indicators are contained in the IRIS Dataset and are available for the 1985-1997 period only.

Market liberalization and monetary union. We include a dummy EU92 that is equal to one for 1992 and later years for the European Union countries that had to eliminate restrictions on capital movements by 1992. This dummy should thus capture the effect of progressive European capital market integration that picked up significantly after the negotiations of the Maastricht treaty. Several EU countries began to upgrade financial institutions and regulations under the pressure of competition. In particular, in the last decade they drastically reformed the trading systems on their exchanges[7], which is likely to have an effect on liquidity. A theoretical argument for this is given in the model by Pagano (1993) mentioned in section two. A reduction in listing costs attracts new IPOs, which enhance diversification opportunities for other investors who are attracted into stocks because they

[7] For a good overview of these developments see Demarchi and Foucault (1998).

expect and obtain higher liquidity. This is also the case in Biais (1993), where liquidity is affected by competition among stock exchange intermediaries. As the number of dealers increases, the premium charged to liquidity traders falls because each dealer tries to undercut the others.

We also include another dummy variable (EURO) which equals 1 from 1999 on, in order to test whether there is an independent effect associated with the introduction of a single European currency in some member states of the EU.

Insider trading. Illiquidity has to do with the likelihood of information trading (Glosten and Milgrom, 1985; Kyle, 1985). The higher is such likelihood, the higher is the premium that the less informed speculators and dealers charge to liquidity traders for participating in the trade. The reason is that they anticipate to lose on trades with the better informed investors, and therefore transfer such losses onto those traders whose demand/supply of stocks is relatively price-inelastic due to liquidity needs. Both analysts and insiders are better informed traders. Enforcement of insider trading regulation may reduce the adverse selection premium and thus increase liquidity provided that the information produced by analysts is not a substitute of the insiders' foreknowledge. This hypothesis is supported by Bhattacharya and Daouk (2002), showing that turnover significantly increases after the first prosecution of insider trading in a large panel of countries. As control variable, we employ the indicator for the enforcement of insider trading regulations, as developed by Bhattacharya and Daouk (2002). The dummy INSIDER takes the value one starting from the year of the first prosecution of a case of insider trading.

All models are estimated by Pooled Least Squares with equal country weights. Standard errors are computed by the Newey-West procedure for panel data that takes into

account heteroskedasticity and serial correlation[8]. In reporting the results we use the 5% significance level, unless otherwise indicated.

5. Empirical results

In this section we present the main results of the empirical analysis. First, we present evidence about SIP as a determinant of aggregate market liquidity. Second, we test the existence of any spillover effect of privatization on the liquidity of private companies as well. Finally, we will check the robustness of the empirical results obtained.

5.1 Privatization and aggregate market liquidity

Estimation results with Amihud's illiquidity measure (ILLIQ) and (log) turnover as the dependent variable are reported in Table 3. Our findings are similar for both measures of market development: most of the privatization variables are significant albeit with slightly different *t*-statistics. The R^2 statistics indicate a better fit for models based on the turnover measure (R^2 around 80%).

The most important finding is that privatization issues have a statistically significant *direct* effect on market liquidity besides the indirect effects associated with an increase in market capitalization. As Table 3 shows, both the Amihud illiquidity measure and the turnover ratio are significantly affected by the total value of the free float of privatized companies (PRIVAFLOAT). The negative sign of the coefficient in Table 3, panel A (the ILLIQ regression) and the positive sign in Table 3, panel B (the turnover regression) indicate that an increase in free float decreases illiquidity. A sustained privatization program based on

[8] The primary regressions are performed in Eviews. Heteroskedasticity and autocorrelation consistent standard errors are calculated separately in a GAUSS program, using the Newey-West procedure with a window of

the floating of shares through a sequence of both IPOs and seasoned offerings appears to be a successful policy to increase the efficiency of the home market.

Increases in the capitalization of privatized companies in the telecom, energy and utility sectors (PRIVASECT) also contribute to liquidity and to turnover. This effect should stem from improved investors' diversification opportunities. Industries characterized by large economies of scale were typically under state ownership before privatization, so that privatization enlarges the trading strategies and risk sharing opportunities available to investors.

When the telecom, utility and energy industries are separately considered in the estimations, the liquidity enhancing effect is associated only to telecommunications (PRIVATLC), while the effect of privatization in the utility (PRIVAUTL) and energy sectors (PRIVAENR) remains insignificant. SIPs in telecommunication sector stand out for being critical in boosting liquidity measured by the Amihud index. In Table 3, the variable PRIVATLC (i.e. the share of the capitalization of privatized TLCs) shows a highly statistically significant coefficient, which is also the highest in absolute value. There are three candidate explanations for this remarkable effect. First, a typically state-owned sector enters the market for the first time when privatization occurs, improving investors' diversification opportunities. Second, telecom SIPs in several countries have been explicitly designed to spread share ownership in the population. France Telecom and Telefonica are the typical example (Jones et al. 1999). Third, telecom firms are truly global stocks featuring listings in at least three continents. This lowers informational barriers and domestic risk bearing.

Table 3 also shows the liquidity effect of privatization combined with foreign listings. The variable PRIVABROAD is strongly and significantly associated with illiquidity but not with turnover. This evidence again suggests that investments by foreign

13months. For an exact description of the Newey-West procedure in a fixed effects panel data model we refer

investors reduce risk bearing by domestic investors and the associated required risk premium- without affecting domestic trading volume.

We have seen that the free float (PRIVAFLOAT) and privatization in the main sectors (PRIVASECT) have significant estimates in both turnover and illiquidity regressions. An increase in the number of privatized firms (PRIVANUM) – which captures the effect of privatization IPOs - affects turnover, but not illiquidity. Thus a sustained privatization policy based on IPOs appears successful in fostering market activity only. However, we are not able to find a rationale for the missing impact on the risk premium. [9]

We now turn to control variables, which yield some interesting results. The effect of lagged volatility on ILLIQ is very strong, the elasticity being close to 2, with a *t*-statistic of 8 or higher. The estimates show a positive relation between volatility and illiquidity. A possible explanation for this correlation is suggested by the literature on market microstructure. More uncertain estimates of future returns command a higher risk premium for investors, thus translating in a stronger price impact of trade due to frictions such as inventory control and asymmetries of information.[10] Turnover is also positively affected by volatility, confirming the well-known positive correlation between volatility and trading volume (Karpoff, 1987).[11]

The size of the equity market, measured by the beginning-of-month market capitalization in dollars (CAP), is an important determinant of liquidity for both the Amihud and turnover indices (with reverse signs). The estimates with the market value to GDP ratio

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to Greene (2000, p.580).

[9] We estimate the combined effect of certain privatization variables within the same regression (for example, PRIVAFLOAT and PRIVASECT together) in order to find out whether specific features of privatization are more relevant. However, due to the relatively strong correlation between the privatization measures, we abandon this strategy and assess this question by looking at individual *t*-statistics and the R^2.

[10] For an overview of market microstructure theory we refer to O'Hara (1995).

[11] Since we use the same return data to estimate ILLIQ and volatility, there is a concern about endogeneity of current volatility, and therefore we estimate the regressions for ILLIQ with one month lagged volatility.To rule out doubts on simultaneity we also estimate the models without volatility. It turns out that the coefficients of the other variables do not change much if we omit volatility. We conjecture that volatility mainly captures short term fluctuations in liquidity without affecting the long run impact of the other variables.

give similar results. Notice that this is a time series effect: we measure the improvement in liquidity as the own market's capitalization increases. This control variable captures the indirect effect that past privatization exerts on liquidity by increasing beginning-of-month capitalization.

Bekaert and Harvey (2000) and Henry (2000) argue that financial liberalization leads to a lower cost of capital. A lower cost of capital can be associated with higher liquidity. In our regression analysis, the dummy variable for European countries after 1992 (EU92) significantly affects both liquidity and turnover. This dummy may capture the combined effect of European capital market integration and the reforms taking place on capital markets. It suggests that enhanced competition leads to a significant improvement in stock market conditions.

The effects of the privatization variables are robust to including the ICRG political risk measure. In the reported estimates we do not include the ICRG political risk measure itself but rather an orthogonalized measure, that we obtain as the residual of a regression of POLRISK on two privatization variables (PRIVANUM and PRIVAFLOAT). With this transformation the estimated coefficient of the privatization variables includes the indirect effect of privatization on liquidity via an associated increase in the political risk measure. The political risk itself has a positive effect on illiquidity, and is significant at the 10% level. The significance of the political risk variable is in line with the findings of Perotti and van Oijen (2001). However, they also report that the direct effect of the privatization variables on market development of emerging economies disappears when the control for political risk is included. In contrast, we still find an important and strongly significant direct effect of privatization in our sample of developed economies, even when controlling for political risk. However, one should consider that the two empirical models are hardly comparable, as we use stock variables, while Perotti and van Oijen instead focus on flow variables.

Among the other institutional variables, only the enforcement of insider trading rules is significant at (or around) the 10% level. In line with the results of Bhattacharya and Daouk (2002) we find that enforcement of insider trading rules fosters market development, here measured by liquidity.

The other control variables neither have significant effects on liquidity, nor do they change the effect of privatization. Some appear insignificant in almost all regressions. Examples of such variables are the dummy variable EURO, and indicators for expropriation and repudiation risk, the quality of the bureaucracy, rule of law, corruption, and ethnic tensions. Due to space constraints, we do not present these results.

5.2 The spillover effect of privatization

So far, we focused on the liquidity of the market as a whole. One may argue, however, that the increase in liquidity associated with privatization is simply a consequence of the higher liquidity of privatized firms. But does the effect of privatization on liquidity survive when only non privatized companies are considered? In other words, do we observe a significant spillover effect on the liquidity of private companies - as implied by several theories we referred to in section 2? We address this question below.

Liquidity of non-privatized firms is measured as follows. Daily market value and trading volume of the non-privatized firms are obtained by subtracting the market value (trading volume) of the privatized firms from the total market value (total trading volume). This procedure is slightly inaccurate, because the total market value and turnover series refer to the constituents of the Datastream index, which does not always include all companies listed in the domestic market. On the other hand, privatized companies – which are often the largest and more actively traded companies in the market – are typically

included in the index.[12] We may then 'overcorrect' the total market value and total trading volume, ending up with too low values for the non-privatized firms. However, this possible bias would distort our empirical results against the hypothesis of a positive spillover effect. We therefore believe that the data available are suitable for this further empirical inquiry.

Using the newly created data, we construct daily return[13] and turnover series, and from these we calculate monthly volatility, average turnover and Amihud's index, using the same definitions as before. We then estimate the regressions (Table 4) where the explanatory variables are the same as before, but the dependent variables (NONPRIV_ILLIQ in Panel A and NONPRIV_TURNOVER in panel B) now refer to the non-privatized firms. Results show a strong spillover effect on the new Amihud index. The same privatization variables and control variables matter, with coefficients that are of the same magnitude as the ones in Table 3. The only exception is the EU dummy, which loses explanatory power.

We find a weaker spillover effect of privatization on turnover, with one regressor only – PRIVAFLOAT – maintaining a statistical significant coefficient. Thus privatization seem to have a more marked effect on price impact rather than trading volume of non-privatized companies. The EU dummy does not again contribute to turnover, while the enforcement of insider trading appears especially important for increasing trading volume in non-privatized firms.

We conclude that our main hypothesis, i.e. that privatization enhances market liquidity, is confirmed not only for the market as a whole, but also for the subset of non-privatized firms. Privatization therefore has a strong spillover effect on the liquidity of other stocks. Higher post privatization liquidity is not simply driven by the higher liquidity of

[12] We have checked the coverage of privatized companies in the Datastream Index for a random sample of countries using the Data Appendix. Approximately, 98% of privatized companies are included.

privatized stocks, but also by the structural changes occurring in the domestic market in the course of a sustained large scale privatization program.

5.3. Robustness checks

Our regressions may be affected by the possible endogeneity of the privatization process. Governments may attempt to privatize when stock prices on financial markets are high. To the extent that such periods are also exceptionally liquid, the privatization variable may not be exogenous but rather be simultaneously determined with liquidity. A formal test for endogeneity is difficult, since it requires instrumental variables that affect the privatization process, but not the liquidity of the market. Such variables are difficult to find, however.

In order to control for this possible endogeneity, we run regressions with lagged privatization indicators. Only the most recent privatizations are possibly simultaneously determined with liquidity, while privatizations in earlier periods should be predetermined. We think a lag of 12 months is reasonable (this is also the order of autocorrelation in the residuals that we allow when calculating standard errors). Table 5 and 6 show the results of running the same regressions in Table 3 and 4 with 12 month lagged privatization variables. These regressions can also be interpreted as providing evidence on the persistence of the effects of privatization. Overall, our results remain qualitatively comparable when we control for endogeneity, with a stronger effect of privatization on the price impact, as argued below in more detail.

The magnitude and significance of the coefficients are somewhat smaller in the ILLIQ regressions for the market as a whole. There are other minor changes, such as the free

[13] Daily return is set equal to the relative change in market value of the non-privatized firms. This excludes dividends, and includes increases in market cap due to new issues of non privatized firms. Unfortunately, we

float of privatized companies losing its explanatory power in the price impact regression and PRIVABROAD gaining it in the turnover regression. Political risk indicators also display statistically significant coefficients in both sets of regressions. These results suggest that privatization improves future market liquidity, with political stability contributing to consolidate liquidity gains.

The endogeneity test performed using the sub-sample of non privatized listed firms yields intriguing results. *All* privatization variables become statistically significant at conventional levels in the price impact regressions, with the free float reporting the highest coefficient in absolute value. The evidence concerning turnover is instead close to the one obtained in the contemporaneous regressions, pointing to a weak spillover effect on trade volume. These results confirm an asymmetric spillover effect on price impact and turnover, and reveal that the first externality is stronger after twelve months. [14]

Another potential problem may be the non-stationarity of the data or the regression error terms. Table 7 provides tests for stationarity of the dependent variables and some of the most important independent variables in our regression model. We employ a panel unit root test developed by Im, Pesaran and Shin (1997), that performs a test of the joint null hypothesis that the series for all countries are non-stationary, against the alternative that all series are stationary. The results show that we reject non-stationarity for all our dependent variables, i.e. the liquidity measures, and also for volatility. In contrast, some of the explanatory variables like market capitalization and the privatization variables are non-stationary. The privatization variables are all non-stationary; this is not too surprising as they all have a marked upward trend in the sample period. To test for potential problems with non-

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don't have a proper price index for the non-privatized firms only, that would be ideal.

[14] The market value of privatized companies in the utility sectors (which was never significant in previous regressions) now generates a *negative* externality on the liquidity of private stocks, an empirical fact we leave unexplained.There is room for such a negative effect in Chiesa and Nicodano (2000), if the covariance

stationarity in the regression, we test the residuals of the regressions for unit root. The tables report the IPS (Im, Pesaran and Shin, 1997) statistic (to be precise, for each country in the panel we calculated the ADF (Augmented Dickey Fuller) test statistic; the IPS statistic is calculated as the standardized the average of the ADF statistics over the 19 countries). The test statistics are quite low, and typically reject non-stationarity of the residuals. Hence, we conclude that non-stationarity is not a problem for our panel regression model.

7. Conclusion

In this paper, we have shown that a privatization program improves domestic stock market liquidity. This effect persists after controlling for several economic and institutional factors. Privatization affects liquidity by increasing market size. However, it has a further direct effect, which we try to capture through different measures. Privatization increases both market liquidity and turnover when it enlarges the free float and the share of privatization belonging to the telecommunication, energy and public utility industries. Market development seems to be spurred by improved diversification opportunities in these cases. The share of privatization in the telecommunication industry, as well as the share of privatization cross-listed abroad, increase liquidity without affecting trading activity. Our conjecture is that both reduce informational barriers, since telecom companies are listed simultaneously in at least three continents. Hence the risk premium associated with residual uncertainty falls also in the domestic market, while domestic turnover is not affected due to increased competition from other marketplaces.

This paper selects explanatory variables and interprets econometric results according to the insight provided by different models, but does not test their implications. We

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between privatized network companies and non privatized companies is negative. We doubt this to be the case.

do not disentangle the relative strength of the political risk channel suggested in Perotti (1995), in that the estimated coefficients of the privatization variables include the indirect effect of privatization on liquidity via an associated increase in the political risk measure. Nor does it look for a non-linear effect of privatization IPOs, that would benefit markets caught in a low-liquidity trap according to Pagano (1993).

Moreover, dual-listings may matter because of increased participation by foreigners which reduces risk bearing by domestic investors (as in Chiesa and Nicodano (2000)). However, dual listings could be associated with improved information production about companies and the adoption of higher listing standards (as in Gehrig, 2002). In the latter case, we would expect a simple dummy variable to have more explanatory power than the amount of dual-listed privatization. This analysis is left for further research.

The post-92 dummy for European Union members deserves further scrutiny. Currently we cannot tell whether its positive effect on market development comes from increased economic integration and competition, or the expectation of reduced public sector deficits and monetary integration, or micro-structural stock market reforms occurring in several continental markets and so on. Results concerning the spillover effects of privatization make us believe in a simpler interpretation, namely that privatized companies in the EU were especially liquid. Policy evaluation requires to disentangle the relative roles of these changes by focussing on detailed data of EU members. More generally, the liquidity impact of reforms and events other than privatization and insider trading regulation in the sample period within each country are picked up in the intercept of our regressions and in this dummy variable. But an analysis of these events with individual country data would contribute to our understanding of other institutional developments that – together with privatization programs – improve stock market liquidity.

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Table 1: Descriptive Statistics of Liquidity Measures

This table reports the average values of the monthly turnover ratio, given by the ratio of the value of trades to total market value, and of the variable ILLIQ, given by the monthly average of the absolute price change to the trading value.

Countries	TURNOVER 1985-2000	TURNOVER 1994-2000	ILLIQ 1985-2000	ILLIQ 1994-2000	First date used in estimation
AUS	3.51	4.16	4.03	3.04	01-01-85
AUT	3.81	4.87	3.93	2.34	01-08-86
BEL	1.25	1.80	10.26	6.30	01-01-86
CAN	3.01	4.45	3.62	2.56	01-01-85
DEN	2.00	3.04	4.70	4.07	01-10-91
FIN	1.83	3.06	12.69	9.02	01-10-93
FRA	3.61	5.15	7.51	3.04	01-07-91
GER	14.98	17.39	0.97	0.93	01-06-88
ITA	3.43	6.29	13.76	3.42	01-07-93
JAP	2.64	3.07	6.07	5.57	01-12-90
NET	6.70	9.01	1.93	1.60	01-02-86
NEW	2.35	2.60	7.45	5.41	01-01-90
NOR	3.95	5.26	7.51	2.98	01-04-88
POR	2.36	3.55	3.60	3.56	01-11-93
SPA	4.66	5.76	3.98	2.97	01-02-90
SWE	3.58	5.67	6.97	3.33	01-01-85
SWI	4.31	5.59	3.77	2.37	01-01-89
UK	4.87	5.48	2.57	2.23	01-10-86
USA	7.15	9.26	1.64	1.31	01-01-85

Table 2. End of Period Values of Privatization Measures

This table includes the end of period (31/12/2000) number of privatized firms, the number of privatized firms as a percentage of the total number of firms quoted on the market, the market capitalization of privatized companies as a percentage of total market capitalization, and the value of floated privatized shares as a percentage of market capitalization.

Countries	Privatized firms	Number of privatized firms (%)	Capitalization of privatized firms (%)	Value of float of privatized firms (%)
AUS	20	2	23	15
AUT	26	23	42	17
BEL	3	1	10	9
CAN	26	2	5	3
DEN	6	3	10	5
FIN	22	14	8	1
FRA	54	6	83	59
GER	20	2	19	7
IRE	4	4	12	7
ITA	45	15	41	21
JAP	16	1	6	3
NET	11	3	-	2
NEW	7	4	30	12
NOR	13	6	1	0
POR	39	35	45	30
SPA	24	2	54	29
SWE	10	3	10	3
SWI	3	1	2	1
UK	54	2	15	12
USA	7	0	0	0

Table 3. Privatization and Market Liquidity: Regression Analysis

This table shows results of fixed effect panel data regressions of the dependent variable (ILLIQ or turnover) on a number of explanatory variables. PRIVANUM is the ratio of the number of privatized firms to the total number of firms quoted on the market. PRIVAFLOAT is the value of the free float of privatized firms scaled by total market capitalization. PRIVABROAD is the sum of the capitalization of privatized companies listed at home and in one or more than one foreign exchange, scaled by total market capitalization. PRIVATLC, PRIVAENR, and PRIVAUTL are the sum of the capitalization of privatized companies in the telecommunications, energy (oil and gas, electricity generation), and utility (gas and electricity distribution, transports, water and sewerage) sectors, respectively, all scaled by total market capitalization. PRIVASECT aggregates all these sectors. VOLATILITY is the monthly average absolute return. CAP is the (US dollar) total market value. EU92 is a dummy variable taking the value 1 from 1-1-1992 onwards, and zero otherwise, for EU countries. POLITICAL RISK originates from the residuals of the political risk regression. INSIDER is a dummy taking the value one starting from the date of one country's first prosecution of insider trading. Significant estimates are typed **bold**, t-statistics are in brackets. The IPS statistic is the (standardized) average of the residual ADF (Augmented Dickey Fuller test) t-statistics for each country. Asymptotically, it follows standard normal distribution.

Panel A: the Amihud illiquidity index

Dependent Variable. ILLIQ						
PRIVANUM	-4.97 (-1.11)					
PRIVAFLOAT		**-6.07** **(-2.41)**				
PRIVABROAD			**-6.43** **(-2.26)**			
PRIVATLC				**-13.85** **(-3.09)**		
PRIVAUTL					-1.38 (-0.45)	
PRIVASECT						**-8.62** **(-2.70)**
Log(Volatility)	**1.97** **(8.30)**	**1.98** **(7.97)**	**1.93** **(8.19)**	**1.88** **(8.46)**	**1.95** **(8.24)**	**1.96** **(8.43)**
Log(CAP)	**-1.79** **(-6.99)**	**-1.70** **(-7.69)**	**-1.62** **(-8.10)**	**-1.67** **(-8.37)**	**-1.82** **(-7.74)**	**-1.60** **(-8.43)**
EU92	**-1.26** **(-2.96)**	**-1.26** **(-2.75)**	**-1.43** **(-3.34)**	**-1.53** **(-3.94)**	**-1.44** **(-3.62)**	**-1.41** **(-3.49)**
Political Risk	**0.05** **(1.78)**	**0.05** **(1.84)**	**0.06** **(2.13)**	**0.05** **(1.97)**	**0.05** **(1.64)**	**0.07** **(2.31)**
INSIDER	-0.50 (-1.16)	-0.47 (-1.05)	-0.71 (-1.60)	**-0.74** **(-1.69)**	-0.68 (-1.53)	**-0.72** **(-1.67)**
R^2	0.549	0.546	0.551	0.558	0.547	0.551
IPS-statistic	**-4.38**	**-3.73**	**-3.08**	**-2.74**	**-3.96**	**-3.20**
Nobs:	2434	2434	2397	2397	2397	2397

Table 3 (continued)

Panel B: the turnover ratio

Dependent Variable: Log(TURNOVER)						
PRIVANUM	**2.54** **(4.17)**					
PRIVAFLOAT		**1.34** **(4.71)**				
PRIVABROAD			0.27 (1.14)			
PRIVATLC				0.20 (0.62)		
PRIVAUTL					**0.96** **(1.65)**	
PRIVASECT						**0.65** **(2.16)**
Log(Volatility)	**0.27** **(11.24)**	**0.27** **(10.83)**	**0.28** **(12.01)**	**0.28** **(12.14)**	**0.28** **(12.22)**	**0.28** **(11.96)**
Log(CAP)	**0.34** **(10.82)**	**0.36** **(11.53)**	**0.38** **(11.87)**	**0.39** **(12.05)**	**0.38** **(12.80)**	**0.37** **(12.50)**
EU92	**0.18** **(3.93)**	**0.20** **(4.50)**	**0.23** **(5.06)**	**0.23** **(5.23)**	**0.22** **(4.97)**	**0.23** **(5.16)**
Political Risk	**-0.01** **(-2.79)**	**-0.01** **(-2.78)**	**-0.01** **(-2.75)**	**-0.01** **(-2.63)**	**-0.01** **(-2.86)**	**-0.01** **(-2.89)**
INSIDER	**0.09** **(1.69)**	0.07 (1.28)	**0.10** **(1.84)**	**0.10** **(1.83)**	**0.10** **(1.92)**	**0.10** **(1.92)**
R^2	0.819	0.816	0.803	0.802	0.803	0.804
IPS-statistic	**-3.58**	**-2.95**	**-3.55**	**-3.58**	**-3.51**	**-3.48**
Nobs:	2434	2434	2397	2397	2397	2397

Table 4. Spillover Effects of Privatization: Regression Analysis

These tables report the results of fixed effect panel data regressions of liquidity of non-privatized firms as the dependent variable. As in table 3, we consider two liquidity measures: NONPRIV_ILLIQ (Panel A) and NOPRIV_TURNOVER (Panel B). PRIVANUM is the ratio of the number of privatized firms to the total number of firms quoted on the market. PRIVAFLOAT is the value of the free float of privatized firms scaled by total market capitalization. PRIVABROAD is the sum of the capitalization of privatized companies listed at home and in one or more than one foreign exchange, scaled by total market capitalization. PRIVATLC, PRIVAENR, and PRIVAUTL are the sum of the capitalization of privatized companies in the telecommunications, energy (oil and gas, electricity generation), and utility (gas and electricity distribution, transports, water and sewerage) sectors, respectively, all scaled by total market capitalization. PRIVASECT aggregates all these sectors. VOLATILITY is the monthly average absolute return. CAP is the (US dollar) total market value. EU92 is a dummy variable taking the value 1 from 1-1-1992 onwards, and zero otherwise, for EU countries. POLITICAL RISK originates from the residuals of the political risk regression. INSIDER is a dummy taking the value one starting from the date of one country's first prosecution of insider trading. Significant estimates are typed **bold**, t-statistics are in brackets. The IPS (Im, Pesaran and Shin) statistic is the (standardized) average of the residual ADF (Augmented Dickey Fuller test) t-statistics for each country. Asymptotically, it follows standard normal distribution.

Panel A: the Amihud illiquidity index

Dependent Variable. NONPRIV_ILLIQ						
PRIVANUM	-4.08 (-1.27)					
PRIVAFLOAT		**-3.81** **(-4.34)**				
PRIVABROAD			**-4.36** **(-2.09)**			
PRIVATLC				**-11.86** **(-3.70)**		
PRIVAUTL					1.96 (1.20)	
PRIVASECT						**-6.82** **(-3.33)**
Log(Volatility)	**1.90** **(12.38)**	**1.92** **(12.60)**	**1.91** **(12.30)**	**1.85** **(13.40)**	**1.88** **(12.12)**	**1.88** **(12.45)**
Log(CAP)	**-1.68** **(-10.60)**	**-1.66** **(-11.89)**	**-1.60** **(-12.66)**	**-1.57** **(-13.93)**	**-1.76** **(-11.45)**	**-1.61** **(-13.34)**
EU92	-0.10 (-0.43)	-0.11 (-0.50)	-0.33 (-0.84)	**-0.41** **(-1.87)**	**-0.40** **(-1.76)**	-0.32 (-1.25)
Political Risk	0.002 (0.14)	0.003 (0.15)	0.02 (1.10)	0.005 (0.31)	-0.002 (-0.08)	0.01 (0.56)
INSIDER	0.16 (0.73)	0.28 (1.27)	0.14 (0.51)	-0.02 (-0.12)	-0.05 (-0.22)	0.08 (0.38)
R^2	0.536	0.537	0.536	0.543	0.547	0.531
IPS-statistic	**-2.10**	**-1.73**	**-1.53**	**-1.58**	**-1.54**	**-1.66**
Nobs:	1883	1883	1846	1846	1846	1846

Table 4 (continued)

Panel B: the turnover ratio

Dependent Variable: Log(NON_PRIV TURNOVER)						
PRIVANUM	0.11 (0.16)					
PRIVAFLOAT		**0.43** **(3.66)**				
PRIVABROAD			-0.24 (-1.28)			
PRIVATLC				0.01 (0.03)		
PRIVAUTL					-0.43 (-1.26)	
PRIVASECT						0.10 (0.47)
Log(Volatility)	**0.21** **(11.13)**	**0.21** **(11.09)**	**0.21** **(11.58)**	**0.22** **(11.70)**	**0.22** **(11.60)**	**0.22** **(11.71)**
Log(CAP)	**0.35** **(18.21)**	**0.34** **(17.05)**	**0.35** **(16.38)**	**0.35** **(16.87)**	**0.36** **(17.78)**	**0.36** **(17.35)**
EU92	-0.02 (-0.57)	-0.03 (-0.78)	-0.0005 (-0.01)	-0.0002 (-0.005)	0.009 (0.24)	0.001 (0.03)
Political Risk	-0.005 (-0.60)	**-0.005** **(-1.66)**	-0.005 (-1.60)	-0.005 (-1.58)	-0.004 (-1.31)	-0.004 (-1.36)
INSIDER	**0.08** **(2.50)**	**0.07** **(2.18)**	**0.10** **(3.01)**	**0.11** **(3.06)**	**0.11** **(3.34)**	**0.11** **(3.25)**
R^2	0.818	0.818	0.795	0.795	0.796	0.796
IPS-statistic	**-0.55**	**-0.71**	**-0.55**	**-0.54**	**-0.66**	**-0.53**
Nobs:	1887	1887	1850	1850	1850	1850

Table 5. Endogeneity Test I. Privatization and Market Liquidity Regressions

These tables report the estimated coefficients of the privatization variables, lagged one year (12 periods). The specifications are as in Table 3, but with lagged privatization. The coefficients for the control variables are not reported. In Panel A, the dependent variable is our first measure for illiquidity, while in Panel B, it is turnover ratio. PRIVANUM is the ratio of the number of privatized firms to the total number of firms quoted on the market. PRIVAFLOAT is the value of the free float of privatized firms scaled by total market capitalization. PRIVABROAD is the sum of the capitalization of privatized companies listed at home and in one or more than one foreign exchange, scaled by total market capitalization. PRIVATLC, PRIVAENR, and PRIVAUTL are the sum of the capitalization of privatized companies in the telecommunications, energy (oil and gas, electricity generation), and utility (gas and electricity distribution, transports, water and sewerage) sectors, respectively, all scaled by total market capitalization. PRIVASECT aggregates all these sectors. Significant estimates are typed **bold**, t-statistics are in brackets. The IPS (Im, Pesaran and Shin) statistic is the (standardized) average of the residual ADF (Augmented Dickey Fuller test) t-statistics for each country. Asymptotically, it follows standard normal distribution.

Panel A: the Amihud illiquidity index

Dependent Variable: ILLIQ						
PRIVANUM(-12)	-2.67 (-0.51)					
PRIVAFLOAT(-12)		-0.52 (-0.24)				
PRIVABROAD(-12)			**-6.54** **(-4.16)**			
PRIVATLC(-12)				**-11.46** **(-2.71)**		
PRIVAUTL(-12)					1.12 (0.33)	
PRIVASECT(-12)						**-7.85** **(-2.92)**
Log(Volatility)	**1.97** **(8.31)**	**1.92** **(8.74)**	**1.95** **(11.19)**	**1.86** **(8.02)**	**1.92** **(7.89)**	**1.96** **(8.41)**
Log(CAP)	**-2.00** **(-7.24)**	**-1.71** **(-8.93)**	**-1.75** **(-14.03)**	**-1.83** **(-8.79)**	**-2.06** **(-8.31)**	**-1.75** **(-8.77)**
EU92	**-1.13** **(-2.63)**	**-1.10** **(-2.34)**	**-1.18** **(-4.14)**	**-1.32** **(-3.08)**	**-1.23** **(-2.83)**	**-1.14** **(-2.77)**
Political Risk	**0.06** **(2.17)**	**0.06** **(2.38)**	**0.08** **(5.02)**	**0.08** **(2.63)**	**0.06** **(1.98)**	**0.08** **(2.69)**
INSIDER	-0.45 (-1.05)	-0.70 (-1.59)	**-0.69** **(-3.02)**	-0.68 (-1.52)	-0.53 (-1.15)	**-0.72** **(-1.75)**
R^2	0.555	0.562	0.559	0.56	0.55	0.561
IPS-statistic	**-4.12**	**-3.51**	**-3.38**	**-3.53**	**-4.10**	**-3.64**
Nobs:	2302	2302	2365	2365	2365	2365

Table 5 (continued)

Panel B: the turnover ratio

Dependent Variable: Log(TURNOVER)						
PRIVANUM(-12)	**2.38 (3.59)**					
PRIVAFLOAT(-12)		**0.56 (2.05)**				
PRIVABROAD(-12)			**0.60 (2.70)**			
PRIVATLC(-12)				0.26 (0.55)		
PRIVAUTL(-12)					0.83 (1.56)	
PRIVASECT(-12)						**0.83 (2.76)**
Log(Volatility)	**0.27 (11.24)**	**0.26 (10.94)**	**0.28 (11.86)**	**0.28 (12.54)**	**0.28 (11.65)**	**0.28 (12.43)**
Log(CAP)	**0.37 (10.69)**	**0.39 (13.48)**	**0.39 (12.11)**	**0.41 (14.72)**	**0.40 (13.20)**	**0.38 (12.66)**
EU92	**0.16 (3.54)**	**0.17 (4.14)**	**0.20 (4.19)**	**0.20 (5.08)**	**0.19 (4.29)**	**0.19 (4.31)**
Political Risk	**-0.01 (-3.10)**	**-0.01 (-3.06)**	**-0.01 (-3.34)**	**-0.01 (-3.65)**	**-0.01 (-2.99)**	**-0.01 (-3.42)**
INSIDER	**0.08 (1.66)**	0.09 (1.56)	**0.10 (1.99)**	**0.09 (1.64)**	**0.09 (1.73)**	**0.11 (2.19)**
R^2	0.820	0.827	0.812	0.810	0.811	0.813
IPS-statistic	**-3.55**	**-2.85**	**-3.53**	**-3.51**	**-3.66**	**-3.55**
Nobs:	2378	2302	2365	2365	2365	2365

Table 6. Endogeneity tests II: Spillover Effect Regressions

These tables show the results of fixed effect panel data regressions of liquidity of non-privatized firms as the dependent variable. The privatization variables are lagged by 12 periods (one-year). As in table X, we consider two liquidity measures for non-privatized firms: NONPRIV_ILLIQ (Panel A) and NOPRIV_TURNOVER (Panel B). PRIVANUM is the ratio of the number of privatized firms to the total number of firms quoted on the market. PRIVAFLOAT is the value of the free float of privatized firms scaled by total market capitalization. PRIVABROAD is the sum of the capitalization of privatized companies listed at home and in one or more than one foreign exchange, scaled by total market capitalization. PRIVATLC, PRIVAENR, and PRIVAUTL are the sum of the capitalization of privatized companies in the telecommunications, energy (oil and gas, electricity generation), and utility (gas and electricity distribution, transports, water and sewerage) sectors, respectively, all scaled by total market capitalization. PRIVASECT aggregates all these sectors. VOLATILITY is the monthly average absolute return. CAP is the (US dollar) total market value. EU92 is a dummy variable taking the value 1 from 1-1-1992 onwards, and zero otherwise, for EU countries. POLITICAL RISK originates from the residuals of the political risk regression. ENFORCEMENT is a dummy taking the value one starting from the date of one country's first prosecution of insider trading. Significant estimates are typed bold, t-statistics are in brackets. The IPS (Im, Pesaran and Shin) statistic is the (standardized) average of the residual ADF (Augmented Dickey Fuller test) t-statistics for each country. Asymptotically, it follows standard normal distribution.

Panel A: the Amihud illiquidity index for non-privatized firms

Dependent Variable: NONPRIV_ILLIQ						
PRIVANUM(-12)	**-7.65** **(-2.03)**					
PRIVAFLOAT(-12)		**-4.85** **(-5.93)**				
PRIVABROAD(-12)			**-6.83** **(-3.78)**			
PRIVATLC(-12)				**-12.05** **(-4.05)**		
PRIVAUTL(-12)					**3.97** **(1.85)**	
PRIVASECT(-12)						**-7.64** **(-3.57)**
Log(Volatility)	**1.92** **(12.39)**	**1.78** **(12.49)**	**1.92** **(12.48)**	**1.82** **(13.36)**	**1.87** **(11.93)**	**1.93** **(12.74)**
Log(CAP)	**-1.57** **(-8.05)**	**-1.54** **(-10.79)**	**-1.43** **(-11.28)**	**-1.46** **(-12.52)**	**-1.77** **(-10.23)**	**-1.45** **(-11.79)**
EU92	-0.06 (-0.24)	**0.42** **(2.32)**	-0.21 (-0.78)	**-0.42** **(-1.84)**	**-0.43** **(-1.92)**	-0.15 (-0.61)
Political Risk	-0.0005 (-0.02)	0.01 (1.17)	0.02 (1.12)	0.02 (0.90)	-0.004 (-0.22)	0.02 (0.98)
INSIDER	0.12 (0.52)	0.14 (0.68)	0.05 (0.24)	-0.10 (-0.49)	0.003 (0.01)	0.05 (0.22)
R^2	0.539	0.549	0.542	0.552	0.526	0.544
IPS-statistic	**-1.99**	**-2.07**	**-1.78**	**-1.72**	**-1.64**	**-1.62**
Nobs:	1860	1829	1847	1847	1847	1847

Table 6 (continued)

Panel B: the turnover ratio

Dependent Variable: Log(NONPRIV_TURNOVER)						
PRIVANUM(-12)	0.28 (0.38)					
PRIVAFLOAT(-12)		**0.29** **(2.15)**				
PRIVABROAD(-12)			-0.02 (-0.13)			
PRIVATLC(-12)				0.12 (0.40)		
PRICAUTL(-12)					-1.26 (-1.20)	
PRIVASECT(-12)						-0.04 (-0.21)
Log(Volatility)	**0.22** **(11.10)**	**0.21** **(11.21)**	**0.22** **(11.56)**	**0.22** **(11.56)**	**0.23** **(11.93)**	**0.22** **(11.57)**
Log(CAP)	**0.34** **(15.53)**	**0.36** **(14.95)**	**0.34** **(14.08)**	**0.34** **(14.40)**	**0.36** **(15.29)**	**0.34** **(14.76)**
EU92	-0.02 (-0.48)	**-0.13** **(-3.49)**	0.008 (0.21)	0.009 (0.24)	0.04 (1.18)	0.009 (0.23)
Political Risk	-0.005 (-1.34)	**-0.006** **(-1.94)**	-0.004 (-1.23)	-0.004 (-1.33)	-0.003 (-0.97)	-0.004 (-1.21)
INSIDER	**0.09** **(2.62)**	**0.07** **(2.08)**	**0.11** **(3.29)**	**0.12** **(3.36)**	**0.13** **(3.73)**	**0.12** **(3.63)**
R^2	0.817	0.823	0.802	0.802	0.804	0.802
IPS-statistic	**-0.52**	**-0.43**	**-0.60**	**-0.60**	**-0.39**	**-0.60**
Nobs:	1864	1831	1851	1851	1851	1851

Table 7. Unit Root Tests

Unit root tests based on the Augmented Dickey-Fuller regressions

$$\Delta Y_{it} = \alpha_i + \delta_i t + \rho_i Y_{i,t-1} + \gamma_{i1} \Delta Y_{i,t-1} + \gamma_{i2} \Delta Y_{i,t-2} + \gamma_{i3} \Delta Y_{i,t-12} + \varepsilon_{it}$$

The IPS statistic is based on the individual t-statistics for countries I=1,..N. The statistic is

$$IPS = \sqrt{N}\{\mathbf{t}\text{-}E(t))/ \sqrt{Var(t)},$$

where **t** is the average of the individual t-statistics, and E(t) and Var(t) are tabulated in Im, Pesaran and Shin (1997). All statistics are distributed as N(0,1) asymptotically. **Bold** indicates a significant rejection of non-stationarity (5% one-sided test).

	IPS test statistic (no trend)	IPS test statistic (trend)
ILLIQ	**-11.81**	**-13.39**
NONPRIV_ILLIQ	**-10.41**	**-9.54**
LOG(TURNOVER)	**-4.65**	**-10.59**
LOG(NONPRIV_TURNOVER)	**-3.57**	**-7.67**
LOG(VOLATILITY)	**-10.95**	**-10.73**
LOG(MVALUE)	3.05	0.06
POLRISK	-1.07	0.94
PRIVANUM	3.02	0.07
PRIVAFLOAT	3.66	1.31
PRIVASECT	-0.98	-1.35
PRIVABROAD	2.04	-0.12
PRIVATLC	-1.07	-0.68
PRIVAUTL	0.12	-0.68

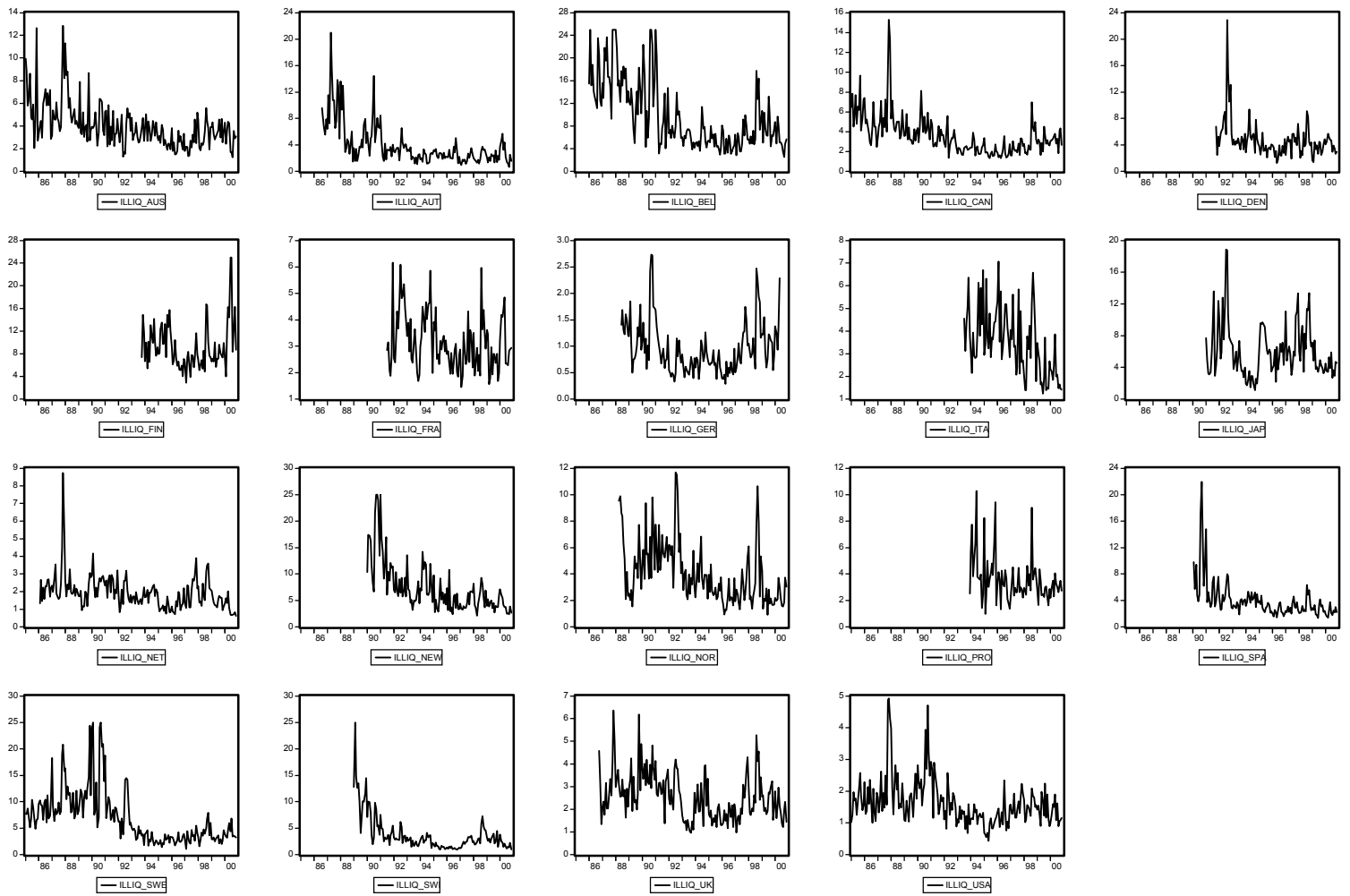


Figure 1: Time Series Graphs of ILLIQ

Figure 2. The Total Number of Privatized Companies in OECD Economies

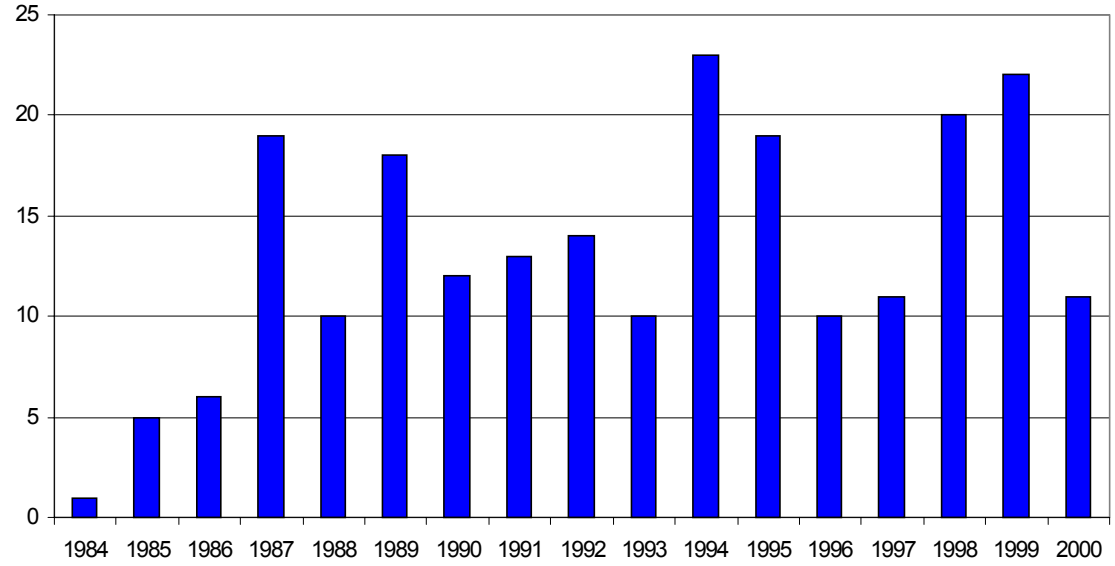
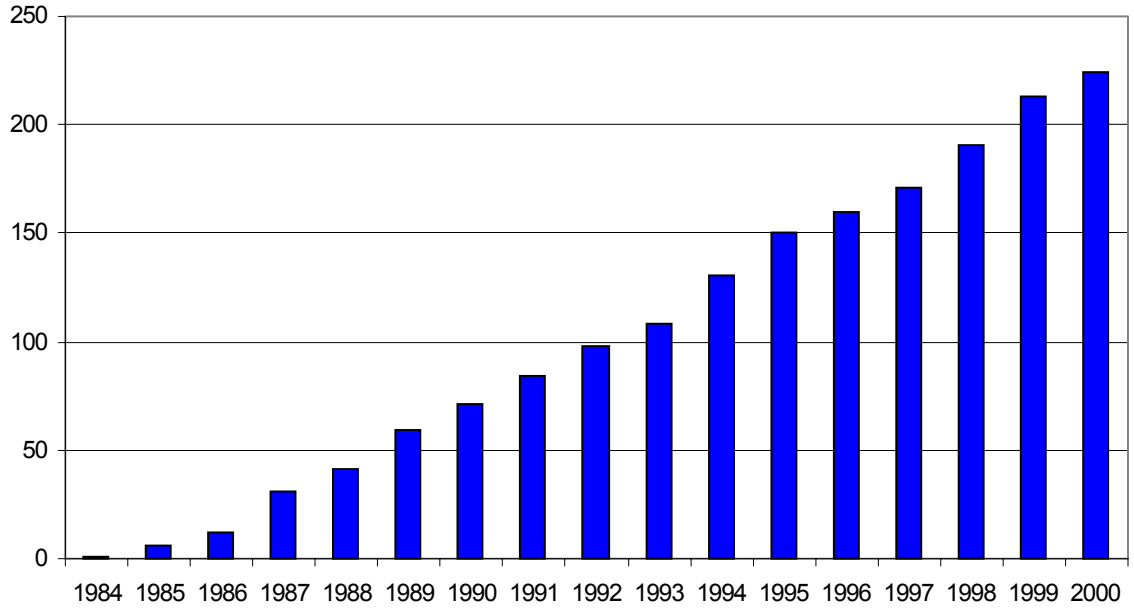


Figure 3. The Cumulative Number of Privatized Companies in OECD Economies



SOURCE: Privatisation International, IFR-Thomson

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