The impact of foreign direct investment on total factor productivity growth: international evidence from the banking industry

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Abstract:

Purpose – The purpose of this study is to examine the association between inward foreign direct investment (FDI) and bank level productivity changes using an international sample of 566 publicly quoted commercial banks operating in 75 countries, covering the period 2000-2004.
Design/methodology/approach – The empirical analysis is conducted in two stages. First, a non-parametric Malmquist analysis is employed to decompose total factor productivity change of banks into pure efficiency, scale efficiency, and technological change. Then, panel regressions are performed to identify the productivity impact of FDI while controlling for relevant bank-specific and country-specific characteristics.
Findings – The results indicate that inward FDI has a negative short-term level effect but a positive long-term rate effect on total factor productivity change, which is consistent with the evidence from the Malmquist analysis suggesting that banks experience episodes of technical regress and progress.
Originality/value – The paper explores for the first time the link between FDI and bank level total factor productivity, hypothesising that aggregate FDI inflows yield productivity changes in the banking sector as part of the overall environmental effect on the economy, and providing supportive cross-country evidence.

Keywords:

Banking, FDI, Total Factor Productivity

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1. Introduction

With the rapid pace of global financial integration, perhaps most directly observed in the explosive growth of foreign direct investment (FDI) over the last two decades, concerns have been raised in both academic and public communities about the potential negative impact of such environmental changes on the development of domestic enterprises (Alfaro and Charlton, 2006). On the other hand, increasing openness and economic liberalisation across the globe has been credited with facilitating the pace of global financial integration with positive consequences for domestic entrepreneurial activity and high economic growth rates observed specifically in industrial and emerging market economies (Obstfeld and Taylor, 2004). While there is an established literature pointing to the ongoing debate about the potential effects of FDI inflows and access to foreign capital on the productivity of (non-financial) domestic enterprises (see e.g. Gorg and Greenaway, 2004; Moran et al. 2005; Crespo and Fortura, 2007), empirical research about the impact of such environmental change on the productivity of financial institutions, in particular banks, is very limited. The aim of this study is to undertake such empirical analysis and provide international evidence about the impact of FDI inflows on productivity growth in the banking industry.

Since FDI represents a dimension of the economic environment affecting bank productivity, this paper relates to the recent literature in banking that emphasises the impact of environmental factors on the total factor productivity (TFP) of banks. Chaffai et al (2001), for example, analyse the sources of productivity differences among French, German, Spanish and Italian banks and show that these are sensitive to country-specific economic, demographic and technological conditions. Other cross-country studies relate TFP growth of banks to the regulatory environment in which banks operate (Delis et al, 2008) and the importance of identifying the success or failure of policy initiatives (Casu et al., 2004), while various country studies have examined the impact of economic liberalization or financial deregulation on bank productivity (Asmild et al, 2004; Berg et al, 1992; Dogan and Fausten, 2003; Grifell-Tatje and Lovell, 1997; Isik and Hassan, 2003; Mukerjee at al, 2001; Tirtiroglu et al., 2005; Worthington, 1999). It is generally acknowledged that environmental factors and deregulatory policies play an important role in explaining cross-country differences in bank productivity, as well as in bank efficiency (e.g. Dietsch and

Lozano-Vivas, 2000; Cavallo and Rossi, 2002; Lozano-Vivas et al, 2002; Pasiouras at al, 2007; Lensink et al, 2008; Pasiouras, 2008; Lozano-Vivas and Pasiouras, 2008). However, while there is positive evidence to suggest that international financial integration and access to external finance promotes firm entrepreneurship (Alfaro and Charlton, 2006; Beck et al., 2004; 2006; Rajan and Zingales; 1998), the literature on bank efficiency/ productivity has largely ignored to account for these influences, in the form of FDI inflows, trade openness or other aspects of international economic/ financial integration.[2] Furthermore, the literature on foreign banking concentrates mostly on evaluating the relative performance of home vs. foreign ownership (Classens et al., 2001; Demirguc-Kunt and Huizinga, 2000; Berger and Humphey, 1997; Berger et al. 2000), offering little insight on how foreign presence affects bank productivity.[3] Hence, this study aims to expand on the existing literature on banks by attempting to shed light, for the first time to the author's knowledge, on the impact of FDI as a driver of productivity change in the banking industry, using a broad sample of publicly quoted commercial banks.[4]

In view of the absence of prior studies relating FDI to the productivity of banks, the empirical analysis in this paper draws on the established literature linking FDI to the productivity of industrial firms. Here, empirical studies typically use data on domestic industrial firms and include as an explanatory variable some measure of foreign (multinational) presence, usually the share of foreign firms in a given industry's output or employment. Likewise, empirical studies relating to aspects of bank performance (e.g. profitability, efficiency, etc) also use some measure of foreign presence, such as the proportion of foreign owned assets in the domestic banking industry or, in some cases, simply a dummy variable for foreign ownership. Using such industry-specific measures of foreign presence, however, precludes broader

[2] Some recent cross-country bank level studies (e.g. Pasiouras et al., 2007, Pasiouras, 2008; Lensink et al, 2008; Delis et al., 2008) account for foreign presence using ownership dummies or the share of foreign owned assets in the domestic banking system, although the focus of these studies is different and the measures used therein are specific to the banking industry. For instance, Pasiouras (2008) and Pasiouras et al (2007) examine the impact of regulations on bank efficiency, while Delis et al (2008) examine the same on bank productivity. Lensink et al (2008), however, focus on the foreign ownership-bank efficiency relationship and examine how this is influenced by the role of institutions. In contrast, a parallel literature on firm level studies uses international data on firms and measures the impact of financial integration, including FDI, on firm activity (e.g. Alfaro and Charlton, 2006).

[3] A limited number of bank efficiency studies (see Lensink et al., 2008) test the impact of foreign ownership on bank efficiency, mainly using ownership dummies, although none can be found to focus on the foreign ownership-bank productivity relationship.

[4] The sample includes 556 banks in 75 countries, and is restricted to publicly listed commercial banks to avoid comparability problems associated with private or other types of banks (e.g. cooperatives, investment, etc.).

investigation of FDI "spillovers", which characterise the extent of technology transfer or knowledge diffusion that might occur between industrial and financial sectors of the economy for instance.[5] In this context, Eller et al (2006) use a measure of financial sector FDI to examine its impact on economic growth in the transition economies of Central and Eastern Europe, emphasising the crucial role of the efficiency channel whereby the inflow of FDI induces microstructure changes in the banking industry which spillover into overall efficiency gains for the financial sector, with appropriate consequences for economic growth. In the present study, we associate the importance of such spillover effects with FDI inflows that affect TFP growth in the banking industry, thus highlighting a source of environmental change affecting the banking sector.[6]

The main focus of this paper is thus to test the impact of aggregate FDI spillovers on bank productivity. There are a number of channels through which FDI inflows could influence bank productivity. As argued by Eller et al. (2005, 2006), a possible source of positive spillover effect on banks comes through the efficiency channel whereby the inward FDI facilitates better management of financial resources, technical progress and economies of scale directly; or indirectly via higher economic growth leading to better opportunities for risk diversification, lower transaction costs and improved allocation or pooling of financial resources to high-return projects. On the other hand, as suggested by Aitken and Harrison (1999), FDI inflows may negatively affect the productivity of domestic firms through competition effects as foreign firms exploit their firm specific advantage to acquire a greater market share in the host economy, forcing domestic firms to spread their fixed costs over a smaller volume of production. In a similar way, domestic banks could be adversely affected by direct competition from foreign banks with better resources and technologies, which are able to gain market share with lower interest margins and risk premiums.[7]

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[5] Firm-level studies use measures of technological spillovers, such as the share of foreign firms in total industry output, which characterise the effect intra-industry (or horizontal) spillovers, as well as measures of inter-industry (or vertical) spillovers to explore the effects of backward or forward linkages. These measures are, nevertheless, industry based (see, e.g. Javorcik, 2004; Javorcik and Spatareanu, 2008; Liu, 2008).

[6] It should be noted that Eller et al (2006) investigate spillovers from financial sector FDI to economic growth, and detect a hump shaped effect that is positive beyond a certain threshold of human capital. In contrast, this study concentrates on investigating a "reverse linkage" hypothesis from the economy level FDI to the banking industry, at a broader cross-country level.

[7] The *global advantage* hypothesis (Berger at al., 2000) suggest that foreign banks benefit from competitive advantages relative to domestic banks, although the *home field advantage* hypothesis predicts that foreign banks suffer from cost and other advantages that domestic banks possess.

Alternatively, FDI inflows can have a negative effect on firm productivity, especially in the short run, if they face costly transaction costs in learning to 'catch up' with new technologies (Liu, 2008). Furthermore, negative effects may arise where banks, particularly in less developed economies, use inferior production technologies and low skilled workers, which amount to a low "absorptive capacity" of domestic banks to benefit from FDI spillovers (Papi and Rovoltella, 2003). The net effect of aggregate FDI on bank productivity could therefore be positive or negative.[8] Both the negative and positive effects are consistent with banking system restructuring which, ultimately, may affect bank productivity.

In order to analyse these possible effects of FDI inflows on bank productivity, section 2 describes a two-stage empirical methodology as followed in recent studies (e.g. Mukerjee et al, 2001; Delis et al, 2008; Dogan and Fausten, 2003; Worthington, 1999). In the first stage, we use the Malmquist productivity index to estimate the TFP growth of banks, employing a decomposition that isolates the contributions of technical, efficiency and scale changes. Then, in the second stage, we complement this analysis with panel data regressions to test the impact of FDI on TFP growth. Section 3 presents the data and variables while section 4 discusses the empirical results. Whilst we uncover a negative short-term effect of FDI spillovers on bank TFP, its long-term effect is significantly positive, offering an explanation at cross-country level of why banks experience episodes of adverse technical change followed by technical progress over the period of analysis. Finally, section 5 concludes.

2. Methodology

Following Fare et al. (1994), the Malmquist index (output oriented) of TFP change between period *s* (the base technology period) and period *t* (the reference technology period) is estimated by

$$m_0^t(y_s, x_s, y_t, x_t) = \frac{d_0^t(y_t, x_t)}{d_0^t(y_s, x_s)} \tag{1}$$

[8] Liu (2008) presents a theoretical model based on endogenous growth theory which suggests a trade-off, where technological spillovers generate negative short-term level effects but positive long-term rate effects on the productivity of domestic firms, since a firm has to expend investment resources in order to learn from foreign firms' technological advantage which then helps enhance their future productive capacity.

If *t* is the base technology and *s* is the reference technology, then (1) becomes:

$$m_0^s(y_s, x_s, y_t, x_t) = \frac{d_0^s(y_t, x_t)}{d_0^s(y_s, x_s)} \tag{2}$$

The Malmquist TFP index is calculated as the geometric mean of these two indices by:

$$m_0(y_s, x_s, y_t, x_t) = \left[\frac{d_0^s(y_t, x_t)}{d_0^s(y_s x_s)} \times \frac{d_0^t(y_t, x_t)}{d_0^t(y_s, x_s} \right]^{\frac{1}{2}} \tag{3}$$

A value of m_0 greater than one corresponds to a positive TFP growth from period *s* to period *t* while a value less than one indicates a decrease in TFP. The above index can be rewritten as:

$$m_0(y_s, x_s, y_t, x_t) = \frac{d_0^t(y_t, x_t)}{d_0^s(y_s, x_s)} \left[\frac{d_0^s(y_t, x_t)}{d_0^s(y_s x_s)} \times \frac{d_0^t(y_t, x_t)}{d_0^t(y_s, x_s} \right]^{\frac{1}{2}} \tag{4}$$

The ratio outside the square brackets in equation (4) corresponds to the change in the output-oriented measure of Farrell technical efficiency between periods *s* and *t*. The remaining part of the index in equation (4) is a measure of the shift in technology between the two periods, evaluated at x_t and also at x_s.

Hence, the total factor productivity change (TFPCH) is the product of technical efficiency change (TEFCH) and technological change (TCH). An improvement in TCH shows a shift in the best practice frontier, whereas an improvement in TEFCH corresponds to the efficiency (catch up) effect. Thus, if we assume that the production technology exhibits constant returns to scale (CRS) there are only two sources of productivity growth: efficiency change and technical progress. However, if the production technology exhibits variable returns to scale (VRS) there are two additional sources of productivity growth: pure technical efficiency (PTECH) and scale efficiency (SECH). The pure efficiency change is given by

$$PTECH = \frac{d_{0v}^{t}(y_t, x_t)}{d_{0v}^{s}(y_s, x_s)} \tag{5}$$

and the scale efficiency change is given by

$$SECH = \left[\frac{d_{ov}^{t}(y_t, x_t) / d_{oc}^{t}(y_t, x_t)}{d_{ov}^{t}(y_s, x_s) / d_{oc}^{t}(y_s, x_s)} \times \frac{d_{ov}^{s}(y_t, x_t) / d_{oc}^{s}(y_t, x_t)}{d_{ov}^{s}(y_s, x_s) / d_{oc}^{s}(y_s, x_s)} \right]^{\frac{1}{2}} \tag{6}$$

where the subscripts, *v* and *c*, refer to the VRS and CRS technologies, respectively. Thus, as noted above, the efficiency change under constant returns to scale (TEFCH) is the product of pure technical efficiency (PTECH) and scale efficiency (SECH). Consequently, the total factor productivity change is obtained by:

$$\text{TFPCH} = \text{PTECH x SECH x TCH} \tag{7}$$

The Malmquist index of TFP change (TFPCH) is then used as the dependent variable in the estimation of the second-stage panel-data regression of the form:

$$TFPCH_{itc} = a_0 + a_1 FDI_{tc} + a_2 B_{itc} + a_3 Z_{tc} + u \tag{8}$$

where TFPCH of bank *i* that operates in country *c* at time *t* is written as a function of FDI inflow into country *c* at time *t*; a set of time-dependent bank-level variables, *B*, and country-specific variables, *Z*; and the random error term *u*. In the empirical analysis below, we use this basic specification allowing for appropriate interaction, time and lagged effects to test the effect FDI on TFPCH.

3. Variables and Data

Inputs/Outputs

In calculating the Malmquist index of TFP change, we model banks as financial intermediates collecting purchased funds and transforming them to loans and other assets. It should be noted that the alternative, production based approach is commonly used in firm-industry level studies, where the standard production function is augmented with an industry based measure of FDI, whose significance determines the effect of FDI spillovers. The production function may also incorporate "skilled" input factors such as human capital (education) or R&D in determining TFP, which are deemed important in aiding the process of technology transfer. Using the intermediation approach avoids the use of (unavailable) bank data on quality input factors like human capital or R&D, although implicitly nets out the effects of these factors in determining TFP.[9] Treating banks as financial intermediaries, therefore, we choose two outputs: loans (Y_1) and other earning assets (Y_2); and three inputs: fixed assets (X_1), deposits (X_2), and personnel expenses (X_3).

Second stage variables

Since we investigate the impact of economy wide FDI inflows, we allow for the logarithm of FDI (LOGFDI) as the main explanatory variable, commonly used in testing for causal links between FDI and GDP growth at the aggregate level.[10] As for the control variables, we follow similar studies that account for relevant bank specific and country-specific factors (Delis et al, 2008; Pasiouras et al, 2007; Lensink et al, 2008). The bank specific control variables we select are (i) the logarithm of total assets (LOGAS) as a measure of size, (ii) the equity to assets ratio (EQAS) as a measure of capital strength, (iii) the pre-tax profit to total assets ratio (ROA) as a measure of profitability, and (iv) the cost to income ratio (COST) as a measure of the effectiveness in expenses management. The last two are indicators of managerial performance. The country-specific control variables are chosen to account for country-level differences in the industry market structure, financial development,

[9] It should be noted, as Berger and Humphrey (1997) point out, that neither of these two approaches is perfect as they cannot fully capture the dual role of financial institutions as providers of transactions/ document processing services and being financial intermediaries.

[10] It has been argued that the FDI/GDP ratio might be more preferable to log FDI for testing causal links between FDI and GDP, due to potential "endogeneity" problems with FDI at the aggregate level (see e.g. Herzer et al, 2008). However, this endogeneity problem is not so serious with industry level data and we prefer to use the (log) level of (gross) FDI inflows as it provides a better proxy on practical grounds, given that we also include GDP growth as one of the control variables.

macroeconomic conditions, and the structure of the legal and regulatory framework relating to incentives for freer trade and investment. Accordingly, we use (v) the concentration ratio (CONC), given by the percentage of three largest commercial banks relative to the total assets in the country's banking industry, as a measure of market structure, (vi) the ratio of bank claims to private sector over GDP (CLAIMS), measuring activity in the banking sector, and the ratio of stock market capitalization to GDP (MACGDP), reflecting the size of the stock market, as two measures of financial development, (vii) annual real GDP growth (GDPGR) and inflation rate (INF) as commonly used to represent the macroeconomic environment, and (viii) the Heritage indices on regulations in the banking/financial industry (BREG), overall trade freedom (TRADE) and overall investment freedom (INVEST)[11]. Lensink et al (2008) emphasise the importance of the legal and regulatory framework in defining institutional proxies to assess the impact of foreign ownership on bank efficiency, while we consider the legal and regulatory framework that is conducive to open trade and investment in assessing the impact of inward FDI on bank productivity.

Data

Our starting list consisted of the total population of 1,008 publicly quoted commercial banks that appeared in Bankscope at the time of our analysis. We then excluded banks that: (i) had no annual data for all the years of our analysis[12], (ii) had zero or negative values for the inputs/outputs, (iii) had missing values in any of the control variables. As a result, our final sample consists of 2,830 observations, from 566 quoted banks in 75 countries between 2000 and 2004. All the bank-specific variables were drawn from Bankscope database, with data expressed in real (1995) US dollars using official exchange rates and individual country GDP deflators.

[11] These indices reflect country level differences in policies relating to regulatory interventions in the banking/financial sectors and aggregate restrictions on trade and investment. The index BREG for instance is a composite measure of (i) the extent of government regulation of financial services; (ii) the extent of state intervention in banks and other financial services; (iii) the difficulty of opening and operating financial services firms; and (iv) government influence on the allocation of credit. The score can take values between 0 and 100 with higher scores indicating greater regulatory freedom. Similarly, TRADE is a composite measure characterising the absence of tariff and non-tariff barriers that affect imports and exports of goods and services. It takes values between 0 and 100, with higher values indicating greater trade freedom. INVEST is similarly a composite measure characterising country's orientation towards foreign investment and internal capital mobility. Again, it takes values between 0 and 100, with higher values indicating lower restrictions.

[12] The software that we used, DEAP 2.1 (Coelli, 1996), to estimate TFP growth, requires a balanced panel although, due to some missing data and outliers, the second stage estimation uses an unbalanced panel.

The country-specific data are collected from three sources. Data for CONC are obtained from the updated version of the WB database on financial development and structure (Beck et al., 2006a), initially constructed by Beck et al. (2000). The macroeconomic (GDPGR, INF) and financial (CLAIMS, MACGDP) data are from Euromonitor's Global Market Information Database, while the regulatory, trade and investment freedom indices (BREG, TRADE, INVEST) are from the Heritage Foundation.

Table 1 presents the Pearson's correlation coefficients among the explanatory variables of the second-stage regression. They reveal fairly low to moderate correlations, indicating that they can all be included in the empirical estimation without particular concerns in terms of multicollinearity.[13] Nevertheless, our empirical strategy follows similar studies by estimating several specifications of Eq. (8) while accounting for interaction effects in checking for the robustness of the results.

<<Table 1 here>>

4. Empirical Results

Stage 1 – TFP results

Table 2 presents the Malmquist TFP estimates calculated using the intermediation approach discussed above. We report the TFP changes with TFPCH decomposed into TEFCH and TCH, and TEFCH further decomposed into PTECH and SECH, as in Casu et al (2004), Isik and Hassan (2003), Mukerjee et al. (2001) and others. The results are presented for each year as well as over the whole period of analysis (2000-2004). For each year, the indices are calculated relative to the previous year (i.e. using successive reference technologies). The annual entries are geometric means of results for individual banks and the entries for the whole period (reported in the last row) are the geometric means of the annual results. A value greater than one indicates positive TFP growth while a value lower than one indicates a TFP decline over the given period.

[13] Judge et al. (1988) point out that correlation below 0.8 should not be too harmful as far as multicollinearity is concerned. By rough comparison, some of the bank-specific variables have among themselves correlation coefficients below 0.5 while some country-specific variables have correlations slightly above 0.5. The rest of the correlations are very low.

<<Table 2 here>>

The results in Table 2 suggest that, over the entire period 2000-04, the average bank experienced a productivity increase of 1.5%, comprising an average efficiency increase of 5.9% but technological regress of 4.2%. In fact, for each successive year except 2003-04, banks experienced average efficiency gain and technological regress. This trend was reversed in 2003-04 when banks demonstrated technical progress of 8.3%, but suffered a decline in average efficiency of 5.5%, and so the net increase in TFP change was 2.4%, this being the highest annual increase in the entire period. By contrast, TFP change was lowest in the period 2000-01, as this coincided with high average efficiency increase and technological regress. Thus, there is a trade-off between efficiency gain and technological progress although TFP change between any two successive years is consistently positive, and its magnitude has risen throughout the period, implying a shift in the marginal productivity of banks each year.

The decomposition of TFP change (TEFCH) into its components suggests that the efficiency gain/loss has been due to both pure technical (or managerial) efficiency change (PETCH) and scale efficiency change (SECH). For example, in 2002-2003, average efficiency gain of 6.4% was due both to managerial efficiency of 2% and scale efficiency of 4.4%. However, in 2001-2002, the efficiency gain (4.4%) was primarily the result of much higher managerial efficiency (7.4%) that was partly offset by scale inefficiency (-2.8%). Taken together, these results suggest that inefficient banks tended to *catch up* with efficient banks largely in terms of pure technical (managerial) efficiency as banks experienced stagnancy (or regress) in their technology, although efficiency gain was compromised when banks made technical progress in 2003-2004. These results are consistent with the findings of some authors (e.g. Berg et al, 1992; Isik and Hassan, 2003) although they differ with those reported by others for developed countries (e.g. Mukerjee et al, 2001; Casu et al. 2004).

Stage 2 – Regression results

We now turn to the second stage of our analysis where we use panel regressions to examine the impact of FDI on TFP change. The availability of panel data with a time horizon of 2001-04, albeit short, allows the possibility of investigating both short run

and long run effects of FDI on TFP change, which is important for two reasons. First, given that the average efficiency gain over this period masks the fact that banks experienced both technical regress and progress, it makes sense to analyse both static and dynamic effects of FDI on productivity. Second, theory suggests that level and rate effects of FDI on productivity can go in opposite directions (Liu, 2008) as scarce resources must be devoted to learning – implying that technology transfer is a costly process – but this process has the potential to enhance future productivity. A fixed-effects formulation of Eq. (8) is chosen to take account for bank-level heterogeneity across countries and also to alleviate the problem of reverse causality, namely that countries with more productive firms tend to attract more foreign investment.[14] Furthermore, since FDI is a continuous variable, we account for the presence of both current and lagged FDI in regressions, the latter interacting with a time trend to ensure a long-term rate effect of FDI on bank productivity. The implicit assumption of the regression analysis is that the current FDI effect on bank productivity is essentially short run, while the longer run rate effect on productivity is captured by the inclusion of a time trend and its interaction with the lagged FDI term.

<<Table 3 here>>

The results of the second-stage regressions are reported in Table 3.[15] For ease of analysis, we show the results of the base specification with just the current FDI effect in column (1), and with the added one period lagged effect of FDI in column (2), along with all the control variables.[16] In both these regressions we include time dummies, although the results are not significantly affected without time specific effects. The results in column (1) show that the effect of FDI is negative but

[14] The latter argument is based on similar reasoning applied to firm-industry level studies (e.g. Liu, 2008). In addition, the preference for fixed effects against a random effects model is based on the Hausman test of the correlation between the error components and the explanatory variables, whose chi-square value of 65.18 indicates that the fixed effects model is more appropriate.

[15] A few of the outliers observed on TFPCH were excluded in the second stage regressions, although qualitatively the main results were unaffected when the regression were performed with the outliers; in particular the negative short term and the positive long term effect of FDI prevailed. Along with some missing values of FDI, the second stage estimation uses the within transformation LSDV method on an unbalanced panel. The fixed effects model confirmed a significant improvement of fit over the OLS estimation with a common intercept, implying that country specific effects are jointly significant (using a simple F-test), which are not reported for space reasons.

[16] The estimation sample period is 2001-2004 as TFP estimates are changes over the previous period. In turn, because of the presence of lagged FDI term in the second regression, the estimation in column (2) and (3) is over the shorter horizon 2002-2004, although the number of banks in the sample is the same.

insignificant, while the inclusion of the lagged FDI term in column (2) results in a significant improvement in the goodness of fit - the lagged effect is not only positive and significant, but it has the potent effect of making the current FDI effect (as well as other control variables) statistically significant. Furthermore, the lagged FDI effect on TFP is an order of magnitude higher than the effect of current FDI, suggesting that spillovers from FDI are clearly more significant over time. However, while the positive effect of lagged FDI outweighs the adverse effect of current FDI, the regressions in columns (1) and (2) do not capture the long-term rate effect of FDI on productivity growth. Column (3) accounts for this effect with a trend rate of productivity growth and its interaction with lagged FDI.[17] The results confirm the statistical significance of the negative level effect of FDI, which is offset over time by the positive rate effect of FDI. Note that while the results show a negative effect of the time trend on TFPCH, this is in fact positive for a few countries in the sample with high values of inward FDI.[18]

The results in Table 3 show that the aggregate level impact of FDI on the productivity of banks is negative although the longer term rate effect is positive, a finding that seems to be consistent with the results of the Malmquist analysis which showed that banks experienced, on average, technical regress before the surge in technical progress during 2003-04. The Malmquist results also indicated a trade-off between managerial efficiency and technical progress over the period of analysis, which could be explained by the fact that technology transfer through FDI takes time to materialise, as resources have to be devoted to learning during which time banks seek ways of attaining gains in terms of managerial or scale efficiency.

With regard to the impact of the control variables, the results in columns (2) and (3) show that, among the bank-specific variables, larger bank size (LOGAS) and capital strength (EQAS) have a positive impact on bank productivity, as expected. While the effect of profitability (ROA) is insignificant, the positive effect of higher cost relative to income (COST) seems surprising, although a possible explanation for this might be that COST includes resources that are devoted to enhance productivity. Among the country-specific variables, we find, as in Delis et al (2008), that financial development, in particular activity in the banking sector (CLAIMS) contributes to

[17]This specification follows the approach of Liu (2008), and excludes time dummies because of the inclusion of an explicit time trend.

[18] The threshold value for which this effect is positive, namely the logarithm of FDI = 0.148/0.33 = 4.48, is met by a few countries in the sample.

increased bank productivity, consistent with the macro literature on FDI which suggests that financial development is an important pre-condition for yielding positive effects of FDI on economic growth (Alfaro et al, 2004, 2006). The other significant country effects are GDP growth (marginally at10% level) and trade freedom, both of which have perversely adverse effect on productivity. To the extent that FDI operates through these channels as conduits of technology transfer, they serve to reinforce the short-term negative impact of FDI on bank productivity.

5. Conclusion

This paper has explored the relationship between inward FDI and productivity changes in the banking industry using a sample of 566 publicly quoted commercial banks operating in 75 countries, covering the period 2000-2004. While numerous studies can be found to examine the impact of foreign presence or ownership on bank efficiency (e.g. Berger and Humphrey, 2007; Lensink et al, 2008), there are no precedents in bank level studies for investigating the FDI-productivity nexus that has been studied extensively for industrial firms in the FDI literature. This paper therefore draws on several comparable industry level studies on firm productivity as well as studies examining the impact of FDI on economic growth, and uniquely investigates the impact of aggregate FDI as a driver of productivity change in the banking industry. The empirical analysis reveals that FDI has a short run adverse effect on the productivity of banks, but this is outweighed by a positive long-run rate effect as banks improve their productivity from knowledge and technology associated with inward FDI. To some extent, this is consistent with the results of the preceding Malmquist analysis, which indicated a period of technical regress before technical progress. The regression results also point to the importance of financial development as a means to facilitate the productivity growth of banks.

The paper contributes to our understanding of the literature by implying that technology transfer associated with inward FDI yields bank productivity effects that are inherently dynamic, allowing short run effects to be distinguished from long run effects. More generally, analysing the dynamic effects of foreign presence may be important in seeking answers to some of the pertinent questions about the effects of foreign banks on the host country banking industry. For example, Lensink at al (2008) argue that the existing literature of foreign banking does not give unambiguous answers to questions about why the efficiency of a foreign bank differs from the

efficiency of a domestic bank and why the impact of foreign presence on bank efficiency is positive for some countries and negative for others. While their analysis suggests that good governance and better institutional quality mitigates the negative impact of foreign ownership on bank efficiency, assessing the impact of such institutional proxies and their interaction with FDI (or alternative measures of foreign presence) in a dynamic framework provides a potential avenue for further research in addressing these important questions.

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Table 1 – Correlations

	logas	eqas	roa	cost	logfdin	logfdout	inf	gdpgr	macgdp	claims	conc	breg	trade	invest
logas	1.000													
eqas	-0.463	1.000												
roa	-0.274	0.447	1.000											
cost	-0.088	-0.080	-0.380	1.000										
logfdin	0.155	-0.015	0.003	-0.008	1.000									
logfdout	0.296	-0.128	-0.090	0.035	0.400	1.000								
inf	-0.427	0.226	0.259	0.098	-0.059	-0.099	1.000							
gdpgr	-0.191	0.054	0.088	-0.148	-0.047	-0.111	0.053	1.000						
macgdp	0.240	0.024	-0.056	-0.058	0.110	0.104	-0.250	-0.004	1.000					
claims	0.472	-0.156	-0.192	-0.017	0.056	0.002	-0.509	-0.381	0.303	1.000				
conc	-0.181	0.115	0.055	-0.012	-0.180	-0.304	-0.075	0.013	0.209	0.192	1.000			
breg	0.101	0.075	-0.028	0.083	0.102	-0.096	-0.255	-0.314	0.395	0.511	0.468	1.000		
trade	0.297	-0.002	-0.139	0.097	0.080	0.138	-0.340	-0.295	0.291	0.543	0.266	0.502	1.000	
invest	0.183	-0.025	-0.092	0.154	-0.014	-0.021	-0.178	-0.333	0.298	0.413	0.355	0.665	0.411	1.000

Table 2 – Malmquist estimates

Year	TEFCH	TCH	PTECH	SECH	TFPCH
2000-2001	1.199	0.838	1.130	1.062	1.005
2001-2002	1.044	0.970	1.074	0.972	1.012
2002-2003	1.064	0.958	1.020	1.043	1.019
2003-2004	0.945	1.083	0.978	0.967	1.024
2000-2004 (mean)	1.059	0.958	1.049	1.010	1.015

Table 3: Determinants of TFP change

Mode1	1	2	3
LOGFDI	-0.0048 (-0.96)	-0.0068* (-1.93)	-0.0043*** (-2.48)
LOGFDI_1		0.0840*** (-4.52)	
TIME			0.1484*** (3.47)
TIME*LOGFDI_1			0.0325*** (3.14)
LOGAS	0.0641 (1.30)	0.1651*** (4.06)	0.1532*** (3.84)
EQAS	0.0064 (1.94)	0.0015*** (14.57)	0.0116*** (15.30)
ROA	0.0046 (1.48)	0.0082 (1.49)	0.0079 (1.45)
COST	0.0005 (1.18)	0.0009** (2.53)	0.0008** (2.42)
INF	0.0005 (0.51)	0.0005 (0.58)	0.0005 (0.53)
GDPGR	-0.0001 (-0.09)	-0.0003 (-0.77)	-0.0005* (-1.93)
MACGDP	0.0165*** (2.63)	0.0072* (1.88)	0.0040 (0.77)
CLAIMS	0.1040*** (4.20)	0.1250*** (2.67)	0.1221*** (2.78)
CONC	-0.0021 (-1.69)	0.0004 (0.41)	0.0002 (0.30)
BREG	0.0001 (0.63)	-0.0002 (-0.88)	-0.0003 (-0.71)
TRADE	-0.0002 (-0.24)	-0.0020*** (-9.11)	-0.0021*** (-9.71)
INVEST	-0.0007*** (-3.12)	-0.0010 (-1.18)	-0.0013 (-1.55)
Constant	0.8183*** (4.48)	0.0480 (0.87)	0.5089 (13.74)
Time dummies	Yes	Yes	No
Sample Size	2250	1680	1680
R-Squared	0.30	0.42	0.42

Notes: Estimation by Least Squares (LSDV); Figures in parenthesis are t-ratios based on White corrected heteroskedastic standard errors; *Significant at 10% level, **Significant at 5% level, ***Significant at 1% level.

Legend: LOGFDI: ln (inward FDI, gross inflows); LOGFDI_1: LOGFDI lagged one period; LOGAS: ln (real total assets); EQAS: equity/total assets; ROA: Return on assets; COST: Cost/Income; INFL: Inflation rate; GDPGR: Real GDP growth; MACGDP: Stock market capitalization/GDP; CLAIMS: Bank claims to the private sector/GDP.; CONC: 3-bank concentration; BREG: Heritage index of Regulatory freedom; TRADE: Heritage index on trade freedom; INVEST: Heritage index on investment freedom.