Sectoral FDI and Economic Growth — Evidence from Egyptian Governorates

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Abstract

This paper investigates the effect of sectoral foreign direct investment (FDI) on economic growth in Egypt, using a novel panel dataset of 26 Egyptian governorates for the period 1992–2007. The growth literature is robust with the benefits of using a within-country dataset for such a research question (Ford et al., 2008). Despite the large number of theoretical models on the channels through which FDI can enhance economic growth, empirical findings are still inconclusive. We argue that one possible reason for the ambiguous effect is the use of aggregate FDI data across different sectors. Our results show no significant effect of aggregate FDI stock on economic growth in Egyptian governorates, which can be partly explained by the contradictory growth effects of FDI at the sectoral level. We find a positive effect of manufacturing FDI, a negative effect of agricultural FDI and no significant effect of services FDI on economic growth.

Keywords: Foreign direct investment; sectoral FDI; economic growth; Egypt.

JEL: F21, F23, F43, O47, O53

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1. Introduction

FDI is expected to have a long-run growth effect from a theoretical perspective (Barro and Sala-i-Martin, 1995). In addition to capital formation, the presence of foreign firms is expected to generate knowledge and technology spillovers that enhance aggregate productivity and growth (De Mello, 1997; Castellani and Zanfei, 2006). Yet, growth impacts of FDI remain more evident in growth theories than in empirical studies. Despite the large number of empirical studies on the effect of FDI on economic growth, findings are still inconclusive. In a recent meta-regression analysis, Iamsiraroj and Ulubasoglu (2015) find that only 43% of surveyed regression estimates show a significantly positive FDI-induced growth effect, whereas 17% show a significantly negative effect and 40% an insignificant effect.[1]

One possible reason for the ambiguous empirical findings on the impact of FDI on economic growth is the use of highly aggregated FDI data, as similarly argued by Alfaro (2003), Nunnenkamp and Spatz (2004) and Alfaro and Charlton (2013). Empirical research mostly uses aggregate FDI data, whereas the growth effects of FDI likely depend on the sector that receives FDI (Dutt, 1997; Alfaro, 2003; Chakraborty and Nunnenkamp, 2008; Wang, 2009; Alfaro and Charlton, 2013). This is because the potential for technology transfer, linkages, and spillover effects between foreign and domestic firms differs across sectors (Alfaro, 2003). Linkages are much stronger in manufacturing, for example, than in the agriculture and services sectors. Moreover, FDI-related transfers of technology and know-how and introduction of new processes primarily occur in the manufacturing sector.

This paper investigates the effect of aggregate as well as sectoral FDI on economic growth in Egypt, using a novel panel dataset of 26 Egyptian governorates for the period 1992–2007. The dataset focuses on 'non-petroleum Greenfield FDI', as described in Hanafy (2015a, 2015b).[2]

Our dataset has several advantages. First, the growth literature is robust with benefits of using within-country datasets (Ford et al., 2008). These benefits include the similarity of governorates in terms of culture, language, legal framework and institutional characteristics

[1] One further recent meta-analysis by Iwasaki and Tokunaga (2014) reaches similar mixed results on the growth effect of FDI in transition countries and concludes that more research is needed.

[2] For a thorough description of non-petroleum greenfield FDI in Egypt and its sectoral and geographical distribution, see Hanafy (2015a). Hanafy (2015b) uses the same panel dataset to investigate determinants of FDI location in Egypt.

as well as the consistency of data collection process across governorates. Moreover, spillovers tend to typically occur more locally than nationally and only disperse slowly over time into neighbouring regions (Jaffe et al., 1993; Ford et al., 2008). Thus, our dataset that is regionally disaggregated at the governorate level, seems more appropriate than national data for capturing FDI growth effects.[3]

Second, our dataset allows us to treat FDI as a heterogeneous group, by differentiating between the sectors that receive FDI. We can, thereby, avoid data limitation issues that challenge many previous studies on the effect of FDI on economic growth.[4] In our analysis, we differentiate between the effects of manufacturing, agricultural and services FDI on economic growth.

Third, we are able to construct a stock measure of FDI that allows us to better estimate the long-term growth effect of FDI, compared to using FDI flows. Using FDI stock is more consistent with growth theory and FDI related theories (Nunnenkamp and Spatz, 2004; Ford et al., 2008). This is because growth enhancing spillovers are not only restricted to recent FDI inflows but should also result from FDI received in previous periods. In addition, the use of FDI stock considerably reduces possible endogeneity problems (Dutt, 1997; Nunnenkamp and Spatz, 2004; Cipollina et al., 2012).

Fourth, the country of analysis, Egypt, has recently experienced an uprising, not only due to political but also economic reasons (Malik and Awadallah, 2013) and is currently undergoing several economic reforms. Attracting FDI is one of the highest priorities of the current Egyptian government, as indicated by the government-launched 'Egypt Economic Development Conference' in Sharm El Sheikh in March 2015, which presented key investment opportunities to international investors to increase the country's economic growth.[5] Our novel dataset allows us to investigate whether, and in which sectors, FDI is a source of economic growth in Egypt. In fact, we are not aware of any econometric study that

[3] A similar argument is made by Ford et al. (2008), who analyze the impact of FDI on economic growth at the level of US states. Similarly, Zhang (2001) and Yao and Wei (2007) investigate the effect of FDI on economic growth in China using a panel of Chinese provinces.

[4] Our paper follows the recommendation by different researchers, such as Chakraborty and Nunnenkamp (2008), Chowdhury and Mavrotas (2006) and Dutt (1997), to conduct country case studies that investigate the growth effect of sectoral FDI.

[5] http://www.middleeasteye.net/news/high-hopes-egypts-economy-conference-bombs-rock-cairo-1705596510 (Accessed 2 November 2015).

investigates the determinants of economic growth on the level of Egyptian governorates. Our results, therefore, should be relevant for policymakers in Egypt.

We are only aware of one study at the national – not governorate – level by Massoud (2008), who attempts to investigate the impact of FDI inflows on economic growth in Egypt. However, our analysis is different from Massoud (2008) in many respects. Massoud (2008) investigates the impact of sectoral FDI on sectoral value-added and output growth, using annual observations from a panel of 24 sub-sectors for the period 1974-2005. Therefore, Massoud (2008) de facto analyzes short-term output growth effects of FDI in the recipient sub-sector, and not long-term aggregate economic growth effects of (sectoral) FDI, as interpreted by Massoud (2008).

That is, Massoud (2008) does not account for possible inter-industrial spillover effects between the different sub-sectors, which could result from vertical linkages between foreign firms and domestic suppliers. In fact, a body of literature on FDI-induced spillovers shows that vertical spillovers are widespread, whereas horizontal spillovers are very limited (Javorcik, 2004; Kugler, 2006; Blalock and Gertler, 2008).[6] Therefore, if FDI in one sub-sector creates spillovers from which other subsectors would benefit as well, then estimated growth effects of sectoral FDI by Massoud (2008) would be biased downwards in assessing the impact of sectoral FDI on economic growth. Our approach is different in that it allows for spillovers to occur within as well as between industries and sectors, as we investigate the effect of sectoral FDI on aggregate economic growth in the hosting region.

In addition, whereas we average our data over four-year-subperiods to remove the business cycle effect and investigate a long-term growth effect of FDI, Massoud (2008) uses annual observations and, thus, analyzes short-term sub-sectors' growth effects. Furthermore, panel regressions by Massoud (2008) do not account for possible time-specific effects that equally affect output in all economic sub-sectors and disregard the effect of domestic investments, thereby running the risk of omitted variables biasness.

Our findings support our hypothesis that sectoral FDI should not be treated as a homogenous group in terms of its impact on economic growth. We find no significant effect

[6] For example, Javorcik (2004) shows evidence for positive productivity spillovers from FDI through contacts between multinationals and their local suppliers (backward linkages), but does not find evidence for positive externalities within the same industry. We mention the rationale in section 2.

of aggregate FDI stock on economic growth in Egyptian governorates. However, when FDI stock is disaggregated by sector, we find a positive effect of manufacturing FDI, a negative effect of agricultural FDI and no significant effect of services FDI on economic growth, in line with propositions and cross-country findings by Alfaro (2003). Thus, our results suggest that differences in growth effects of FDI at the sectoral level, which could be even opposite-signed, might be one explanation for the ambiguous effect of aggregate FDI on economic growth in several macroeconomic studies. Our results show that it is the presence of foreign firms in the linkage-intensive manufacturing sector that seems to enhance economic growth.

We also test the hypothesis by Borensztein et al. (1998) that the effect of FDI on economic growth is conditional on local human capital. Our findings, however, do not support this hypothesis, neither for aggregate nor for sectoral FDI. Our result on aggregate FDI is in line with findings by Carkovic and Levine (2005) and Herzer et al. (2008) on developing countries and El-wassal (2012) on the case of Arab countries, and our result on sectoral FDI is in line with findings by Alfaro (2003).

The paper is structured as follows. Section 2 reviews the related literature and introduces our hypotheses. Section 3 introduces the data and estimation approach. Section 4 presents our estimation results and robustness checks. In Section 5 we present our conclusions.

2. Literature Review and Hypotheses

2.1. Growth Effects of (Aggregate) FDI

According to endogenous growth models, FDI is expected to have a long-run growth effect by generating technological transfer and diffusion (Barro and Sala-i-Martin, 1995). FDI is regarded as a 'composite bundle of capital stocks, know-how, and technology' that can play an important role for economic growth (De Mello, 1999). In addition to the capital inflows, the presence of foreign firms is expected to generate knowledge and technology spillovers that enhance aggregate productivity and growth (De Mello, 1997; Castellani and Zanfei,

2006). These spillovers would offset the effects of diminishing returns to capital of Solow-type models and thus, keep the economy on a long-term growth path (Herzer et al., 2008).[7]

Productivity spillovers take place when the entry or presence of foreign firms generate productivity or efficiency benefits for domestic firms, whereas the foreign firm is not able to fully internalize these benefits. The positive spillovers, in other words, take the form of positive externalities, which occur when domestic firms benefit from the superior knowledge of foreign firms without incurring a cost that exhausts the total gain from these benefits (Blomström and Kokko, 1998).[8]

Blomström and Kokko (1998) present a detailed overview of possible channels of productivity spillovers of activities of foreign firms.[9] The productivity and efficiency of local firms, for example, might improve as a result of forward or backward linkages with foreign firms[10], imitation of foreign firms, and increasing competition by foreign firms which might increase the efficiency of local firms. A further channel of productivity spillover is through hiring workers who were trained by foreign firms and who bring their learned knowledge, skills and technology. Furthermore, foreign firms' experience and knowledge about international markets may spill over to local firms. However, the impact of these potential channels likely depends on the strength and nature of economic linkages between foreign and local firms (Cipollina et al., 2012).[11]

While FDI-induced spillovers could be horizontal (intra-industrial) or vertical (inter-industrial), empirical literature shows that vertical spillovers through vertical linkages are more

[7] See Baldwin et al. (2005), for an endogenous growth model where multinational corporations (MNCs) directly affect the endogenous growth rate via technology spillovers.

[8] It is usually assumed that a foreign firm that enters a certain domestic market has some superior technology or knowledge that allows it to compete in a foreign country and/or compensate for the better knowledge of domestic markets by domestic firms (Graham and Krugman, 1991; Blomström and Kokko, 1998; Borensztein et al., 1998; Ford et. al., 2008).

[9] For theoretical work that models the importance of FDI as a channel for technology transfer, see Findlay (1978) and Wang and Blomström (1992).

[10] See, for example, Rodriguez-Clare (1996) for a theoretical model of FDI spillovers via backward linkages. In this framework, the intensive use of intermediate products by foreign firms increases the local variety of specialized inputs, which generates positive externalities to other final-good producers and enhances production efficiency in the host economy. For further examples of spillover channels through backward and forward linkages, see Javorick (2004).

[11] Few studies argue that the positive knowledge spillovers, as predicted by endogenous growth models, might not occur in developing countries (e.g., Aitken and Harrison, 1999; Görg and Greenaway, 2004; Herzer et. al., 2008). For example, multinationals might be able to protect their firm-specific knowledge or the technological gap between domestic and foreign firms might be too large (Görg and Greenaway, 2004). Moreover, multinationals might be procuring their intermediate inputs from foreign and not from local suppliers (Aitken and Harrison, 1999).

pronounced, whereas horizontal spillovers are very limited or even missing (Javorcik, 2004; Kugler, 2006; Blalock and Gertler, 2008). The reasoning is that whereas foreign firms have an incentive to minimize technology leakage to competitors, which might limit horizontal spillovers, they strongly benefit from productivity improvements of their local input suppliers. Moreover, while the technology gap between foreign and domestic producers may limit within-industry technology transfer, domestically purchased inputs are likely to be technically less sophisticated (Blalock and Gertler, 2008). Vertical spillovers could also be inter-sectoral, that is, the potential benefits are not necessarily limited to the sector that receives FDI, but may be diffused across different sectors and thus, to the rest of the economy, for example, through forward and backward linkages (Chakraborty and Nunnenkamp, 2008). Our dataset does not allow us to disentangle these different effects, however, our framework allows for the different channels to occur and to affect aggregate productivity in the hosting region. Ford et al. (2008) argues that if the total effect of FDI-generated spillovers is positive, the effect should be felt through increased economic growth rates.

Despite the large number of theoretical models on channels through which FDI can enhance growth, and despite the large number of empirical studies on the effect of FDI on economic growth, empirical findings are still inconclusive. Using cross-country growth regressions, some studies find a positive direct impact of FDI on economic growth (Li and Lui, 2005; Lensink and Morrissey, 2006), whereas other studies find no direct significant effect of FDI on economic growth (Borensztein et al., 1998; Alfaro, 2003; Alfaro et al., 2004; Carkovic and Levine, 2005). In a recent paper, Herzer (2012) finds that FDI, on average, has a negative effect on economic growth—with large differences in the effect across countries.

A body of literature shows that the effect of FDI on economic growth is conditional on prerequisite local characteristics such as human capital (Borensztein et al., 1998), level of development (Blomström et al., 1994), trade openness (Balasubramanayam et al., 1996) and local financial markets (Alfaro et al., 2004, 2010). However, these conditional effects of FDI were rejected by Carkovic and Levine (2005), Lensink and Morrissey (2006) and Herzer et al. (2008). Borensztein et al. (1998) use a cross-sectional analysis of FDI from industrialized to 69 developing countries in 1970-1989, showing that FDI only enhances economic growth when a minimum threshold of human capital exists in the host country. In their analytical

framework, the level of human capital in the host economy serves as an indicator for the ability of local firms to absorb and adapt foreign technology and knowledge. The study by Borensztein et al. (1998) is more relevant for our within-country analysis, where the human capital level varies between governorates, whereas institutions, financial markets and trade regime are largely homogenous.

Li and Liu (2005) conclude that "(t)he role of FDI seems to be country-based, and can be positive, negative, or insignificant, depending on the economic, institutional, and technological conditions in the recipient economy." Similarly, several studies emphasize that the causal relationship between FDI and economic growth is characterized by a considerable degree of heterogeneity and call for host country-specific studies (Chakraborty and Nunnenkamp, 2008; Chowdhury and Mavrotas, 2006; Nair-Reichert and Weinhold, 2001).

El-wassal (2012) and Neaime and Marktanner (2009), having investigating the effect of FDI on economic growth in Arab countries, find that FDI has no, or only very limited, growth-enhancing effect. Moreover, El-wassal (2012) rejects the hypothesis that the effect of FDI on economic growth is conditional on the level of human capital in Arab countries.

Hypotheses on Aggregate FDI

Using total FDI at the governorate level in Egypt, we test two hypotheses. First, we test the hypothesis that FDI has a direct positive impact on economic growth in the host region. Second, following Borensztein et al. (1998), we investigate human capital as a channel for the effect of FDI on economic growth. More specifically, we test the hypothesis that the effect of FDI depends on the level of human capital in the host region.

2.2. Growth Effects of Sectoral FDI

One possible reason for the inconclusive findings on the effect of FDI on economic growth is the use of highly aggregated FDI data, as similarly argued by Alfaro (2003), Nunnenkamp and Spatz (2004) and Alfaro and Charlton (2013). Most of the empirical studies on FDI-induced growth effects do not consider the varying impact of FDI across economic sectors, in part due to data limitations, especially in developing countries. The limited comparable cross-country datasets of sectoral FDI are mentioned in several studies that analyze the growth

effect of aggregate FDI (e.g., Blomström et al., 1994, Borensztein et al., 1998). El-wassal (2012) mentions that missing comparable data on FDI sectoral composition in Arab countries makes a distinction of sector-specific growth effects impossible.

However, potential FDI-induced growth effects are expected to differ across the primary, manufacturing and service sectors (Alfaro, 2003; Chakraborty and Nunnenkamp, 2008; Wang, 2009; Alfaro and Charlton, 2013). The idea that different sectors vary in their potential to absorb foreign technology and to create linkages with the rest of the economy was discussed in the seminal work on economic development by Hirschman (1958). Accordingly, FDI-receiving sectors are expected to differ in their potential for FDI-induced productivity enhancing spillovers (Alfaro, 2003; Chakraborty and Nunnenkamp, 2008).

According to Alfaro (2003), FDI-related transfers of technology and know-how and introduction of new processes primarily occur in the manufacturing sector. In fact, most of the theoretical work on FDI-associated benefits is related to the manufacturing sector. Manufacturing FDI predominantly transfers 'hard technology' such as equipment and industrial processes, compared to services FDI, which typically transfers 'soft technology' such as management and marketing know-how and organizational skills (Doytch and Uctum, 2011). The manufacturing sector encompasses a broad range of linkage-intensive activities (UNCTAD, 2001). These likely generate positive externalities from foreign to domestic firms and increase aggregate productivity (Chakraborty and Nunnenkamp, 2008). Rodriguez-Clare (1996), who theoretically models the ability of FDI to create linkages to the host country, shows that the linkage effect is more favorable when multinationals intensively use intermediate goods in their production, which is more likely in the manufacturing sector. A body of literature of FDI-induced spillovers focusing on manufacturing FDI, empirically shows the widespread occurrences of spillovers through vertical linkages compared to the limited horizontal spillovers (Javorcik, 2004; Kugler, 2006; Blalock and Gertler, 2008). Our analysis also allows for inter-sectoral spillovers of sectoral FDI through linkages across sectors as we investigate the effect of sectoral FDI on aggregate economic growth in the hosting region.

The growth effects of FDI in the service sector seem to be a priori more ambiguous, as argued by Chakraborty and Nunnenkamp (2008). In contrast to the manufacturing sector, the potential for linkages and spillovers between foreign and local firms is limited in the service sector due to the restricted scope for dividing production into separate stages and

subcontracting out large parts to local firms (UNCTAD, 2001; Alfaro, 2003). This limits the potential for productivity enhancing spillovers (Chakraborty and Nunnenkamp, 2008). However, if FDI in the service sector improves the quality of services in the host country, this is expected to positively affect the productivity of other sectors in the economy as well (Aykut and Sayek, 2007). This would be the case, for example, if service FDI enhances the efficiency of business services, which are used throughout the economy (Chakraborty and Nunnenkamp, 2008).[12]

The growth effects of agricultural FDI are also a priori ambiguous. The literature on agricultural FDI mentions the typical potential theoretical benefits of FDI activities, such as increasing capital inflows, technology transfer and dissemination, better access to foreign markets, improving infrastructure and forward and backward linkages that attract complementary investment (UNCTAD, 2009; Songwe and Deininger, 2009; Hallam, 2011). However, this body of literature also emphasizes that these effects depend on several factors such as the type of agricultural product as well as policy and institutional arrangements.[13] Spillover and multiplier effects would fail to occur if agricultural FDI projects have an enclave character, whereas joint ventures offer more spillover benefits for the host economy (Hallam, 2011). UNCTAD (2001) and Alfaro (2003) argue that, as in the services sector and in contrast to the manufacturing sector, the scope for linkages and spillover potential between foreign and domestic firms is rather limited in the agriculture sector, thereby restricting the effect of agricultural FDI in promoting economic growth.[14]

The limited body of empirical literature on cross-country effects of sectoral FDI on economic growth supports the notion that the effects vary across different sectors. Alfaro (2003), using a cross-sectional analysis of 47 countries, shows that whereas the effect of aggregate FDI flows on economic growth is ambiguous, the effect of FDI on economic growth differs across sectors. FDI flows in the primary sector have a negative effect, manufacturing FDI has a

[12] Moreover, FDI in services could generate inter-sectoral positive spillovers through forward linkages. For example, manufacturing firms may benefit from their interaction with foreign services suppliers through spillovers of management or organizational knowledge. Foreign service suppliers are likely to be less concerned about leakages of knowledge to a different sector (Fernandes and Paunov, 2012).

[13] For example, positive benefits from FDI likely depend on the contractual design of FDI (e.g., Songwe and Deininger, 2009; UNCTAD, 2009; Deininger et al., 2011; Halam, 2011).

[14] Opponents of agriculture-led growth argue that agriculture does not have strong linkages to other sectors and the innovation required for enhancing productivity and growth (Lewis 1954; Hirschman 1958; Fei and Ranis 1961). For a recent review of the literature on the opposing viewpoints and mixed empirical findings regarding the role of agriculture for economic growth, see Awokuse and Xie (2015).

positive effect and findings from the service sector show that FDI flows here have insignificant effects on growth. Alfaro (2003) further rejects the hypothesis that the growth effect of FDI in any of the three sectors depends on human capital. Using a panel dataset for 12 Asian economies in the period 1987-1997, Wang (2009) finds a significant growth-enhancing effect of manufacturing FDI and an insignificant effect of non-manufacturing FDI.[15] Using cross-country data between 1990 and 2003, Aykut and Sayek (2007) find a positive effect of FDI on economic growth when the sectoral composition of FDI is skewed towards the manufacturing sector, and a negative effect when the sectoral composition is skewed towards the service or primary sectors. Analyzing intra-sectoral and cross-sectoral growth effects of manufacturing and services FDI, Doytch and Uctum (2011) find a positive effect of manufacturing FDI on the manufacturing output growth, especially in low income countries and find mixed effects of service FDI. Chakraborty and Nunnenkamp (2008) find that, in India, positive growth effects stemming from FDI are largely restricted to the manufacturing sector and are missing in the primary sector.

None of the aforementioned studies that compare the effects of sectoral FDI investigate the effect of FDI in agriculture separately. Agricultural FDI is only included in some of these studies as a part of FDI in the primary sector (Alfaro 2003; Aykut and Sayek 2007; Chakraborty and Nunnenkamp 2008), suggesting a negative effect of FDI in the primary sector on economic growth. Generally, despite the abundant empirical literature on the long-term effect of FDI on economic growth, studies on the effect of agricultural FDI on economic growth are scarce. Recent studies emphasize problems of availability and reliability of agricultural FDI data in developing countries, (e.g., UNCTAD, 2009; Deininger et al., 2011; Hallam, 2011; Liu, 2014) and in the case of Arab countries (Tanyeri-Abur and Elamin, 2011), which limits empirical research. Research on the impacts of agricultural FDI in developing countries mainly relies on country case studies and shows mixed results on technology transfer (Gerlach and Liu, 2010; Hallam, 2011; FAO, 2013; Liu, 2014). According to UNCTAD (2009), technology transfers by agricultural multinationals in developing countries are limited. However, a study on Egypt by FAO (2009) reports productivity enhancing technology spillovers and an increase in value added by agricultural FDI. In

[15] However, Wang (2009) uses annual observations of GDP per Capita growth rates due to the limited number of observations and thus might be putting too much emphasis on business cycle fluctuations.

contrast to this, Massoud (2008) finds a negative effect of agriculture FDI inflows on value-added growth and output growth in the same agricultural sub-sectors in Egypt.[16]

Hypotheses on Sectoral FDI

We argue that FDI should not be treated as a homogenous group in terms of its effect on economic growth. Sectoral FDI can have different, or even opposite-signed, effects on economic growth. We use sectoral FDI at the governorate level to further test two sets of hypotheses. First, we hypothesize that the effect of sectoral FDI on economic growth varies according to the FDI receiving sector. Following the reviewed literature, we expect manufacturing FDI to have a positive effect on economic growth and remain exploratory on the growth effect of FDI in the services and agriculture sectors. Second, as in our analysis for aggregate FDI, we further test whether the effect of sectoral FDI on economic growth depends on human capital.

3. Data and Estimation Approach

3.1. FDI in Egypt

As in many other countries, attracting FDI is an important target of Egyptian policymakers. FDI policies and data in Egypt are described thoroughly in Hanafy (2015a). Our FDI data at the governorate level are based on registered investments by foreign firms at the General Authority for Investment and Free Zones (GAFI).[17] The data from GAFI only include greenfield FDI and company expansions[18] and does not include investments in the petroleum sector. Consequently, our dataset captures only 'non-petroleum greenfield FDI' in Egypt. For the sake of simplicity, we mostly use 'FDI' in this paper as shorthand for 'non-petroleum greenfield FDI'.

[16] Massoud (2008) further finds no significant direct effect of FDI inflows in manufacturing and services sub-sectors on the respective sub-sector's value added growth and output growth.
[17] FDI data by the Central Bank of Egypt (CBE) are not reported at the governorate level.
[18] In fact, separating the effect of greenfield FDI from mergers and acquisitions (M&A) while investigating their effect on economic growth is consistent with literature recommendations and findings by Wang and Wong (2009) and Harms and Méon (2014). However, data on M&A in Egypt are not available at the governorate level to test hypotheses on differences in growth effects by FDI mode.

Hanafy (2015a) thoroughly describes the development and characteristics of FDI in Egypt since the beginning of the open-door policy in the 1970s, based on the GAFI dataset. Here, we briefly mention relevant facts for the time period of our model analysis in 1992–2007. The contribution of FDI inflows to GDP increased together with the strong increase of real FDI inflows to Egypt starting in mid 2000s (Figure A.1 in the Appendix). In 2007, non-petroleum greenfield FDI inflows constituted 5% of the country's GDP.[19] The same period saw an acceleration of GDP per capita growth rate in Egypt, which reached 5% in 2007. Non-petroleum greenfield FDI on average contributed 24% of total non-petroleum private investment in 1992–2007. This contribution more than doubled from 15% in 1992–1999 to 33% in 2000–2007, reflecting the increasing contribution of foreign investments.

In a manner similar to domestic private investment (DPI), non-petroleum greenfield FDI inflows in Egypt mainly target the manufacturing and services sectors. In 1992–2007, an annual average of 41% of FDI targeted the manufacturing sector, 56% was directed to the service sector and only 3% went to the agricultural sector.[20] The average sectoral composition of DPI is quite similar to FDI inflows (36% manufacturing, 60% services, 4% agriculture). FDI has a non-negligible contribution to private investment in all three sectors. In the same time period, FDI, on average, accounted for 25% of private investments in manufacturing, 23% of private investments in services and 18% of private investments in agricultural.

The geographic distribution of FDI in Egypt is highly uneven (Hanafy, 2015a, 2015b). Egypt has 27 governorates, but 60% of FDI flows in Egypt were almost equally directed to the governorates of Cairo and Giza in 1992–2007. Moreover, roughly 90% of FDI flows targeted only 10 governorates. Regarding the geographical distribution of sectoral FDI, FDI in services

[19] The stock of non-petroleum greenfield FDI accounted for 23% of GDP in 2007.

[20] On average, over our time period, the breakdown of services FDI flows is as follows: finance (34%), tourism (27%), construction (12%), ICT (7%), 'other services' (20%). We do not have data from GAFI on the breakdown of manufacturing FDI and agricultural FDI. However, according to the American Chamber of Commerce in Egypt (2008), manufacturing FDI stock in 2007 consists of FDI in chemicals (27%), building materials (21%), food and beverages (16%), pharmaceuticals (11%), engineering (9%) and others (15%). In our dataset, FDI in agriculture includes land reclamation and cultivation, livestock, poultry farming, fish and slaughter houses. According to FAO (2011), the majority of agricultural FDI is directed to land reclamation and cultivation projects.

shows the strongest concentration, whereas manufacturing FDI is the most geographically dispersed.[21]

3.2. Estimation Approach

Our estimation models for FDI-induced growth at the governorate level in Egypt are derived from an endogenous growth model, building on the cross-country analysis by Borensztein et al. (1998) and on Ford et al. (2008), who investigate the growth effects of FDI in US states. The growth literature is robust with benefits of using within-country datasets (Ford et al., 2008). These include governorates' similarity in terms of culture, language, legal framework and institutional characteristics as well as the consistency of data collection process.

Our empirical strategy is straightforward. In a first step, we estimate the effect of total FDI across all sectors on economic growth. In a second step, we investigate the impact of sectoral FDI on economic growth. In addition to the FDI variable(s), our panel data regression model of 26 Egyptian governorates over the period 1992–2007 includes the standard growth explanatory variables domestic investment, human capital and initial per capita GDP.[22] We average our data over four-year-subperiods to remove the business cycle effect.[23] This is consistent with the underlying growth theories, which do not attempt to explain short-run business fluctuations but rather long-run growth effects (Barro, 2013). Our panel is unbalanced due to lack of data on the population-scarce frontier governorates in the 1990s.

3.2.1. Aggregate FDI (Across all Sectors)

As a benchmark model, we first estimate the direct effect of aggregate FDI on economic growth at the governorate level—that is, we do not distinguish between FDI sectors—, based on the following panel regression model (1):

[21] For more details on the distribution of aggregate and sectoral FDI at the governorate level, see Hanafy (2015a).

[22] Egypt consists of 27 governorates. However, we merged the governorates Qena and Luxor for the sake of data consistency, as most data sources do not report separate data for Luxor for our sample period. Luxor was only split from the governorate Qena to become a single governorate in 2010.

[23] We opt for four-year-averages due to the limited time span of our sample. The four-year-subperiods for our dependent variable are constructed for the intervals 1996–1999, 2000–2003 and 2004–2007. The model timeframe is restricted by available data on GDP.

$$(1) \quad Y_{it} = \alpha_i + \beta_1 * FDI_{it} + \beta_2 * DPI_{it} + \beta_3 * PI_{it} + \beta_4 * y(0)_{it} + \beta_5 * H_{it} + \mu_t + \eta_{it}$$

α_i denotes the governorate-specific effect, which accounts for unobserved heterogeneity due to time-invariant governorate characteristics such as their geographical location.[24] μ_t captures time-specific effects that equally affect economic growth in all governorates. η_{it} is an error term; we use cluster-robust standard errors.

Our dependent variable, Y_{it}, is the average real GDP per capita growth rate of a given governorate i over a four-year-period t. FDI_{it} is the average ratio of FDI to GDP over a four-year-period.[25] We use FDI stock as a measure for FDI, following Nunnenkamp and Spatz (2004), Ford et al. (2008) and Cipollina et al. (2012). In fact, some studies justified the use of FDI flows by the lack of data on FDI stock (e.g., Borensztein et al., 1998). First, using FDI as a stock measure is more consistent with growth theory and FDI theories (Nunnenkamp and Spatz, 2004; Ford et al., 2008). This is because growth-enhancing spillovers are not only restricted to recent FDI inflows but should also result from FDI received in previous periods. Thus, using a flow measure of FDI does not capture the total long-term growth impact of FDI. Second, using FDI flows is more likely to cause endogeneity problems as higher economic growth could cause higher FDI inflows. However, endogeneity is reduced considerably when using FDI stocks, as these include investments undertaken long before the considered period of economic growth (Dutt, 1997; Nunnenkamp and Spatz, 2004; Cipollina et al., 2012).

DPI_{it} is the average ratio of domestic private investment to GDP over each time period. PI_{it} is the average ratio of public investment to GDP. The initial level of real per capita GDP at the start of each period, $y(0)_{it,}$ accounts for the conditional convergence hypothesis, that is, the idea that poor governorates tend to grow faster than rich governorates relative to their steady state ('catching-up' effect). H_{it} is the average stock of human capital in each governorate over the period t. We measure human capital as the percentage of labour force with at least a secondary education. Our measure has the advantage of measuring the actual education level of the labour force. We use the percentage of the labour force holding a university degree as a robustness check. We lag the explanatory variables by one period to

[24] The governorate dummy also captures the urbanisation rate as well as port and airport availability at the governorate level, since available data show that these variables have hardly changed over time during our sample period (Hanafy, 2015b).

[25] The FDI-to-GDP-ratio is used to control for the size of the host governorate, since growth effects of FDI should depend on the relative importance of FDI in the host governorate, rather than its absolute size.

avoid endogeneity and to allow the different explanatory variables to have an impact on economic growth. The model predicts a positive effect of FDI, investment and human capital and a negative effect of initial income. More information on the variables and data sources can be found in the Appendix.

To test the hypothesis that the growth effect of FDI depends on the level of human capital in the host region (Borensztein et al., 1998), Model 2 extends Model 1 by including an interactive term of FDI with our human capital variable.

$$(2) \quad Y_{it} = \alpha_i + \beta_1 * FDI_{it} + \beta_2 * DPI_{it} + \beta_3 * PI_{it} + \beta_4 * y(0)_{it} + \beta_5 * H_{it} + \beta_6 * (FDI_{it} x\ H_{it}) + \mu_t + \eta_{it}$$

3.2.2. FDI at the Sectoral Level

To test the hypothesis that the effect of FDI on economic growth is different across sectors, we allow in Model 3 for the FDI-induced growth effect to vary according to manufacturing, agriculture, and service sectors. Our analysis also allows for inter-sectoral externalities of sectoral FDI as we investigate the effect of sectoral FDI on aggregate economic growth in the hosting region. We also disaggregate domestic private investment according to the same sectors to allow for more insight into the growth effect of domestic private investment.

$$(3) \quad Y_{it} = \alpha_i + \beta_1 * FDI_{it}^{Manf} + \beta_2 * FDI_{it}^{Agri} + \beta_3 * FDI_{it}^{Serv} + \beta_4 * DPI_{it}^{Manf} + \beta_5 * DPI_{it}^{Agri} + \beta_6 * DPI_{it}^{Serv} + \beta_7 * PI_{it} + \beta_8 * y(0)_{it} + \beta_9 * H_{it} + \mu_t + \eta_{it}$$

Finally, we use Model 4 to test whether the effect of sectoral FDI on economic growth depends on the local stock of human capital. To do this, we estimate an extended version of model 3 by including interaction terms of FDI in each sector with human capital.

$$(4) \quad Y_{it} = \alpha_i + \beta_1 * FDI_{it}^{Manf} + \beta_2 * FDI_{it}^{Agri} + \beta_3 * FDI_{it}^{Serv} + \beta_4 * DPI_{it}^{Manf} + \beta_5 * DPI_{it}^{Agri} + \beta_6 * DPI_{it}^{Serv} + \beta_7 * PI_{it} + \beta_8 * y(0)_{it} + \beta_9 * H_{it} + \beta_{10} * (FDI_{it}^{Manf} x\ H_{it}) + \beta_{11} * (FDI_{it}^{Agri} x\ H_{it}) \beta_{12} * (FDI_{it}^{Serv} x\ H_{it}) + \mu_t + \eta_{it}$$

4. Results

Table 1 provides the panel regression results of Models 1 and 2, in which we use aggregate FDI as our FDI explanatory variable. Table 2 shows the results of Models 3 and 4, in which we use disaggregated FDI at the sectoral level. All models include governorate fixed effects (the Hausman-test rejects a random-effects model in favour of the fixed-effects model) and time fixed effects (the time dummies are jointly significant at the 1% level in all models).

4.1. Aggregate FDI (Across all Sectors)

Table 1: Fixed effects estimation results using aggregate FDI stock

	Model 1	Model 2
FDI stock (in % of GDP)	0.118	0.458
	(0.074)	(0.635)
DPI (in % of GDP)	0.223***	0.202***
	(0.064)	(0.067)
Public investment (in % of GDP)	0.436	0.508
	(0.341)	(0.338)
Initial GDP per capita	-0.010***	-0.009***
	(0.0012)	(0.0016)
H: Secondary education (% labour force)	0.148	0.206
	(0.118)	(0.165)
FDI*H		-0.005
		(0.009)
Constant	19.68**	14.32
	(7.333)	(12.02)
(1) Model joint significance	F(7,25)=23.07***	F(8,25)=26.29***
(2) Time dummies (jointly significant)	yes	yes
(3) Joint significance of insignificant variables?	no	no
(4) Observations	68	68
(5) R-squared (within model)	0.711	0.715

Notes: (i) *, **, *** indicate significance at a 10%, 5%, and 1% level, respectively. (ii) Dependent variable is growth of real per capita GDP. (iii) Cluster-robust standard errors are used and reported in parentheses below each coefficient estimate.

The first column of Table 1 provides our regression results for Model 1, using aggregate FDI stock as our FDI explanatory variable. The model is jointly significant at the 1% level, as shown by the F-test of joint significance in line 1 at the bottom of the Table. Note that the insignificant variables in Model 1 are also jointly insignificant.

The coefficient for the direct effect of aggregate FDI stock on economic growth is positive, but the effect is not significant at conventional significance levels. Our result is in line with

several previous cross-country studies that do not find support for a significant direct effect of aggregate FDI on economic growth in developing countries (e.g., Borensztein et al., 1998; Alfaro, 2003; Alfaro et al., 2004; Carkovic and Levine, 2005; Herzer et al., 2008) and in the specific case of Arab countries (Neaime and Marktanner, 2009; El-wassal, 2012).

We find that domestic private investment is a significantly important source of economic growth in Egyptian governorates, whereas the effect of public investment is not statistically significant. Specifically, a 1 percentage point (pp) higher share of DPI in GDP is associated with a 0.22 pp increase in GDP per capita growth rate of the host governorate. The effect is significant at the 1% level.[26]

As to initial GDP per capita, this variable has a negative and statistically significant coefficient at the 1% level, supporting the conditional convergence hypothesis. Our result suggests that poor governorates tend to grow faster than rich governorates in per capita terms, supporting a catching-up effect by poor governorates. Specifically, an additional real per capita GDP of 1000 EGP (at 1992 prices) reduces the economic growth rate at the governorate level by about 10 pp.[27] Finally, our human capital variable of percentage of labour force with at least a secondary school education is insignificant. That is, we do not find a positive effect of human capital on economic growth in Egyptian governorates.

The second column in Table 1 presents our estimation results of Model 2, which extends Model 1 by including an interactive term of FDI stock with human capital. The results show no significant effect of the interactive term. Moreover, the three variables FDI, human capital and their interactive term (FDI*H) are jointly insignificant ($F(3,25)=0.87$). Consequently, we reject the hypothesis that the impact of aggregate FDI on economic growth depends on the local level of human capital. This result differs from that of Borensztein et. al. (1998) and Li and Liu (2005), but is similar to findings by Carkovic and Levine (2005) and Herzer et al. (2008) for developing countries and El-wassal (2012) for Arab countries.

[26] Note that we do not investigate whether FDI and DPI are complementary in their growth effect, by including an interactive term of FDI and DPI due to induced collinearity.

[27] This is not a trivial impact, as the average governorate's real GDP per capita varies between 2000 and 6500 EGP during our sample period.

4.2. FDI at the Sectoral Level

Table 2: Fixed effects estimation results using sectoral FDI stock

	Model 3.1	Model 3.2	Model 4
Manufacturing FDI (in % of GDP)	0.202	0.121*	-0.168
	(0.149)	(0.070)	(0.730)
Agriculture FDI (in % of GDP)	-1.132	-1.114***	2.391
	(0.819)	(0.361)	(2.919)
Services FDI (in % of GDP)	-0.103		0.782
	(0.407)		(0.794)
Manufacturing DPI (in % of GDP)	0.252	0.348**	0.274
	(0.184)	(0.131)	(0.188)
Agriculture DPI (in % of GDP)	-1.116	-0.804	-2.643
	(2.347)	(2.346)	(2.407)
Services DPI (in % of GDP)	0.231		0.188
	(0.198)		(0.240)
Public investment (in % of GDP)	0.970	0.689	1.431**
	(0.726)	(0.475)	(0.690)
Initial GDP per capita	-0.010***	-0.010***	-0.008***
	(0.0013)	(0.0011)	(0.0013)
H: Secondary edu (% labour force)	0.089		0.170
	(0.150)		(0.187)
Manufacturing FDI*H			0.007
			(0.011)
Agriculture FDI*H			-0.060
			(0.046)
Services FDI stock *H			-0.019*
			(0.010)
Constant	20.16**	26.84***	12.85
	(9.368)	(3.788)	(12.40)
(1) Model joint significance	F(11,25)=18.96***	F(8,25)=23.43***	F(14,25)=39.62***
(2) Time dummies (jointly signif.)	yes	yes	yes
(3) Joint significance of insignificant variables?	yes: (F(8,25)=4.74***)	no: (F(2,25)=1.26)	yes: (F(9,25)=6.00***)
(4) Observations	68	68	68
(5) R-squared (within model)	0.726	0.716	0.760

Notes: See Table 1. Manufacturing, agricultural and services FDI are in stock measures (in % of GDP).

The first column of Table 2 provides our regression results for Model 3, in which we distinguish between FDI and DPI in the manufacturing, agriculture and services sector, respectively (model specification 3.1). Our main interest is to test the hypothesis that the FDI-induced growth effect varies between the different sectors. Model 3.1 is jointly significant at the 1% level, as shown by the F-test of joint significance in line 1 at the bottom of Table 2. However, the model suffers from collinearity, as indicated by the F-test of joint significance of insignificant variables in line 3. The model's eight insignificant variables are jointly significant at the 1% level (F(8,25)=4.74***). The three sectoral FDI variables

(F(3,25)=9.78***) and the three sectoral DPI variables (F(3,25)=3.73**) are also jointly significant, respectively.[28]

To be able to distinguish the effects of sectoral FDI on economic growth, we need to reduce model specification 3.1 to a model without collinearity. The variables services FDI, services DPI and secondary education are jointly insignificant (F(3,25)=0.45) in 3.1. Dropping these three variables provides the more efficient model specification 3.2, which is jointly significant at the 1% level. Note that the two insignificant variables (agricultural DPI and public investment) are not jointly significant (F(2,25)=1.26).

Accordingly, our results imply that services FDI stock has no significant effect on economic growth in Egypt, which is in line with cross-country findings by Alfaro (2003) and results for Asian countries by Wang (2009). Our result seems to support the propositions by UNCTAD (2001) and Alfaro (2003) on limited potentials for linkages and positive productivity spillover effects from foreign firms in the service sector to domestic firms. This finding, together with the insignificant effect for services DPI, further suggests the insignificant role of private investments in services for economic growth in Egypt.

The results of the reduced model 3.2 show a positive effect of manufacturing FDI and a negative effect of agricultural FDI on economic growth.[29] Specifically, a 1 pp higher ratio of manufacturing FDI stock to GDP increases economic growth by 0.12 pp, significant at the 10% level. Contrarily, we observe that a 1 pp higher ratio of agriculture FDI stock to GDP is associated with lower economic growth in the host governorate by 1.1 pp, significant at the 1% level. Our findings support our hypothesis that sectoral FDI should not be treated as a homogenous group in terms of its impact on economic growth. In fact, our findings show opposite-signed growth effects of FDI at the sectoral level. The opposite-signed growth effects of FDI when disaggregating FDI by sector offer one explanation for the insignificant effect of aggregate FDI stock in Model 1 of Table 1.[30]

[28] Note that a model that includes aggregate DPI and distinguishes between sectoral FDI only is still subject to collinearity, making an identification of the FDI effect on economic growth, by sector, impossible.

[29] Our findings on the effect of sectoral FDI on economic growth are robust to estimating model 3.1 without time dummies, which shows a positive effect of manufacturing FDI stock, a negative effect of agricultural FDI and an insignificant effect of services FDI.

[30] Despite the large negative coefficient of agricultural FDI, the weight of this negative effect on the impact of aggregate FDI on economic growth in Egypt is rather small, as agricultural FDI accounts for only 3% of FDI flows, on average, of our sample period.

In the following, we discuss these results in more detail. In line with theoretical expectations, the presence of foreign firms in the manufacturing sector seems to enhance aggregate productivity and growth, for example, through generating knowledge and technology transfer and spillovers to local firms. These productivity spillovers by manufacturing FDI could be within the manufacturing sector, as well as through linkages to other sectors.[31] Again, our result echoes cross-country findings by Alfaro (2003), Aykut and Sayek (2007) and Wang (2009).

We also find a positive significant effect of manufacturing DPI on economic growth. Specifically, a 1 pp increase in manufacturing DPI (in % of GDP) increases economic growth by 0.35 pp, significant at the 5% level. Thus, our results for manufacturing FDI and DPI suggest that private investments in the manufacturing sector play a significant role in enhancing economic growth in Egyptian governorates.

Our results, in addition, show that FDI in the agricultural sector did not go in hand with higher economic growth. In fact, governorates that received more agricultural FDI significantly experienced lower economic growth. Our findings support the reasoning in section 2 that the scope for linkages and technology transfer is typically limited in the agricultural sector (UNCTAD, 2001, 2009).[32] Model 3.2 further shows no significant effect of agricultural DPI on economic growth. Our findings on lacking growth effects of agricultural FDI and DPI in Egypt seem to support the viewpoint of opponents of agriculture-led growth and may reflect the low productivity of agricultural investments in Egypt, as shown by Tanyeri-Abur and Elamin (2011).[33]

Similar to our results from Model 1 of Table 1, the effect of public investment on economic growth is not statistically significant in model specification 3.2. Moreover, our results continue to support the conditional convergence hypothesis, which remains significant at the 1% level. The magnitude is also similar to that from Model 1.

[31] Making data on sectoral output growth available for researchers at the governorate-level would make it possible to differentiate intra-sectoral and inter-sectoral growth effects of FDI by sector.

[32] The productivity enhancing spillovers effects, as reported by FAO (2009) for agricultural FDI in Egypt, do not seem to result in positive effects of agricultural FDI on economic growth. One reason might be their inclusion of agriculture-related industries (e.g., food processing), which are part of manufacturing and not agricultural investment in our dataset. The negative effect of agricultural FDI on economic growth might be partly driven by the negative effect of agricultural FDI flows on the sector's value added and output growth, as shown by Massoud (2008).

[33] On problems of the Egyptian agriculture sector, see FAO (2011).

Finally, we estimate Model 4, to investigate whether the impact of sectoral FDI on economic growth depends on the stock of human capital (third column of Table 2). We extend the general model 3.1 by three interactive terms, that is, an interactive term of human capital with FDI in each sector. Model 4 is jointly significant, but the model suffers from collinearity, as indicated by the F-test of joint significance of insignificant variables in line 3. The test result shows that the nine insignificant variables are jointly significant at the 1% level (F(9,25)=6.0***).

Yet, our results show that the effect of sectoral FDI on economic growth does not positively depend on human capital: first, the insignificant interactive terms for manufacturing FDI (manufacturing FDI*H) and agricultural FDI (agriculture FDI*H) are jointly insignificant (F(2, 25)=0.99), rejecting the notion that the effect of manufacturing FDI or agricultural FDI on economic growth depends on labour force education. Second, regarding services FDI, our results show a negative coefficient for the interactive term with significance at the 10% level. At first, this seems to suggest that services FDI is growth-enhancing in governorates with *lower* human capital. However, we are cautious not to over-interpret this 'counterintuitive' finding.[34] At any rate, our results do not support that higher human capital increases the absorptive capacity of possible benefits of services FDI in Egypt. Hence, we conclude that—similar to the case of aggregate FDI—the effect of sectoral FDI on economic growth does not positively depend on the stock of human capital in the host governorate. Again, our results are in line with cross-country findings by Alfaro (2003).

4.3. Robustness Checks

Our results are robust to several robustness checks. To economize on space, we do not present the results here.[35] First, our results are robust to rerunning our regression models based on the available balanced panel, which slightly lowers our number of observations.

[34] In fact, when the governorate Giza, which hosts the largest amount of services FDI in Egypt, is excluded from our sample, the interactive term (services FDI*H) is no longer significant at any conventional level. In this case, the three interactive terms for the three sectors are jointly insignificant. Note that our FDI results of Model 3.2 are robust to excluding the governorate Giza. Moreover, Model 4 (including Giza) can be reduced to an extended version of model 3.2, which includes the interactive term (services FDI*H) in addition to the variables of 3.2 (Testing-down restriction: F(5,25)=1.92). Estimating this reduced model shows that the interactive term is no longer significant and our further results remain robust. In fact, manufacturing FDI becomes significant at the 5% level with a larger magnitude of 0.24 (all results available upon request).

[35] All additional results are available upon request.

Second, our results are qualitatively robust to using FDI flow instead of FDI stock as an explanatory variable. Third, substituting our human capital variable on secondary education with the share of labour force that holds a university degree does not change our results on human capital: (1) the effect of university education is also insignificant for economic growth in Egyptian governorates. (2) Our results do not support the notion that the effect of FDI (both aggregate and sectoral FDI) on economic growth increases with an increasing level of labour force education.

5. Concluding remarks

Using panel data regressions at the governorate level in Egypt, our findings support the idea that FDI should not be treated as a homogenous group in terms of its impact on economic growth. Our results show no significant effect of aggregate FDI stock on economic growth in Egyptian governorates. However, when we disaggregate FDI stock by sector, we find a positive effect of manufacturing FDI, a negative effect of agricultural FDI and no significant effect of services FDI on economic growth, in line with cross-country findings by Alfaro (2003). Thus, our results suggest that contradictory growth effects of FDI at the sectoral level might be one explanation for the ambiguous effect of aggregate FDI on economic growth in several macroeconomic studies.

Moreover, our results do not support the notion that the effect of aggregate or sectoral FDI on economic growth depends on human capital. Using different levels of labour force education does not alter our empirical results. This finding suggests that the level of labour force education in the host governorate does not serve as a good indicator for the ability of local firms to absorb foreign technology and knowledge.

As to the other explanatory variables, our regression models support the conditional convergence hypothesis, supporting a catching-up effect by poor governorates. Regarding domestic investment, our results show that DPI has a positive and significant effect on economic growth, whereas the effect of public investment is not statistically significant. The positive effect of DPI seems to be driven by DPI in manufacturing, which further highlights the importance of investments in the manufacturing sector for economic growth in Egypt.

Our results suggest that Egypt could benefit more from FDI if more FDI is attracted to the manufacturing sector. Encouraging more FDI in Egypt's manufacturing sector would promote economic growth. Moreover, policies that encourage manufacturing DPI in Egypt seem to be beneficial for two reasons. First, our results show that manufacturing DPI promotes economic growth in Egypt. Second, FDI flows to Egypt (also in the manufacturing sector) seem to be attracted to regions with more DPI, as shown by Hanafy (2015b). Thus, our findings seem to justify existing special incentives for FDI and DPI projects in the manufacturing sector in Egypt, such as in Industrial Zones and Free Zones.[36]

Our results on the effect of investment in agriculture on economic growth seem to be in line with opponents of agricultural-led growth. Agricultural FDI in Egypt seems to slowdown economic growth. However, one should be cautious about recommending limiting agricultural FDI based on this finding alone. Further studies need to assess the impact of agricultural FDI on further factors, such as food security, employment creation and poverty. Given the low investments in the Egyptian agricultural sector, agricultural FDI might be contributing by filling the investment gap in this sector (FAO, 2011; Hanafy, 2015a). Moreover, linkages to investments in food processing, food services and other agriculture-related industries, which are not part of agriculture investment data, need to be further analyzed.

Finally, some limitations of our dataset and analysis should be addressed. First, if FDI-induced spillover effects also occur across governorates in Egypt, then our model would be underestimating the long-term effect of FDI. Future research could expand our model by employing spatial econometric techniques to possibly account for this issue. Second, our results show that total FDI in the service sector did not significantly contribute to economic growth. Future research should further investigate whether this result holds for the different services subsectors. Third, although macro-level studies on the growth effects of FDI have the merit of measuring aggregate growth effects of aggregate and sectoral FDI, they remain limited in identifying and measuring the channels of spillover effects through which FDI promotes economic growth. If data on sectoral output growth were made available for researchers at the governorate-level, for example, it would be possible to differentiate intra-

[36] For example, facilitating the financing of domestic projects through financial market development could promote positive spillovers between foreign and domestic firms (Alfaro et al., 2010). According to Dobronogov and Iqbal (2005), the inefficiency of financial intermediation is a constraint on economic growth in Egypt.

sectoral and inter-sectoral growth effects of FDI by sector. Moreover, if a panel of firm-level data (e.g., similar to the data by Kugler (2006) on Columbian firms) became available, future work could complement our analysis with more insights on identifying inter-industrial and intra-industrial spillover effects from FDI firms.

References

Aitken, B.J. & Harrison, A.E. (1999). Do domestic firms benefit from direct foreign investment? Evidence from Venezuela. *American Economic Review, 89(3),* 605–618.

Alfaro, L. (2003). Foreign direct investment and growth: Does the sector matter? *Harvard Business School*, 1–31.

Alfaro, L., Chanda, A., Kalemli-Ozcan, S., & Sayek, S. (2004). FDI and economic growth: The role of the financial markets. *Journal of International Economics, 64(1)*, 89–112.

Alfaro, L., Chanda, A., Kalemli-Ozcan, S., & Sayek, S. (2010). Does foreign direct investment promote growth? Exploring the role of financial markets on linkages. *Journal of Development Economics*, 91(2), 242–256.

Alfaro, L. & Charlton, A. (2013). Growth and the quality of foreign direct investment: Is all FDI equal? In: Stiglitz, J. E. & Yifu, J. L. (Eds.). *The industrial policy revolution I: The role of government beyond ideology*. (pp. 151–1). London: Palgrave Macmillan.

American Chamber of Commerce in Egypt (2008). *Egypt economic profile 2008*. Cairo: American Chamber of Commerce.

Awokuse, T.O. & Xie, R. (2015). Does agriculture really matter for economic growth in developing countries? *Canadian Journal of Agricultural Economics, 63(1),* 77–99.

Aykut, D. & Sayek, S. (2007). The role of the sectoral composition of FDI on growth. In: Piscitello, L. & Santangelo, G.D. (Eds.). *Do multinationals feed local development and growth?* (pp. 35–62). Amsterdam: Elsevier.

Balasubramanyam, V.N., Mohammed, S., & Sapsford, D. (1996). FDI and growth in EP and IS countries. *Economic Journal, 106(1)*, 92–105.

Baldwin, R., Braconier, H., & Forslid, R. (2005). Multinationals, endogenous growth, and technological spillovers: Theory and evidence. *Review of International Economics 13(5)*, 945–63.

Barro, R. (2013). Education and economic growth. *Annals of Economics and Finance, 14(2),* 301–328.

Barro, R. & Sala-i-Martin, X. (1995). *Economic growth*. Cambridge, MA: McGraw-Hill.

Blalock, G. & Gertler, P. (2008). Welfare gains from foreign direct investment through technology transfer to local suppliers. *Journal of International Economics 74(2),* 402–421.

Blomström, M. & Kokko, A. (1998). Multinational corporations and spillovers. *Journal of Economic Surveys, 12(3),* 247-277.

Blomström, M., Lipsey, R.E., & Zejan, M. (1994). What explains developing country growth? In: Baumol, W. J. (Ed.). Convergence of productivity: Cross-national studies and historical evidence. New York: Oxford University Press.

Blonigen, B.A., Davies, R.B., Waddell, G.R., & Naughton, H.T. (2007). FDI in space: Spatial autoregressive relationships in foreign direct investment. *European Economic Review*, *51(5),* 1303–1325.

Borensztein, E., De Gregorio, J., & Lee, J.W. (1998). How does foreign direct investment affect growth? *Journal of International Economics 45(1)*, 115–135.

Carkovic, M. & Levine, R. (2005). Does foreign direct investment accelerate economic growth? In: Moran, H. & Graham, E.M. (Eds.). *Does foreign direct investment promote development?* (pp. 195–220). Washington: Institute for International Economics.

Castellani, D. & Zanfei, A. (2006). Multinational firms, innovation and productivity. Cheltenham: Edward Elgar.

Chakraborty, C. & Nunnenkamp, P. (2008). Economic reforms, FDI, and economic growth in India: A sector level analysis. *World Development, 36(7),* 1192–1212.

Chowdhury, A. & Mavrotas, G. (2006). FDI and growth: What causes what? *The World Economy, 29(1),* 9–19.

Cipollina, M, Giovannetti, G., Pietrovito, F., & Pozzolo, A. (2012). FDI and growth: What cross-country industry data say. *The World Economy, 35(11)*, 1599–1629.

De Mello Jr., L.R. (1997). Foreign direct investment in developing countries and growth: A selective survey. *The Journal of Development Studies, 34(1)*, 1–24.

De Mello Jr, L.R. (1999). FDI-led growth: Evidence from time series and panel data. *Oxford Economic Papers, 51(1),* 133–51.

Deininger, K., Byerlee, D., Lindsay, J., Norton, A., Selod, H., & Stickler, M. (2011). *Rising global interest in farmland: Can it yield sustainable and equitable benefits?* Washington, D.C: World Bank.

Dobronogov, A. & Iqbal, F. (2007). Economic growth in Egypt: Constraints and determinants. *Journal of African Development, 9(1)*. 31–66.

Doytch, N. & Uctum, M. (2011). Does the worldwide shift of FDI from manufacturing to services accelerate economic growth? A GMM estimation study. *Journal of International Money and Finance, 30(3)*, 410–427.

Dutt, A.K. (1997). The pattern of foreign direct investment and economic growth. *World Development, 25(11)*, 1925–1936.

El-wassal, K.A. (2012). Foreign direct investment and economic growth in Arab countries (1970-2008): An inquiry into determinants of growth benefits. *Journal of Economic Development, 37(4),* 79–100.

FAO (2009). *Foreign investment in the agricultural sector: Egypt case study.* Rome: FAO.

FAO (2011). *International investments in agriculture in the Near East. Evidence from Egypt, Morocco and Sudan.* Rome: FAO.

FAO (2013). *Trends and impacts of foreign investment in developing country agriculture: Evidence from case studies.* Rome: FAO.

Fei, J. & Ranis, G. (1961). A theory of economic development. *American Economic Review, 51(4)*, 533–65.

Fernandes, A.M. & Paunov, C. (2012). Foreign direct investment in services and manufacturing productivity: Evidence for Chile. *Journal of Development Economics, 97*(2), 305–321.

Findlay, R. (1978). Relative backwardness, direct foreign investment, and the transfer of technology: A simple dynamic model. *Quarterly Journal of Economics, 92(1),* 1–16.

Ford, T.C., Jonathan, C.R., & Elmslie, B.T. (2008). Foreign direct investment, economic growth, and the human capital threshold: Evidence from US states. *Review of International Economics, 16(1),* 96–113.

Gerlach, A. & Liu, P. (2010). Resource-seeking foreign direct investments in Africa: A review of country case studies. *FAO Commodity and Trade policy research working paper 31*. Rome: FAO.

Görg, H. & Greenaway, D. (2004). Much ado about nothing? Do domestic firms really benefit from foreign direct investment? *World Bank Research Observer, 19,* 171–197.

Graham, E. & Krugman, P. (1991). *Foreign direct investment in the United States*. Washington DC: Institute for International Economics.

Hallam, D. (2011). International investment in developing country agriculture—issues and challenges. *Food Security Journal, 3(1),* 91–98.

Hanafy, S. (2015a). Patterns of foreign direct investment in Egypt—Descriptive insights from a novel panel dataset at the governorate level. *MAGKS Discussion Paper 12-2015.*

Hanafy, S. (2015b). Determinants of FDI location in Egypt—Empirical analysis using governorate panel data. *MAGKS Discussion Paper 13-2015.*

Harms, P. & Méon, P.-G. (2014). Good and bad FDI: The growth effects of greenfield investment and mergers and acquisitions in developing countries. *CEB Working Paper N°14/021.*

Herzer, D. (2012). How does foreign direct investment really affect developing countries' growth? *Review of International Economics, 20(2)*, 396–414.

Herzer, D., Klasen, S., & Nowak-Lehmann D., F. (2008). In search of FDI-led growth in developing countries: The way forward. *Economic Modelling, 25(5),* 793–810.

Hevia, C. & Loayza, N. (2012). Saving and growth in Egypt. *Middle East Development Journal*, *4(1),* 1250002-1–1250002-23.

Hirschman, A. (1958). *The strategy of economic development*. New Haven: Yale University Press.

Iamsiraroj, S. & Ulubasoglu, M.A. (2015). Foreign direct investment and economic growth: A real relationship or wishful thinking? *Economic Modelling, 51, 200–213.*

Iwasaki, I. & Tokunaga, M. (2014). Macroeconomic impacts of FDI in transition economies: A meta-analysis. *World Development, 61*, 53–69.

Jaffe, A., Trajtenberg, M., & Henderson, R. (1993). Geographic localization of knowledge spillovers as evidenced by patent citations. *Quarterly Journal of Economics, 108(3),* 577–598.

Javorcik, B. S. (2004). Does foreign direct investment increase the productivity of domestic firms? In search of spillovers through backward linkages. *American Economic Review, 94(3)*, 605–627.

Kugler, M. (2006). Spillovers from foreign direct investment: Within or between industries? *Journal of Development Economics, 80(2),* 444–477.

Lensink, R. & Morrissey, O. (2006). Foreign direct investment: Flows, volatility, and the impact on growth. *Review of International Economics, 14(3),* 478–493.

Lewis, W. A. (1954). Economic development with unlimited supplies of labour. *The Manchester School, 22(1)*, 139–91.

Li, X. & Liu, X. (2005). Foreign direct investment and economic growth: An increasingly endogenous relationship. *World Development, 33(3)*, 393–407.

Liu, P. (2014). Impacts of foreign agricultural investment on developing countries: Evidence from case studies. *FAO Commodity and Trade Policy Research Working Paper No. 47.* Rome: FAO.

Malik, A. & Awadallah, B. (2013). The economics of the Arab Spring. *World Development, 45*, 296–313.

Massoud, N. (2008). FDI and growth in emerging markets: Does the sectoral distribution matter – The case of Egypt. *EMG Working Paper Series 05-2008.*

Nair-Reichert, U. & Weinhold, D. (2001). Causality tests for cross-country panels: A new look at FDI and economic growth in developing countries. Oxford *Bulletin of Economics and Statistics, 63(2),* 153–171.

Neaime, S. & Marktanner, M. (2009). The role of foreign direct investment for economic development in the MENA region. In: Cinar, M. (Loyola University Chicago) (Ed.), *Topics in Middle Eastern Economies and North Africa. Proceedings of the Middle East Economic Association Conference 2009.*

Nunnemkamp, P. & Spatz, J. (2004). FDI and economic growth in developing economies: How relevant are host-economy and industry characteristics. *Transnational Corporations*, *13(3),* 53–86.

Rodriguez-Clare, A. (1996). Multinationals, linkages, and economic development. *American Economic Review, 86(4), 852–73.*

Songwe, V. & Deininger, K. (2009). Foreign investment in agricultural production: Opportunities and challenges. *Agricultural and Rural Development Notes*. Washington, DC: World Bank.

Tanyeri-Abur, A. & Elamin, N.H. (2011). International investments in agriculture in Arab countries: an overview and implication for policy. *Food Security Journal, 3(1),* 115–127.

UNCTAD (2001). *World investment report: Promoting linkages*. New York: United Nations.

UNCTAD (2009). *World Investment Report 2009. Transnational corporations, agricultural production and development.* New York and Geneva: United Nations.

Wang, J.Y. & Blomström, M. (1992). Foreign Investment and Technology Transfer: A Simple Model. *European Economic Review, 36(1)*, 137–155.

Wang, M. (2009). Manufacturing FDI and economic growth: Evidence from Asian economies. *Applied Economics, 41(8)*, 991–1002.

Wang, M. & Wong, M.C.S. (2009). What drives economic growth? The case of cross-border M&A and greenfield FDI activities, *Kyklos, 62(2)*, 316–330.

Yao, S. & Wei, K. (2007). Economic growth in the presence of FDI: The perspective of newly industrialising economies. *Journal of Comparative Economics, 35(1)*, 211–234.

Zhang, K.H. (2001). How does foreign direct investment affect economic growth in China? *Economics of Transition, 9(3)*, 679–693.

APPENDIX

Appendix A: Data Sources and Details

Real GDP per capita growth (dependent variable): Growth rate of GDP per capita (at 1992 prices) over four-year period. Data on nominal GDP per capita were collected from several English and Arabic *Egypt Human Development Reports* by UNCTAD. These reports are not issued annually and thus data are missing for a few years. Where possible, we used governorates' *Human Development Reports*, made available by the National Institute of Planning, to fill in missing data on governorate GDP per capita. To fill in remaining gaps, we conducted a linear interpolation. Real figures have been calculated using the GDP deflator (1992 = 100) reported by the World Bank. Note that data on the population-scarce frontier governorates are available only since 2000. Thus, our panel is an unbalanced one.

FDI flow (in % of GDP): FDI inflows (in EGP) are divided by GDP (in EGP) and multiplied by 100 (four-year-average). The FDI inflows are based on unpublished raw data of investments by foreign enterprises registered at the General Authority for Investment and Free Zones (GAFI). GAFI only registers 'non-petroleum greenfield FDI' and their expansions. To obtain the **governorate's GDP**, GDP per capita was multiplied by the population at the governorate level. GDP per capita data is compiled from *Egypt Human Development Reports* by UNCTAD and governorates' *Human Development Reports*, as described above. We obtained the population data at the governorate level from two sources: (1) the population since 1995 was collected from available yearbooks by the Central Agency for Public Mobilization and Statistics (CAPMAS) and (2) the population for the period 1990–1992 was obtained from the Annual Labour Force Sample Issues by CAPMAS. To bridge the gap of the two missing years of 1993 and 1994, we conducted a linear interpolation of population data.[37] Both FDI flow and GDP were in current EGP. *This variable is used for robustness check.*

FDI stock (in % of GDP): FDI stock (in EGP) is divided by GDP (in EGP) and multiplied by 100 (four-year-average). The FDI stock is defined as the amount of cumulative FDI flows from 1972 until the end of the respective year. Egypt's open-door policy started in 1974, but the country had already begun receiving first inflows in 1972. To calculate the FDI stock, we used an annual deprecation rate of 4%, based on the calculations by Hevia and Loayza (2012) for Egypt. See FDI flow above for more details on the construction of this variable.

Manufacturing FDI stock (in % of GDP): FDI in manufacturing only. Calculation and sources similar to FDI stock above.

Agricultural FDI stock (in % of GDP): FDI in agricultural only. Calculation and sources similar to FDI stock above.

Services FDI stock (in % of GDP): FDI in services only. Calculation and sources similar to FDI stock above.

DPI (in % of GDP): Domestic private investment (in EGP) are divided by GDP (in EGP) and multiplied by 100 (four-year-average). Calculation similar to FDI flow. Source: GAFI.

[37] Similarly, Blonigen et al. (2007) use linear interpolation to fill missing data.

Public investment (in % of GDP): Public investment data (in EGP) are divided by GDP (in EGP) and multiplied by 100 (four-year-average). Unpublished regional public investment data, which were made available by the Ministry of Planning, are disaggregated at the governorate level starting in 1997. For the years before 1997, only annual aggregate public investment data were made available according to five-year-plans. To estimate public investments per governorate for 1992–1996, we made the assumption that a governorate's share in total public investment is the same as the average of the following five years (1997–2001).

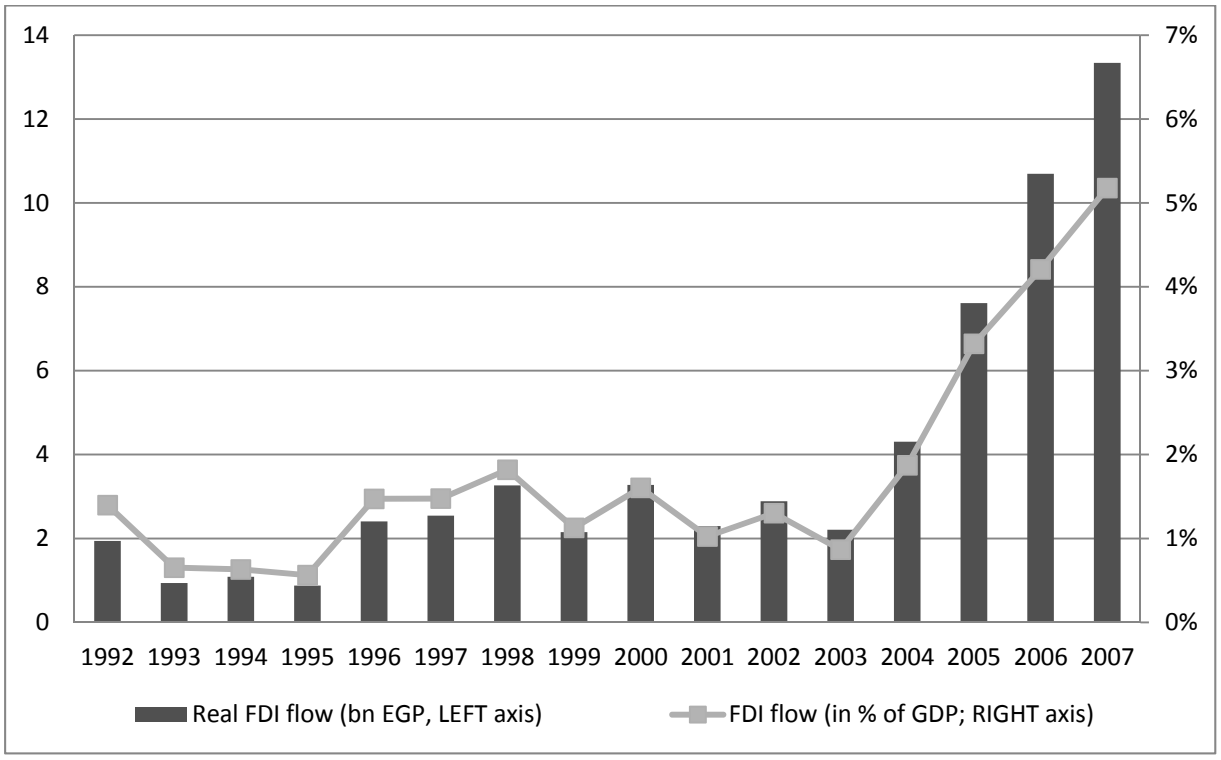
Initial GDP per capita: The initial level of real GDP per capita in the first year of each four-year-period. Source on nominal GDP per capita: *Egypt Human Development Reports* by UNCTAD and governorates' *Human Development Reports* (see above). Real figures have been calculated using the GDP deflator (1992 = 100) by the World Bank.

Secondary education (% of labour force): Share of labour force that holds at least an intermediate level of education (equivalent to at least secondary education) in percent. Data on labour force and labour force education are collected from the Annual Labour Force Sample Issues by CAPMAS. As no issue is available for the year 1996, we interpolated the data to fill this gap.

University education (% of labour force): Share of labour force that holds a university degree in percent (see secondary education above).

Appendix B: Figures

Figure A.1: 'Non-petroleum greenfield' FDI to Egypt in 1992–2007



Notes: On left axis: Real 'non-petroleum greenfield' FDI flow (in billion EGP at constant 1992 prices). On right axis: Flow of 'non-petroleum Greenfield FDI' (in % of GDP). Source: Author's calculations, based on FDI data from GAFI and GDP data from the World Bank.