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The Effects of Greenfield FDI and Cross-border M&As on Total Factor Productivity

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Abstract:
We examine and compare the effects of greenfield FDI and cross-border mergers and acquisitions (M&As) on total factor productivity (TFP) in developed and developing host countries of FDI. Using panel data for up to 123 countries over the period from 2003 to 2011, we find that greenfield FDI has no statistically significant effect on TFP while M&As have a positive effect on TFP in the total sample. Greenfield FDI and M&As both appear to be ineffective in increasing TFP in the sub-sample of developing countries. In contrast, M&As have a strong and positive effect on TFP in the sub-sample of developed countries.

Keywords: greenfield FDI; cross-border mergers and acquisitions; total factor productivity.

JEL classification: F21; F23; O47

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1. Introduction

According to the so-called Monterrey Consensus agreed at the UN summit on Financing for Development in 2002, foreign direct investment (FDI) "is especially important for its potential to transfer knowledge and technology, create jobs, boost overall productivity, enhance competitiveness and entrepreneurship, and ultimately eradicate poverty through economic growth and development" (United Nations, 2003: 9). This may explain why policymakers in various host countries compete fiercely for FDI inflows, even though the empirical evidence on the effects of FDI on economic growth and factor productivity is rather mixed.[1]

Empirical findings could be inconclusive since macroeconomic studies typically rely on overall FDI inflows and do not disaggregate FDI by type and mode of entry. Particularly in developing countries, policymakers seem to prefer so-called greenfield FDI over mergers and acquisitions (M&As). UNCTAD (2000: 159) observes that "concerns are expressed in political discussions and the media in a number of host countries that acquisitions as a mode of entry are less beneficial for economic development than greenfield investment, if not positively harmful." Kim (2009: 88) reports that M&As in Korea "have been criticized as speculative funds seeking only the arbitrage profits with no value-adding contribution such as the technology transfer or new investment for technological innovation." Bertrand et al. (2012: 1084) note that governments tend to be concerned "about foreign acquisitions of high-quality domestic firms, the so-called cherries or national champions." The preferences of policymakers appear to be largely because greenfield FDI creates new capital assets and additional production capacity, whereas cross-border M&As only involve a change from local to foreign ownership of existing assets and production capacity.

[1] Prominent studies include Borensztein el al. (1998), Carkovic and Levine (2005), Alfaro et al. (2004; 2009), and Woo (2009). Görg and Greenaway (2004) conclude that the evidence on spillovers from foreign to local firms is mixed.

As we discuss in more detail in Section 2, this argument may be overly simplistic by overlooking analytical ambiguities and findings from firm-level studies pointing to productivity enhancing effects of M&As in some relatively advanced host countries. However, the lack of reliable data on greenfield FDI rendered it almost impossible to assess in a convincing way whether M&As are no less effective than greenfield FDI in promoting macroeconomic growth and productivity in a large sample of developing and developed countries. The few studies analysing the growth effects of different modes of FDI approximated greenfield FDI by subtracting M&A sales from total FDI inflows (Calderón et al., 2004; Wang and Wong, 2009; Harms and Méon, 2011),[2] even though the reporting of M&As is not consistent with FDI statistics.[3] As shown in Section 4, this procedure is likely to distort empirical findings.

We overcome this problem by drawing on a new dataset on greenfield FDI, available from UNCTAD since 2003 for a large sample of host countries. Our major contribution to the nascent literature on the macroeconomic effects of different types of FDI is that we employ this dataset to compare the impact of greenfield FDI and M&As on total factor productivity (TFP) in developed and developing host countries.

Our focus is on overall, or "macro," TFP for two reasons: First, overall TFP is the main driver of economic growth in the long run (see, e.g., Easterly and Levine, 2001), and FDI is typically assumed to affect TFP, and hence long-run growth, via the introduction of new and better technologies, acquisition of skills, and spillover effects to domestic firms. Thus, by focusing on TFP, we gain insights into how greenfield investment and cross-border M&As may or may not affect economic growth. Second, the FDI-productivity literature consists mainly of firm-level studies. While these studies provide valuable insights into both

[2] Ashraf and Herzer (2014) provide an exception. They use the new dataset on greenfield FDI to assess the effects of different modes of FDI on domestic investment.
[3] FDI is a balance-of-payments concept, i.e. FDI flows are recorded on a net basis for a particular year. Transaction amounts recorded in M&A statistics are for the time of the announcement or closure of particular deals, and the amounts are not necessarily for a single year (UNCTAD, 2000).

the productivity of multinational firms and possible productivity spillovers to domestic firms, they are, by definition, unable to capture the overall effect of FDI on macroeconomic productivity. Studies on the impact of total FDI on overall TFP are scarce and inconclusive, and there are no studies examining the separate effects of greenfield investment and M&As on TFP. This paper is the first to evaluate and compare the effects of total FDI, greenfield investment, and M&As on TFP.

In addition, our analysis addresses other important limitations of previous research on different types of FDI. We perform separate estimations for the specific modes of FDI, in order to avoid multicollinearity due to the complementarities between greenfield FDI and M&As shown by Calderón et al. (2004). We consider two sub-samples to avoid "inappropriate pooling of wealthy and poor countries" (Blonigen and Wang, 2005). While developed and developing host countries in our sample accounted for 54 and 46 percent, respectively, of the sum of greenfield FDI and M&As throughout the period 2003-2011, the structure of FDI differed considerably between the two sub-samples. M&As contributed only slightly more than 10 percent to the flows of both types of FDI to developing host countries. In sharp contrast, M&As constituted the dominant FDI type for the sub-sample of developed countries (57 percent of the inflows of both types). Finally, we apply a dynamic panel data model to account for the dynamic process of productivity growth and to mitigate the problems associated with omitted variables and serial correlation.

In Section 2, we review the relevant literature and derive our hypothesis that M&As are not necessarily inferior to greenfield FDI. We introduce the data and our estimation approach in Section 3. Our empirical findings are reported in Section 4. Our main result is that greenfield FDI has no statistically significant effect on TFP while M&As have a positive effect on TFP in the total sample. In addition, we find that inconclusive results on the productivity effects of FDI in developing countries can hardly be attributed to the typical aggregation of different modes (the use of total FDI) in previous studies. Rather, greenfield FDI and M&As both appear to be ineffective in increasing TFP in this sub-sample. In contrast, M&As have a strong and positive effect on TFP in the sub-sample of developed host countries. Specifically, we show by including an interaction term that most developing host countries fall below the threshold level of economic development to benefit from M&As. Section 4 concludes.

2. Analytical background and related literature

As indicated in the Introduction, the "overall enthusiasm about FDI" (Harms and Méon, 2011: 2) contrasts strikingly with widespread concerns that M&As as a major mode of entry are "less beneficial for economic development …, if not positively harmful" (UNCTAD, 2000: 159). On closer inspection of the relevant theoretical and empirical literature it appears that both perceptions are unlikely to hold, notably when taking into account that the chances to benefit from different modes of FDI may vary considerably between developed and developing host countries of FDI.

First of all, previous research suggests that positive effects of FDI on economic growth and productivity cannot be taken for granted. Theoretically, FDI is expected to increase productivity in the host country primarily through the transfer of advanced technological and managerial knowledge (Caves, 1974; de Melo, 1997). FDI is also assumed to intensify competition; i.e., foreign firms put pressure on domestic competitors to adopt product and process innovations which increases their productivity compared to a situation without FDI. However, Aghion et al. (2008) present a Schumpeterian growth model explaining why more FDI could have positive growth effects only where local production is relatively close to the technological frontier, whereas growth is left unchanged or even reduced where local producers lack absorptive capacity since they lag too far behind the technological frontier. Findlay (1978: 2) argued in the late 1970s already that the technology gap "must not be too wide" for developing host countries to make use of FDI-related technology transfers. FDI may even reduce productivity if the entry of foreign firms crowds out domestic competitors (Aitken and Harrison, 1999).

Several empirical contributions reflect these theoretical ambiguities. The regression results of Alfaro et al. (2004: 89) indicate that "FDI alone plays an ambiguous role in contributing to economic growth;" the growth effects of FDI are contingent on sufficiently developed local financial markets (see also Alfaro et al., 2009). Likewise, Durham (2004) stresses the role of financial and institutional development for the capacity of host countries to absorb superior technologies. The convergence regressions of Mayer-Foulkes and Nunnenkamp (2009) suggest that FDI helps host countries catch up with the average per-capita income of advanced source countries only if initial income levels are already relatively high. According to Xu (2000), host countries must be endowed of sufficient human capital to benefit from technology transfers by US-based multinationals. Herzer (2012) finds that several factors, including primary export dependence, explain the large differences in the growth effects of FDI across developing host countries.[4] This leads to our first hypothesis:

H1: The effects of FDI on TFP tend to be blurred when assessed for a large sample of developed and developing host countries.

More closely related to the topic of different modes of FDI, UNCTAD (2000) provides a detailed discussion of concerns that M&As are inferior to greenfield FDI in promoting economic development in the host countries. The most popular concern is that M&As do not add to productive capacity at the time of entry and may reduce competition in

[4] Doucouliagos et al. (2010) perform a meta-analysis of 880 FDI-growth regressions reported in 108 studies. Less than half of these studies found a positive and statistically significant effect. Lipsey (2002: 55) concludes from an earlier review of the literature: "The size of inward FDI stocks or flows, relative to GDP, is not related in any consistent way to rates of growth. However, most studies find that among some subsets of the world's countries, FDI, or FDI in combination with some other factor or factors, is positively related to growth."

the host country.[5] However, M&As do add to the host country's external financial resources, as does greenfield FDI, and the effects on domestic productive capacity largely depend on whether the released domestic resources are reinvested or consumed. UNCTAD (2000: 168) argues that "over the longer term, there is no reason to expect any difference in the impacts on capital formation of the two modes of entry." Moreover, Calderón et al. (2004) find that higher M&A sales are typically followed by higher sequential FDI inflows of the greenfield mode.[6]

Models emphasizing the capacity effects of different modes of FDI entry often abstract from spillover effects through which foreign firms may enhance the productivity of domestic firms.[7] Again, UNCTAD does not expect significant differences in the longer run in the degree of linkages with local firms established by either mode of FDI. Immediately after entry, however, M&As may involve closer links as the acquired local firm "tends to have stronger linkages with other firms in the economy than a new foreign entrant as it takes time to establish local supply relations; these linkages are likely to persist after a merger or acquisition and may well be strengthened" (UNCTAD, 2000: 171).

Mattoo et al. (2004) develop a theoretical model to shed light on the relationships between the mode of FDI entry, technology transfers and market structure. The degree of technology transfers as well as the intensity of market competition can be regarded as two major factors shaping the productivity effects of FDI inflows in the host country. Both factors in turn depend on the mode of entry chosen by the foreign investor. Mattoo et al. (2004: 96) argue that the competition enhancing effect of greenfield FDI is clearly greater than that of M&As: "However, one mode does not unambiguously dominate the other in terms of the

[5] For instance, Harms and Méon (2011: 9) note: "Our model emphasizes a particular reason why greenfield FDI and M&A sales may differ in their impact on growth – namely, that every dollar of greenfield FDI expands productive capacity, while a large share of M&A sales merely represents a rent that accrues to incumbent owners."

[6] According to Meyer and Estrin (2001: 576), many FDI projects which are formally M&As in fact resemble greenfield FDI: "In such 'brownfield' cases, the foreign investor initially acquires a local firm but almost completely replaces plant and equipment, labor and product line."

[7] This is explicitly acknowledged by Harms and Méon (2011).

extent of technology transfer. On the one hand, the relatively larger market share that the foreign firm enjoys under acquisition increases its incentive for transferring costly technology (scale effect). On the other hand, strategic incentives to transfer technology in order to wrest market share away from domestic rivals can be stronger in more competitive environments (strategic effect)."

Similar theoretical ambiguity prevails with regard to the diffusion of FDI-related managerial and technological knowledge. Given that the most efficient firms are widely assumed to prefer entry through greenfield FDI, the potential for knowledge diffusion appears to be particular large for this mode of FDI.[8] However, the most efficient firms also have the strongest incentives to protect superior knowledge and avoid spillovers. Hence, knowledge diffusion is not necessarily smaller in the case of M&As. Technological diffusion and upgrading could even be faster after entry through M&As, compared to greenfield FDI: "M&As involve existing firms directly, albeit under new ownership, while greenfield investments do not. The impact of the latter on other local firms' technology (through, e.g. competition and demonstration) is thus slower. Where the technological gap between foreign entrants and domestic firms is large, greenfield FDI may in fact drive existing domestic firms out of the market" (UNCTAD, 2000: 175).

The few empirical panel studies addressing the economic growth effects of different modes of FDI cannot resolve these theoretical ambiguities. Harms and Méon (2011) find that greenfield FDI has a significantly positive effect on economic growth in developing host countries, whereas M&As have no significant effect. In contrast to Harms and Méon, the sample of Wang and Wong (2009) includes developed host countries. This may explain why Wang and Wong find that M&As can be beneficial for host countries endowed with sufficient human capital. However, the estimation results of Calderón et al. (2004) suggest that growth

[8] See Balsvik and Haller (2011: 161) and the literature on the choice of entry given there.

precedes (i.e., Granger-causes) both types of FDI, while there appears to be no statistically significant reverse effect from either greenfield FDI or M&As to economic growth. All three studies approximate greenfield FDI by subtracting M&A sales from total FDI inflows. While data on greenfield FDI did not exist until recently, the limitations of treating greenfield FDI as a residual are well known (see, e.g., UNCTAD, 2000). Consequently, the reliability of results is open to question at least with respect to the greenfield mode of FDI.

Furthermore, FDI-related growth effects could be due to factor accumulation and expanded production capacity or improved factor productivity. Previous empirical studies typically do not isolate productivity effects of different modes of FDI. The country study on Norway by Balsvik and Haller (2011) provides a notable exception. These authors use micro data for Norwegian firms to assess whether greenfield FDI and M&As in the same industry and the same labor market region affect the productivity of domestic firms. Somewhat surprisingly perhaps, Balsvik and Haller (2011) find that recent entry via greenfield FDI in the same industry and region has a negative impact on the productivity of domestic firms, whereas recent entry via M&As in the same industry (though not in the same region) has a positive impact on the productivity of domestic firms.[9] Some other studies using micro data focus on R&D activity of MNEs' affiliates created through acquisitions or greenfield FDI. Bertrand et al. (2007; 2012) find that affiliates acquired by Swedish MNEs are more likely to engage in R&D and have a higher R&D intensity than affiliates created by greenfield FDI of Swedish MNEs. The authors conclude that restricting M&As in order to favor greenfield FDI could reduce FDI-related technology transfers to the host countries, which would constrain

[9] Balsvik and Haller's (2011) explanation of this finding partly resembles the above noted reasoning of UNCTAD (2000). In particular, the positive productivity effects of M&As are attributed to knowledge spillovers in the shorter run due to pre-existing intra-industry linkages of the acquired Norwegian firms.

the potential for productivity enhancing spillovers.[10] Against this backdrop, our second hypothesis reads:

H2: M&As are not necessarily inferior to greenfield FDI in improving TFP in the host countries.

As noted in the Introduction, M&As contribute a much larger share to total FDI flows in advanced host countries than in developing host countries. This could reflect that more advanced countries offer a larger supply of target firms with complementary domestic assets (Bertrand et al., 2007). At the same time, it can reasonably be assumed that M&As in developed host countries are largely driven by asset-seeking motives.[11] In the theoretical acquisition-auction based model of Bertrand et al. (2012), several foreign investors compete for high-quality domestic target firms possessing important complementary local assets.[12] Due to competitive bidding over complementary local assets "the acquisition price is significantly higher than the reservation price, since the seller is then not only paid for selling its assets to the acquiring MNE, but also for not selling to a rival MNE" (Norbäck and Persson, 2007: 368). While rival non-acquirers may undertake greenfield FDI, the model of Bertrand et al. (2012) predicts that acquired affiliates invest more in R&D than greenfield affiliates. Higher sequential R&D is required to ensure that the acquisition is profitable and to prevent the expansion of rivals.

Importantly, this reasoning applies when complementarities between the acquirer and local assets are strong, while it does not necessarily apply under circumstances prevailing in many developing countries where competition among potential acquirers for complementary local assets is limited or absent (Norbäck and Persson, 2007). Kim (2009) specifically refers to so-called fire-sale M&As under crisis conditions – such as in East Asia in the late 1990s –

[10] Likewise, Belderbos (2003) finds that foreign affiliates acquired by Japanese MNEs are characterized by substantially higher R&D intensity than wholly-owned greenfield affiliates of Japanese MNEs.
[11] Dunning (2000) lists strategic asset seeking FDI as one of the main types of FDI, which helps protect or augment the existing ownership advantages of the investing firm and/or reduce those of competing firms.
[12] Bertrand et al. (2012) build on the model developed by Norbäck and Persson (2007).

when MNEs have considerable market power in bargaining with host-country governments and local target firms. More generally, poor countries with narrow product and factor markets may have little to offer in terms of valuable local assets that are complementary to the firm-specific advantages of potential acquirers.

Related empirical evidence comes mainly from studies using firm-level data for selected OECD countries. The most notable exception is Arnold and Javorcik's (2009) analysis of Indonesian micro data. Their findings contradict Kim's (2009) skeptical assessment of fire-sale M&As. M&As during the period 1983-2001 improved TFP in the acquired Indonesian firms by 13.5 percent. This improvement is attributed to M&A-related restructuring: acquired firms increased investment, employment and wages and strengthened their world-market integration through higher exports and imports.

Bandick et al. (forthcoming) evaluate the effects of foreign acquisitions on R&D intensity of the targeted domestic firms in Sweden. In contrast to the often feared depletion of Swedish R&D and its relocation to the home country of foreign acquirers, there is robust evidence that acquisitions lead to increasing R&D intensity in the acquired Swedish firms. Bertrand (2009) reports similar results for acquisitions of French firms by foreign firms.[13] Bertrand and Zuniga (2006) compare the impact of purely national M&As and cross-border M&As on private R&D investment in OECD countries during the 1990s. In contrast to purely national M&As, cross-border M&As in OECD host countries were associated with more R&D investment in relatively technology intensive industries, which appear to be more important for TFP in these countries than low-technology intensive industries. In summary, these findings suggest that cross-border M&As "may result in efficiency gains that are

[13] The earlier study of Conyon et al. (2002), covering the period 1989-1994, shows that the labor productivity of UK firms which were acquired by foreign firms increased by 13 percent. In contrast, Harris and Robinson (2002) find some evidence that total factor productivity declined after the acquisition of UK firms by foreign firms during 1987-1992.

predominant over various costs of integration and market power effects" (Bertrand, 2009: 1028) – at least in relatively advanced countries.[14] This invites our last hypothesis.

H3: The chances to benefit from M&A-induced increases in TFP are higher in more advanced host countries.

3. Empirical model and data

In this section, we present the basic empirical model and discuss some econometric issues (Subsection 3.1). Then, we describe the data and present descriptive statistics (Subsection 3.2).

3.1. Basic empirical model and econometric issues

Our baseline specification is a dynamic panel data model of the general form

$$TFP_{it} = \alpha TFP_{it-1} + \beta FDI_{it} + \sum_{m=1}^{M} \gamma_m X_{mit} + \mu_i + \lambda_t + \varepsilon_{it} \, , \tag{1}$$

where $i = 1, 2, ..., N$ is the country index, $t = 1, 2, ..., T$ is the time index, *TFP* represents total factor productivity of capital and labor, and *FDI* stands for three different FDI variables. The first is total FDI, *FDItotal*, measured as net inflows of FDI as a percentage of GDP—the most commonly used measure of FDI; the second FDI variable is greenfield investment as a percentage of GDP, *Greenfield*; and the third FDI variable is cross-border M&As, *M&A*, also expressed as a percentage of GDP. *Greenfield* and *M&A* are the main variables of interest in this study. Importantly, we perform separate estimations for *Greenfield* and *M&A* to avoid multicollinearity due to complementarities between the specific modes of FDI (Calderón et al., 2004). Since some observations on net M&As and net FDI are negative for some countries in some years, we follow the literature and do not log-transform the FDI variables to avoid

[14] As stressed by Arnold and Javorcik (2009: 43), the evidence for M&A-related increases in R&D and productivity of the acquired firms "cannot provide an answer to the question of how foreign ownership affects firms that do not receive FDI." However, positive direct effects appear to be the precondition for FDI-related spillovers of superior knowledge and technology.

loss of observations. We also do not take the log of the dependent variable since there is no a priory reason for imposing a semi-log specification. Moreover, the Durbin-Watson statistic (which we report in the results tables) suggests that the linear model is more appropriate than the semi-log model. Nevertheless, we show in the robustness section of the paper that the results do not change qualitatively when total factor productivity is log-transformed.

X is the usual vector of control variables. In the baseline model, we control for human capital, *Humancap*, population growth, *Pop*, and the Kaufmann–Kraay–Mastruzzi measure of political stability and absence of violence, *Stability*. In the robustness checks, we extend the baseline model to include trade openness, *Trade*, government consumption expenditures (as a percentage of GDP), *Gov*, and domestic credit to the private sector (as a percentage of GDP), *Credit*, as a measure of financial development.

Following common practice in panel data analysis, we include fixed effects, μ_i, to control for any country-specific omitted factors that are relatively stable over time, such as geography and institutions. We also use period dummies, λ_t, to account for common shocks affecting all countries in a given period. Examples of such shocks are global financial crises and global technological advances.

Finally, we include lagged TFP and thus estimate a dynamic panel model. The reasons for using a dynamic rather than a static model are as follows: First, by including lagged TFP, we can explicitly account for the dynamic process of productivity growth; second, the inclusion of lagged TFP helps control for the effect of potentially relevant, but omitted, variables; and third, the lagged dependent variable also helps control for serial autocorrelation. While the dynamic specifications exhibit little sign of serial correlation, the static counterparts of equation (1) suffer from serial correlation, as we show in the empirical section using the Durbin-Watson statistic.

A potential problem is that the dynamic fixed effects model may suffer from the so-called Nickell (1981) bias; that is, the correlation between the lagged dependent variable and the fixed effects may bias the coefficient on the lagged dependent variable toward zero. If the explanatory variables are correlated with the lagged dependent variable, then the estimated coefficients of the explanatory variables may inherit this Nickell bias. It is well known that the bias decreases with *T* and becomes small when *T* is about 20 or more. Unfortunately, reliable data on the value of greenfield FDI projects are available only from 2003 onwards. Thus, in the present application, the standard least-squares dummy variable (LSDV) estimator may produce biased coefficients, at least for the lagged dependent variable. Indeed, there are alternative estimators of dynamic panel data models. Bun and Kiviet (2006) examine the performance of commonly used dynamic panel estimators, including LSDV, difference-GMM, and system-GMM estimators. They conclude that none of these estimators dominates the others in terms of bias. We use the standard LSDV estimator, which is most commonly used and also yields more plausible results, as our main estimator. To ensure the robustness of our results we employ the Blundell and Bond (1998) system-GMM estimator. Moreover, to overcome any possible Nickell bias, we not only use the GMM estimator, but we also estimate static panel data regression models and dynamic panel data regression models without fixed effects.

Another econometric issue is the potential endogeneity of the FDI variables. FDI may go to rich countries with high productivity, which could explain a positive correlation between FDI and TFP. Alternatively, to the extent that FDI is driven by international factor price differences, FDI may go to poor countries with low productivity and low wages, resulting in a negative correlation between FDI and TFP (see also Hong and Sun, 2011). To control for this endogeneity problem, the FDI variables are treated as endogenous in the

GMM estimation procedure. In addition, we also present fixed-effects results using lagged instead of contemporaneous values of the independent variables.

3.2. Data and descriptive statistics

We now describe the data used in the empirical analysis. Since there is no database providing information on the level of TFP,[15] we construct our TFP variable in the usual way, as $TFP = Y/[K^{(1-\alpha)}L^{\alpha}]$, where *Y* is output, *K* denotes the capital stock, *L* stands for labor input, $1-\alpha$ is the capital share of income, and α is the labor share of income. We assume a constant α of 0.6667, which can be justified as follows: First, it is common practice in the literature to assume and use a constant labor share of 2/3. Second, the evidence of Gollin (2002) suggests that the labor share is approximately constant across time and space with a value of about 2/3. We are aware that recent studies show a decline in the labor share since the 1980s in many (but not all) countries (see, e.g., Karabarbounis and Neiman, 2013). However, and third, reliable data on the labor share are still lacking for many countries. This forces us to rely on the standard assumption of $\alpha = 0.6667$. It should be noted in this context that any time-invariant country-specific measurement error will be absorbed into the fixed effects. At the same time, the bias arising from temporary measurement error will be mitigated by our use of lagged variables as instruments in the GMM procedure.

Output is measured by real GDP (in 2005 US$) from the World Development Indicators (WDI) 2014 online database;[16] capital (in 2005 US$) is measured by the perpetual inventory method and is from the Penn World Tables (PWT) version 8.0 (Feenstra et al., 2013);[17] and labor input is represented by the labor force (the number of people of working age, defined as being from 15 to 64 years old) from the WDI 2014 online database. A better

[15] Although the Penn World Tables (version 8.0) report TFP growth rates and relative TFP levels (relative to the US), this database contains no data on the absolute level of TFP.
[16] Available at: http://data.worldbank.org/data-catalog/world-development-indicators.
[17] Available at: http://www.rug.nl/research/ggdc/data/penn-world-table.

measure of labor input would be employment times average hours, but reliable data on employment and hours worked are not available for many countries, particularly developing countries. Therefore, we follow common practice and use instead the labor force as our measure of labor input (see, e.g., Abu-Qarn and Abu-Bader, 2007; Herzer, 2011). The combination of WDI labor force data and PWT capital stock data allows us to maximize the number of observations in our empirical analysis. In the robustness analysis, we consider alternative TFP measures based on (i) employment data from the PTW8.0 and (ii) capital stock data from Berlemann and Wesselhöft (2012).[18]

Data on total net FDI inflows, the value of greenfield FDI projects, and cross-border M&As are from the United Nations Conference on Trade and Development (UNCTAD) database.[19] It should be noted that the sum of greenfield FDI and M&As often exceeds net FDI inflows as reported in the balance-of-payments statistics. UNCTAD's M&A statistics are based on information provided by Thomson Reuters which may include transactions via domestic and international capital markets which are normally not considered as FDI flows. UNCTAD's new statistics on greenfield FDI are based on information provided by fDi Markets of Financial Times. Similar to M&As, this dataset may include investments that normally would not be considered as FDI flows. Nevertheless, the new database in clearly superior to the arbitrary procedure of treating greenfield FDI as a residual. In the empirical section, we alternatively define greenfield FDI as the difference between net FDI inflows and M&A sales to demonstrate that this practice, often applied in previous studies, leads to misleading results. We express all FDI-related variables as a percentage of GDP, as is common practice in the literature.

The GDP data, as well as the data on population growth, trade openness (exports plus imports as a percentage of GDP), government consumption as a percentage of GDP, and

[18] Available at: http://www.hsu-hh.de/berlemann/index_552HQnG7mehYlNnS.html.
[19] Available at http://unctad.org/en/pages/DIAE/World%20Investment%20Report/Annex-Tables.aspx.

domestic credit to the private sector as percentage of GDP are from the WDI 2014 online database. The Kaufmann-Kraay-Mastruzzi measure of political stability and absence of violence is from the Worldwide Governance Indicators project.[20] It captures "perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism" (Kaufmann et al., 2010: 4). The measure for human capital is from the PWT8.0, and is based on years of schooling weighted by an efficiency parameter.

Merging data from these sources yields an unbalanced panel of up to 123 countries with data for the period 2003-2011. These 123 countries are listed in Table A1 (Appendix A). Table A.2 in Appendix B shows some summary statistics on the main variables used in the analysis.

4. Empirical analysis

In this section, we examine the effects of total FDI, greenfield investment, and M&As on total factor productivity using panel techniques. We also examine whether the practice of subtracting M&A sales from total FDI to construct (previously unavailable) data on greenfield investment leads to misleading empirical results. In accordance with the objective of this study, the focus is on evaluating the separate effects of greenfield investment and M&As. We first present our baseline results (Subsection 4.1) and then provide several robustness checks (Subsection 4.2). Finally, we examine whether the results differ between developed and developing economies (Subsection 4.3).

4.1. Baseline results

Table 1 presents our baseline results with and without control variables. In the table, we also report the Durbin-Watson statistic to provide a test for the presence of first-order

[20] The data are available at http://info.worldbank.org/governance/wgi/index.aspx#home.

serial correlation in the residuals. The Durbin-Watson statistics are always close (or equal) to 2, suggesting no serious serial correlation.

[Table 1]

The signs on the coefficients of the control variables are largely as expected. Human capital is positively and significantly associated with TFP in all specifications. This is consistent with the results of a number of previous studies (see, e.g., del Barrio-Castro et al., 2002; Woo, 2009; Fleisher and Zhao, 2010), while some other studies do not find a significant impact of human capital on TFP (see, e.g., Miller and Upadhyay, 2000; Alfaro et al., 2009; Baltabaev, 2014). Consistent with the findings of Pritchett (1996) and Baltabaev (2014), we find that population growth is significantly negatively related to TFP. A possible explanation for this finding might be that parents substitute child quality for child quantity, and decide to have fewer children with more education (see, e.g., Galor and Moav, 2002). Population growth might also reduce productivity by worsening the health status of the population. Finally, the positive coefficients on *Stability* suggest that political stability reduces uncertainty, thus facilitating better planning and decision making, which translates into more efficient use of resources and higher productivity.

Turning to the main variables of interest, total FDI is negatively but insignificantly related to TFP. This is consistent with the findings of Alfaro et al. (2009), but contradicts the results of Woo (2009) and Baltabaev (2014). Most interestingly, while the coefficient on *Greenfield* is insignificant across the specifications presented in Table 1, the coefficient on *M&A* is positive and significant. The point estimate of the coefficient on *M&A* in column (6) implies, if viewed causally, that a one percentage point increase in the M&As to GDP ratio increases TFP by 0.969 units (on average). While this coefficient represents the short-run effect, the long-run effect can be calculated by dividing the estimated short-run coefficient by one minus the coefficient on the lagged dependent variable, $\beta/(1-\alpha)$. Thus, the long-run effect of M&As is 9.888.

To evaluate the magnitude of this effect, column (7) of Table 1 reports the standardized long-run coefficients from the model in column (6).[21] These coefficients imply that the estimated size of the effect of M&As on TFP (0.088) is about one-thirteenth that of human capital (1.155), about half that of population growth (0.196 in absolute value), and about half that of political stability (0.195). Overall, the magnitudes are not implausible.

In Table 2, we examine whether the use of constructed data on greenfield FDI in earlier studies leads to misleading results. To this end, we replace the original data on greenfield investment (available since recently from the UNCTAD FDI database) by following past practice of employing the difference between net FDI inflows and M&A sales, labelled *Greenfieldconstruct*. The results (with and without control variables) in Table 2 are in contrast to the results in columns (3) and (4), of Table 1: the coefficient on the constructed greenfield FDI variable has a negative sign and is significant at the 10% level. The implication is that the conclusions reached in studies with constructed greenfield FDI data are potentially flawed, as a result of measurement error.

[Table 2]

4.2. Robustness

The estimates in Table 1 suggest that greenfield FDI has no effect on TFP while M&As have a positive effect on TFP. To check the robustness of this finding, we augment our baseline model with three additional control variables: trade openness (*Trade*), government

[21] The standardized long-run coefficients are calculated by multiplying the unstandardized long-run coefficients by the ratio of the standard deviations of the independent and dependent variables. The standard deviation of *TFP* is 481.533; the standard deviations of the independent variables are: 4.262 for *M&A*, 0.544 for *Humancap*, 1.571 for *Pop*, and 0.997 for *Stability*.

consumption (*Gov*), and financial development (*Credit*). The results of this exercise are reported in Table 3.

[Table 3]

Concerning the additional control variables, only government consumption is significant and has the expected sign while trade openness and financial development are insignificant. Of course, one must be cautious in interpreting these findings given the potential multicollinearity between the explanatory variables. Nevertheless, the findings in Table 3 are consistent with those reported in Table 1: the coefficient on *Greenfield* is not significantly different from zero while the coefficient on *M&A* is positive and significant.

In Table 4, we examine whether our results are robust to alternative measures of TFP. Columns (1) and (2) present results using the log of TFP; columns (3) and (4) report results using TFP calculated from employment data; and columns (5) and (6) present estimates using TFP calculated from capital stock data from Berlemann and Wesselhöft (2012). No matter which TFP measure is used, *Greenfield* is insignificant while M&As are significantly positively associated with TFP. However, given the relatively low Durbin-Watson statistics, the reported statistical significance levels should be viewed with some caution. Specifically, the Durbin-Watson statistics presented in columns (1) and (2) of Table 4 are relatively low compared to the Durbin-Watson statistics presented in columns (4) and (6) of Table 1. This could suggest that the functional form in columns (1) and (2) is misspecified. We therefore prefer the unlogged form.

[Table 4]

Next, we address the Nickell (1981) bias by estimating both a static fixed effects model and a dynamic model without fixed effects. The estimation results are presented in Table 5. Again, we do not find significant effects for greenfield investment. The effects of M&As, in contrast, appear to be statistically significant. However, the low value of the

Durbin-Watson statistics suggests serially correlated residuals in the static models and so casts doubt on the results in columns (1) and (2). Even in columns (3) and (4), which do not control for country-specific fixed effects, the Durbin-Watson statistics are quite low. Overall, the Durbin-Watson statistics suggest that the dynamic fixed effects model is superior to the static model and the dynamic model without fixed effects.

[Table 5]

As an additional sensitivity analysis, we re-estimate equation (1) using the Blundell and Bond (1998) system GMM estimator for dynamic panels. This estimator has become popular in the FDI-growth literature so as to overcome the Nickell bias and to address the problems of endogeneity and measurement error. It combines the standard set of equations in first differences with suitable lagged levels as instruments, with an additional set of equations in levels with suitable lagged first-differences as instruments (known as GMM-style instruments). By adding the original equation in levels to the system and exploiting these additional moment conditions, Arellano and Bover (1995) and Blundell and Bond (1998) find a dramatic improvement in efficiency and a significant reduction in finite sample bias compared with the first-differenced GMM estimator suggested by Arellano and Bond (1991).

To account for the well-known problem of too many instruments, we instrument only the lagged dependent variable (lagged *TFP*) and the variables of primary interest (*Greenfield* and *M&A*) with GMM-style instruments. We also collapse the instrument set; thus, the GMM estimator is based on one instrument per variable instead of one instrument for each variable at each period.

The system GMM results are reported in columns (1) and (2) of Table 6. Following common practice, we also present the Hansen-J test of overidentifying restrictions (Hansen) and a second-order serial correlation test (AR2). As can be seen, the Hansen-J test fails to reject the validity of the instruments, and the second-order serial correlation test indicates that the errors exhibit no second-order serial correlation; it appears that the models presented in columns (1) and (2) models are correctly specified.

Turning to the FDI variables, we again find an insignificant coefficient on *Greenfield* and a positive and statistically significant coefficient on *M&A*. Because none of the coefficients on the control variables are significantly different from zero in column (2), and also because even the system GMM estimator may suffer from weak instruments (Bun and Windmeijer, 2010), we find the GMM results less reliable than the LSDV results presented in Table 1.

[Table 6]

An alternative approach to address potential endogeneity concerns is to use lagged explanatory variables. We report the results from this exercise in columns (3) and (4) of Table 6. Again, the coefficient on *Greenfield* is not significantly different from zero while the coefficient on the M&A variable remains significantly positive.

4.3. Differences between developed and developing countries

As stated in our third hypothesis, we expect that the effect of M&As on TFP is larger for developed than for developing countries. To investigate this, we divide our sample into developed and developing countries. Since our FDI variables are drawn from the UNCTAD FDI database, we follow the United Nations (UN) classification of developed and developing (UNCTAD, 2014).[22] Table 7 presents the results, again with and without controls for human capital, population growth, and political instability.

[Table 7]

Somewhat surprisingly, the coefficient on human capital is not significant for both sub-samples, and the coefficient is even negative (with *t*-statistics of -0.79 and -0.38) for

[22] The countries in the sub-samples of developed and developing countries are listed in Appendix A.

developed countries. However, this is consistent with some previous studies that have found either a negative but insignificant effect of human capital on TFP (see, e.g., Baltabaev, 2014) or even a significant negative effect of human capital on growth (see, e.g., Islam, 1995).

Concerning our main variables of interest, it can be seen that the effect of greenfield investment is insignificant for both developed and developing countries, which resembles previous results for the overall sample. As far as M&As are concerned, we find that their effect is statistically significant only for developed countries, regardless of whether the controls are included or not.

As noted above, our use of the term "developing country" accords with current UN practice. Thus, some countries, such as Singapore and Hong Kong, are classified as developing countries even though their per capita incomes are now among the world's highest and despite the fact that they are classified by the IMF (2014) as advanced economies. This is why we finally assess whether M&As have a positive and significant impact only in countries with high levels of income. To this end we include GDP per capita (from the WDI), *GDPpc*, and an interaction between *GDPpc* and *M&A*, *GDPpc×M&A*, in our baseline M&As regression. Based on the results in Table 7, we expect that the coefficient on *GDPpc×M&A* will be positive and significant while the coefficient on *M&A* will be negative but not significant. In fact, this is what we find in Table 8 (which, again, presents results with and without control variables).

[Table 8]

The results in columns (1) and (2) of Table 8 imply that M&As stimulate productivity only in countries that have reached a certain threshold level of GDP per capita. To specify the threshold, we first calculate the long-run coefficients of *M&A* and *GDPpc×M&A* by dividing the estimated short-run coefficients of *M&A* and *GDPpc×M&A* from column (2) by one minus the coefficient on the lagged dependent variable. The resulting long-run coefficient of

M&A is –3.4184, and the resulting long-run coefficient of *GDPpc×M&A* is 0.000204. Then, we differentiate $TFP = -3.4184 M\&A + 0.000204 GDPpc \times M\&A$ with respect to *M&A* to obtain $dTFP/dM\&A = -3.4184 + 0.000204 GDPpc$. Finally, this equation is set equal to zero and solved for *GDPpc*. We find that the effect of M&As on TFP is positive (and statistically significant) when *GDPpc* is above 16756.86 US$. This applies (on average over the sample period) to 36 of the countries examined.[23] With the exception of China (which is an upper middle-income country), all these countries are high-income or developed countries according to current World Bank classification.[24]

5. Summary and conclusion

Policymakers in various host countries compete fiercely for FDI inflows. At the same time, they typically prefer greenfield FDI over M&As. UNCTAD (2000: 159) notes that M&As as a mode of entry are widely perceived to be "less beneficial for economic development than greenfield investment, if not positively harmful." On closer inspection it appears that prevailing perceptions are unlikely to hold, notably when taking into account that the chances to benefit from different modes of FDI may vary considerably between developed and developing host countries of FDI. Specifically, we hypothesize that M&As are not inferior to greenfield FDI in improving TFP in the host countries – while the chances to benefit from M&A-induced increases in TFP are higher in more advanced host countries.

Until recently, the lack of reliable data on greenfield FDI rendered it almost impossible to assess our hypotheses in a convincing way for large sub-samples of developing and developed countries. We overcome this problem by drawing on a new dataset on greenfield FDI, available from UNCTAD since 2003. Our focus is on overall, or "macro,"

[23] The 36 countries above the threshold are Australia, Austria, the Bahamas, Bahrain, Belgium, Brunei Darussalam, Canada, Cyprus, Denmark, Finland, France, Germany, Greece, Hong Kong, China, Iceland, Ireland, Israel, Italy, Japan, South Korea, Kuwait, Luxembourg, Macao, Malta, Netherlands, New Zealand, Norway, Portugal, Qatar, Singapore, Slovenia, Spain, Sweden, Switzerland, United Kingdom, and the United States.
[24] See http://data.worldbank.org/about/country-and-lending-groups.

TFP in order to gain insights into how greenfield investment and cross-border M&As may or may not affect economic growth. In this way, we complement firm-level studies which provide valuable insights into the productivity of multinational firms and possible productivity spillovers to connected domestic firms, while they are, by definition, unable to capture the overall effect of FDI on macroeconomic productivity.

In addition to considering total FDI inflows, we perform separate estimations for the two specific modes of FDI. Furthermore, we distinguish between developed and developing host countries in order to avoid "inappropriate pooling of wealthy and poor countries" (Blonigen and Wang, 2005). Estimating a dynamic panel data model allows us to account for the dynamic process of productivity growth and to mitigate the problems associated with omitted variables and serial correlation.

Our empirical findings are in sharp contrast with the revealed preferences of most policymakers. Our main result is that greenfield FDI has no statistically significant effect on TFP while M&As have a positive effect on TFP in the total sample of all developing and developed host countries. In addition, we find that inconclusive results on the productivity effects of total FDI in developing countries can hardly be attributed to the aggregation of different modes in most previous studies. Rather, greenfield FDI and M&As both appear to be ineffective in increasing TFP in this sub-sample. In contrast, M&As have a strong and positive effect on TFP in the sub-sample of developed host countries. Specifically, we show that almost all developing host countries fall below the threshold level of economic development to benefit from M&As.

The policy implications of our analysis are fairly sobering, in particular for developing host countries, corroborating previous studies which have cast into doubt the widespread enthusiasm about FDI (e.g., Aitken and Harrison, 1999; Carkovic and Levine, 2005). It appears that, in order to benefit from FDI-induced increases in productivity through technological spillovers, the host countries must not lag too far behind the technological frontier (Findlay, 1978; Aghion et al., 2008). Hence, domestic government resources could probably be better spent than by offering tax incentives and outright subsidies to multinational enterprises with superior technological and managerial knowledge. Importantly, this conclusion would remain valid even if greenfield FDI differed from M&As in the short run by adding more to capital formation and production capacity. Such an effect is unlikely to persist (UNCTAD, 2000), and factor accumulation is unlikely to play a major role for growth (Easterly and Levine, 2001).

The policy implications for developed host countries are more favorable, though no less challenging. In order to derive more benefits from inward FDI, policymakers would be required to fundamentally revise their current preferences and no longer oppose M&As while inviting greenfield FDI. Our findings clearly suggest that the productivity enhancing effects of M&As are not restricted to the acquired domestic firms and a narrow network of local suppliers, as shown by several firm-level studies. Importantly, the productivity enhancing effects also carry over to the macroeconomic level of developed host countries.

Appendix A: Countries in the Sample, 2003-2011

[Table A.1]

Appendix B: Summary Statistics

[Table A.2]

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Table 1. Baseline results

	(1)	(2)	(3)	(4)	(5)	(6)	(7) Standardized long-run coefficients
Lagged *TFP*	0.830***	0.849***	0.856***	0.860***	0.896***	0.902***	
	(20.59)	(25.04)	(26.19)	(24.21)	(30.96)	(29.08)	
FDItotal	–0.415	–0.396					
	(–1.33)	(–1.23)					
Greenfield			0.029	0.027			
			(0.57)	(0.80)			
M&A					0.794**	0.969***	0.088
					(2.46)	(4.40)	
Humancap		120.166***		97.161**		100.198**	1.155
		(3.05)		(2.57)		(2.13)	
Pop		–6.868***		–8.218***		–5.903***	–0.196
		(–2.70)		(–4.30)		(–2.92)	
Stability		8.496**		8.690**		9.193**	0.194
		(2.48)		(2.41)		(2.03)	
Durbin-Watson	1.68	1.68	1.59	1.76	1.93	2.00	
R-squared	0.998	0.998	0.998	0.998	0.998	0.998	
No. of obs.	976	892	927	854	715	676	
No. of countries	123	113	123	113	123	113	

Notes: The dependent variable is *TFP*. *t*-statistics (calculated with robust White-Huber standard errors) are in parenthesis. *** (**) indicate significance at the 1% (5%) level. Coefficients for country and time fixed effects are not reported. Column (7) reports standardized long-run coefficients from the regression in column (6).

Table 2. Results based on constructed data on greenfield FDI

	(1)	(2)
Lagged *TFP*	0.882***	0.886***
	(25.63)	(22.87)
Greenfieldconstruct	–0.790*	–0.847*
	(–1.79)	(–1.96)
Humancap		109.839**
		(2.23)
Pop		–5.080**
		(–2.37)
Stability		8.904*
		(1.90)
Durbin-Watson	1.83	1.87
R-squared	0.998	0.998
No. of obs.	715	676
No. of countries	123	113

Notes: The dependent variable is *TFP*. *t*-statistics (calculated with robust White-Huber standard errors) are in parenthesis. *** (**) [*] indicate significance at the 1% (5%) [10%] level. Coefficients for country and time fixed effects are not reported.

Table 3. Additional control variables

	(1)	(2)	(3)	(4)	(5)	(6)
Lagged *TFP*	0.861***	0.865***	0.849***	0.905***	0.898***	0.873***
	(24.29)	(26.32)	(27.14)	(27.56)	(28.67)	(25.04)
Greenfield	0.0273	0.040	0.045			
	(0.80)	(0.83)	(0.84)			
M&A				0.982***	0.969***	0.936***
				(4.64)	(4.50)	(4.59)
Humancap	98.717**	105.096**	97.293**	108.597**	114.558**	111.421**
	(2.58)	(2.54)	(2.32)	(2.26)	(2.38)	(2.22)
Pop	–8.282***	–7.412***	–7.178***	–6.310***	–5.120***	–4.568*
	(–4.83)	(4.34)	(–3.98)	(–3.13)	(–2.31)	(–1.66)
Stability	9.596**	9.448**	10.186***	11.598***	12.507***	12.904***
	(2.51)	(2.48)	(2.62)	(2.74)	(3.02)	(3.09)
Trade	–0.006	0.080	0.056	0.077	0.098	0.108
	(–0.24)	(0.93)	(0.55)	(0.73)	(0.92)	(0.84)
Gov		–1.857**	–2.513***		–2.056**	–2.863***
		(–2.23)	(–3.14)		(–2.21)	(–2.69)
Credit			–0.186			–0.263
			(–0.93)			(–1.65)
Durbin-Watson	1.76	1.78	1.81	2.01	2.00	1.98
R-squared	0.998	0.998	0.998	0.998	0.998	0.998
No. of obs.	839	824	798	671	668	650
No. of countries	112	112	112	112	111	111

Notes: The dependent variable is *TFP*. *t*-statistics (calculated with robust White-Huber standard errors) are in parenthesis. *** (**) [*] indicate significance at the 1% (5%) [10%] level. Coefficients for country and time fixed effects are not reported.

Table 4. Alternative definitions of TFP

	TFP in logs		TFP based on employment data		TFP based on different capital stock data	
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged *TFP*	0.768***	0.827***	0.862***	0.892***	0.836***	0.878***
	(19.34)	(22.90)	(29.25)	(29.36)	(12.82)	(13.36)
Greenfield	–0.00005		0.022		0.024	
	(–0.60)		(1.03)		(0.40)	
M&A		0.0003**		0.346***		1.071***
		(2.08)		(3.62)		(3.34)
Humancap	0.200***	0.177**	31.902	30.903	142.720**	131.285**
	(2.70)	(2.14)	(1.65)	(1.22)	(2.58)	(2.10)
Pop	–0.004	–0.001	–7.274***	–5.982***	–7.325	–7.086
	(–1.17)	(–0.34)	(–5.09)	(–4.79)	(–0.91)	(–0.71)
Stab	0.026***	0.015	3.993**	2.751	16.892***	19.974***
	(3.36)	(1.11)	(2.10)	(1.20)	(2.81)	(3.19)
Durbin-Watson	1.59	1.49	1.59	1.69	1.57	1.77
R-squared	0.999	0.999	0.998	0.998	0.998	0.998
No. of obs.	854	676	854	676	637	536
No. of countries	113	113	113	113	82	82

Notes: The dependent variable is *TFP*. *t*-statistics (calculated with robust White-Huber standard errors) are in parenthesis. *** (**) indicate significance at the 1% (5%) level. Coefficients for country and time fixed effects are not reported.

Table 5. Static model and dynamic model without fixed effects

	Static model		Dynamic model without fixed effects	
	(1)	(2)	(3)	(4)
Lagged *TFP*			0.981***	0.978***
			(211.14)	(194.09)
Greenfield	0.059		0.021	
	(0.36)		(0.85)	
M&A		0.707***		0.496**
		(2.69)		(2.11)
Humancap	354.336**	392.127**	2.605	6.275**
	(2.37)	(2.19)	(0.95)	(1.98)
Pop	–10.857	5.953	–2.751**	–0.620
	(–1.33)	(0.95)	(–2.54)	(–0.88)
Stab	26.481**	26.210**	1.275	2.095
	(2.53)	(1.97)	(1.26)	(1.63)
Country-fixed effects	yes	yes	no	no
Durbin-Watson	0.57	0.60	1.37	1.41
R-squared	0.993	0.993	0.997	0.997
No. of obs.	958	750	854	676
No. of countries	113	113	113	113

Notes: The dependent variable is *TFP*. *t*-statistics (calculated with robust White-Huber standard errors) are in parenthesis. *** (**) indicate significance at the 1% (5%) level. Coefficients for country and time fixed effects are not reported.

Table 6. GMM results and LSDV results using lagged values of all right-hand side variables

	GMM		Lagged variables	
	(1)	(2)	(4)	(5)
Lagged *TFP*	0.182	0.873***	0.847***	0.891***
	(0.97)	(6.26)	(20.04)	(20.92)
Greenfield [lagged in column (4)]	0.163		–0.007	
	(1.49)		(–0.08)	
M&A [lagged in column (5)]		1.626***		1.556***
		(2.99)		(3.73)
Humancap [lagged in columns (4) and (5)]	2536.462***	–283.581	90.398**	81.538
	(3.06)	(–1.02)	(2.44)	(1.62)
Pop [lagged in columns (4) and (5)]	–19.253*	–27.663	–4.475***	–6.021**
	(–1.97)	(–0.69)	(–3.19)	(–2.05)
Stability [lagged in columns (4) and (5)]	49.311	224.685	1.817	4.823
	(0.43)	(1.20)	(0.46)	(0.80)
Hansen (p-value)	0.167	0.336		
AR2 (p-value)	0.292	0.106		
Number of instruments	22	25		
Durbin-Watson			1.66	1.75
R-squared			0.998	0.998
No. of obs.	725	676	850	666
No. of countries	113	113	113	113

Notes: The dependent variable is *TFP*. *t*-statistics are in parenthesis. We use the Windmeijer (2005) correction procedure to employ robust standard errors for the GMM procedure. The *t*-values presented in columns (4) and (5) are based on robust White-Huber standard errors. Coefficients for country and time fixed effects are not reported. *** (**) [*] indicate significance at the 1% (5%) [10%] level.

Table 7. Results for developed and developing countries.

	Developing countries				Developed countries			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged *TFP*	0.824***	0.843***	0.899***	0.968***	0.846***	0.833***	0.863***	0.846***
	(14.47)	(12.71)	(13.61)	(14.80)	(25.42)	(23.17)	(30.13)	(25.91)
Greenfield	0.026	0.030			–0.162	–0.264		
	(0.48)	(0.83)			(–0.52)	(–0.83)		
M&A			–0.084	0.090			0.988***	1.053***
			(–0.62)	(0.15)			(5.33)	(6.50)
Humancap		25.223		51.596		–45.589		–22.863
		(0.55)		(0.79)		(–0.79)		(–0.38)
Pop		–9.134***		–8.255***		–7.499		–4.175
		(–4.33)		(–2.94)		(–1.22)		(–0.62)
Stability		0.499		–1.631		34.375***		34.735***
		(0.22)		(–0.45)		(4.03)		(4.44)
Durbin-Watson	1.36	1.60	1.60	1.77	1.82	1.84	2.00	2.02
R-squared	0.996	0.996	0.996	0.997	0.997	0.997	0.997	0.997
No. of obs.	640	571	438	403	287	282	277	272
No. of countries	87	77	87	77	36	36	36	36

Notes: The dependent variable is *TFP*. *t*-statistics (calculated with robust White-Huber standard errors) are in parenthesis. *** indicate significance at the 1% level. Coefficients for country and time fixed effects are not reported.

Table 8. Interaction-term regressions

	(1)	(2)
Lagged *TFP*	0.898***	0.902***
	(33.58)	(33.91)
M&A	–0.392	–0.335
	(–1.14)	(–0.49)
Humancap		121.644**
		(2.09)
Pop		–6.383***
		(–2.74)
Stability		9.417**
		(2.08)
GDPpc	0.0003	0.0006
	(0.45)	(0.71)
GDPpc × *M&A*	0.00002***	0.00002**
	(4.48)	(2.25)
Durbin-Watson	1.95	2.00
R-squared	0.998	0.998
No. of obs.	715	676
No. of countries	123	113

Notes: The dependent variable is *TFP*. *t*-statistics (calculated with robust White-Huber standard errors) are in parenthesis. *** (**) indicate significance at the 1% (5%) level. Coefficients for country and time fixed effects are not reported.

Table A.1. List of countries and their classification

Angola	1	Egypt, Arab Rep.	1	Latvia	2	Portugal	2
Argentina	1	El Salvador	1	Lebanon	1	Qatar	1
Australia	2	Equatorial Guinea	1	Liberia	1	Romania	2
Austria	2	Estonia	2	Lithuania	2	Rwanda	1
Bahamas, The	1	Ethiopia	1	Luxembourg	2	Saudi Arabia	1
Bahrain	1	Fiji	1	Macao SAR, China	1	Senegal	1
Bangladesh	1	Finland	2	Madagascar	1	Sierra Leone	1
Barbados	1	France	2	Malawi	1	Singapore	1
Belgium	2	Gabon	1	Malaysia	1	Slovak Republic	2
Belize	1	Germany	2	Maldives	1	Slovenia	2
Bolivia	1	Ghana	1	Mali	1	South Africa	1
Botswana	1	Greece	2	Malta	2	Spain	2
Brazil	1	Guatemala	1	Mauritania	1	Sudan	1
Brunei Darussalam	1	Guinea	1	Mauritius	1	Sweden	2
Bulgaria	2	Honduras	1	Mexico	1	Switzerland	2
Cambodia	1	Hong Kong	1	Mongolia	1	Syria	1
Cameroon	1	Hungary	2	Morocco	1	Tanzania	1
Canada	2	Iceland	2	Mozambique	1	Thailand	1
Cape Verde	1	India	1	Namibia	1	Trinidad & Tobago	1
Chile	1	Indonesia	1	Nepal	1	Tunisia	1
China	1	Iran, Islamic Rep.	1	Netherlands	2	Turkey	1
Colombia	1	Iraq	1	New Zealand	2	Uganda	1
Congo, Dem. Rep.	1	Ireland	2	Nigeria	1	United Kingdom	2
Congo, Rep.	1	Israel	2	Norway	2	United States	2
Costa Rica	1	Italy	2	Oman	1	Uruguay	1
Cote d'Ivoire	1	Japan	2	Pakistan	1	Venezuela, RB	1
Cyprus	2	Jordan	1	Panama	1	Vietnam	1
Czech Republic	2	Kenya	1	Paraguay	1	Yemen, Rep.	1
Denmark	2	Korea, Rep.	1	Peru	1	Zambia	1
Dominican Republic	1	Kuwait	1	Philippines	1	Zimbabwe	1
Ecuador	1	Lao PDR	1	Poland	2		

Note: The number "1" ["2"] indicates that the country was included in the subsample of 87 [36] developing [developed] countries (according to UNCTAD classification).

Table A2. Summary statistics on the main variables used in the analysis

	Observations	Mean	Min.	Max.	Std. Dev.
TFP	1099	491.13	21.84	2522.40	481.53
FDItotal	1106	5.35	–55.07	85.96	7.66
Greenfield	1047	8.12	0.0001	355.13	19.37
M&A	797	1.21	–14.22	82.28	4.26