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THE PERSISTENCE OF BANK PROFIT

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The persistence of bank profit[1]

Abstract

This paper examines the strength of competition in 65 national banking industries. Country-level dynamic panel estimates of the persistence of bank profit are reported and compared. The persistence of bank profit appears to be weaker for banks in developing countries than for those in developed countries. Persistence is relatively high in North America and Western Europe and relatively low in East Asia, the Pacific and Sub-Saharan Africa. The persistence of profit is stronger when entry barriers are high, and when competition is low according to both structure- and conduct-based competition indicators.

Keywords: Banking, competition, dynamic panel estimation, entry, profitability, persistence

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1. Introduction

The competitive landscape of banking has been transformed over the past three decades by forces such as deregulation, technological change and the globalization of goods and financial markets. These developments have impacted upon the operations, efficiency, productivity, margins and profitability of banks in all countries (Demirguc-Kunt and Huizanga, 1998; Claessens et al., 1998; Levine, 2003; Clarke et al., 2003; Carbo and Fernandez, 2007; Maudos and Fernanadez de Guevara, 2004; 2007; Berger, 2007)[2]. Banks nowadays operate in product and geographical markets very different from those that existed thirty years ago. Banks use a range of conventional and innovative technologies to serve their customers.

To date, most academic research on competition and its effects on bank performance is based on theoretical models that are static in nature (Claessens and Laeven, 2004; Shaffer 2004; Goddard and Wilson, 2009; Dick and Hannan, 2009). Static models are useful in identifying causal relationships between key variables when markets are in equilibrium, but they provide only a snapshot picture of a dynamic competitive process (Geroski, 1990). There is no certainty that conduct or performance measures observed at any point in time represent equilibrium values. For example, an empirical association between high concentration and high profitability (implicit in SCP-based models) may simply appear by chance, from observations taken during a period when the relevant market is in a state of disequilibrium. If so, cross-sectional data does not capture (unless by luck) the long-run equilibrium relationship. Furthermore, cross-sectional data usually does not contain sufficient information on which to base reliable policy decisions to promote competitive

[2] Berger et al. (1995) and Jones and Critchfield (2005) provide an exhaustive analysis of structural and strategic change in US banking. Goddard et al. (2007) provide an overview of European banking. DeYoung et al. (2004) and Berger et al. (2004) analyze the response of banks to changes in their competitive environment. Vander Vennet (2002), Stiroh and Strahan (2003) and Maudos and Fernandez de Guevara (2004) assess the impact of these changes on bank performance. Cetorelli (2004) examines the effect of bank competition on the size distribution of non-financial firms. Beck et al. (2004) and Cetorelli and Strahan (2006) analyse the effect of bank competition on the availability of credit to small, medium and large firms. Black and Strahan (2002), Bonaccorsi Di Patta and Dell'Aricca (2004) and Zarutskie (2003) assess the implications for borrowing, investment, entrepreneurship and new firm creation.

outcomes. An abnormal or monopoly profit realized in one period could disappear in the next, rendering intervention by government or other regulatory agencies unnecessary.

This paper uses a simple dynamic model of the competitive process to test the hypothesis that entry and exit are sufficiently free to eliminate any abnormal profit quickly, so that bank profit rates converge rapidly towards their long-run equilibrium values. The alternative hypothesis is that the structural characteristics of banking markets in particular countries, or specialist knowledge or regulatory advantages enjoyed by incumbent banks, results in entry being retarded or blocked. The slower is the speed of adjustment, the longer is the period over which abnormal profits may persist, and the greater is the extent of the potential departure from the competitive ideal.

This paper tests for the persistence of profits using bank-level data from 65 countries. Generalised Methods of Moments (GMM) estimation of a first-order autoregressive model for normalized profit rates yields estimates for the persistence of profit at country level. These estimates indicate that the persistence of bank profit is higher in developed countries than it is in developing countries. Factors that influence the degree of persistence are examined in a second-stage analysis. Persistence appears to be stronger for banks located in countries with high entry barriers, and low levels of competition based on static measures.

The remainder of the paper is structured as follows. Section II reviews the theoretical and empirical literature on the persistence of profit. Section III describes the model specification. Section IV presents estimates of persistence for a sample of banks drawn from 65 countries. Section V examines the determinants of the persistence of profit. Section VI concludes.

2. Literature

The persistence of profit approach is based on empirical investigation of the dynamics of firm-level profits. This constitutes a departure from the static, cross-sectional

methodology that is prevalent in much of the literature based on the structure conduct performance paradigm (SCP) and the New Industrial Organization (NEIO) literature.[3]

In its strongest form, the persistence of profit hypothesis developed by Mueller (1977, 1986) consists of two conditions. First, entry and exit are sufficiently free to eliminate any firm's abnormal profit quickly. Second, all firms' profit rates tend to converge towards an identical long-run average value. The second condition is stronger than the first; and under a less restrictive version of the persistence of profits hypothesis, abnormal profit rates dissipate quickly and convergence of profit rates is towards long-run average values that may differ between firms. The empirical analysis in this paper concentrates upon this latter formulation of the persistence of profit hypothesis. The alternative hypothesis is that some incumbent firms enjoy regulatory protection, or possess the capability to prevent imitation or block entry. If so, abnormal profit tends to persist from year to year, and convergence is either slow or, in the most extreme case, non-existent.

A number of studies have tested the persistence of profits hypothesis for the (non-bank) manufacturing and services sectors (Mueller; 1986; Geroski and Jacquemin, 1988; Waring, 1996 Goddard and Wilson, 1996, 1999; McGahan and Porter, 1999; Glen et al., 2001, 2003; Marayuma and Odagiri 2002). This literature typically observes patterns in the time-series variation of firm-level profit rate data, and draws inferences about the nature of competition (whether barriers to entry exist, and if so, whether they are temporary or permanent). Most studies report an average persistence of profit estimate, in the form of a first-order autoregressive coefficient in a time-series regression of firm-level normalized profit rates, in the range 0.4 to 0.5. Some studies report either lower or higher values.[4] The persistence of profit has been found to be lower in developing countries than in developed countries. This pattern is attributed to lower sunk costs of entry, faster economic growth, the role of government, and the presence of large conglomerate firms in developing

[3] For an overview, see Berger (1995), Berger et al. (2004), Dick and Hannan (2009), Goddard et al. (2001, 2004b), Claessens and Laeven (2004), Shaffer (2004).

[4] Goddard and Wilson (1999) and Lipczynski et al. (2009) review evidence on the persistence of profit in manufacturing and services.

countries which tend to increase the intensity of competition experienced by domestic firms (Glen et al., 2001; Stephan and Tsapin, 2008).

The evidence for the persistence of profit in banking is relatively scant.[5] Using a sample of large US banks observed over the period 1986-91, Levonian (1993) finds that despite restraints on competition imposed by bank regulation, abnormal profits tend to be temporary, rather than permanent. The pace of convergence, however, is slower than that suggested by most manufacturing studies. Roland (1997) examines the persistence of profits of US bank holding companies, using quarterly data for the period 1986-92. The persistence of profit is stronger for banks with below-average performance. Berger et al. (2000) use a non-parametric methodology to examine the persistence of bank profit. The strength of persistence is found to differ between banks initially located in the top and bottom deciles of the distribution of banks by performance.

Goddard et al. (2004a) estimate the persistence of profit for a sample of European banks from six countries, using a model that incorporates bank-specific variables including size, diversification, risk and ownership type. The persistence of profit is higher for mutual (savings and cooperative) banks than for commercial banks. By country, persistence is highest for France, where a strong regulatory tradition may have insulated banks from the full rigours of competition.

Several recent studies focus on individual countries. Agosttino et al. (2005) report estimates of the persistence of profit for Italian banks for the period 1997-2000. Persistence is positively associated with ownership concentration. Knapp et al. (2006) report persistence estimates for a sample of US banks, suggesting that profits take as long as five years to converge towards average industry norms. Persistence estimates for Turkey and Greece are reported by Bektas (2007) and Athanasoglou et al. (2008), respectively. In a recent cross-country study for Sub-Saharan Africa, Flamini (2009) finds that strong persistence is associated positively with bank size, diversification and private ownership.

Overall, the empirical evidence to date focuses on a relatively small number of countries, and identifies positive autocorrelation in bank profit rates observed over time.

[5] Stiroh and Strahan (2003) test the effectiveness of deregulation in improving the competitive process. Deregulation increases both entry and exit, and reallocates market share from unprofitable banks to profitable banks.

The persistence of bank profit is driven by bank-specific and industry characteristics, and macroeconomic conditions. Surprisingly, there is little evidence on the extent to which bank regulation and supervision determine differences in the persistence of profit between countries. A principal objective of this paper is to fill this gap in the literature.

3. Methods

This section describes the empirical methods used in this paper. A two-stage approach is used to measure the persistence of profit, and investigate the factors that determine the persistence of profit. At the first stage, dynamic panel first-order autoregressive models are estimated for the normalized profit rates of banks in each of the 65 countries. At the second stage, the first-order autoregressive coefficients obtained at the first stage are used as the dependent variable in a cross-sectional regression for the determinants of the persistence of profit in each country.

Stage 1 Estimating the persistence of profit

In order to eliminate the effect of cyclical fluctuations which impact similarly on the profit rates of all of the banks within each country, $\pi_{i,t}$ is expressed as a deviation from the cross-sectional mean profit rate in year t. Therefore $\pi_{i,t}$ is the normalized profit rate of bank i in year t. In the theoretical model, the change in the normalized profit rate of bank i between year t–1 and year t, denoted $\Delta\pi_{i,t}$, is assumed to be a function of bank i's lagged normalized profit rate; the component of current and past entry which impacts directly on bank i's profitability, denoted $E_{i,t-k}$ for k=0 ... ∞; and an idiosyncratic component, denoted $u_{i,t}$:

$$\Delta\pi_{i,t} = \theta_i + \sum_{k=0}^{\infty}\beta_{j,k}E_{i,t-k} + u_{i,t} \qquad (1)$$

In (1), the coefficients $\beta_{j,k}$, which measure the impact of $E_{i,t-k}$ on $\Delta\pi_{i,t}$, are assumed to be the same for all banks that are located in country j. Entry is assumed to be a function of past realizations of bank i's normalized profit rate:

$$E_{i,t} = \phi + \sum_{k=1}^{\infty} \alpha_{j,k} \pi_{i,t-k} + e_{i,t} \qquad (2)$$

Substituting (2) into (1) and re-parameterizing yields an autoregressive model for bank i's normalized profit rate:

$$\pi_{i,t} = \tilde{\pi}_i + \sum_{k=1}^{\infty} \lambda_{j,k} \pi_{i,t-k} + v_{i,t} \qquad (3)$$

When employing panel data with a short time-dimension, it is convenient to estimate a first-order autoregressive (AR(1)) specification for $\pi_{i,t}$, with the higher-order lagged profit rates suppressed:

$$\pi_{i,t} = \tilde{\pi}_i + \lambda_j \pi_{i,t-1} + v_{i,t} \qquad (4)$$

In (4), $\tilde{\pi}_i$ denotes bank i's long-run mean normalized profit rate, and λ_j in (4) replaces $\lambda_{j,1}$ in (3). The adjustment of normalized bank profit rates described by (4) is interpreted as a consequence of the interaction between profitability and the entry threat, as postulated in the contestable markets literature (Baumol et al., 1982; Bratland, 2004).

Estimation of the persistence of profit coefficients, λ_j in (4), is implemented using Arellano and Bover's (1995) system GMM estimator, including both lagged differences and levels of the explanatory variables as instruments. The system GMM estimator reduces potential biases in finite samples, and asymptotic imprecision associated with Arellano and Bond's (1991) differenced GMM estimator (Blundell and Bond, 1998). The consistency of the system GMM estimator depends both on the validity of the assumption that the error term

is not autocorrelated, and on the validity of the instruments. Two specification tests are reported. The first is the Hansen (1982) test, which is commonly used as a standard test of instrument validity.[6] It can also be viewed as a test of structural specification (Roodman, 2006, 2008). Omitting important explanatory variables, for example, could move components of variation into the error term and make them correlated with the instruments, making the model specification seriously biased. The second test examines the hypothesis of no autocorrelation in the error term. The presence of first-order autocorrelation in the differenced residuals does not imply that the estimates are inconsistent, but the presence of second-order autocorrelation implies that the estimates are inconsistent. The second-order autocorrelation test is reported.[7]

Stage 2 Investigating the determinants of the persistence of profit

At stage 2, the determinants of variations in the country-level persistence of profit coefficients are examined. The estimated λ_j obtained from stage 1 are the dependent variable in a regression in which country and banking sector characteristics are the independent variables. The independent variables are grouped into the following four categories: macroeconomic and financial system; regulatory; institutional and external governance; and market structure and competition.

The macroeconomic and financial system control variables are *inflation*, *real GDP growth* and *market capitalization*. *Inflation* is the annual percentage change in the country GDP deflator. The banking market is less likely to be competitive when it is subject to high inflation, as the prices of financial services, such as interest rates, are less informative (Claessens and Laeven, 2004), and will in turn exacerbate credit market frictions (Boyd et al, 2001). Angelini and Cetorelli (2003) find evidence of a negative relationship between

[6] The Sargan test is another test of over identifying conditions as discussed in Arellano and Bond (1991). This test, however, requires homoscedastic errors for consistency, which is not necessarily the case in our large cross-country data sample. Hence we report Hansen statistics only.

[7] The failure to pass either of the tests in some cases suggests that these estimates are not completely free of statistical problems. However, instead of using different methodologies for different countries, a consistent methodology is adopted so that the results are comparable.

inflation and competition, suggesting an association between high inflation and the persistence of profit.

A positive relationship is expected between *real GDP growth* and business opportunities for banks. The increased business opportunities may help banks to sustain their profits. Therefore an association might be expected between growth in GDP and the persistence of profit. On the other hand, the availability of business opportunities might lead to an intensification of competition, in which case a negative relationship would be expected between GDP growth and the persistence of profit.

Market capitalization, the value of listed shares on the domestic stock market divided by GDP, is an indicator of the size of the stock market relative to the economy. Claessens and Laeven (2004) argue for a positive association between market capitalization and competition, on the basis that a highly developed non-banking financial sector may apply competitive pressure upon the banking sector. Therefore a negative relationship is expected between market capitalization and the persistence of profit.

The regulatory control variables include proxies for restrictions on bank activity, capital requirements, and legal barriers to entry, obtained from the Barth et al. (2004, 2006, 2008) database. *Activity restriction* is a measure of a bank's ability to engage in three fee-based activities, securities, insurance and real estate, in addition to interest-based banking activity.[8] This indicator is scaled from 0 to 12, where a higher value indicates more onerous restrictions. Restrictions on bank activity might improve the safety and soundness of the banking system, by minimizing opportunities for banks to take on excessive risk, eliminating some conflicts of interest, and simplifying bank supervision. However, restrictions might also reduce or eliminate opportunities for banks to realize economies of scale and scope, or to manage the variability in earnings across product lines.

Total fraction of entry denied is the number of entry applications denied as a fraction of the number of applications received from domestic and foreign banks over the period 2001 to 2005. This measure reflects one aspect of barriers to entry, and a positive

[8] Banks in both developed and developing countries have increased the proportion of their operating income obtained from non-interest sources in recent years. While part of the increase in non-interest income is due to diversification into lines of business such as investment banking, venture capital and insurance underwriting, growth in fee-paying and commission-paying services linked to traditional retail banking services has also been significant. Most evidence suggests that the shift towards non-interest income has not improved risk-adjusted returns (Stiroh and Rumble, 2006; Goddard et al., 2008; Stiroh, 2009).

relationship is expected between this measure and the persistence of profit. *Domestic fraction of entry denied* and *foreign fraction of entry denied* are used as alternative barrier to entry measures in separate estimations.

Capital requirements is defined as the minimum capital to asset ratio required by government regulatory agencies. Higher *capital requirements* increase the size of entry barriers, thus insulating incumbent banks from competition, and increasing bank profit persistence.

Financial freedom is a measure of banking security as well as a measure of independence from government control. According to the Index of Economic Freedom published in 2009, this measure is determined by the extent of government regulation of financial services, the amount of state intervention in financial institutions, entry barriers to the financial services area, and government influence on the allocation of credit. The higher the score, the less the government influence and hence the more financial freedom.

An association is expected between the quality of the country's institutional and external governance framework and persistence of profit. Governance rules and practice differ between countries, and are dependent on the level of economic and financial development (La Porta et al., 1998, 2002; Chhaochharia and Laeven, 2009). Four institutional variables are used, covering property rights, institutional development, economic freedom, and GDP per capita. Protection of property rights is an important pre-requisite for a well-functioning financial system. The *property rights* covariate, measured on a scale of 1 to 5 with higher scores indicating stronger protection, is 6 *minus* the average property rights freedom index reported by the Heritage Foundation over the period 1997-2007. The *KKZ index* (Kaufman et al., 2008) measures the level of institutional development, based on six dimensions of governance, with higher scores reflecting a more advanced level of development. The average value for the period 1998-2007 is used. The degree of freedom enjoyed by businesses and individuals from government interference is measured by the *economic freedom* covariate. This indicator is 6 *minus* the average economic freedom index reported by the Heritage Foundation over the period 1997-2007, measured on a scale of 1 to 5 with higher scores reflecting greater freedom. As a standard

measure of economic development, logarithm of *per capita GDP* is found by Claessens and Laeven (2004) to influence banking sector performance.

HHI, the Herfindahl-Hirschman Index, is used as a concentration measure for each country's banking sector.[9] According to either the collusion hypothesis or the efficiency hypothesis, a positive relationship is expected between concentration and the persistence of profit (Berger, 1995; Goddard et al., 2001). According to the 'quiet life' hypothesis, however, a negative relationship between concentration and persistence of profit might be expected if the managers of large banks choose to settle for a quiet life instead of pursuing profits (Hicks, 1935; Berger and Hannan, 1998). The Panzar and Rosse (1987) *H-statistic* is used as an alternative conduct-based measure of competitive conditions.[10] Typically, the empirical literature on bank competition that uses the H-statistic reports evidence of monopolistic competition (Carbo et al. 2009; Goddard and Wilson, 2009).[11]

4. Data and results

[9] For an industry that consists of a single monopoly producer, HH = 1. A monopolist has a market share of $s_i = 1$. For an industry with N firms, the maximum possible value of the Herfindahl–Hirschman index is HH = 1, and the minimum possible value is HH = 1/N. The maximum value of HH = 1 occurs when the size distribution of the N firms is highly skewed. In the most extreme case, one dominant firm has a market share only fractionally smaller than 1, and N – 1 very small firms each has a market share only fractionally larger than zero.

[10] Under monopoly conditions H<0 as an increase in average cost resulting from an equi-proportionate increase in factor input prices leads to an increase in equilibrium price and, since the profit-maximising firm operates on the price-elastic segment of the market demand function, this results in a reduction in revenue. Under perfect competition, H=1. The representative firm holds its output constant and raises its price in proportion to the increase in average cost. In the case of monopolistic competition, 0<H<1. Here the representative firm achieves equilibrium at Chamberlin's (1933) tangency solution, with (i) MR=MC (marginal revenue *equals* marginal cost) and (ii) AR=AC (average revenue *equals* average cost). The perceived number of competitor firms determines both the location and the price elasticity of the perceived demand function. Following an increase in AC, both output and the perceived number of competitor firms adjust in order to satisfy (i) and (ii). This adjustment produces a change in revenue that is positive, but proportionately smaller than the increase in the input prices. In this sense, the numerical value of H within the range 0<H<1 can be interpreted as a measure of the intensity of competition, within a spectrum of cases that are characterized by the monopolistic competition model.

[11] The H-statistic is estimated using the following reduced-form revenue equation:

$$\ln(P_{it}) = \alpha + \beta_1 \ln(W_{1,it}) + \beta_2 \ln(W_{2,it}) + \beta_3 \ln(W_{3,it}) + \gamma_1 \ln(Y_{1,it}) + \gamma_2 \ln(Y_{2,it}) + \gamma_3 \ln(Y_{3,it}) + \delta D + \varepsilon_{it}$$

where P_{it} is the ratio of gross interest revenue to total assets (proxy for output price of loans), $W_{1,it}$ is the ratio of interest expense to total deposits and money expense to total assets (proxy for input price of deposits), $W_{2,it}$ is the ratio of personal expenses to total assets (proxy for input price of labour), and $W_{3,it}$ is the ratio of overheads to total assets (proxy for input price of equipment/fixed capital). The subscript i denotes bank i, and the subscript t denotes year t. Three control variables are at the individual bank level. Specifically, $\gamma_{1,it}$ is the ratio of equity to total assets, $\gamma_{2,it}$ is the ratio of net loans to total assets, and $\gamma_{3,it}$ is the logarithm of total assets (to control for potential size effects). D is a vector of year dummies for years 1998 through 2007.

Financial accounts data (unconsolidated) for the period 1997 to 2007 for 11,634 banks from 65 countries are obtained from Bankscope. The sample selection criteria are as follows. Any country with five or more commercial banks (domestic or foreign) is selected for the first-stage analysis. The start-year, 1997, is constrained by the availability of data on Bankscope. To eliminate outliers, observations for which the profit rate was more than three standard deviations from the sample mean of each country are deleted. Countries for which λ_j is estimated at the first stage using data for fewer than 15 banks are eliminated from the second-stage analysis.

The data for the macroeconomic and regulatory variables used in the second-stage analysis are obtained from the following sources. Macroeconomic data (inflation, GDP per capita, real GDP growth, stock market capitalization) are obtained from the World Bank's World Development Indicators. The regulatory variables (activity restrictions, capital requirements) and the domestic and foreign entry variables are obtained from Barth et al. (2008). The financial freedom, economic freedom and property rights variables are obtained from the Economic Freedom Index of the Heritage Foundation; the KKZ index is obtained from Kaufmann et al. (2008). Full details of sources and variable definitions are listed in Table 1.

Table 1 Data sources and variable definitions

The final sample for the first-stage analysis is an unbalanced panel with 46,959 bank-year observations (11,634 banks). The profit rate measure is return on average equity (ROE), measured by the ratio of net income after tax to total equity. [12] Taxes are deducted, because if effective tax rates differ between countries, entry and exit should be driven by after-tax profits. The profit rate of bank i located in country j at year t, $\pi_{i,t}$, is normalized by deducting the mean profit rate of all banks located in country j in year t.

[12] The empirical analysis is also conducted using a return on average assets (ROA) profitability measure. To save space these estimations are not reported, but they are available from the authors upon request.

Table 2 and 5 collectively reports descriptive statistics for return on equity. Summary data are tabulated for all countries, based on averages for the period 1997-2007 in Table 5. Average profitability varies significantly between countries. The lowest average ROE are -9.10% (Uruguay) and -4.29 (Thailand). The highest are 25.37% (Venezuela) and 23.84% (Nigeria). Average profitability was higher in developing countries (10.87%) than in developed countries (6.51%). By region (Table 2), North American banks reported the highest profitability on average (12.76%). East Asian and Pacific region banks reported the lowest profitability on average (1.06%). Table 3 reports descriptive statistics for the dependent variable and covariates used in the second-stage analysis, while Table 4 presents the correlation matrices.

Insert Tables 2 and 3 Descriptive statistic for profit rates and other variables

Insert Table 4 Correlation Matrices

First-stage analysis: estimating the persistence of profit

Table 5 reports estimates of the short-run persistence of profit coefficients by country, λ_j in (5). Countries for which the estimated persistence of profit coefficient lies outside the range (-1, 1) are omitted from Table 5.[13]

Insert table 5 Profit persistence parameters -- two step dynamic panel data model

In Table 5, the estimated persistence of profit coefficient is positive for 62 of the 65 countries, and negative for three countries (Costa Rica, Dominican Republic and South Korea). The mean λ_j for the entire sample is 0.43, somewhat higher than the mean value for six European countries of 0.26 reported by Goddard et al. (2004a). The results suggest that the elimination of abnormal profits through competition is by no means instantaneous.

[13] Microeconomic theory predicts that the dynamic process of competition will restore profits to a normal return. Assuming that $-1 \leq \lambda \geq 1$ profits will converge to the equilibrium rate of return over time.

Barriers to entry and exit are sufficiently high to enable banks to retain a significant portion of their abnormal profits from year to year.

Table 5 reports the frequency distribution of the estimated persistence of profit coefficients, λ_j. For 40 of the 65 countries, the estimated λ_j lies within the interval 0.2 to 0.6.[14] Developed countries have slightly higher persistence of profit (average $\lambda_j = 0.442$) than developing countries (average $\lambda_j = 0.426$), but these differences are not significant.

Insert table 6 frequency distribution of the persistence coefficients

Table 6 also reports the average estimated λ_j for countries located in eight international 'regions': Latin America and Caribbean; East Asia and the Pacific; North America; West Europe; East Europe; Middle East and North Africa; Sub-Saharan Africa; and South Asia. There is considerable regional variation in the average persistence of profit. The highest average λ_j are obtained for North America (average = 0.680) and Western Europe (average = 0.495). The lowest values are obtained for East Asia and the Pacific (average = 0.288) and Sub-Saharan Africa (average = 0.296).

Second-stage analysis: identifying the determinants of persistence of profit

The second-stage analysis examines the determinants of the persistence of profit. Table 7 reports the estimation results. In column 1, only the macroeconomic variables (inflation, real GDP growth, stock market capitalization) are included in the estimation. In columns 2-7, the regulatory variables (entry barriers, activity restrictions, barriers to domestic banks, and barriers to foreign banks) are added, one at a time. In columns 8-11 the institutional and external governance variables (property rights, KKZ index, GDP per capita and economic freedom) are added. In columns 12-13 the industry concentration and competition measures (HHI and H-statistic) are added. Finally, in column 14 all covariates

[14] The definition of advanced and developing countries follows the IMF, International Financial Statistics (2008).

are included in a multivariate model of the determinants of persistence of profit. Windmeijer small sample correction is used to obtain reliable standard errors.[15]

Insert Table 7 Cross country determinants of short run profits persistence

Among the macroeconomic variables, inflation generally has a positive impact on the persistence of profit, although only a few of the coefficients are significant. In column 4, there is a significant negative relationship between stock market capitalization and the persistence of profit. This would suggest that the more highly developed is the non-bank financial sector, the greater is the competitive pressure on the banking sector. However, this finding is reversed in column 14. Overall, therefore, there is little evidence for any relationship between financial sector development and the persistence of bank profit. The coefficients on GDP growth are predominantly negative, and significant in many cases. This is consistent with the argument that greater business opportunities afforded by higher economic growth lower the opportunity cost of entering the banking sector, thereby reducing entry barriers. Subsequently, increased competition weakens the ability of incumbent banks to sustain their profitability.

The coefficients on the three legal barriers to entry indicators in columns 2, 6 and 7 are positive and significant. This suggests that successful banks in markets that are protected by entry barriers are more able to sustain their profitability over time. The remaining regulatory variables - activity restrictions, capital regulation, and financial freedom - seem to exert little or no influence on the persistence of profit.

Overall, regulation appears to impact on the persistence of profit through the erection and enforcement of legal barriers to entry. Higher entry barriers tend to reduce competition, and increase profitability. The opposite is also true. For incumbent banks, however, other types of regulation do not exert any discernable impact on competition measured by the persistence of profit.

[15] The control variables are selected to avoid high correlation, and problems of multicollinearity are therefore minimal.

Among the institutional and external governance variables, the coefficient on the property rights measure is negative and significant in column 11. This suggests that the stronger is the protection of property rights, the lower is the persistence of profit. With stronger property rights, new entrants may feel more secure in conducting business, so the intensity of competition increases. The coefficients on the other institutional variables are negative in columns 9 and 10, but these coefficients are not significant.

There is no relationship between the HHI index and the persistence of profit, according to the estimation reported in column 12. Differences between the objectives of banks may render the relationship between industry structure and concentration tenuous. For example, some banks might sacrifice potential profits in order to reduce risk by making more secure investments; or alternatively, some banks might simply enjoy a quiet life afforded by a lack of competitive discipline (Berger and Hannan, 1998; Goddard et al., 2004b). Similarly, there is no relationship between the Rosse-Panzar H-statistic and the persistence of profit, according to the estimation reported in column 13. In column 14, however, where both the HHI index and the H-statistic are included, the coefficients on both are significant. The relationship between the HHI and the persistence of profit is negative, in accordance with the 'collusion' hypothesis of an association between concentration and entry barriers. The relationship between the H-statistic and the persistence of profit is negative. This finding is also consistent with an association between the intensity of competition and the persistence of profit.

In the multivariate model reported in column 14, the coefficients on the total fraction of entry denied, property rights and GDP growth variables become insignificant. It appears that the market structure and competition variables tend to dominate the entry barriers, institutional and macroeconomic variables in explaining the variation in the persistence of profit.

5. Conclusion

Over the past three decades, banking markets around the world have experienced fundamental regulatory and structural change, with profound implications for the

intensity of bank competition. Using a large cross-country dynamic panel data set, this paper reports estimates of the intensity of competition, based on a dynamic analysis of the persistence of bank profit over time. In contrast with the essentially static structure-conduct-performance (SCP) and new empirical industrial organization (NEIO) frameworks, which dominate the analysis of competition in the empirical banking literature, this paper adopts a dynamic view of bank competition. The present approach is consistent with the view, articulated in the contestable markets literature, that threatened or potential entry is as important as actual entry in determining the intensity of competition.

A two-stage analysis of the persistence of profit is reported using data on banks from 65 countries over the period 1997 to 2007. At the first stage, a first-order autoregressive model is used to estimate the short-run persistence (speed of adjustment) of bank profit. The speed of convergence varies between countries, with banks in developed countries exhibiting higher persistence of profit on average than those in developing countries. Although competition exerts some discipline on bank profitability, adjustment towards equilibrium after an abnormal profit has been earned is by no means instantaneous. Barriers to entry and exit are sufficiently high to enable banks to retain a significant portion of their abnormal profits from year to year.

At the second stage, the determinants of the persistence of profit are examined. The estimated persistence coefficients from the first stage are used as the dependent variable in regressions with covariates that measure macroeconomic conditions, bank regulation, the institutional environment and external governance, and competition. The results suggest that the persistence of profit is stronger in markets that are sheltered from competition by legally imposed and enforced barriers to entry.

From an antitrust, regulatory and supervisory perspective, the approach that is adopted in this paper suggests that policy recommendations based on profits prevailing in the banking sector at any point in time are inadvisable, as current profitability is essentially a transitory phenomenon. A dynamic model of profitability provides an indication of the efficiency of competition in forcing the adjustment or convergence of profits (above or below the norm) towards their long-run equilibrium values. This assists the regulator in distinguishing between cases in which a competitive equilibrium is likely

to be achieved rapidly without intervention, and cases in which regulatory intervention may be required in order to achieve a competitive outcome.

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Table 1 Variable definitions and sources

Variable name	Description and source
Dependent Variable	
Return on average equity (ROE)[2]	Total net income after tax divided by average equity, as reported by Bankscope.
Bank market structure and competition[2]:	
Herfindahl Index	A measure of the degree of concentration in the banking industry, calculated by the sum of the squares of each bank's market shares of the country of the year.
H-statistic	A measure of the degree of competitiveness of the industry, with less than 0 being a monopoly, less than 1 while larger than 0 being monopolistic competition, and 1 being perfect competition .
Macroeconomic variables[5]:	
Inflation rate	Rate of inflation, calculated by log difference of GDP deflator.
GDP growth	The growth in GDP.
Market Capitalization	Total domestic stock market capitalization divided by GDP
Regulatory restrictions:	
Activity Restrictions[1]	A measure of a bank's ability to engage in the businesses of securities underwriting, insurance, and real, and of the regulatory restrictiveness of banks to own shares in non-financial firms (sum of Survey of Bank Regulation and Supervision questions 4.1 through 4.4).Greater values signify more restrictions.
Financial freedom[3]	An indicator of financial freedom (ranging from 0 to 100). Calculated as 100 minus the financial freedom index of the Heritage Foundation. Higher values signify less freedom.

Capital requirements[1]	The minimum capital to asset ratio required by the government (Based on question 3.1 of Survey of Bank Regulation and Supervision).
Fraction of entry denied[1]	A measure of the number of entry applications denied as a fraction of the number of applications received from domestic and foreign entities (ratio of Survey of Bank Regulation and Supervision questions 1.9.1 and 1.10.1 to 1.9 and 1.10).
Domestic fraction of entry denied[1]	A measure of the number of entry applications denied as a fraction of the number of applications received from domestic entities (ratio of Survey of Bank Regulation and Supervision questions 1.9.1 to 1.9).
Foreign fraction of entry denied[1]	A measure of the number of entry applications denied as a fraction of the number of applications received from foreign entities (ratio of Survey of Bank Regulation and Supervision questions 1.10.1 to 1.10).
***Institutional environment**:*	
Economic freedom[3]	An indicator of economic freedom (ranging from 0 to 100). Greater values signify more freedom.
Property rights[3]	An indicator of the protection of private property rights (ranging from 0 to 100). Greater values signify better protection of property rights.
KKZ Institution index[4]	An indicator of the quality of institutional development in the country. Calculated as the average of six indicators: voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption.
GDP per capita[5]	Logarithm of GDP per capita expressed in original values.

Data Sources:

1 Barth et al. (2008). Data available at: www.worldbank.org/research/projects/bank_regulation.htm

2 Calculated based on Fitch IBCA's Bankscope Database

3 Economic Freedom Index of the Heritage Foundation

4 Kaufmann, Kraay, Zoido-Lobaton (2008)

5 World Development Indicators, World Bank

Table 2 Summary statistics for ROE by region and development.

Region	Number of countries	ROE
Latin America and Caribbean	16	10.07
East Asia & the Pacific	11	1.06
North America	1	12.76
West Europe	15	7.02
East Europe	11	11.47
Middle East & North Africa	2	7.10
Sub-Saharan Africa	6	13.22
South Asia	3	15.93
Advanced Countries	19	6.51
Developed Countries	46	10.87
Overall	65	10.10

Table 3 Summary statistics for the persistence of profit, and covariates

	Mean	Standard Deviation	Number of countries
Persistence of profit, λ_j	0.429	0.243	64
Inflation rate	0.078	0.129	62
Market capitalization	0.546	0.643	59
GDP growth	0.040	0.018	62
Herfindahl-Hirschman Index	0.177	0.135	60
Rosse-Panzar H-statistic	0.553	0.255	62
Activity restrictions	2.554	0.650	56
Capital requirements	0.089	0.014	55
Financial freedom	46.393	15.568	61
Total fraction of entry denied	0.070	0.135	48
Domestic fraction of entry denied	0.093	0.194	31
Foreign fraction of entry denied	0.057	0.131	42
Economic freedom index	63.452	9.000	61
KKZ Index	0.388	0.910	63
Property rights Index	59.061	23.035	61
GDP per capita	8.572	1.463	61

Table 4 Correlation Matrices for the explanatory variables.

	Inflation	Market capitalization	GDP growth	HHI	H-statistic	Activity restrictions	Captial requirements	Financial freedom	Total entry denied	Domestic entry denied	Foreign entry denied	Economic freedom	KKX	GDP per capita
Inflation	1.00													
Market capitalization	-0.28	1.00												
	0.03													
GDP growth	0.05	-0.19	1.00											
	0.68	0.15												
HHI	-0.01	-0.14	0.11	1.00										
	0.92	0.30	0.41											
H-statistic	0.08	-0.06	-0.16	0.06	1.00									
	0.54	0.64	0.23	0.66										
Activity restrictions	0.09	-0.41	0.13	0.11	-0.07	1.00								
	0.50	0.00	0.36	0.43	0.63									
Captial requirements	0.54	-0.39	0.18	0.04	-0.08	0.03	1.00							
	0.00	0.00	0.19	0.80	0.55	0.84								
Financial freedom	0.23	-0.51	0.30	0.15	0.00	0.43	0.32	1.00						
	0.08	0.00	0.02	0.26	0.97	0.00	0.02							
Total entry denied	-0.02	-0.15	0.25	0.10	0.05	0.16	0.06	0.31	1.00					
	0.88	0.31	0.09	0.53	0.73	0.28	0.68	0.04						

Domestic entry denied	0.21	-0.04	0.36	0.18	0.01	0.18	0.05	0.51	0.90	1.00				
	0.27	0.84	0.05	0.35	0.95	0.34	0.77	0.00	0.00					
Foreign entry denied	-0.06	-0.19	0.30	-0.06	-0.02	0.13	0.16	0.17	0.81	0.45	1.00			
	0.73	0.24	0.06	0.71	0.89	0.44	0.34	0.31	0.00	0.02				
Economic freedom	-0.38	0.71	-0.33	-0.14	0.12	-0.34	-0.54	-0.80	-0.33	-0.42	-0.32	1.00		
	0.00	0.00	0.01	0.30	0.36	0.01	0.00	0.00	0.02	0.02	0.04			
KKX	-0.28	0.59	-0.38	-0.12	0.01	-0.46	-0.46	-0.67	-0.36	-0.38	-0.36	0.79	1.00	
	0.03	0.00	0.00	0.37	0.93	0.00	0.00	0.00	0.01	0.04	0.02	0.00		
GDP per capita	-0.25	0.56	-0.47	-0.20	0.08	-0.49	-0.44	-0.67	-0.42	-0.42	-0.51	0.75	0.91	1.00
	0.05	0.00	0.00	0.13	0.52	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	

Notes: p value of each pair of correlation coefficients is reported underneath each correlation coefficient.

Table 5 First-stage estimation results: Short-run persistence of profit estimates and profit rates (ROE) by country

Country	Country type	Region	No.of banks	No. of obs	ROE Mean	ROE Std. Dev.	Lambda	Lambda Std. Err.	Hansenp	AR(2)
Argentina	DC	Latin America and Caribbean	94	543	-3.29	37.14	0.164	0.008	0.302	0.546
Australia	AC	East Asia & the Pacific	26	87	11.52	21.86	0.255	0.085	0.477	
Austria	AC	West Europe	248	1361	7.10	8.08	0.477	0.039	0.570	0.107
Bahamas	DC	Latin America and Caribbean	16	89	19.83	17.67	0.353	0.098	0.988	0.294
Bangladesh	DC	South Asia	31	198	17.94	17.03	0.284	0.034	0.192	0.811
Belgium	AC	West Europe	62	344	9.80	19.07	0.539	0.004	0.522	0.547
Bosnia and Herzegovina	DC	East Europe	23	124	6.28	10.09	0.525	0.033	0.474	0.313
Brazil	DC	Latin America and Caribbean	151	861	14.14	23.34	0.311	0.021	0.102	0.818
Bulgaria	DC	East Europe	22	132	13.15	16.33	0.392	0.008	0.444	0.220
Cayman Islands	DC	Latin America and Caribbean	16	82	11.29	11.48	0.613	0.046	0.999	0.387
Chile	DC	Latin America and Caribbean	34	197	9.26	10.76	0.400	0.005	0.474	0.451
China	DC	East Asia & the Pacific	70	345	12.78	10.08	0.570	0.025	0.823	0.727
Colombia	DC	Latin America and Caribbean	27	169	9.39	30.87	0.324	0.003	0.957	0.449
Costa Rica	DC	Latin America and Caribbean	45	208	13.14	7.14	0.887	0.016	0.866	0.832
Croatia	DC	East Europe	41	226	8.03	12.92	-0.061	0.002	0.601	0.230
Cyprus	AC	East Europe	15	71	16.17	28.65	0.508	0.011	0.990	0.136
Czech Republic	DC	East Europe	24	130	9.53	18.78	0.201	0.003	0.998	0.102
Denmark	AC	West Europe	104	636	10.70	7.92	0.488	0.010	0.105	0.990
Dominican Republic	DC	Sub-Saharan Africa	33	175	9.92	28.90	-0.034	0.002	0.863	0.102
Ecuador	DC	Latin America and Caribbean	33	218	12.21	12.79	0.169	0.009	0.301	0.286
Egypt, Arab Rep.	DC	Sub-Saharan Africa	30	181	8.49	18.43	0.517	0.002	0.828	0.135
France	AC	West Europe	343	2022	9.17	19.08	0.446	0.024	0.331	0.031
Germany	AC	West Europe	2123	12178	5.41	5.57	0.178	0.017	0.000	0.002
Guatemala	DC	Latin America and Caribbean	32	205	12.14	14.46	0.808	0.008	0.803	0.614
Honduras	DC	Latin America and Caribbean	20	122	11.27	8.90	0.723	0.016	0.599	0.866

Hong Kong, China	DC	East Asia & the Pacific	34	145	10.82	12.20	0.228	0.002	0.754	0.962
Hungary	DC	East Europe	23	130	12.65	22.01	0.709	0.003	0.929	0.113
India	DC	South Asia	77	476	15.36	12.47	0.477	0.003	0.628	0.853
Indonesia	DC	East Asia & the Pacific	62	338	10.99	46.15	0.038	0.002	0.310	0.685
Ireland	AC	West Europe	25	127	9.43	9.51	0.779	0.011	0.850	0.623
Italy	AC	West Europe	671	1863	7.13	7.91	0.464	0.029	0.272	0.623
Japan	AC	East Asia & the Pacific	758	4711	-1.94	19.06	0.132	0.031	0.143	0.471
Kenya	DC	Sub-Saharan Africa	36	195	8.50	20.65	0.194	0.003	0.897	0.947
Korea, Rep.	DC	East Asia & the Pacific	21	141	10.34	42.61	-0.296	0.001	0.408	0.244
Latvia	DC	East Europe	21	143	15.76	13.78	0.720	0.021	0.359	0.264
Lebanon	DC	Middle East & North Africa	37	182	7.18	17.01	0.790	0.038	0.978	0.137
Luxembourg	AC	West Europe	126	702	12.86	12.46	0.425	0.035	0.439	0.614
Malaysia	DC	East Asia & the Pacific	42	222	12.12	12.72	0.122	0.006	0.944	0.553
Mexico	DC	Latin America and Caribbean	38	222	4.96	18.42	0.512	0.001	0.625	0.453
Netherlands	AC	West Europe	46	219	11.20	11.20	0.719	0.005	0.785	0.277
Nigeria	DC	Sub-Saharan Africa	58	309	23.84	22.31	0.316	0.014	0.801	0.142
Norway	AC	West Europe	105	420	8.64	5.17	0.375	0.001	0.461	0.499
Pakistan	DC	South Asia	26	158	15.17	25.66	0.578	0.002	0.857	0.153
Panama	DC	Latin America and Caribbean	71	321	15.65	16.29	0.377	0.015	0.417	0.330
Paraguay	DC	Latin America and Caribbean	20	120	14.56	18.97	0.573	0.014	0.968	0.282
Peru	DC	Latin America and Caribbean	18	107	8.43	14.49	0.328	0.048	1.000	0.028
Poland	DC	East Europe	48	202	8.65	14.90	0.594	0.008	0.972	0.553
Portugal	AC	West Europe	24	106	9.91	9.95	0.482	0.009	0.999	0.361
Romania	DC	East Europe	24	147	4.31	22.51	0.290	0.014	0.733	0.484
Russian Federation	DC	East Europe	695	2341	12.44	11.83	0.315	0.020	0.172	0.290
Senegal	DC	Sub-Saharan Africa	32	138	3.94	26.95	0.526	0.001	0.596	0.235
Singapore	DC	East Asia & the Pacific	16	71	11.05	21.23	0.243	0.044	0.803	
Spain	AC	West Europe	92	428	8.73	13.76	0.531	0.015	0.332	0.553
Sweden	AC	West Europe	91	466	7.91	5.00	0.118	0.023	0.065	0.600

Switzerland	AC	West Europe	442	2392	8.18	7.51	0.725	0.032	0.116	0.861
Taiwan, China	DC	East Asia & the Pacific	46	301	-0.80	17.44	0.325	0.022	0.356	0.101
Tanzania	DC	Sub-Saharan Africa	15	52	19.99	26.02	0.254	0.156	0.077	
Thailand	DC	East Asia & the Pacific	21	135	-4.29	55.57	0.967	0.002	0.403	0.259
Tunisia	DC	Middle East & North Africa	15	94	6.95	7.12	0.630	0.028	0.840	0.034
Ukraine	DC	East Europe	33	188	11.71	11.34	0.454	0.017	0.599	0.796
United Kingdom	AC	West Europe	145	692	9.13	13.47	0.684	0.017	0.455	0.198
Uruguay	DC	Latin America and Caribbean	44	195	-9.10	82.89	0.589	0.010	0.692	0.665
United States	AC	North America	738	4319	12.76	9.27	0.680	0.041	0.098	0.004
Venezuela	DC	Latin America and Caribbean	49	268	25.37	18.63	0.391	0.025	0.358	0.593
Vietnam	DC	East Asia & the Pacific	22	128	10.38	14.59	0.580	0.010	0.479	0.271

Note: λ is estimated by applying the system GMM estimator to Equation (4), with the profit rates being the ROE's (return-on-average equity) as reported by BankScope. 'AC' represents advanced countries, while 'DC" represents developing countries.. 'Hansenp' is the p-value for the Hansen test for the validity of the over-identifying restrictions in the System GMM estimation. 'AR(2)' is the p-value for the 2nd-order autocorrelation in the residuals from the System GMM estimation.

Table 6 Frequency distribution of estimated short-run persistence coefficients

a) By frequency interval

Frequency interval	Number of countries			
	AC	DC	all	%
<0	0	3	3	5%
0 - 0.2	2	6	8	12%
0.2 - 0.4	7	11	18	28%
0.4 -0.6	5	17	22	34%
0.6- 1	5	9	14	22%
Sum	19	46	65	100%
Mean lambda	0.442	0.426	0.430	

b) By region

Region	Number of countries	Lambda
Latin America and Caribbean	16	0.470
East Asia & the Pacific	11	0.288
North America	1	0.680
West Europe	15	0.495
East Europe	11	0.422
Middle East & North Africa	2	0.710
Sub-Saharan Africa	6	0.296
South Asia	3	0.446

Note: λ_j is the estimated short-run persistence of profit coefficient

Table 7: Second-stage regression results, determinants of the persistence of profit

	Macro-economic conditions	**Macroeconomic conditions and bank regulation**					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	0.858*	0.714**	1.115	1.294	0.783	1.041***	0.763
	(2.82)	(2.44)	(1.93)	(1.77)	(1.51)	(3.97)	(2.02)
Inflation rate	2.512**	1.881	2.305	-0.252	2.613	-3.387	1.756
	(2.19)	(1.44)	(1.25)	(-0.27)	(1.25)	(-1.59)	(1.28)
Market capitalization	0.0137	0.0758	0.00322	-0.0836*	0.0298	-0.0517	0.0637
	(0.19)	(1.28)	(0.04)	(-3.01)	(0.25)	(-0.25)	(0.98)
GDP growth	-20.91**	-21.35*	-23.29	4.167	-21.05**	-15.39	-21.55**
	(-2.19)	(-2.78)	(-1.66)	(0.75)	(-2.34)	(-1.85)	(-2.33)
Total entry denied		1.871***					
		(3.75)					
Activity restrictions			-0.0711				
			(-0.72)				
Capital requirements				-11.34			
				(-1.09)			
Financial freedom					0.00133		
					(0.15)		
Domestic entry denied						0.964**	
						(2.47)	
Foreign entry denied							1.804**
							(2.54)

N	61	46	53	52	59	31	40
adj. R-sq	0.482	0.476	0.434	0.826	0.417	0.931	0.291

Note: Dependent variable is λ coefficients estimated from the first stage system GMM estimator. Since the dependent variable is an estimated parameter, all equations are weighted with the inverse of the standard errors of the dependent variable. The constant variable is suppressed; however, the inverse of standard error of dependent variable is used instead. OLS with robust standard errors is applied in each equation and t statistics of estimated coefficients are shown in parentheses.*,**,*** represents 10, 5, and 1 percent significant level, respectively

	Institutional and External Governance				**Market Structure**	**Competition**	A11
	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Constant	3.307	1.096*	2.632**	1.794*	0.663	1.355*	-0.115
	(1.91)	(3.08)	(2.62)	(3.13)	(1.87)	(3.24)	(-0.20)
Inflation rate	1.383	1.830**	1.892**	0.554	2.694**	1.627	0.560
	(0.88)	(2.06)	(2.32)	(0.45)	(2.26)	(1.53)	(0.86)
Market capitalization	0.298	0.0842	0.0932	0.106	0.0260	-0.0366	-0.107*
	(1.52)	(1.28)	(1.46)	(1.85)	(0.33)	(-0.53)	(-2.74)
GDP growth	-25.89*	-24.80**	-27.17*	-25.74*	-19.22	-22.94**	2.181
	(-3.05)	(-2.46)	(-2.72)	(-3.07)	(-1.98)	(-2.64)	(0.41)
Total entry denied							-0.00136
							(-0.00)
Economic freedom	-0.0360						
	(-1.47)						

KKZ		-0.211					
		(-1.60)					
GDP per capita			-0.170				
			(-1.99)				
Property rights				-0.0106**			0.0127
				(-2.01)			(2.45)
HHI					0.514		1.035***
					(1.11)		(3.64)
H-statistic						-0.348	-1.100***
						(-1.30)	(-6.88)
N	59	60	61	59	61	59	44
adj. R-sq	0.526	0.541	0.593	0.554	0.496	0.565	0.795

Note: Dependent variable is λ coefficients estimated from the first stage system GMM estimator. Since the dependent variable is an estimated parameter, all equations are weighted with the inverse of the standard errors of the dependent variable. The constant variable is suppressed; however, the inverse of standard error of dependent variable is used instead. OLS with robust standard errors is applied in each equation and t statistics of estimated coefficients are shown in parentheses.*,**,*** represents 10, 5, and 1 percent significant level, respectively