Tjalling C. Koopmans Research Institute

How to reach the authors

Please direct all correspondence to the first author.

Jacob A. Bikker
De Nederlandse Bank
Supervisory Policy Division, Stategy Department
PO Box 98
1000 AB Amsterdam
The Netherlands
E-mail: j.a.bikker@DNB.nl
Utrecht University
Utrecht School of Economics
Janskerkhof 12
3512 BL Utrecht
The Netherlands.

Laura Spierdijk
University of Groningen
Faculty of Economics, Department of Econometrics
PO Box 800
9700 AV Groningen
The Netherlands
E-mail: l.spierdijk@RUG.nl

Measuring and explaining competition in the financial sector

Jacob A. Bikker[a]
Laura Spierdijk[b]

[a]De Nederlandse Bank
Amsterdam, the Netherlands

Utrecht School of Economics
Utrecht University

[b] Faculty of Economics
University of Groningen

February 2009

Abstract
The first part of this paper provides a systematic discussion of the structural problems of competition on financial markets as observed from the demand and from the supply side, using a diagnostic framework. Potential impediments to competition are concentration, entry barriers, lack of transparency, product complexity, switching and search costs, financial illiteracy, lack of consumer power and weak intermediaries. In response to such financial market failures, we suggest a number of possible policy reactions. The second part of the paper investigates ways to measure competition and provides empirical figures on banking competition in 101 separate countries and assesses the market structure as monopolistic (or a perfect cartel), perfectly competitive or monopolistic competitive. Also, banking competition is explained, using explanatory variables of market structure, contestability, inter-industry competition, and institutional and macro economic conditions. This analysis provides possible instruments for reform in order to help promote competition. Next, the impact of banking consolidation is examined. Finally, developments in competition are observed over time, generally pointing to a downward trend.

1   **Introduction**

This paper consists of two parts. The first discusses structural characteristics of the financial markets including potential obstacles that may hinder competition, whereas the second deals with measuring and explaining competition, the impact of consolidation and changes in competition over time.

Claessens (2008) provides a splendid introduction to the theory on competition in the financial sector, addresses implications for competition policy and gives an excellent overview of the literature on this subject. Rather than run the risk of repeating parts of his argument, we refer to Claessens' paper for the general setting of competition in the financial sector. Further, we aim to expand on his introduction by presenting an overview of the structural features of financial markets which may impair competition, focusing especially on underlying microeconomic market failures and suggesting possible solutions. We use a diagnostic framework to investigate the typical structure of the financial sector, distinguishing between supply and demand characteristics. Weaknesses at the supply side are (in)formal entry barriers (*e.g.* large scale economies and brand names), the heterogeneity of bank products and their complexity, the sometimes limited numbers of suppliers, and cross-ownership and bank productions' network properties. Possible obstacles at the demand side are high search and switching costs, the opaque nature of pricing and quality of financial products, and financial illiteracy of consumers. A further problem is the weakly functioning markets of intermediaries. Given the potential weaknesses of the financial market structure, we suggest a number of possible policy reactions to these market failures.

The structure of the financial markets provides information on potential threats to competition. However, structure itself does not impair competition. It is the conduct of financial institutions that determines competitive behaviour. To assess the real situation on the financial markets in terms of competition, we need to measure the latter. This paper provides estimates of the degree of banking competition in 101 countries. Further, it tests for each country whether its market structure is either monopolistic (or a perfect cartel), perfectly competitive or monopolistic competitive. A next step is to explain each country's level of competition, using explanatory variables of market structure, contestability, inter-industry competition, and institutional and macro economic conditions. Determining what drives competition and, hence, observing which different feature across countries are crucial, helps in developing competitive policies and regulation further. Finally, we observe how competition develops over time.

The setup of this paper is as follows. Section 2 describes structural problems of competition on financial markets, while Section 3 develops possible policy reaction to financial market failures. Section 4 discusses how competition should be defined and measured, while the next section provides empirical results of the competition measure for the banking markets in 101 countries. Section 6 explains the observed banking competition in 76 countries, examining a large set of potential determinants of competition. The next section investigates the impact of consolidation by assessing the market power of larger banks compared to that of smaller ones. Section 8 examines changes in banking competition over time, seeking for upward or downwards trends. The last section summarizes, and provides policy recommendations.

2   Structural problems of competition on financial markets

The diagnostic framework developed in CPB (2003) enables us to assess whether a given market structure harbours impediments to competition. Structural problems promote the occurrence of supernormal profits during a substantial period of time, in comparison to more competitive market structures. 'Supernormal' refers to profits that exceed a market-conforming rate of risk-adjusted return on capital, while 'substantial period of time' typically reflects several years. We apply this framework to the financial markets. Note that structure itself does not impair competition. It is the conduct of financial institutions that determines competitive behaviour. But structure may create the temptation which incites exploitation of market power.

Table 1   Determinants of imperfect competition

	Coordinated factors	**Unilateral factors**
Supply side factors		
Essential	Few firms	Few firms
	High entry and exit barriers	High entry barriers
	Frequent interaction	Heterogeneous products
Important	Transparency	Structural links
	Symmetry	Adverse selection
Demand side factors		
	Low firm-level elasticity of demand (incl. switching costs and lock-in effects	Ditto
	Stable demand	Imperfection in financial advice

Supply side factors

The diagnostic framework contains a list of coordinated and unilateral factors that increase the probability of a tight oligopoly, see Table 1. Coordinated factors refer to explicit or tacit collusion, while unilateral factors refer to actions undertaken by individual firms without any form of coordination with other firms.

High concentration is conducive to the realization of supernormal profits, according to the traditional economic theory. A more recent and dynamic view considers that high concentration may also be the result of heavy competition forcing the market to consolidate and that it is therefore difficult to draw clear conclusions from concentration in the financial industry.

High entry barriers have long been recognized as an obstacle to competition. Although many formal barriers in financial markets have been removed over time in many countries, informal entry barriers are quite common. The existence of large scale economies in many financial industries, due to relatively large fixed costs, makes a hindrance for new entries. Due to developments in informational technologies, increases in regulatory, accounting and legal requirements (*e.g.* IFRS, Basel II, Solvency II), the high costs of developing new products and so on, the optimal size of financial firms is ever increasing (*e.g.* Bikker and Gorter, 2008). The importance of brand names, supporting confidence in the respective financial firms, has a similar result. A large scale is also necessary for the supply of certain specific services to wholesale firms, such as merger and take-over advice, the equity and bond issuance management, and the construction of complex investment products.

Frequent interaction, transparency (with respect to competitors) and symmetry (in terms of equal cost structures) are beneficial to a tight oligopoly, since they make it easier for firms to coordinate their actions and to detect and punish deviations from the (explicitly or tacitly) pre-agreed behaviour. Although frequent interaction is common and sometimes unavoidable (*e.g.* in the case of efficient payment systems), cost structures of financial markets are quite opaque.

Heterogeneous products make it easier for firms to raise prices independently of competitors, as clients are less likely to choose for, or switch to, other firms in response to price differences. Here we observe a second severe weakness of financial markets. Most financial products are quite complicated in practice and carry high switching costs. Payment accounts become easily more complex owing to varying tariff structures and services, while savings and deposits accounts may carry diverging withdrawal conditions. Mortgage loans are complicated by redemption rules and the frequency and timing of interest payments. The sophistication of mortgages increases when they are combined with life insurance policies or where redemption is based on investment portfolios. Life insurance, pension and (mutual) investment products are generally far more complicated than the basic banking products. Bank services for wholesale clients usually show an even higher level of sophistication, although, of course, those clients are also more professional. Financial institutions offer a wide range of heterogeneous products, most probably in respond to market demands, but in addition, they may well have purposely raised product complexity to be able to exploit monopolistic competition. An incentive to offer more transparent products seems

absent. This potential weakness of financial markets is aggravated by the behaviour of the clients of financial institutions, as discussed below.

Structural links between firms such as cross-ownership would give firms a stake in each others' performance, thus softening competition. Such links between financial institutions are quite common in European countries, but less in the US. Information about risks (and the lack of it) plays a crucial role in markets for financial products. Asymmetric information plays a major role in lending. Particularly in lending to small and medium-sized enterprises (SMEs), some local banks are far better informed than others due to long-lasting and close relationships with clients and the benefit of local presence. This severely limits banking competition, but may have gains in terms of access to external financing.[2] In the case of life insurance, adverse selection may play a role when consumers have more information regarding their life expectancy than insurance companies. Adverse selection may lead to higher price-cost margins.

Its network property makes the payment market special. Banks need to cooperate in developing technical standards for automatic processing, which adds substantially to market efficiency. Of course, competition may be limited under such an arrangement, due to the trade-off against efficiency, though not absent (NMa, 2006). This is also observed in other financial markets with network properties. Drawbacks of standardisation may be increase of entry barriers, risks for illegitimate coordination and a disincentive for innovation.

All in all, we observe a number of supply conditions that may contribute to (tacit) collusion and make oligopoly on financial markets more likely than perfect competition. Such dubious conditions are potential market distortions and regulation may be needed to reduce their disruption of competition.

Demand side factors
Demand-side factors also affect the intensity of competition, see Table 1. As above, we distinguish coordinated and unilateral factors. The elasticity of residual demand determines how attractive it is for a firm to change its prices unilaterally. The firm may relinquish a price agreement, if only demand responds sufficiently strongly to price changes. In the absence of coordination among firms, low elasticity of demand will also help to keep prices above competitive levels, as in that case the loss of sales caused by a price increase will be small. High search and switching costs contribute to low firm-level demand elasticity. Stable, predictable

---

[2] The stronger banking competition is, the less banks are inclined to invest in lasting relationships, as their clients may be snatched by competitors before they have re-earned their investment (Petersen and Rajan, 1995).

demand makes it easier for firms to collude in order to keep prices high, since cheating by one or more firms will be easier to detect than in the case of volatile demand.

The elasticity of residual demand for financial services is limited, in practice, as substitutes are rare. Bank savings, investment funds and life insurance policies (such as annuities) are, in principle, substitutes for each other, but only in a limited way since their characteristics differ substantially in terms of risk, liquidity and tax treatment. For other financial services, substitutes are absent. Foreign competition may help to alleviate this problem. However, in practice, cross-border competition is often limited, particularly for consumers. Entry by foreign banks may help but in practice remains limited in many markets and segments, probably due to differences in legal, regulatory and institutional structures, consumer preferences, national habits, et cetera.

High switching costs are typical for many financial products such as mortgage loans, life insurance policies and pension arrangements, since contracts are often of a long-term nature and early termination of contracts involves costs. These high switching costs are prohibitive, so consumers are locked-in. (By the way, this holds also for the financial institutions). Switching costs are also high for payment accounts (in terms of the effort required), where automatic payment and collection services are linked to a unique account number. Here, the switching costs are not prohibitively high.

Search costs for financial products are high as these products are often complicated or seen as such. The financial market is opaque in the sense that prices and quality are often difficult to observe or assess. Search cost could be alleviated if search could be entrusted to specialist agents. However, the flip side from this extra link in the supply chain is that is goes with additional costs. Advice would help consumers (and producers) to avoid errors in their product and brand choice. Moreover, it would make the market more competitive by increasing the elasticity of demand. Thus, it is very desirable to have a well-functioning market for financial advice. However, financial advice markets often function improperly. In particular, under less efficient incentive structures in these markets (notably commissions) and with inexperienced consumers, insurance agents may give advice that is not in the best interest of consumers.[3]

---

[3] Research in the Netherlands shows that the effect of advice may turn out to be negative: the clients that bought a policy through an insurance advisor received, on average, a significantly lower pay-out than the respondents that bought a policy directly from an insurer. Further, intermediaries appeared to deteriorate the (initial) choice of consumers with respect to risk taking, probably because commissions are highest for high risk products, so that their added value is negative (CPB, 2005, Chapter 5). New regulation requires intermediaries to disclose their commission or income and their dependency on financial institutions.

Consumer power weakens as a market becomes less transparent. Strong brand names are indicators of non-transparency, as confidence in a well-known brand may replace price comparisons or personal judgment.[4] The power of consumers also depends on their financial literacy. On average, financial literacy is rather low, also among the high educated. This has been documented particularly for pension services (Van Rooij *et al.*, 2007). Financial illiteracy increases the dependency of consumers on the (weak) intermediation sector. Another indicator is the degree to which buyers organize themselves, for instance to be informed and to reduce the opaque nature of the market. Consumer organizations, Internet sites and financial magazines, compare prices and inform consumers continuously on financial product conditions and prices in order to enable them to make comparisons and well-founded choices. Consumer (and commercial) organizations reduce market opacity, but they are unable to overcome all problems, because products are inherently complicated and come in a wide range of different properties. Besides, many consumers are not able or not willing to make the effort to search for the best offer. A third indicator is the degree to which consumers can take out financial products collectively. Collective contracts are usually based on thorough comparisons of conditions and prices by experts, are often negotiated via the employer and contribute substantially to consumer power.[5] There are examples of how in the US 401(k) plans offered by large employers carry lower costs. Of course, many people are unable to add to their consumer power this way. Particularly for banking products such collective contracts are rare.

Abundant examples exist of poorly functioning consumer markets. We name a few current examples in the Netherlands: interest rates on simple saving accounts vary between 1.25% and 3.5%, due to consumers' loyalty, ignorance, or apathy, and to smart strategies of the banks,[6] similar large spreads in prices of annuities and life insurances,[7] high cost margins (of around 40%) in life insurance types of saving products. Similarly, regarding failing international competition, we observe large differences in interest rate on deposits across countries, annual costs of payments accounts varying within in the EU from € 34 to € 252 (Cap Gemini, 2005), and so on.

---

[4] Strong effects of brands names may also reflect a good functioning reputation mechanism. However, we observe that bank 'use' their brand names, for instance, by offering low deposit rates.

[5] In the Netherlands, health cost insurance arrangements are often offered by employers or social organizations. Of course, the employees' pension plan is the best example of a collectively offered financial product.

[6] For instance, the regular introduction of new types of account, while lowering the interest rates on older accounts of mainly immobile clients.

[7] In the Netherlands, the guaranteed pay-out a life insurances with the same premium may vary across insurers by a factor of 1.5 (CPB, 2005, Chapter 5).

Most problems faced by consumers are also affecting SMEs. However, their position may be even more unfavourable, as they usually depend on a few local banks only, due to information asymmetries. Incidentally, dependency on local banks can also have benefits.[8] Boot (2007) recommends introduction of legislation and regulation to support existence of credit registries with fine-grained information about SME clients to make them more attractive to a potential new bank. The position of wholesale firms is more difficult to assess. Of course, for traditional banking products, the wholesale firms are well equipped to assess the prices and quality of banking services. However, we observe a continuous shift over time from traditional intermediation to new, more sophisticated and complex products whose prices and quality are more difficult to assess. Examples are merger and take-over services the equity and bond issuance management, and the construction of complex investment products such as SPVs and SIVs. Furthermore, the price and quality of many wholesale banking services are subject to tailor-made contracts and therefore less public. Consequently, price competition in these new banking service markets is presumably more limited than in traditional intermediation.

Thus on the supply side, we observe a certain degree of supplier power, due in particular to the existence of informal entry barriers and strong product differentiation, where in the case of limited numbers of suppliers the risk of (tacit) collusion may increase. On the demand side we find factors such as high search and switching costs, few substitution possibilities, limited consumer power due to the opaque nature of financial products and financial illiteracy of consumers. Furthermore, the booming markets of complex, tailor-made wholesale banking services are also opaque.

All in all, we observe a number of conditions that make some kind of oligopoly or monopolistic competition on financial markets more likely than perfect competition. It should be kept in mind that impediments to perfect competition may simply result from, given existing trade-offs with stability, innovations and access to financial services. Regulation of competitive authorities may be needed to improve these conditions and reduce their possible adverse effects on competition, thereby aiming at heavier competition, not necessary at perfect competition.

---

[8] Benefits from having local banks could come from relationship lending, where the banks are more willing to acquire information on the borrower.

3 Possible policy reaction to financial market failures

The analysis above points to many factors, which contribute to financial market failures. Some of them have already been discussed by Claessens (2008), *e.g.* removal of entry barriers.[9] Here, we briefly discuss some possibilities to remove other obstacles to competition.

Competition is generally seen as crucial in order to obtain low prices, high quality, efficiency, innovation, easy access for all potential clients, effective monetary policy,[10] financial stability, and so on. Nevertheless, there may be submarkets where, given the underlying market conditions, strong (let alone full) competition cannot produce welfare gains. An example is the market for pensions. The Netherlands has an extensive capital based collective pension system, which is mandatory for (almost) all employees. The employer and the labour unions choose a company-specific or industry-wide pension fund,[11] an insurer or (in the near future) a so-called General Pension Institution to perform the agreed pension scheme.[12] Although this choice creates a certain degree of competition between pension funds and insurers, competition is limited in the sense that individual employees have no choice at all. The alternative is a free market for pension provisions, where we need to distinguish between freedom with respect to savings (free versus mandatory) and freedom with respect to the way the savings are managed (fund's choice versus employee's own choice). In countries where mandatory savings are (often) absent, as in the UK and the US, consumers frequently appear unable to save adequately for their old age. For instance, Chile and the Netherlands have some mandatory savings components, but management in Chile takes place on a competitive, individual basis, whereas in Netherlands it is collective. However, 'commercial' pension funds and insurers need to lay out high costs to acquire clients, have to deal with adverse selection and with expenses to diminish its adverse effects, and (with respect to insurers) the need to make a profit.[13] In the Netherlands, the operational costs of free-market voluntary pension provisions, the only tax-friendly option open to the self-employed, are estimated to be seven times those of obligatory employee pension funds (Bikker and De Dreu, 2007).[14] The operational costs of Dutch pension funds are among the lowest world-wide (Bikker and De Dreu, 2009). Most Dutch employers appear to be quite happy about not having to choose

---

[9] Boot (2007) recommends regulators and governments to ensure that costs of essential memberships (credit bureaus, banking associations and payment systems), regulatory reporting, and minimum capital requirements are not disproportionate to the size of new institutions.

[10] More competition lowers bank interest rate spreads on policy and market rates and increases the speed of adjustment after changes in the latter rates (Van Leuvensteijn *et al.*, 2008).

[11] In the Netherlands, unless an industry-wide pension fund is mandatory under the sector's Collective Labour Agreement.

[12] Or, due to coming EU regulation, a foreign pension fund (NMa, 2006).

[13] Many of these arguments also apply to a lot of non-financial markets. Stimulation of pension savings may be the dominant reason for the authorities to act more paternalistic on the pension market.

[14] Different institutional conditions and regulatory regimes across types of voluntary pension providers also play a role.

(Van Rooij *et al*., 2007). Of course, this is a very specific situation, where many issues may raise further discussion. More generally, in the presence of information asymmetries, agency issues and so forth, competition is likely to be imperfect and may lead to perverse results. Hence, for some particular financial submarkets, we should not aim at competition but only at efficiency.

Using our diagnostic framework, we observed that financial illiteracy is one of the major causes of weak consumer power. Providing financial education may relieve the problem and enhance competition. A range of academic articles evaluate the results and indicate what kind of programmes are effective (*e.g.* Bernheim and Garrett, 1996; Lusardi, 2004; Mooslechner *et al.*, 2003; Braunstein and Welch, 2002). Programmes should particularly focus on knowledge and information, sense of urgency and self-confidence. It seems likely that only a part of the population is susceptible to such efforts. Further development of price comparison websites may also be very helpful but, again, such sites only serve part of the population, albeit a gradually increasing part.[15]

Heterogeneity is another structural weakness that can be addressed. A possible step forward is to promote more homogeneous or standardised products. A good example has set by the FSA in the UK, which a few years ago provided a detailed definition of a normalized private pension plan. Further, they opened and maintain a website with prices of the financial institutions which offered such prescribed pension products. These products are included only after a thorough examination to check whether they meet the standards. This approach helps to solve the heterogeneity problem and to avoid the exploitation of semi-monopolistic power. Similarly, in the Netherlands, a basis package for health care insurance has been defined (so standardized) which is a precondition for government support (NMa, 2006).[16] This standardized product enables competition, also where health insurance policies are complicated and many consumers are not well-informed or willing to investigate the various offers.

Payment systems typically face serious network property problems. National cooperation has increased efficiency significantly, but at the cost of impairing competition. In the EU, the Single European Payment Area (SEPA) framework, in effect since January 25, 2008, aims at the introduction of several competing, cross-border payment systems, which may benefit from the large, euro area-wide scale (NMa, 2006; Boot, 2007). The problem of the high costs involved in switching one's payment account over to another bank can be solved if bank clients are allowed to transfer their unique payment account number, including the linked automatic payment and

---

[15] A problem is further that it remains difficult to compare complex conditions of financial products.
[16] Around 50% of the cost is covered by a particular income dependent tax, levied by the government. Insurers may also offer supplementary packages.

collection services, to any other bank. Of course this would require large IT investments for banks and international coordination to enable cross-border transmission.

Price competition on new tailor-made and complex wholesale banking services is likely to be more limited than in traditional intermediation. The prices and quality of such services are much more opaque than those of standardized consumer services. This problem creates a major challenge for, among others, competitive authorities, particularly as these new products increasingly dominate the income of (large) banks.

In the banking market, the regulatory regime of the Basel Committee on Banking Supervision (Basel I and II) aims at creating an international level playing field by establishing minimum capital requirements which are identical for internationally operating banks across all joining countries, enabling fair cross-border competition. Similarly, international supervisory regimes for the insurance industries and pension funds would greatly encourage cross-border competition in those sectors. In the EU, Solvency II is under development for insurance firms, leaving still room for a world-wide regime. Further, functionally equivalent products should have similar regulations, as far as possible, in order to enhance competition between banks and other financial institutions.[17]

In many consumer markets intermediary agencies are important in providing support to financially illiterate clients. In order to avoid conflicts of interest such agencies need to be independent from financial institutions and their fee structure needs to be transparent to their clients. Such independence would be best served by a fixed hourly rate to be paid by the client. In practice, however, consumers are generally less rational and dislike paying for such independent advice. They prefer receiving 'free' advice from financial institutions or intermediaries where, of course, similar costs are hidden in product prices while the advice may be less in line with their own preferences. Such irrational behaviour hampers the disciplinary power from the demand side, which is a sound condition for competition.

Although many financial market failures are difficult to solve, the discussion above explains that there are many – general and specific – possible steps in the right direction, which would help to foster competition.

---

[17] This is far from simple. For instance, a long-term mortgage may increase the interest rate risk of a bank (having a low duration), while it generally reduces the interest rate risk of an insurance firm (having a high duration).

4   How to measure competition

Given the trade-off that competition in the financial markets should be strong enough to support welfare and economic development, but that competition should not be too high so that it may threaten financial stability, innovation and unhindered access to credit, an optimal level of competition exists. In order to be able to judge the current level and to compare that with the (not necessarily known) optimal level, we need to measure competition. Though competition is a clear concept in economic theory, we need a precise definition, if we want to measure it. The dictionary explains competition as "the effort of two or more parties acting independently to secure the business of a third party by offering the most favourable terms", "active demand by two or more organisms or kinds of organisms for some environmental resource in short supply" and "a contest between rivals". While precise enough in themselves, these definitions offer no clues on how to *measure* competition.

In many economic theories, competition is related to the (relative) size of a mark-up on the cost price as a component of the output price. However, data on the price-cost margin (PCM) are generally not available in the financial markets. Whereas prices are observable on a number of banking or insurance submarkets, one seldom finds data on the cost prices of individual products. Therefore, we have to measure competition indirectly. Many measurement approaches are closely linked to the PCM.[18] Bikker and Bos (2005, 2008) derive a formula for the equilibrium PCM from a general framework of a profit maximizing bank under oligopoly behaviour:

$$PCM = HHI \times PED \times (1+CV) \tag{1}$$

where HHI is the Herfindahl-Hirschman index of concentration (that weights banks' market shares with their own market shares), PED the price (or interest) elasticity of demand and CV the conjectural variation, that is, the bank's expectations about the reactions of its rivals in terms of output quantities or prices.[19] Particularly the conjectural variation is difficult to observe.

Competition has often been proxied by simple measures, both in theory and in practice. Examples of proxies are: the number of banks, the HHI, the interest rate margin and efficiency measures such as the cost-income ratio. Although some proxies could bear a certain relationship to the PCM (*e.g.* the interest rate margin) or to components of it (HHI), others are only vaguely

---

[18] Although such PCM is a plausible measure, in practice, this definition has also its shortcomings (Boone *et al.*, 2007).

[19] Under certain conditions, conjectural variation is zero under perfect competition and 1 under monopoly or a perfect cartel.

connected. Therefore, we prefer model-based measures that are closer in line with Equation (1). The literature provides a number of such measures, such as Panzar and Rosse (1987), Bresnahan (1989) and Boone *et al.* (2007),[20] which while derived from Equation (1), are based on different simplifying assumptions (Bikker and Bos, 2005, 2008). This is one of the reasons why different measures may produce divergent estimates of competition.

The literature provides a large number of empirical studies on banking competition. The number of publications on measuring insurance competition is very small, due to limited data availability. A few examples are Bikker and Van Leuvensteijn (2008), who use the Boone indicator for life insurance firms, Bikker and Gorter (2008), who study scale economies of non-life insurers, and Bikker, Spierdijk and Miro (2009), who apply the P-R model to the non-life insurance industry.

This paper gives a survey of measures of competition of over 100 countries based on the Panzar-Rosse (P-R) model. This model has a sound theoretical basis, uses data which are readily available[21] (so that the model can be applied to many countries) and has been applied frequently.[22] This approach measures how total interest revenues of banks in a country or market react to changes in input prices. A firm's competitive behaviour in the market is reflected by the degree by which input price changes are passed through to output prices and to changes in output volume. The P-R model produces a certain H-statistic which under certain conditions reflects the degree of competition with H=1 pointing to perfect competition and H≤0 indicating monopoly or a perfect cartel. The range 0<H<1 denotes monopolistic competition or oligopoly of some sort. Hereby, this P-R approach defines 'competition' as a certain competitive behaviour, measured as an average over all banking products. For each country, one H value has been estimated.

5   Empirical results for banks

Bikker *et al.* (2006a) use the P-R model to provide H values for 101 countries over 1986-2004, based on 25,000 banks, see Table A.1 and Charts A.1 and A.2 in the appendix.[23] Chart A.1 present the estimation results of H in alphabetical order of the respective country names and Table A.2 arranges the estimates from low to high values of H. The world-wide average value if

---

[20] See also Bikker and Van Leuvensteijn (2008) and Van Leuvensteijn *et al.* (2008).
[21] Required data include observations on input prices. Commonly they are unavailable so that proxies are used.
[22] A drawback may be that the P-R approach considers the total banking output as one single product, so that it ignores the existence of many products, and hence of many submarkets, with own levels of competitive pressure. However, the required data to measure competition of single products are hardly ever available.
[23] The charts include only the 80 countries where equilibrium has been observed, a prerequisite for a reliable competition measure. H is the sum of the input price elasticities in the P-R revenue equation.

H is 0.50. Chart A.2 shows that the level of competition varies strongly across countries. Around 30% of the countries have values of H that correspond to monopoly (H is zero or negative) or are close to those values (left part of the chart). Formal testing reveals that monopoly cannot be rejected for 29 countries. Further, this chart shows that around one-third of the countries have H values, corresponding with (near-) perfect competition (H=1; right part of Chart A.2). The formal tests cannot reject perfect competition in 39 countries. At the same time, monopolistic competition cannot be rejected in all countries but one. This divides the countries in three groups with low, medium and high competition. It should be kept in mind that these competition estimates apply to all of a country's banking activities. Competition on sub-markets (individual product, local areas) may deviate from this overall picture.

Chart 1 gives averages of H for each continent. Remarkably, we do not observe any systematic difference between developed and developing countries. The figures are all around the average of 0.50. Banking competition in the Middle East appears to lag somewhat behind the rest of the world, whereas, in terms of competition, banks in South America are leading the other continents.

Chart 1   Average degree of competition in the various continents
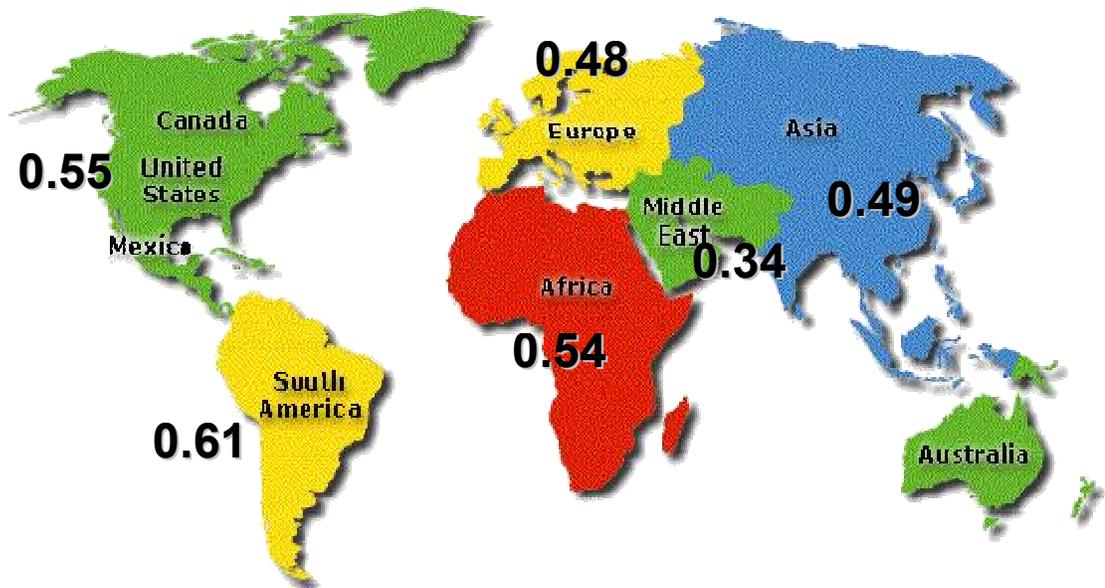
6   Explaining banking competition

What are the main factors that determine the level of competition? This is an important question, particularly with a view to the development of an optimal competition policy and policy

recommendations. The survey of Claessens (2008) and the discussion on the structure of the financial factors above provide many potential drivers of competition. However, many of these factors are not directly observable. Traditionally, the market structure – generally measured by the number of banks, banking concentration or average bank size – takes a pivotal position in explaining competition. Other theories focus on the impact of new entrants or on the contestability caused by potential (new) entrants, the efficiency of banks and the influence of the business cycle. A number of empirical studies[24] assess the impact of other determinants on banking competition, such as measures of interindustry competition, indicators of contestability (*e.g.* actual foreign entrants and barriers to entry such as tighter entry and activity restrictions) and aspects of countries' overall institutional framework (*e.g.* regulatory and supervisory practices, entry restrictions, and barriers to foreign investment).

The seminal study of Claessens and Laeven (2004) is the first extensive investigation into the factors that drive competition, based on the P-R model as the measure of competition. The approach includes two steps. First, they estimate H as measure of competition for 39 countries using data from the 1994-2001 period. Second, they explain H by several sets of competition drivers. The number of countries in this second step varies from 22 to 39 countries. Bikker *et al.* (2007) extend their study by assessing the determinants of banking competition for a much larger set of countries (76 in total), using data from the 1995-2004 period. They apply a wide range of tests to assess the robustness of their approach, so as to ensure that their results do not depend on subjective choices regarding their model specification. The following summarises their study. The first step is the estimation of H, as presented above and as reported in Table A.1. The second step is explaining these H-values, using the potential determinants introduced below.

Potential determinants of competition
To explain banking competition, Bikker *et al.* (2007) consider a number of potential determinants of competition. These variables have been predicted to affect competition in the theoretical literature or have been used in one or more of a number of other empirical cross-country studies that analyse the performance and competitiveness of the banking system. They consider five types of factors: variables with respect to market structure, contestability, inter-industry competition, institutions en macro-economic conditions.

1. Market structure variables
Traditionally, the market structure was considered as a major determinant of competition.

---

[24] Angelini and Cetorelli (2003), Maudos and Nagore (2005), Fernandez de Guevara *et al.* (2005), Carbó Valverde and Rodríguez Fernández (2006) and Fernández de Guevara and Maudos (2007), using the Lerner index, and Bikker and Haaf (2002a) and Claessens and Laeven (2004), using the P-R model.

- Bank concentration ratios. The five-bank concentration ratio (CR5) as a first measure of banking market concentration, defined as the total market share of the five largest banks in a particular country, based on total assets. As an alternative concentration ratio, the HHI has been considered.

- Number of banks. The above concentration indices show a strong negative correlation with the number of banks, due to a well-known weakness of concentration indices, namely their dependence on the size of a country or banking market. This shortcoming has been dealt with by taking the number of banks into account as well as an explanatory variable.[25] The number of banks itself is also a commonly used variable to describe the market structure.

- Foreign ownership of banks. This is a measure of the degree of foreign ownership of banks calculated as the fraction of the banking system's assets that is in banks that are 50% or more foreign owned. It takes into account the fact that foreign banks may behave differently from domestic banks.

2. Contestability variables

Since the contestability theory predicts a direct relation between entrance barriers and the competitiveness of the banking industry, variables measuring contestability of the banking sector have been included.

- (Cross-sector) activity restrictions. An activity restrictions variable has been included that measures the banks' ability to engage in the businesses of underwriting, insurance and real estate, as well as the regulatory permission for banks to own shares in non-financial firms. A higher value of the activity restrictions variable indicates that more restrictions are imposed on cross-sector activities in the financial industry.

- Restrictions on foreign investments. The more restrictions exist on such investments, the higher the score of this index will be.

3. Inter-industry variables

Possible competitive pressure banks face from other sectors are also included.

- Capital markets. This variable reflects the country's stock market capitalization as a fraction of GDP.

- Insurance firms. The annual volume of life insurance premiums as a fraction of GDP is a proxy for the competition coming from the non-banking part of the financial sector, assuming

---

[25] Another reason to include the number of banks is that the concentration ratio is a one-dimensional measure taking account of two dimensions: the number of banks (reflecting the density of the banking market) and their size distribution (reflecting skewness). By including, for example, both the HHI and the number of banks as explanatory variables in the regression model, this two-dimensionality has been restored (see Bikker and Haaf, 2002b).

that life insurance premiums not only reflect the demand for life insurance products but also for more sophisticated financial services in general.

4. Institutional variables

To account for national institutional differences, three indices are included that relate to economic freedom in the style of the 'laissez-faire' model.

- Property rights index. This index includes ten indicators of property rights. The lower the score of this index is, the better is the protection of property rights.

- Regulation index. The higher the score of this index is, the tighter are the regulations on investments and on starting up a business.

- Banking freedom. The higher the score of this index is, the less banking freedom exists.

- EU dummy. To account for EU-specific effects not captured by the other determinants, a dummy variable for the EU-15 countries has been included.

- Socialist history dummy. A dummy for countries with a socialist history (*e.g.* the previously centrally planned economies in Eastern and Central European countries that constituted the Warsaw Pact and the republics of the Soviet Union) takes account of the fact that banks in these countries are expected to be affected by economic and institutional conditions prevailing in earlier decades.

5. Macro-economic conditions

Also, differences in the countries' general economic development are considered.

- GDP per capita. This variable has been used as proxy for economic and financial development.

- Real annual GDP growth. The annual GDP growth (or GDP in deviation from its trend) can be taken as a proxy for the business cycle. The pattern in the H-statistic may be affected by the response of banks to business cycle dynamics.

- Inflation rate. This variable has been based on the GDP deflator.

Data on these variables for 2004 could be obtained for 76 countries, so that the explanation of competition (measured by H) is restricted to these countries. Exceptions are the 'foreign ownership of banks' and 'insurance firms' variables, each of which would, if included, reduce the sample by ten countries. They are added to the sample in only two variants. After testing on multicollinearity,[26] five determinants are excluded (HHI, number of banks, property rights index, banking freedom, and inflation rate), so that a smaller set of drivers of competition remains, see Table 2.

---

[26] That is, the phenomenon that two variables reflect roughly the same property.

A remarkable result is that the dominant determinant in the theoretical literature, banking market concentration, does not have a significant impact on competition. The traditional literature suggests that market concentration impairs competition (assuming a static relationship), whereas a more modern and dynamic interpretation of this variable is that competition may force banks to consolidate, so that competitive banks end up in a concentrated market. However, no evidence has been found for either of these theories, perhaps because opposite effects cancel each other out. This outcome also holds for other concentration variables such as the HHI and the number of banks. This result confirms the respective findings of Claessens and Laeven (2004).

Table 2   Explaining competition in 76 countries (2004)

Variables [a]	Coefficient	t-value	SPC [b]
1. Bank concentration CR5	-0.001	-0.8	0.009
2. Activity restrictions	-0.000	-0.7	0.007
3. Ln (Market cap./GDP)	-0.016	-0.4	0.002
4. Foreign investment index	-0.132	-3.2	0.133
Regulation index	0.128	2.5	0.084
EU-15	-0.129	-1.4	0.029
Socialist legal history	-0.435	-5.6	0.320
5. Ln (GDP per cap)	0.011	0.3	0.001
Real growth GDP	-0.023	-2.8	0.109
Sum			0.694
Adjusted R^2	0.82		
Number of countries	76		

[a] The variables are defined in the text; [b] SPC stands for squared partial correlation and reflects the contribution of the respective explanatory variable to the variation in the level of competition or, in short, the economic effect.

Also a next market structure variable, foreign ownership, does not play a significant role (as Table 2 shows), though in contrast to Claessens and Laeven (2004), where this variable turned out significant. Of course, where the effect is absent for the entire sample, it may be present in a number of countries, particularly where foreigners bring in different competitive behaviour. All in all, none of the selected market structure variables seem to play a significant role as determinants of competition.

As expected, contestability does play an important role as a determinant of competition. The more attractive a country's investment climate is for outsiders, the more competitive its banking sector will be. Apparently, the possibility of foreign investors entering the country adds to the competitive pressure. Although activity restrictions are not significant in the full-sample estimates reported in Table 2, they do play a significant role in more restricted analyses where only large banks are included. Apparently, competition among large banks, in particular, is likely to suffer from cross-sector activity restrictions, presumably because otherwise they would be quicker to enter the insurance market than smaller banks.

Neither of the two inter-industry variables appears to be significant. Conversely a country's institutional framework is a major determinant of banking competition. Extensive regulation, particularly antitrust policies (it may be assumed), improves the competitive environment significantly, of course, fully in line with expectations. Competition is substantially weaker in countries with a socialist history, *e.g.* in Eastern and Central Europe. Apparently, in terms of banking competition, the transition towards a market economy has not been fully completed there.

Finally, collusion mark-ups of banks are significantly cyclical in the sense that they follow the movements in GDP growth rate that act as a proxy for the business cycle. Evidently, competitive pressures weaken when the economy booms.

The last column of Table 2 shows how important the determinants are in explaining competition. A socialist history is by far the dominant factor, followed by foreign investment restrictions, the business cycle and the regulation index. Bikker *et al.* (2007) apply a large number of robustness tests to examine how stable the results are: replacing HHI and number of banks for CR5, adding one or two extra explanatory variables (foreign ownership and life insurance sector size, thereby reducing the sample size), estimating with OLS instead of WLS, applying 2SLS (as market structure variables might be endogenous) and, finally, requiring a higher minimum number of banks per country. All results are similar so that the conclusions remain unaffected. The analyses are also repeated for large and small banks, respectively. Here, activity restrictions become significant for large banks, a mentioned above. Further, the EU dummy becomes significant, probably due to the larger share of more developed sophisticated banking products, a submarket where competition is weaker.

The policy recommendations from this paper are straightforward:
• more regulation reducing competitive obstacles
• no obstacles for foreign investment
• reduce cross-sector restrictions

Although this advice seems quite obvious, one should keep in mind that in the current situation, the differences across countries are that large that they explain no less than 82% of differences in competitive pressure across countries (see R^2 in Table 2). According to our interpretation of the results, they contain a warning. Developments of new, sophisticated products may reduce competition, due to their opaque nature. If this would hold true, more regulation or competition policy is required.

7   Impact of consolidation

One of the most prominent developments in the banking industry has been the strong worldwide consolidation observed during the past decades. This is reflected by a sharp fall in the number of banks, increased concentration, and the grown size of the largest (five) banks both in absolute terms and relative to the smaller banks. Table A.2 in the appendix illustrates these developments for the major economies during 1990-2005. The changes in market structure raise the question how and to what extent competition is affected by the expansion of the largest banks. Several studies predict a positive relation between bank size and market power, which they contribute to, for instance, the more dominant position of large banks relative to their smaller competitors.[27] An alternative view holds that smaller banks tend to operate primarily on local markets where competition is often seen as weaker, whereas larger banks tend to operate more on national and international levels, where competition is generally assumed to be stronger due to the pressure from foreign banks (see Gilibert and Steinherr, 1989). The latter view is supported by the empirical literature based on the P-R model, which establishes a negative relation between bank size and market power.[28]

With the contradictory results in the theoretical and empirical literature in mind, Bikker *et al.* (2006b) explore a novel approach to assessing the relation between bank size and market power. They extend the P-R model by introducing a direct role for bank size, using quantile regression as an alternative to splitting up the sample into size classes of large and small banks. For 42 out of 101 countries they find that competition decreases significantly with bank size, including the world's major economies. These countries cover 85% of all 18.500 banks in their sample. For the remaining countries, H is fairly constant over the range from small to large banks, or the number of observations in the sample is too low to draw reliable conclusions.[29] The average H value corresponding to large banks (90th quantile) equals 0.42, while the H value of small banks (10th quantile) averages 0.68. Chart 2 pictures how the average H estimate substantially changes with bank size.[30]

---

[27] See *e.g.* Monti (1972) and Klein (1971), Jappelli (1993), Freixas and Rochet (1997), and Bikker and Bos (2005).

[28] For instance, Bikker and Groeneveld (2000), De Bandt and Davis (2000), Bikker and Haaf (2002a), Hempell (2002), Bikker (2004), and Staikouras and Koutsomanoli-Fillipaki (2006) all find that bank competition increases with bank size. We ascribe this to misspecification (Bikker *et al.*, 2006b).

[29] Costa Rica is the only country for which a substantially positive relation has been established between bank size and competition.

[30] Note that this outcome is not quite consistent with the earlier finding that market structure measured by concentration ratios did not affect the level of competition. Apparently, the concentration indices do not fully reflect the impact of large banks.

Formal testing on the market structure confirms this pattern: monopoly or a perfect cartel in the small bank submarket is rejected for only 12 countries, while it is rejected for 32 national submarkets with large banks, confirming that large banks operate more often under monopoly. Similarly perfect competition is less often rejected for small banks (42 countries) than for large banks (28 countries), confirming that small banks operate more often under perfect competition.

Chart 2   Average H statistic as a function of bank size
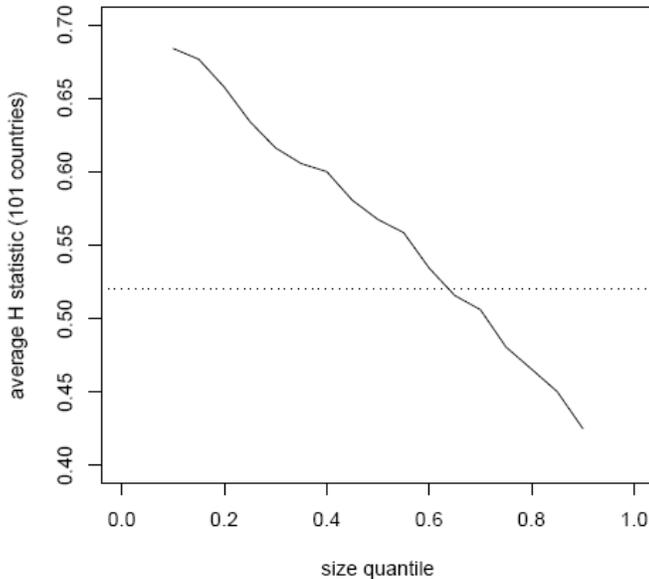
Their findings confirm the theoretical strands of literature that predict a positive relation between bank size and market power. At the same time, their outcomes contradict the conventional view in the P-R literature that the level of competition increases with bank size. They distinguish two possible drivers behind the market power of large banks. The first is that size itself plays a major role. Large banks are likely to be in a better position to collude with other banks. Large banks may also benefit from their more established reputation. Furthermore, large banks are presumably more successful in creating fully or partly new banking products and services than small banks, *e.g.* because of economies of scale in product development. This enables them to exploit their monopolistic power, as is common in markets where monopolistic competition is the prevailing market structure. This outcome implies that small firms face high thresholds when they try to enter the banking market.

The second explanation is that large banks tend to operate partly on different product submarkets (more wholesale than retail) and geographical submarkets (more international than local). The

wholesale market is characterized by tailor-made products and services supplied by only a limited number of large banks, which enables them to exert a degree of monopolistic power.

The world-wide trend towards consolidation combined with this observation of more market power for larger banks increases the need for appropriate antitrust policies on the affected submarkets.

8 Changes over time

Over the past decades, both new developments in information technology and continued liberalization and harmonization of the financial markets have strongly affected the financial environment in which banks operate. Developments in ICT have changed banks' production technologies, products and distribution strategies, as well as size of financial markets. The Second Banking Coordination Directive, as part of the single European market project in 1992, and the establishment of Economic and Monetary Union (EMU) in 1999 have removed important obstacles to cross-border competition. The creation of large and transparent euro capital markets has promoted competition within the European banking world. Advantages in the management of equity and debt issuance, investments and mediation for banks in their own national currency compared to foreign banks, have been sharply reduced since the euro replaced the respective national currencies. Similarly, several changes have drastically altered the banking landscape in the United States. For instance the Reigle-Neal Act of 1994, allowing national banks to operate branches across state lines as of 1997. Another important change was the 1999 Gramm-Leach-Bliley Act, which eliminated the restrictions of the 1933 Glass-Steagall Act on affiliations between commercial and investment banks and allowed banks to engage in underwriting and other dealing activities. These contributions to international integration, together with the entry of new types of competitors using the Internet, are likely to have contributed to banks' competitiveness, particularly in the EMU area. The transition from centrally planned economies to market economies in Eastern and Central Europe also had a major impact on bank competition in that area. Increased competition may force banks to improve their efficiency, on pain of being pushed out of the market.

On the other hand, efficiency has also been among the many drivers of the consolidation wave in the banking industry observed during the past decades. This prominent development is reflected by a sharp fall in the number of banks, by the increased banking concentration, and by the rise in the market share of the largest banks. The consolidation process has impaired competition, reducing the improvements in competitiveness mentioned above. Informational technology may have added to fixed costs in the banking industry, resulting in larger (unused) scale economies,

particularly for smaller banks. Such increased scale economies would contribute further to market power and, hence, to a reduction in competition. Other important developments in the banking industry are also likely to have affected the competitive developments over time. The continuous shift from traditional intermediation to new, more sophisticated and complex products may have reduced competition. Price and quality of modern bank services are more opaque and wholesale banking often deals in tailor-made products. Consequently, price competition in these markets is presumably more limited than in traditional intermediation. Hence, competition may be expected to be weaker on the growing non-interest markets.

Given this multitude of major developments with respect to competition, Bikker and Spierdijk (2008) investigate whether and how banking competition has changed over time. They apply the P-R approach to measure banks' market power over time in three different ways.

- First, explorative yearly and rolling-window estimates of the H statistic for eleven major industrial economies and two regions (where sufficient data were available) are obtained to assess how the competitive climate changed during the 1989-2004 period.[31]

- Second, the linear trend in banking competition during the 1986-2004 period has been assessed for 101 countries. For the aforementioned eleven countries and two regions enough data are available to estimate several parametric models that offer various degrees of flexibility to capture possible nonlinear changes in the competitive climate.

- Finally, structural breaks in competition over time are detected using econometric tests for structural stability. These tests do not impose a priori fixed break dates, but are able to detect breaks endogenously. As a robustness check, a wide range of additional macro-economic factors are included to ensure that the changes they assess, and the breaks that are detected, are genuine and not merely due to *e.g.* business cycle movements.

Bikker and Spierdijk (2008) establish significant changes in banking competition over time. Chart A.3 in the appendix shows graphs of (recursive) annual estimates for eleven major industrial economies in two regions. In France, Germany, Italy, Luxembourg, Switzerland, and the US (after 1998) competition seems to have declined over time. This is particularly clear for the entire EU-15. The remaining nations, being Austria, Denmark, Spain, the UK, Japan, and Eastern-Europe, show a more stable H statistic or a slight increase over time. Particularly, the competition in Eastern Europe shows an upward trend.

---

[31] Rolling-window or recursive estimates of the H statistic start with estimates of the first few years, continue with estimates of the first years, and successively add data of a next year to the sample, using ever larger subsets of the data.

Significantly negative trends in competition were found for 39 of the 101 countries, while the trend is significantly positive for 22 countries. For the emerging markets in the 101 country sample, the average value of the trend coefficient equals 0.007 (*i.e.* an annual rise in H of 0.7 percentage points), reflecting that emerging economies are generally in a transition process of becoming (slightly) more competitive. The remaining nations have a negative average value of the trend coefficient equals to -0.018 (*i.e.* an annual decline in H of 1.8 percentage points). For both the EU-15 and the group of nine Eastern European countries the trend coefficient is significantly negative. On average, the changes in competition over time are small. The average value of the H statistic ranges from 0.55 at the end of the eighties up to 0.50 in 2004. For the EU-15, the H statistics drops from 0.87 in 1989 to 0.55 in 2004. In Eastern and Central Europe the H statistic has been decreasing over time as well, from 0.61 in 1994 to 0.55 in 2004. Apparently, the average levels of competition in Eastern and Western Europe converged over time.

Applying structural break tests to eleven countries and two regions revealed that, with the exception of Italy, all countries considered that have joined EMU feature a significant structural break in either 2001 or 2002, initiating a period of weaker competition. For the non-EMU countries Denmark and the UK there is no significant break, whereas in Switzerland a significant break emerges in 1995. For the US a break has been established in 2001, starting a low-competition period. For Japan a break was found in 2003, which was followed by several years of increased competition. The results above are based on the P-R approach. For the last decade, Van Leuvensteijn *et al.* (2007) used a different approach to measure banking competition, namely the Boone indicator, but they observed the same significant downward trend in the level of competition on the European loan markets.

It seems unlikely that the 2001-2002 breaks and the subsequent decline in banking competition in the EMU countries were caused by a lagged response to the establishment of EMU and the introduction of the 'virtual' (non-cash) euro in 1999. The euro may have played an indirect role, due to the change in banking services after its establishment in 1999. The newly created euro capital market has boosted corporate capital market financing at the cost of direct bank lending. This significant shift did not occur in non-euro countries such as Switzerland, the US and Japan.[32] In the euro area it has reduced traditional intermediation by banks, whereas it has favoured the service of banks relating to equity and debt issuance. We expect that competition on debt issuance services, where pricing and quality figure less prominently than reputation, is significantly

---

[32] During the period 1999-2007, the capital market financing of non-financial companies increased by 400% in the euro area, much faster than bank lending. In the non-euro countries in Europe the change in capital market financing varied between -23% (Switzerland) and 150% (Sweden). In the US, Japan and Canada the growth was between -10% (Japan) and 70% (Canada).

weaker than in the lending market. The introduction of the euro has significantly reinforced the efficiency of corporate capital market funding. At the same time, it may have impaired the average competitive pressure among euro area banks through the shift from lending to equity and debt issuance.

Further, the predominantly downward trend in competition is attributed to the process of consolidation, which generally creates larger banks with more market power (see Bikker *et al.* (2006b)). Another explanation for the decline in competition is the continuous shift over time from traditional intermediation towards more sophisticated and complex banking products. Price and quality of modern bank services are more opaque and the services themselves are more tailor-made than those based on traditional intermediation markets. Therefore, modern services are likely to give banks an advantage in exploiting their market power. In order to find evidence supporting this hypothesis, the P-R model's H parameter has been allowed to depend on the ratio of other income to total income. A significantly negative coefficient for other income as a share of total income would be a first indication that more sophisticated and complex products do indeed reduce competition. A relative increase in the share of other income appears to reduce banking competition in the EU-15. The same effect has been found for seven individual EU-15 countries, but no evidence occurs for a number of countries outside the EU-15, such as the US, Eastern Europe, Japan, Switzerland and the UK.

9 Conclusions

The first part of this paper investigates the financial market by analyzing its structure. We observe quite a number of potential market failures, on both the supply and the demand side, which may tempt financial institutions to exploit market power. Opaqueness hinders the correct perception of pricing and quality of (complex) financial services and acts as a major obstacle to fierce competition. As the share of traditional bank intermediation in total banking activities is currently declining in favour of more complex and tailor-made services, this opaqueness may over time gain in importance and reduce competition. Other market failures found are informal entry barriers, strong product differentiation, cross-ownership, bank productions' network properties, high search and switching costs, lack of substitution possibilities, insufficient consumer power, weak-functioning intermediaries and consumers' financial illiteracy. Many of these structural weaknesses that harm competition are not unique for financial markets, but occur also in many service industries.

A number of solutions are provided to make it harder for financial institutions to profit from these market failures, including financial education, standardization of financial products,

implementation of the right incentive structures for intermediaries, consumer empowerment et cetera. Specific issues are likely to require tailor-made measures. While many of these actions will help, they will not suffice to remedy the market weaknesses fully, let alone permanently. Some market failures may be impossible to eliminate or even relieve. In some markets, failures are better solved by structures without (full) competition.

The second part of this paper deals with measuring and explaining banking competition. Although every measurement approach may have its shortcomings, the literature provides a number of useful methods. We report results for 101 countries based on the Panzar-Rosse approach. Competition appears to vary strongly across countries, as for a third part of the countries we cannot reject monopoly or a perfect cartel, while for another third part we cannot reject perfect competition. Monopolistic competition applies to almost all countries. We do not observe differences across continents. On average, the value of our measure of competition, H, equals 0.5, exactly half-way between monopoly and perfect competition. This outcome indicates that, for most countries, the observed structural market failures did not kept financial institutions from behaving competitively. Of course, our measurement concerns the entire banking business: competition may still vary strongly across submarkets. In any case, there remains ample room for the further enhancement of competition.

The wide range in competitive levels across countries raises the question what determinants are responsible for these differences. Explaining the measured competition by a large set of potential determinants reveals that competition in many countries would be higher with: (i) more (anti-trust) regulation, (ii) fewer obstacles to foreign investment, and (iii) fewer cross-sector restrictions (particularly for larger banks). Further, mark-ups of banks on cost prices appear to be significantly cyclical in the sense that they follow the movements of the business cycle, measured as GDP growth. Finally, a socialist legal history, also counts as transition appears not to be completed yet. These factors determine 82% of the differences in competition across countries. A remarkable outcome is that traditional market structure variables, such as concentration and number of banks, seem to have no impact at all. These outcomes provide clear guidance for competitive policy: more strength for anti-trust regulation, free entry of foreign investment and abolishment of cross-sector obstacles.

One of the major trends in the financial markets is consolidation. For banking, there is evidence that in the major industrial economies larger banks have more market power than smaller ones. Size itself plays a major role, as large banks are likely to be in a better position to collude with other banks and may benefit from their more firmly established reputation. Further, large banks are presumably more successful than small banks in creating innovative banking products and

services, for instance, because economies of scale in product development enable them to exploit their monopolistic power. A second explanation is that large banks tend to operate partly on different product submarkets (more wholesale than retail) and geographical submarkets (more international than local). The wholesale market is characterized by tailor-made products and services supplied by only a limited number of large banks, which enables them to exert a degree of monopolistic power.

Despite ongoing liberalisation, harmonization, internationalisation, financial integration and IT developments, we observe a downward trend in competition in many major economies. Apparently, in recent years other factors have dominated actual competitive conditions. Possible drivers may be consolidation, given large banks' increasing use of market power, and the relative decline in traditional intermediation, in favour of complex, tailor-made banking services, for consumers and, especially, wholesale customers. No simple remedies to counter these developments seem to offer themselves. For the coming years, these trends present a challenge to financial market regulators.

References

Angelini, P. and Cetorelli, N., 2003, The effects of regulatory reform on competition in the banking industry, *Journal of Money, Credit and Banking* 35, 663−684.

Bernheim, B.D., and D.M. Garrett, 1996, The determinants and consequences of financial education in the workplace: evidence from a survey of households, *Stanford Working Paper* nr. 96-007/*NBER Working Papers* nr. 5667, National Bureau of Economic Research, Inc.

Bikker, J.A. and Groeneveld, J.M., 2000, Competition and concentration in the EU banking industry, *Kredit und Kapital* 30, 62−98.

Bikker, J.A and Haaf, K., 2002a, Competition, concentration and their relationship: An empirical analysis of the banking industry, *Journal of Banking and Finance* 26, 2191–2214.

Bikker, J.A., and Haaf, K., 2002b, Measures of competition and concentration in the banking industry: A review of the literature, *Economic & Financial Modelling* 9, 53–98.

Bikker, J.A., 2004, *Competition and efficiency in a unified European banking market*, Edward Elgar, 326 pages.

Bikker, J.A., J.W.B. Bos, 2005, Trends in competition and profitability in the banking industry: a basic framework, *Suerf Series* 2005/2, 88 pages.

Bikker, J.A., L. Spierdijk, P. Finnie, 2006a, Misspecification in the Panzar-Rosse model: assessing competition in the banking industry, *DNB Working Paper* nr. 114, De Nederlandsche Bank, Amsterdam.[33]

Bikker, J.A., L. Spierdijk, P. Finnie, 2006b, The impact of bank size on market power, *DNB*

---

[33] All DNB Working Papers are available from www.dnb.nl.

Working Paper 120, De Nederlandsche Bank, Amsterdam.

Bikker, J.A., L. Spierdijk, P. Finnie, 2007, Market structure, contestability and institutional environment: the determinants of banking competition, *DNB Working Paper* nr. 156, De Nederlandsche Bank, Amsterdam.

Bikker, J.A., J. de Dreu, 2007, Operating costs of pension schemes, in: O. Steenbeek and S.G. van der Lecq (eds), Costs and Benefits of Collective Pension Systems, Springer: Berlin, Heidelberg, New York, 51–74.

Bikker, J.A., J. Gorter, 2008, Performance of the Dutch non-life insurance industry: competition, efficiency and focus, *DNB Working Paper* nr. 164, De Nederlandsche Bank, Amsterdam.

Bikker, J.A., L. Spierdijk, 2008, How banking competition changed over time, *DNB Working Paper* nr. 167, De Nederlandsche Bank, Amsterdam.

Bikker, J.A., J.W.B. Bos, 2008, *Bank Performance: A theoretical and empirical framework for the analysis of profitability, competition and efficiency*, Routledge International Studies in Money and Banking, Routledge, Londen & New York, 176 pag.

Bikker, J.A., M. van Leuvensteijn, 2008, Competition and efficiency in the Dutch life insurance industry, *Applied Economics* 40, 2063–2084.

Bikker, J.A., J. de Dreu, 2009, Operating costs of pension funds: the impact of scale, governance and plan design, *Journal of Pension Economics and Finance* 8, 63-89.

Bikker, J.A., L. Spierdijk and A. Miro, 2009, Competition in the insurance industry: a global analysis, *DNB Working Paper*, De Nederlandsche Bank, Amsterdam (forthcoming).

Boone, J., J. van Oers and H. van der Wiel, 2007, How (not) to measure competition, *CPB Discussion paper* no. 91, CPB Netherlands Bureau for Economic Policy Analysis, The Hague.

Boot, A.W.A., 2007, Review of competition in the Dutch retail banking sector, *Working Party No. 2 on Competition and Regulation*, OECD, Paris.

Braunstein, S., and C. Welch, 2002, Financial literacy: an overview of practice, research and policy, *Federal Reserve Bulletin*, November, 88 (11), 445–457.

Bresnahan, T.F., 1982, The oligopoly solution concept is identified, *Economics Letters* 10, 87–92.

Capgemini, 2005, *World Retail Banking Report*, Capgemini, http://www.hr-rapportenservice.nl/world-retail-banking-report-2005.5680.lynkx?RapportPointer=9-218-3838-30529

Carbó Valverde, S. and F. Rodríguez Fernández ,2006, *The determinants of bank margins in European banking*. Available at http://www.ugr.es/ franrod/CarboRodJBF.pdf.

Claessens, S. and Laeven, L., 2004, What drives bank competition? Some international evidence, *Journal of Money, Credit and Banking* 36, 563–584.

Claessens, S., 2008, *Competition in the financial sector: overview of competition policies*, Paper prepared for the G-20 meeting on Competition in the Financial Sector, Bali, February 16–17, 2008.

CPB, 2003, Tight oligopolies, *CPB Document no. 29*, CPB Netherlands Bureau for Economic Policy Analysis, The Hague.

CPB, 2005, Competition in markets for life insurance, *CPB Document no. 96,* CPB Netherlands Bureau for Economic Policy Analysis, The Hague.

De Bandt, O. and Davis, E.P., 2000, Competition, contestability and market structure in European banking sectors on the eve of EMU. *Journal of Banking and Finance* 24, 1045–1066.

Fernández de Guevara, J. and J. Maudos, 2007, Explanatory factors of market power in the banking system, *Manchester School* 75, 275–296.

Fernández de Guevara, J., J Maudos, and F. Perez, 2007, Integration and competition in the European financial markets, *Journal of International Money and Finance* 26, 26–45.

Freixas, X., and Rochet, J.C., 1997, *Microeconomics of Banking*, MIT Press: Massachusetts Institute of Technology.

Gilibert, P.L. and Steinherr, A., 1989, The impact of financial market integration on the European banking industry, *EIB Papers* no. 8, European Investment Bank.

Hempell, H.S., 2002, Testing for competition among German banks, *Economic Research Centre of the Deutsche Bundesbank. Discussion paper 04/02*.

Jappelli, T., 1993, Banking Competition in southern Italy: A review of recent literature, *Studi Economici* 49, 47–60.

Klein, M.A., 1971, A theory of the banking Firm, *Journal of Money, Credit, and Banking* 3, 205–218.

Lusardi, A., 2004, Saving and the effectiveness of financial education, in: O.S. Mitchell and S.P. Utkus (eds), *Pension design and structure: New lessons from behavioural finance*, Oxford and New York: Oxford University Press, 157–184.

Maudos, J. and A. Nagore, 2005, Explaining market power differences in banking: a cross-country study. *WP-EC 2005-10, Instituto Valenciano de Investigaciones Económicas*, S.A.

Monti, M., (1972, Deposits, credit and interest rate determination under alternative bank objective functions. In: Shell, K. and Szego, G.P. (eds.), *Mathematical Methods in Investment and Finance*, North Holland, Amsterdam.

Mooslechner, P., M. Schürz and B. Weber, 2003, *Transparancy as a mechanism of governance in financial systems*, (OeNB), paper presented at the conference 'Transformation of statehood,' Austrian Academy of Sciences, Vienna, January 23–25, 2003.

NMa, 2006, *Financial Sector Monitor 2006*, The Hague: NMa (Dutch competition authority).

Panzar, J.C. and J.N. Rosse, 1987, Testing for 'monopoly' equilibrium, *Journal of Industrial Economics* 35, 443–456.

Petersen, M.A. and R. Rajan, 1995, The effect of credit market competition on lending relationships, *The Quarterly Journal of Economics* 110, 407–443.

Staikouras, C.K. and A. Koutsomanoli-Fillipaki, 2006, Competition and Concentration in the

New European Banking Landscape, *European Financial Management* 12, 443–482.

Van Leuvensteijn, M., J.A. Bikker, A.A.R.J.M. van Rixtel, C. Kok Sørensen, 2007, A new approach to measuring competition in the loan markets of the euro area, *DNB Working Paper 143*, De Nederlandsche Bank, Amsterdam / *ECB Working Paper nr 768*, European Central Bank, Frankfurt.

Van Leuvensteijn, M., C. Kok Sørensen, J.A. Bikker, A.A.R.J.M. van Rixtel, 2008, Impact of bank competition on the interest rate pass-through in the euro area, *DNB Working Paper* nr 171, De Nederlandsche Bank, Amsterdam / *ECB Working Paper* nr 885, European Central Bank, Frankfurt.

Van Rooij, M.C.J., C.J.M. Kool, and H.M. Prast, 2007, Risk-return preferences in the pension domain: are people able to choose?, *Journal of Public Economics* 91, 701−722.

APPENDIX

Table A.1: P-R measures (H) of banking competition banking and other statistics

Country	Member State of G-20 [a]	H value (Bikker *et al.*, 2006a) [b]	Market structure [c]	Change over time [d]	Lower H for larger banks [e]	H value (Claessens and Laeven, 2004) [f]
Algeria		0.25	Mon/PC			
Andorra		0.89	PC	Incr		
Argentina	X	0.41		Incr		0.73
Armenia		0.51				
Australia	X	0.56	PC			0.80
Austria		0.07	Mon	Decr	Y	0.66
Azerbaijan		0.11	Mon	Decr		
Bahamas		0.53				
Bahrain		0.52	Mon/PC	Decr		
Bangladesh		0.98	PC	Decr	Y	0.69
Belgium		0.49		Decr	Y	0.73
Bermuda		0.76		Decr		
Bolivia		0.99	PC			
Botswana		0.08	Mon	Incr		
Brazil	X	0.32		Incr		0.83
Canada	X	-0.11	Mon	Decr		0.67
Cayman Islands		0.59	Mon/PC			
Chile		0.95	PC	Incr		0.66
China PR	X	1.57				
Colombia		0.56	PC	Incr		0.66
Costa Rica		1.08	PC		N	0.92
Croatia		0.44		Decr	Y	
Cyprus		-0.11	Mon	Decr	Y	
Czech Republic		0.77	PC	Incr		0.73
Denmark		0.33			Y	0.50
Dominican Republic		0.71	PC	Decr		0.72
Ecuador		0.63	Mon/PC			0.68
El Salvador		0.41		Decr		
Estonia		0.45	Mon/PC			
Finland		-0.27	Mon		Y	
France	X	0.60		Decr	Y	0.69
Germany	X	0.65		Decr	Y	0.58
Ghana		0.65	PC		Y	
Greece		0.51			Y	0.76
Hong Kong		0.00	Mon			0.70
Honduras		–				0.81
Hungary		0.17	Mon	Incr		0.75
Iceland		-0.14	Mon/PC	Incr	Y	
India	X	0.48			Y	0.53
Indonesia	X	0.07	Mon	Decr	Y	0.62
Ireland		1.11	PC	Decr		
Israel		0.12	Mon	Incr	Y	
Italy	X	0.09	Mon		Y	0.60
Ivory Coast		0.39				0.56
Japan	X	0.50		Incr	Y	0.47
Jordan		0.27		Decr	Y	
Kazakhstan		0.25	Mon	Decr		
Kenya		0.79	PC	Incr	Y	0.58
Korea, South	X	0.51	Mon/PC	Decr		
Kuwait		0.70	PC	Decr		
Latvia		0.57			Y	0.66
Lebanon		0.44		Incr	Y	
Liechtenstein		0.71	PC	Decr		

Country						
Lithuania		0.45	Mon/PC			
Luxembourg		0.31		Incr	Y	0.82
Macau		0.37		Decr	Y	
Macedonia		1.08	PC			
Malaysia		0.73		Decr	Y	0.68
Malta		-0.22	Mon	Incr		
Mauritius		0.58	PC			
Mexico	X	0.85	PC			0.78
Moldova		0.64		Incr		
Monaco		0.38			Y	
Morocco		0.20	Mon	Decr		
Mozambique		0.52	PC			
Nepal		0.59	PC			
Netherlands		0.78	PC		Y	0.86
New Zealand		0.35	Mon	Decr	Y	
Nigeria		0.68		Incr	Y	0.67
Norway		0.47			Y	0.57
Oman		0.39				
Pakistan		0.47			Y	0.48
Panama		0.58				0.74
Paraguay		0.62		Incr	Y	0.60
Peru		0.63		Incr	Y	0.72
Philippines		0.66		Decr		0.66
Poland		0.08	Mon	Decr	Y	0.77
Portugal		-0.15	Mon		Y	0.67
Romania		0.64	PC		Y	
Russian Federation	X	0.40				0.54
Saudi Arabia	X	0.47		Decr		
Senegal		1.06	PC	Decr		
Singapore		0.33	Mon/PC			
Slovakia		0.27		Decr	Y	
Slovenia		0.38		Decr		
South Africa	X	0.88	Mon/PC		Y	0.85
Spain		0.87	PC	Decr		0.53
Sri Lanka		0.69	PC	Decr		
Sweden		0.44		Decr		
Switzerland		0.86	PC	Decr		0.67
Taiwan		0.93	PC	Incr		
Thailand		0.52		Decr		
Trinidad & Tobago		0.08	Mon	Decr	Y	
Turkey	X	0.38	Mon/PC	Incr	Y	0.46
Ukraine		0.47				0.68
United Arab Emirates		0.46		Decr		
United Kingdom	X	0.77	PC	Decr	Y	0.74
United States	X	0.49		Incr	Y	0.41
Uruguay		0.52			Y	
Venezuela		0.79	PC	Decr		0.74
Vietnam		0.74				
Zambia		0.50		Decr		
Averages/Totals	*19*	*0.50*	*29 Mon*	*22 Incr*	*42 Y*	*0.67*
			39 PC	*39 Decr*	*1 N*	

[a] The 20th member is the EU; [b] Estimation period 1986-2004; [c] Mon means 'monopoly not rejected', PC indicates 'perfect competition not rejected', Mon/PC implies both monopoly and perfect competition not rejected (Bikker *et al.,* 2006a); [d] 'Incr' means that the H statistic increases significantly over time and 'Decr' refers to a significant decrease, both based on a one-sided t-test (Bikker and Spierdijk, 2008); [e] Y means significantly lower H values for larger banks, reflecting more market power, N signifies a significantly lower H value (Bikker *et al.*, 2006b); [f] Estimation period 1994-2001;

Table A.2   Number of banks and concentration ratios over the period 1990-2005

This table reports the number of banks, the Herfindahl-Hirschman index (HHI), and the five-bank concentration ratio (CR5) (all based on total assets) for various countries during the period 1990-2005. A blank indicates that no data are available.

EU	# banks				% decrease	HHI			% increase	CR5			% increase
year	1990	1995	2000	2005	1990-2005	1997	2000	2005	1997-2005	1997	2000	2005	1997-2005
Austria	1,210	1,041	923	873	28	831	548	560	-33	48	43	45	-6
Belgium	115	143	118	101	12	699	1,505	2,108	202	54	75	85	57
Denmark	189	114	99	98	48	1,431	863	1,155	-19	70	60	66	-6
Finland	523	351	342	338	35	2,307	2,359	*2,664	15	89	87	83	-7
France	1,981	1,453	1,108	814	59	449	589	*737	64	40	47	53	33
Germany	3,913	3,500	2,575	1,949	50	114	151	174	53	17	20	22	29
Greece	15	18	17	21	-40	885	1,122	1,096	24	56	65	*65	16
Italy	1,138	959	827	770	32	306	190	230	-25	31	23	27	-13
Luxembourg	177	220	202	155	12	210	242	312	49	23	26	31	35
Netherlands	180	174	87	72	60	1,654	1,694	1,796	9	79	81	*84	6
Portugal	33	37	42	43	-30	600	1,000	*1,164	94	46	59	69	50
Spain	327	318	281	269	18	496	874	**773	56	45	54	**51	12
Sweden	12	13	23	26	-118	2,040	1,975	**2,196	8	87	88	**91	5
United Kingdom	47	40	44	30	36	207	278	*413	100	28	30	*37	33
total # banks EU	9,860	8,381	6,688	5,559									
average % change EU					44				43				18

year				2003							2001		
Switzerland	457	382	335	301	34						65		
United States	12,369	9,982	8,361	7,825	37						21		
Japan	154	149	136	131	15						31		

These figures are taken from different sources. *Number of institutions*: OECD Bank profitability 2004 (1990-2003; thereafter: ECB, the numbers in the table are corrected for a definitional break). *Concentration indices*: ECB, Structural analysis of the EU banking sector 2002; ECB, EU Banking Structures October 2006; Switzerland, USA and Japan: World Bank 2001. Regarding the correction for the definitional break, (*) indicates that a small correction has been made, (**) reflects a substantial correction.

**Chart A.1 H estimates of competition in 80 countries in alphabetical order of country names**
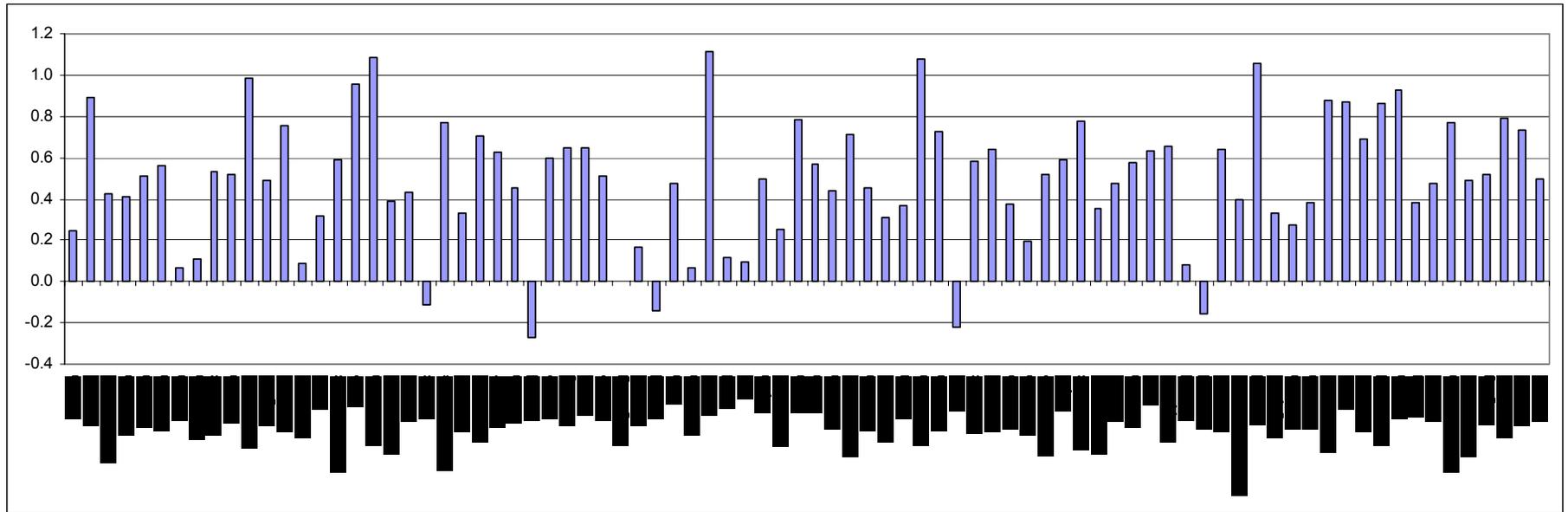
**Chart A.2**   **H estimates of competition in 80 countries arranged from low to high**
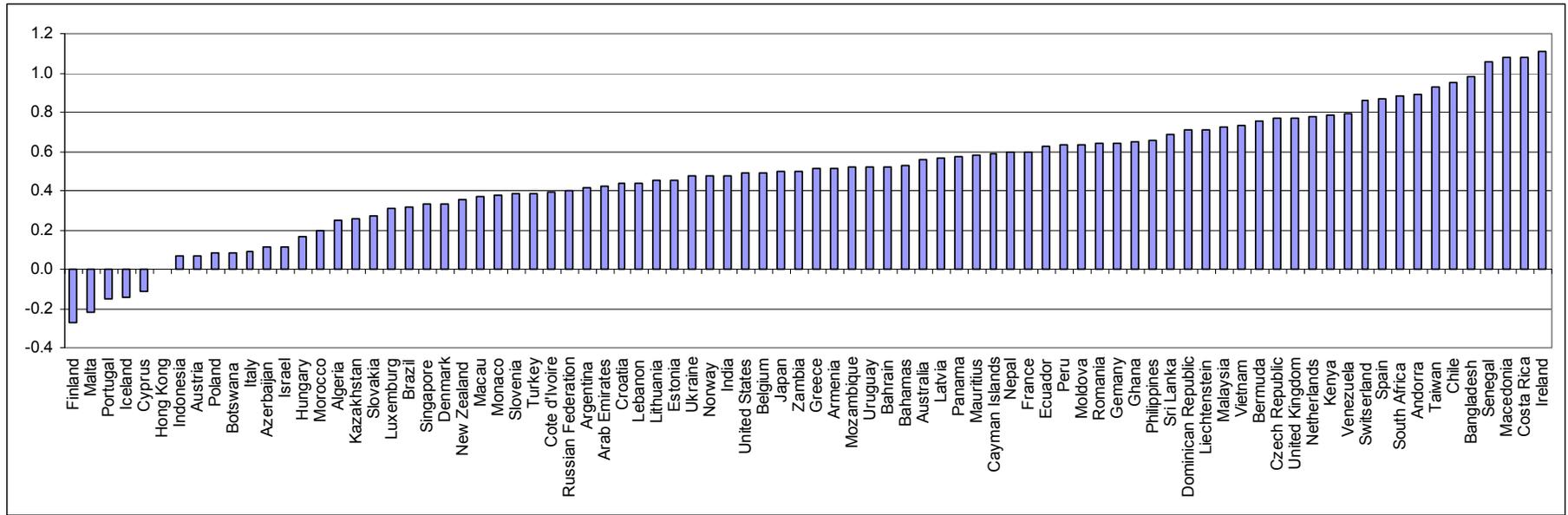
Chart A.3   **Recursive least squares estimates of the H statistic** [34]
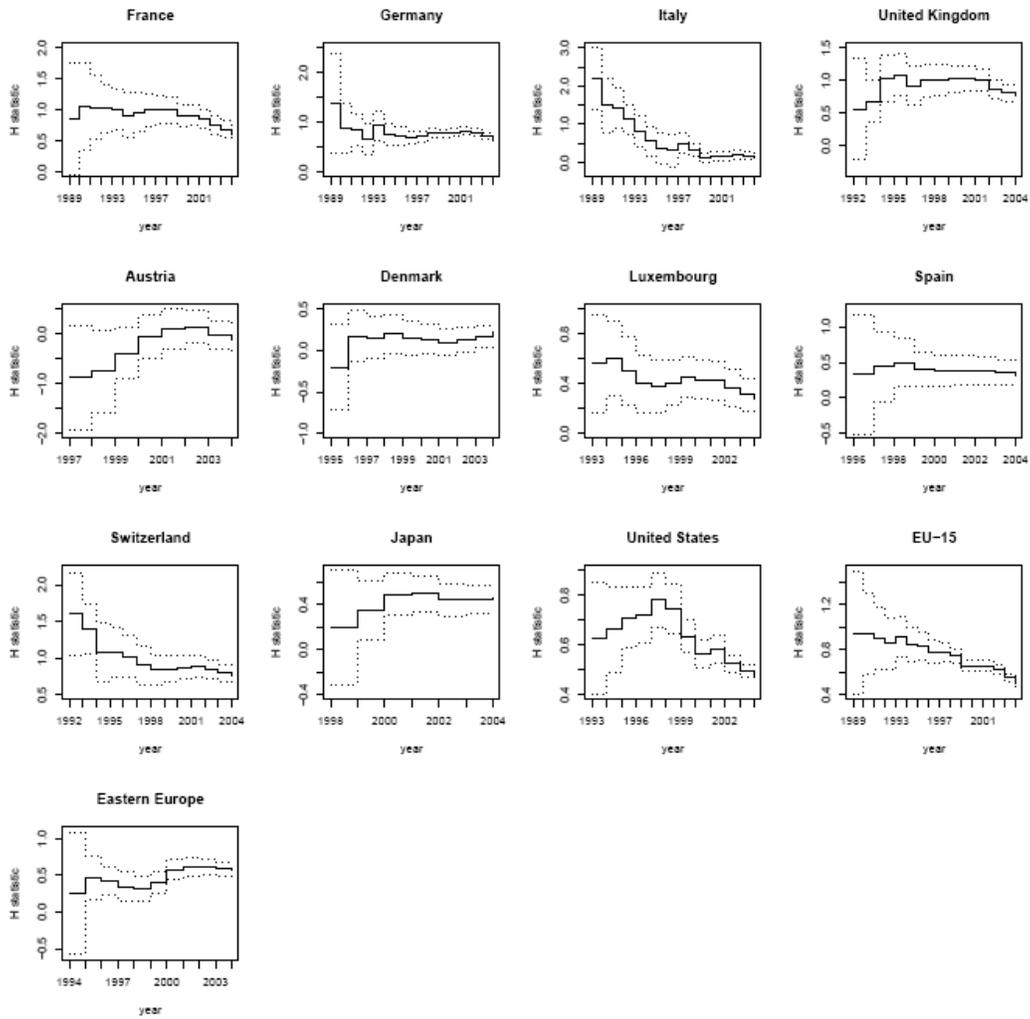
[34] Rolling-window or recursive estimates of the H statistic start with estimates of the first few years, continue with estimates of the first years, and successively add data of one extra year to the sample, using ever larger subsets of the data. Confidence bounds have been shown by dotted lines.