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Learning or Leaning:
Persistent and Transitory Spillovers from FDI

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February 16, 2016

Abstract

Using firm-level data for Jordan, we estimate the extent to which growth spillovers from foreign direct investment (FDI) to local firms stem from persistent learning externalities (i.e., they endure even after foreign investment leaves as knowledge has been transferred to local firms) or from transitory effects (e.g., demand increases which evaporate following disinvestment). We find that they have a significant transitory nature, with employment and capital growth declining when FDI falls, particularly in downstream industries supplied by locals. This suggests that if FDI-attracting policies are intended to promote sustainable growth, it may be more effective to attract and retain FDI via long-term structural policies, for instance, through low corporate tax rates rather than temporary tax holidays or through policies that strengthen the domestic absorptive capacity and linkages between foreign and local firms.

Keywords: FDI; Spillovers.

JEL classification: F23; F16.

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1 Introduction

Among the many reasons given for attracting foreign direct investment (FDI) is the notion that multinational enterprises (MNEs) provide spillovers to local firms, thereby increasing productivity, employment, and investment. Since Javorcik (2004)'s seminal contribution, a large literature has grown that documents when and in what ways foreign entry into an economy affects local firms. In particular, the literature has revealed the importance of both, foreign ownership within a given firm as well as FDI in the sectors local firms supply to while evidence for spillovers from MNEs in the same industry and in those supplying to locals is less robust. Although these findings have often been interpreted as showing the existence of persistent learning externalities from FDI, the exact nature of such productivity growth effects has not been analyzed yet.

In the theoretical literature, two overarching themes describe how spillovers occur.[1] First, there is the idea of persistent technological or learning spillovers (broadly defined including management practices) in which MNEs improve local technology either through direct sharing, imitation by locals, and/or labour market churning. Persistent spillovers may also arise from linkages to the global economy in which local firms learn from MNEs about clients or suppliers of intermediate inputs from technologically more advanced countries. We label these persistent growth spillovers as learning effects since they embody knowledge transfers to local firms generating productivity externalities independent of the continuous local presence of MNEs. Second, the entry of MNEs increases the demand for locally sourced goods and services in the domestic economy as long as the MNEs operate in the country. This domestic demand effect can generate temporary productivity spillovers for local firms, for instance, as they temporarily benefit from economies of scale or higher quality of the inputs they receive from the MNEs. But these effects are transitory in the sense that they evaporate with the disinvestment of the foreign firm (linkage) if the knowledge about the adaption of new technologies, management practices, or linkages with firms in more advanced countries has not been transferred to the local firm.[2] We label these transitory growth spillovers as leaning effects as local firms rely on the presence of the MNE as the main client or intermediary.

The persistence of FDI spillovers has not been discussed despite the fundamentally different economic consequences and implied mechanisms: if the gains come from *learning* effects the benefits to local firms remain after the MNE leaves; if they come from *leaning* effects they quickly evaporate when the MNE exits. Understanding this distinction is critical for several reasons. First, it helps clarify whether attracting FDI is a shortcut to promote foreign tech-

[1] See, for example, Rodriguez-Clare (1996).

[2] See Javorcik and Spatareanu (2003) for a discussion of these various spillover mechanisms.

nology diffusion and thus persistent productivity externalities among local firms in the host country or if more difficult behind the border structural policy reforms are indispensable. Second, it matters for the design of developing FDI policy because it indicates whether it is enough to simply attract the MNE for a limited time (via, for example, a tax holiday) or whether the government must aim to attract and retain foreign firms such as by maintaining low corporate tax rates, strengthening the domestic absorptive capacity, or promoting technology sharing between foreign and local firms (for instance, through joint ventures). Third, if growth spillover stem primarily from leaning rather than learning effects, FDI-led growth increases a country's vulnerability to adverse global shocks in that the productivity gains of domestic firms will be partly reversed with the disinvestment of multinational firms.[3] This paper contributes to the existing literature by exploring whether there are asymmetric spillover effects from FDI increases and decreases using Jordanian firm-level data. Jordan is a particular good example to study (spillover) effects of FDI. First of all Jordan has seen an massive increase in FDI over the last decade cumulating to a share of FDI relative to GDP of 10.1 percent in 2008, becoming one of the most attractive countries for FDI.[4] Furthermore, given the market oriented reforms undertaken, it has also generated sufficient absorptive capacity to take advantage of FDI effects. Our estimates do indeed reveal significant asymmetries between MNE entries and exits which point to significant temporary components to spillovers. We find that FDI in downstream industries (i.e., those that purchase inputs from local firms) are particularly important in generating these transitory leaning effects among local suppliers, with smaller local firms being especially impacted by exiting MNEs. Our results suggest that the significant FDI spillovers to local suppliers in upstream industries which have been found in several developing countries do not necessarily capture persistent learning effects (such as technology transfers) but rather transitory leaning effects reflecting the higher demand for locally sourced goods and services as long as the MNE operates in the country.

Given the large literature on the spillovers from FDI, at this stage it is more useful to point the reader to overviews of the findings rather than specific studies. In particular, Blomström and Kokko (1998) provide an discussion of the earlier literature; for more recent coverage, see Irsová and Havránek (2013), Havránek and Irsová (2010), or Wooster and Diebel (2010). From this literature, two broad themes emerge. First, the impact of FDI on local firms hinges on the supply chain relationship between the MNEs and the local firm. As delineated by Rodriguez-Clare (1996), this relationship can be horizontal (with the MNE

[3]See also Gall et al. (2014) on how FDI can increase the long-term vulnerability of countries to external shocks.

[4]Notably, our sample contains, due to the financial crisis, both increases and decreases in foreign ownership

in the same sector as the local firm), backward (with the MNE in a downstream industry supplied by the local firm), or forward (with the MNE in an upstream industry supplying to the local firm). In work such as Javorcik (2004), the most significant spillovers are typically backwards, although there is often some evidence in favour of horizontal spillovers. The subsequent work cited in the above surveys generally confirms this across countries and time periods. Second, the impact often depends on the characteristics of the local firm. Gorodnichenko et al. (2014) find that the size, age, and industry of the local firm has a significant effect. Damijan et al. (2013) similarly point out the role of the local firm's technological advancement and absorptive capacity. Thus, although there is a sizable body of evidence indicating that inbound FDI increases the productivity and growth of local firms, these effects are conditional.

Building on this literature, we decompose our spillovers into horizontal, backward, and forward linkages. When using the standard approach where only net changes in FDI matter (i.e. where entries and exits have equal but opposite effects, which we refer to as symmetry), we find evidence that increases in net foreign ownership in a given firm, along with increases in net backward and forward spillovers, are associated with higher employment and capital growth in that firm. This symmetry, however, presupposes that all spillovers are transitory in that only the net stock of current multinationals not the history of foreign presence matters for growth. When we relax this assumption and decompose the spillover variables into the changes driven by increases in FDI and those caused by decreases, we firmly reject symmetry. In fact, we find that when FDI exits, this has a more sizable and significant effect on employment and capital growth in local firms than when FDI enters. This is particularly true for backward linkages. As such, this indicates asymmetry with a strong transitory component to the spillover effects since, if the foreign firm leaves, growth falls. In contrast, if the spillovers were permanent reflecting learning effects, then MNE exits should have no impact, since local firms have already adopted the knowledge necessary, for instance, to operate the foreign technology. Furthermore, we find that the impact of FDI on the local firm depends on its sector, size, and age. In particular, in line with Damijan et al. (2013), smaller firms are generally more affected by FDI. However, our results indicate that this is highly driven by reductions in the transitory spillovers resulting from MNE exits, especially via the backwards linkages (reflecting leaning effects of small suppliers to MNEs). This granular effect is something that they (and the rest of the existing literature) cannot identify as they consider only net spillover changes, i.e. as they impose a symmetry our estimates reject.

This evidence of transitory effects is consistent with the idea that spillovers arise from leaning effects due to higher domestic demand for locally sourced goods and services which

are severed once FDI leaves rather than learning effects such as technological spillovers which, once adopted, are likely to persist even after the MNE exits. Beyond improving our understanding of the nature of spillovers and the extent to which FDI promotes foreign technology diffusion among local firms in the host country, this result has important policy implications. If spillovers were permanent, then it would be sufficient to attract FDI, allow its benefits to spillover to the local economy, and permit it to leave. As such, temporary incentives that increase inbound FDI without retaining it, such as tax holidays, would be a sufficient tool for extracting the benefits of FDI.[5] On the other hand, if spillovers disappear when the FDI does, to sustain the benefits it is necessary to sustain the investment. This would then call for long-run structural policy approaches such as maintaining low corporate tax rates, good infrastructure, or other sustainable business friendly policies that attract and retain foreign firms.[6] Thus, our results suggest that if a country is seeking to increase and maintain employment and investment via FDI spillovers, the latter set of policies may be more effective.[7]

The rest of the paper proceeds as follows. Section 2 lays out a simple model illustrating the potential differential effects from increases and decreases in FDI on the productivity and growth of local firms. Section 3 describes our data and empirical methodology. Our results are presented in Section 4. Section 5 concludes.

2 Theory

2.1 Model Structure

In this section, we present a simple model to highlight the potential for asymmetric spillover effects arising from entering and exiting MNEs in order to motivate our empirical analysis. To this end, consider a representative consumer with preferences over S industries, each of which is composed of a set of differentiated products. Utility for the consumer is:

$$U\left(X_1, X_2, ..., X_S\right) = \prod_{s=1}^{S} {X_s}^{\beta_s} \tag{1}$$

[5]Klemm and Parys (2012) provide evidence on the effectiveness of tax holidays in attracting FDI.

[6]See de Mooij and Ederveen (2008) for a survey of the work on the impact of tax rates on FDI.

[7]Du et al. (2013) examine how tariff and tax reductions affected FDI across Chinese sectors and the spillovers these policies therefore created. They do not, however, examine whether such policies attracted and retained the FDI, and thus do not address asymmetries between entries and exits, nor compare temporary policies to longer lasting ones.

where $\beta_s > 0 \forall s$, $\sum_{s=1}^{S} \beta_s = 1$, and $X_s \equiv \left[\int_{j \in s} q(j)^{\alpha_s} dj\right]^{\frac{1}{\alpha_s}}$ is a "composite good" made up of the different varieties within s, each of which is produced by a unique firm j. Note that $\alpha_s > 1$. The set of firms in each sector is exogenous.[8] Focusing on a single sector s, the cost of producing $q(i)$ units for firm i is $a(y_i, z_s)(\alpha_s r + w)$ which depends on a firm-specific productivity parameter $a(y_i, z_s)$, the sector specific unit capital requirement α_s, and the factor prices of capital and labour, r and w.[9] In particular, $a(y_i, z_s)$ depends on firm characteristics y_i and sector characteristics z_s. Firm characteristics can include age (where older firms are typically found to be more productive), the region in which the firm is located in, and foreign ownership (where again, firms with a degree of foreign ownership are commonly more productive). Sector characteristics, meanwhile, include spillovers from multinationals (discussed in detail below).

Using the consumer's maximization problem, a constant share β_s of income W will be spent on sector s. Furthermore, demand for firm i's variety, where $\varepsilon_s = \frac{1}{\alpha_s - 1} > 1$ is the elasticity of substitution, is

$$q(i) = p(i)^{-\varepsilon_s} {P_s}^{\varepsilon_s - 1} \beta_s W \tag{2}$$

where $P_s = \left[\int_{j \in s} p(j)^{-(\varepsilon_s - 1)} dj\right]^{-\frac{1}{\varepsilon_s - 1}}$ is the price index for sector s. As is standard in such models, the equilibrium price for firm i is a markup over marginal cost:

$$p(i) = {\alpha_s}^{-1} a(i)(\alpha_s r + w) \tag{3}$$

resulting in firm output:

$$q(i) = {\alpha_s}^{\varepsilon_s} (a(i)(\alpha_s r + w))^{-\varepsilon_s} {P_s}^{\varepsilon_s - 1} \beta_s W. \tag{4}$$

Recalling that with this production function, labour demand is $L(i) = a(i) q(i)$, we can write labour demand as:

$$\ln L(i) = \varepsilon_s \ln \alpha_s - (\varepsilon_s + 1) \ln a(i) - \varepsilon_s (\alpha_s r + w) + (\varepsilon_s - 1) \ln P_s + \ln \beta_s W \tag{5}$$

while capital demand is $\ln K(i) = \alpha_s^{-1} \ln L(i)$. Thus, ignoring effects operating through the price level, a reduction in $a(i)$ should increase factor usage in firm i, i.e. a rise in productivity leads to employment growth and investment.

[8] As our empirical aim is to estimate how a given firm responds to changes in its environment, something it takes as exogenous. This simplification is intended to simplify the theory with that goal in mind.

[9] This would arise if the production function is $q(i) = a(i)^{-1} \min(\alpha K(i), L(i))$.

2.2 FDI Spillovers

As noted above, the productivity parameter $a(i)$ depends on both firm and sector characteristics, with the latter capturing the spillovers from FDI. Following the literature, we allow the set of spillovers to have three elements: one for horizontal spillovers ${\phi_{s,t}}^H$ (measured by the share of output in sector s owned by foreigners), one for backward spillovers $\phi^B_{s,t}$ (measured as the share of output by sector s that is sold to foreign MNEs), and one for forward spillovers $\phi^F_{s,t}$ (measured as the share of inputs sector s purchases from foreign-owned firms in the country).[10] While we remain agnostic about the exact channel of the spillover, we do distinguish between persistent learning and transitory leaning effects, with the distinction being that whereas a transitory spillover disappears immediately upon a MNE's exit, a persistent spillover does not, since local firms have learned from the MNE; the knowledge about the adaption of new technologies, management practices, or trade linkages has already been transferred to the local firm.

To formalize this difference, consider a MNE that is not present in period $t-1$, arrives in period t, and then exits just before period $t+1$. Before the MNE enters, it generates no spillovers. After it arrives, in period t, it generates a spillover equal to $\rho f_t e_t$ where f_t is the share of the MNE that is foreign-owned and e_t is its employment. After it exits, in $t+1$ its spillover is $(1-\delta)\,\rho f_t e_t$ where $0 \geq \delta \leq 1$. If $\delta = 1$, the FDI all spillovers are transitory and it has no effect after it leaves.[11] On the other hand, if $\delta < 1$, the spillover may depreciate but does not disappear immediately. If $\delta = 0$, then all spillovers are permanent.[12] Finally, assume that spillovers depreciate fully two periods after the MNE exits.[13] Thus, the extent of spillovers generated varies according to whether the firm is present and, if not, when it exited. This is summarized in Table 1.

Table 1: Total Spillovers Generated by a MNE Arriving in period t and then Exiting

	Not Present	Present	Exits before $t+1$	Exits before $t+1$
Period	$t-1$	t	$t+1$	$t+2$
Spillover Effect	0	$\rho f_t e_t$	$(1-\delta)\,\rho f_t e_t$	0

[10] Please note that although we speak here of intermediate input purchases, we do not model them explicitly so as to make the theory as simple as possible while still illustrating the potential for asymmetric effects from FDI entry and exit.

[11] This situation may match spillovers linking local firms to export markets.

[12] This might occur if spillovers are due to technology transfers.

[13] Obviously, this can be extended so that the persistent spillovers gradually dissipate over time, however, this formulation simplifies the discussion because spillovers then depend only on FDI over a two-period window.

Aggregating this up across MNEs in a given sector s and, as is standard in the literature, normalizing by sectoral employment, we see that total horizontal spillovers in period t depend on the number of firms of each type:

$$\phi^H_{s,t} = \frac{\rho \sum_{\text{new entrants}} f_{i,t} e_{i,t} + \rho \sum_{\text{incumbents}} f_{i,t} e_{i,t} (1-\delta) + \rho \sum_{\text{exiting firms}} f_{i,t-1} e_{i,t-1}}{\sum_{\text{all firms}} e_{j,t}}. \tag{6}$$

The literature to date implicitly assumes that $\delta = 1$, so that all spillovers are transitory and depend solely on FDI that is currently present. Put differently, this assumption implies a symmetry between increases and decreases in FDI so that, when measured in changes over time, only net inflows of FDI matter. Nevertheless, for spillover mechanisms that are persistent, this need not be true.

Following the literature, in period t for sector s, we construct our backward and forward spillovers using the horizontal spillover:

$$\phi_{s,t}{}^B = \sum_k \gamma^O_{k,s} \phi^H_{k,t} \text{ and } \phi_{s,t}{}^F = \sum_k \gamma^I_{k,s} \phi^H_{k,t} \tag{7}$$

where $\gamma^O_{k,s}$ is the share of output from sector s sold to sector k, $\gamma^I_{k,s}$ is the share of inputs sector s sources from sector k. Let the (logged) unit labour requirement be:

$$\ln a_{i,s,t} = \psi_1 age_{i,t} + \psi_2 size_{i,t} + \psi_3 fgn_{i,t} + \psi_4 \phi^H_{s,t} + \psi_5 \phi^B_{s,t} + \psi_6 \phi^F_{s,t} \tag{8}$$

where age, $size$, and fgn denote the age, size, and foreign ownership of i in t. Given that older and foreign-owned firms are typically found to be more productive, we presume that $\psi_1, \psi_2 < 0$, i.e. they lower the unit labour requirement, with a similar result for productivity-enhancing FDI spillovers. First differenncing (5), for firm i in sector s in year t, labour growth is:

$$\dot{L}_{i,s,t} = \gamma_1 + \gamma_2 \dot{fgn}_{i,t} + \psi_3 \dot{\phi}^H_{s,t} + \psi_4 \dot{\phi}^B_{s,t} + \psi_5 \dot{\phi}^F_{s,t} \tag{9}$$

where the "dots" indicate changes. Equation (9) then provides the basis for our empirical specification. Note that for the spillover variables, even if there is no net change in FDI levels, that there can still be a change in the spillover. For example, suppose that there is entry and exit in a sector s yet total foreign employment does not change. For spillover of type j, this would result in:

$$\psi_3 \dot{\phi}^j_{s,t} = \frac{\sum_{\text{new entrants}} f_{i,t} e_{i,t} - \delta \sum_{\text{exiting firms}} f_{i,t} e_{i,t}}{\sum_{\text{all firms}} e_{j,t}} \tag{10}$$

which equals zero only if $\delta = 1$, i.e. all spillovers are transitory. This would imply coefficient estimates for entries and exits that are equal but opposite in sign. On the other hand, if FDI spillovers are permanent, then $\delta = 0$ and there should be no significant effect from exits. Finally, if the coefficient is between zero and one, then this would suggest the presence of both transitory and permanent spillovers.

Note that in both of these latter two cases, it should be that the estimated effect of new FDI is greater in absolute value than for exiting FDI if entering investment creates spillovers immediately. Thus, by estimating the impact of increases and decreases in FDI separately, i.e. not assuming that $\delta = 1$, we can test for the presence of transitory versus persistent spillovers. Further, recall that in equation (8), we assumed that firm i's firm-specific characteristics and the spillovers were additively separable. If this is not the case, then then the impact of spillovers will vary across firms. This too is something we will explore in the data. Finally, just as employment growth depends on FDI, so too does capital growth, with investment responding comparably to changes in FDI.

3 Data Description and Empirical Strategy

Our data come from the firm census for 2006 and 2011 from the Department of Statistics in Jordan. These data represent information of about 100,000 firms in Jordan in each year from both, manufacturing and services. We observe 15,465 firms in both periods.[14] These data provide several pieces of firm level information, including the employment of the firm, the share of foreign ownership, the year of incorporation, revenues, capital investment, the region it is located in, and the sector in which it operates. Together, these firms comprise 53% of employment in Jordan as compared to Labor Force Survey (LFS) data.[15]

In studying the spillover effects of FDI, these Jordanian data have several attractive features. First, prior to 2000, FDI inflows were very low (below 1% of GDP). Since then, the government removed restrictions to FDI in manufacturing and several service sectors including banking, telecommunication, and retail trade.[16] As a result, net FDI inflows tripled from US$ 0.9 billion in 2000 to US$ 2.8 billion in 2008. On average, these FDI inflows amounted to 10.1 percent of GDP over the decade, a share which ranks Jordan among

[14]We use sample weights for each firm and year making the subset of firms observed in both periods representative for the entire population of more than 100,000 firms in the 2006 and 2011 firm census. As we focus on changes over this five-year period, we can only use firms for which data are available in both years.

[15]Note that LFS data typically exceed firm census employment data significantly in most countries, since they usually better cover informal employment, illegal foreign workers, family workers, etc.

[16]Note that, transport and professional (accounting and legal) services remain restricted to foreign investors (Schiffbauer et al., 2015). This motivates our sample splits between services and manufacturing.

the most attractive emerging economies for FDI.[17] Thus, Jordan experienced significant increases in FDI which have the potential to generate spillovers. Indeed, the World Bank (2012) attributes Jordanian growth over the period in no small part to these FDI inflows (with half of total investment coming from foreigners). Second, growth and FDI in Jordan were negatively impacted by the global financial crisis in 2009-2010. The external shock led to sudden stop in foreign investments which generated a quasi natural experiment allowing to test for the impact of MNE exits and thus the nature of FDI spillovers. After 2009, FDI into Jordan declined substantially and many foreign subsidiaries exited in 2009 and 2010 as MNEs adjusted their portfolios to reduce exposure to high-risk investments in developing countries. From Table 2, which presents the summary statistics, we can infer that the number of foreign-owned establishments, implying at least 10% foreign ownership, fell from 338 to 142.[18] As can be seen from Table 3 this observation is confirmed when looking at the share if foreign ownership considering all companies (including not foreign owned) and disaggregating the sample to the industry level. Interestingly, for foreign owned firms the share of equity hold by foreigners was quite high with roughly 70% in both years.

Nevertheless, even during the crisis, some MNEs continued to enter and expand the size of their Jordanian investment.[19] Thus, the Jordanian data has both increases and decreases in FDI, with this churning necessary for us to compare persistent and transitory spillovers. Third, Jordan is a setting in which local firms may be poised to take advantage of the spillovers. Overall, Jordan is a low middle income developing country that grew strongly over the last decade based on market-oriented reforms and a favorable external environment. This suggests that its firms have the absorptive capacity to take advantage of spillovers while remaining sufficiently far from the technological frontier that they have room for adopting more efficient foreign technologies or better management practices.[20] Thus, the Jordanian data is well suited to the issues we investigate.

As described in equation (6), our horizontal spillover, $\phi^H_{s,t}$, captures the extent of foreign presence in sector s at time t, which is defined as foreign equity participation averaged over all firms in the sector, weighted by each firm's share in sectoral employment. Using (7), the backwards spillover, $\phi^B_{s,t}$, measures the foreign presence in the industries that are being supplied by sector s, calculated as the weighted sum of the various industries $\phi^H_{k,t}$'s, with the weight being the the proportion of sector s's output supplied to another sector k.

[17] See Davies et al. (2015) for a discussion on the patterns in FDI in developing economies during this period.

[18] We follow the international standard defining firms as foreign owned of they report at least 10% foreign ownership.

[19] More specifically, our sample contains 284 foreign owned companies where FDI has been reduced and 82 companies which report higher levels of foreign ownership or became foreign owned in 2011.

[20] See Damijan et al. (2013) for more discussion on absorptive capacity and spillovers.

Table 2: Summary Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Employment Growth	0.01	0.51	-1.96	1.95	15465
Capital Growth	-0.03	0.87	-2	2	15395
Employees	11.26	84.09	1	4800	30930
Capital	299741.18	6762496.28	0	750000000	30921
Fgn 2006	71.07	29.04	10	100	338
Fgn 2011	68.93	30.97	13	100	142
Start Year	1996.69	11.03	1920	2011	30930

This is taken from the 2006 input-output matrix for 81 industry sectors which is matched to the 221 sectors following the 4-digit ISIC3.1 classification.[21] Note that inputs supplied within the sector are not included since this is already captured by $\phi^H_{s,t}$. Likewise, $\phi^F_{s,t}$ is the share of foreign employment in upstream (or supplying) sectors feeding into s, with the different sectors' $\phi^H_{k,t}$ values weighted by the share of inputs s sources from k (again excluding within-sector purchases). As discussed above, we will decompose changes in these three variables into those arising from increases in foreign ownership and those from declining foreign ownership. For spillover type $j \in \{H, B, F\}$, $\dot{\phi}^{j\ +}_{s,t}$ denotes changes coming from increases in foreign ownership and $\dot{\phi}^{j\ -}_{s,t}$ is that arising from decreases in foreign ownership.[22]

Table 4 presents summary statistics for the changes in foreign ownership and the spillover variables, both on net and decomposed into positive and negative changes.[23] On net, foreign ownership and the forward and backward spillover variables fall; horizontal spillovers, meanwhile, increase. Nevertheless, regardless of which of these one considers, there is a good deal of churning (i.e. simultaneous entry and exits). In the horizontal spillovers, entries are roughly 1.6 times the size of exits (i.e. $\phi^{H\ +}_{s,t} = -1.6\phi^{H\ -}_{s,t}$). For forward spillovers, on the other hand, exits are 2.3 times larger than entries. As the horizontal spillovers increased on average, this means that the exits were tilted towards those industries which purchase from Jordanian firms. Even more extreme are the backward spillovers, where exits are 26 times larger than entries. Thus, in industries which supply to Jordanian firms, reductions in

[21] As there is no input-output matrix available for 2011 we use the same shares for both years.

[22] Note that although the spillover variables can change due to relative changes in employment across firms, this decomposition is constructed only using the changes in ownership.

[23] Note that for the foreign ownership variable, a given firm either experiences an increase or a decrease. For the spillover variables, however, a given firm experiences both changes due to entries and changes due to exits. In unreported results, we measured these changes as growth rates (i.e. changes in logs). When doing so, we found more evidence that foreign ownership increases and forward exits result in higher employment growth. The other spillover results were comparable to those reported. These alternative results are available on request.

Table 3: Foreign Direct Investment by Sector

	isic 1-digit	2006	2011
1	Manufacturing, Mining, Quarrying	4.49	1.62
2	Manufacturing food paper chemicals metal	1.05	0.60
3	Manufacturing office electrical machinery transport furniture	2.31	0.42
4	Electricity, gas and water supply Construction	0.68	0.34
5	Wholesale and retail trade; repair of motor vehicles; motorcycles and personal and household goods; Hotels and Restaurants	0.38	0.16
6	Transport, storage and communications, Financial intermediation	3.43	2.01
7	Real estate, renting and business activities Public administration and defense; compulsory social security	0.82	0.17
8	Education Health and social work	0.27	0.09
9	Other community, social and personal service activities, Activities of private households as employers and undifferentiated production activities of private households, Extraterritorial organizations and bodies	0.37	0.26
	Average	0.78	0.32

Table 4: Summary Statistics of Changes in Spillover Variables

Variable	**Mean**	**Std. Dev.**	**N**
$\dot{Fgn_i}$ (net)	-0.46	8.038	15465
$\dot{Fgn_i}^+$ (entry)	0.166	3.692	15465
$\dot{Fgn_i}^-$ (exit)	-0.626	7.125	15465
Horizontal			
$\dot{\phi}^H$ (net)	0.01	0.127	15465
$\dot{\phi}^{H^+}$ (entry)	0.024	0.105	15465
$\dot{\phi}^{H^-}$ (exit)	-0.015	0.066	15465
Backward			
$\dot{\phi}^B$ (net)	-0.103	0.084	15465
$\dot{\phi}^{B^+}$ (entry)	0.004	0.028	15465
$\dot{\phi}^{B^-}$ (exit)	-0.107	0.074	15465
Forward			
$\dot{\phi}^F$ (net)	-0.019	0.101	15465
$\dot{\phi}^{F^+}$ (entry)	0.013	0.054	15465
$\dot{\phi}^{F^-}$ (exit)	-0.031	0.081	15465

foreign ownership were particularly severe. These characteristics ensure sufficient variation in the data allowing us to empirically identify asymmetric spillover effects from FDI.

Our estimating equation builds from equation 9.[24] Specifically, following **?**, we let employment growth as $H = 2 * \frac{e_t - e_{t-1}}{e_t + e_{t-1}}$ for firm i, in sector j, in region r be determined by, where all control variables are measured in differences:

$$\dot{H_{i,s,r}} = \alpha + \beta_1 H_i^0 + \beta_2 \dot{Fgn_i} + \beta_3 \dot{\phi_s^H} + \beta_4 \dot{\phi_s^B} + \beta_5 \dot{\phi_s^F} + \alpha_s + \alpha_r + \varepsilon_{i,s,r}$$

This growth rate measure has become standard in analysis of establishment and firm dynamics, because it shares some useful properties of log differences but also accommodates entry and exit.[25] In (11), H_i^0 is firm i's initial employment level, $\dot{Fgn_i}$ measures the change in the share of firm's total equity owned by foreign investors, the spillover variables are as described above, and $\varepsilon_{i,s,r}$ is the error term. We use weighted least squares estimation, weighting according to the share of a given sector in the entire economy. Note that although we have two years of data, we estimate a difference equation which nets out any firm-, region-, and sector-specific time invariant factors. That said, by including sector and region dummies

[24]Note that as we lack continuous data on firms' revenues we cannot follow Javorcik (2004) and construct productivity measures. Therefore we focus on employment and capital growth.

[25]See for instance **?**.

α_s and α_r, we are implicitly controlling for region- and sector-specific time trends.[26] Finally we control for the age of the establishment by including the year the company was founded.

We then decompose this into our main specification:

$$\begin{aligned} \dot{H}_{i,s,r} &= \alpha + \beta_1 H_i^0 + \beta_2^+ \dot{F}gn_i^+ + \beta_2^- \dot{F}gn_i^- + \beta_3^+ \dot{\phi_s^H}^+ + \beta_3^- \dot{\phi_s^H}^- + \beta_4^+ \dot{\phi_s^B}^+ + \beta_4^- \dot{\phi_s^B}^- \quad (11) \\ &+ \beta_5^+ \dot{\phi_s^F}^+ + \beta_5^- \dot{\phi_s^F}^- + \alpha_s + \alpha_r + \varepsilon_{i,s,r} \end{aligned}$$

where, to map this into the theory, we would interpret the coefficients as, using the horizontal spillover as an example, $\beta_3^+ = \rho$ and $\beta_3^- = \delta\rho$. Note that as exits are measured as negative values, $\beta_3^- > 0$ means that as there is less exit, $\dot{\phi_s^H}^-$ moves towards zero, increasing spillovers. Finally, if it is only the net change in FDI that matters, then $\beta_3^+ = \beta_3^-$, i.e. churning has no effect.

4 Results

We begin by comparing the standard method in which only net FDI changes matter with our specification in (11). We then consider heterogenous impacts of FDI spillovers on employment and conclude by examining the role of FDI spillovers in investment decisions.

4.1 Baseline Results

Table 5 presents our baseline results. In column (1), we take the standard approach that assumes only net changes in foreign ownership (and thus the spillover variables) matters. In column (2) we decompose these net changes into the positive and negative components. In column (1) we observe that increases in foreign ownership increases employment growth, although the impact is small (with a 10 percentage point increase in foreign ownership increasing growth by .01 percent). We see little evidence for horizontal spillovers which proxy for competition effects due to foreign presence. Regarding vertical spillovers we provide evidence that both backward as well as forward spillover foster employment growth. For backwards spillovers, a 10 percentage point increase in foreign employment of downstream industries would increase firm i's employment growth by 2.67 percent. A comparable increase in the forward linkage, meanwhile, increases by 1.34 percent. Results such as these are fairly common in the existing literature. Furthermore, older firms have higher employment growth, and the initial employment level is significant and, as expected, negative.[27]

[26] Specifically, we include industry effects at the one digit level and regional effects at the governorate level.

[27] Please note that these coefficients are not true zeros, only very small in magnitude.

Table 5: Employment Growth: Net, Persistent, and Transitory Effects

	(1) Net Effects	(2) Persistent & Transitory Effects
$\dot{F}gn_i$	0.001*	
	(0.001)	
$\dot{Fgn_i}^+$		0.002
		(0.001)
$\dot{Fgn_i}^-$		0.001
		(0.001)
$\dot{\phi}^H$	0.005	
	(0.033)	
$\dot{\phi^H}^+$		-0.048
		(0.037)
$\dot{\phi^H}^-$		0.162*
		(0.089)
$\dot{\phi}^B$	0.267***	
	(0.084)	
$\dot{\phi^B}^+$		0.144
		(0.184)
$\dot{\phi^B}^-$		0.291***
		(0.107)
$\dot{\phi}^F$	0.134**	
	(0.060)	
$\dot{\phi^F}^+$		-0.051
		(0.161)
$\dot{\phi^F}^-$		0.114
		(0.078)
H_i^0	-0.0002***	-0.0002***
	(0.000)	(0.000)
Start Year	0.002***	0.002***
	(0.000)	(0.000)
Constant	-2.780***	-2.787***
	(0.795)	(0.794)
Observations	15,456	15,456
R-squared	0.012	0.013
Industry Fixed Effects	Yes	Yes
Region Fixed Effects	Yes	Yes

Notes: $\dot{F}gn_i$ denotes foreign ownership, $\dot{\phi}^H$ horizontal spillover, $\dot{\phi}^B$ backward spillover, $\dot{\phi}^F$ forward spillovers and H_i^0 is firm i's initial employment level.

When we allow for asymmetric effects from entries and exits in column (2), however, we see rather different results. First, we no longer find an effect of changes in foreign ownership or the forward spillover variable. This suggests that, by imposing symmetry, the estimation was overstating the significance for these variables.[28] Second, we now find that only the exits have a significant impact for the backward spillovers.[29] Not only does this suggest asymmetries, but it indicates that a perhaps more accurate description of the results for the backward spillovers in column (1) is that firms that see spillovers fall more reduce employment growth by more. In particular, the estimated coefficient of .291 is significantly different from both zero and one, suggesting that spillovers are a mix of both transitory and persistent effects. Finally, we now see a horizontal spillover which is significant at the 10 percent level and is again driven by the exits.

Thus, in order to maintain level employment, it may be necessary to encourage existing foreign firms to not disinvest even more so than seeking new investment. This seems particularly true for the industries which Jordanian firms supply to, with a somewhat smaller effect via horizontal spillovers. New investment, on the other hand, has no significant impact. One potential cause of this is that spillovers from new FDI take time to manifest, i.e. that new foreign investment during our short time horizon has yet to reveal its full benefits.[30] If that is indeed the case, then this suggests further differences between the spillover effects of new versus exiting FDI over short time horizons that can not be observed when using only net FDI changes as done in previous studies.

4.2 Heterogenous Effects of Spillovers

As discussed above, the impact of the spillovers may vary by firm characteristics, including sector, size, and age. We explore these possibilities in Table 6. For ease of comparison, column (1) replicates the full sample results of Table 5's column (2). First, in columns (2) and (3) we conduct a sample split across manufacturing and service sector. We do so both because of the potentially different effects of FDI as well as the fact that Jordan liberalized manufacturing investment more so than services FDI (Schiffbauer et al., 2015).

[28]Note that the p-value for Fgn_i^+ is 0.106 and very close to the standard level of significance. Furthermore, as explored below, we do find significant impacts for certain subsets of firms even in this expanded specification.

[29]Note that the significance of exits (declining FDI) is not driven by negative demand shocks. If we conduct a statistical test, comparing growth rates of domestic firms in sectors where FDI declines against sectors where FDI increases (at 4 digit level), we find no statistical differences for both employment growth as well as capital growth. Results are available on request.

[30]Unfortunately due to the nature of the data, we cannot separate out early new investments (in say 2007) from later ones (in 2010 for example). Alternatively, this could indicate that, since the bulk of our increases in FDI are due to expansion of existing firms rather than new entrants, that further investment by already present MNEs has no effect.

The two regressions reveal some notable differences. First, for manufacturing we find an impact from increases in foreign ownership of firm i, where additional ownership increases employment growth (with no evidence that reductions in ownership lower growth). Second, we see that the impact from reductions in the horizontal spillover variable are attributable to manufacturing.[31]

Conversely, the backward spillover variables are significant only for services. In addition, for services we now find significant impacts from both increases and decreases in the backward spillovers where, consistent with a mix of persistent learning and transitory leaning effects, the point estimate for entries is greater than for exits. It should be noted, however, that we cannot reject the null hypothesis for equality of these coefficients.[32] This result also lends some support to the notion that new entries may require time before their impacts are felt. If FDI in the service industry comes "on line" faster than that in manufacturing, something suggested by Davies and Desbordes (2016), then this may explain the difference in effects of new entries for manufacturing and services.

In columns (4) through (7), we focus on firm size, with (4) and (5) differentiating by employment (where small firms have less than 20 employees) and (6) and (7) differentiating by revenues (where small firms earn less than 80,000 Jordanian Dinar).[33] On the whole, we find significant spillover effects primarily for small firms, regardless of whether this is measured by employment or revenues. In particular, as in the full sample results, these seem to stem from horizontal and backward exits. One interpretation of these results is that, in order to benefit from FDI spillovers, a given firm must be sufficiently far from the technological frontier, i.e. that it has room to grow. Evidence for this is found in Chinese data by Hu et al. (2005) and across OECD countries by Griffith et al. (2004). In addition, we find that, at least for high revenue firms, that higher foreign ownership in the firm itself is linked with higher employment growth.

Finally, columns (8) and (9) split our sample between old firms (those founded before 1990) and young ones. Overall, we find that older firms are more sensitive to FDI spillovers, a finding consistent with Gorodnichenko et al. (2014). Specifically, we provide evidence that more foreign ownership of firm i increases growth, with a slightly greater effect from increases in foreign ownership than from decreases. Foreign ownership of firm i, however, has no significant impact among the younger firms. Older firms are also affected by horizontal

[31] If we control for sector which attract more FDI as compared to sectors where FDI is leaving we find evidence that this effect is driven by sectors where FDI activity is reduced. In sectors where FDI activity is increasing we find in turn evidence that competition spillover matters. Results are available on request.

[32] The F-statistic for this test was 1.33, resulting in a p-value of 0.25.

[33] Gorodnichenko et al. (2014) use a similar threshold. Our threshold separates the top 5% of companies from the remainder.

Table 6: Heterogenous Effects of Spillovers

	(1) H	(2) Services	(3) Manufact.	(4) Small	(5) Large	(6) Low Rev	(7) High Rev	(8) Old	(9) Young
$\dot{Fgn_i}^+$	0.002	0.001	0.007***	0.000	0.002	0.000	0.005**	0.010***	0.001
	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.003)	(0.001)
$\dot{Fgn_i}^-$	0.001	0.001	0.000	0.000	0.000	0.001	0.001	0.003*	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
$\dot{\phi^H}^+$	-0.048	-0.037	-0.321	-0.059	0.358	-0.040	-0.058	-0.110	-0.039
	(0.037)	(0.037)	(0.308)	(0.036)	(0.348)	(0.038)	(0.158)	(0.088)	(0.041)
$\dot{\phi^H}^-$	0.162*	0.163	0.280**	0.161*	0.293	0.173*	-0.059	0.325*	0.101
	(0.089)	(0.127)	(0.136)	(0.083)	(0.203)	(0.092)	(0.210)	(0.183)	(0.103)
$\dot{\phi^B}^+$	0.144	1.577*	0.044	0.206	-0.199	0.206	-0.251	-0.044	0.118
	(0.184)	(0.884)	(0.224)	(0.182)	(0.552)	(0.207)	(0.402)	(0.369)	(0.212)
$\dot{\phi^B}^-$	0.291***	0.539***	0.092	0.421***	-0.367	0.380***	-0.042	0.464**	0.232*
	(0.107)	(0.172)	(0.158)	(0.117)	(0.335)	(0.117)	(0.242)	(0.232)	(0.120)
$\dot{\phi^F}^+$	-0.051	0.199	0.418	-0.001	0.025	0.053	-0.303	0.459	-0.249
	(0.161)	(0.231)	(1.057)	(0.156)	(0.348)	(0.196)	(0.267)	(0.344)	(0.170)
$\dot{\phi^F}^-$	0.114	0.337	0.005	0.149*	0.070	0.059	0.485*	0.084	0.133
	(0.078)	(0.384)	(0.106)	(0.079)	(0.208)	(0.082)	(0.283)	(0.189)	(0.087)
H_i^0	-0.000***	-0.000**	-0.000	-0.029***	-0.000***	-0.009***	-0.000**	0.000	-0.000***
	(0.000)	(0.000)	(0.000)	(0.008)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)
Start Year	0.002***	0.002***	-0.000	0.001**	0.004**	0.001***	0.002*	0.002*	0.000
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Constant	-2.787***	-4.723***	1.070	-1.422	-7.202**	-2.407***	-4.041*	-3.643**	-0.145
	(0.794)	(0.874)	(2.145)	(0.867)	(2.853)	(0.841)	(2.255)	(1.855)	(1.877)
Observations	15,465	12,828	2,441	14,605	860	13,243	2,222	3,464	12,001
R-squared	0.013	0.015	0.022	0.079	0.134	0.029	0.028	0.028	0.013
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Small represents firms with less than 20 employees, big firms are firms with more than 20 employees, high revenue firms are firms that earn more than 80000 Jordanian Dinar and low revenue firms are firms than earn less than this threshold, old are firms founded before 1990, young firms started business afterwards.

exits whereas we find no such effect for younger firms. Finally, note that while both are impacted by backward exits, the coefficient is twice as large for old firms than for young firms.[34]

Summarizing these estimates, we see not only evidence on the existence of spillover effects with asymmetries between entries and exits, but heterogeneity across sectors and firms. Overall, we find that foreign ownership of a given firm tends to be associated with higher employment growth for older firms, those in manufacturing, and those with high revenues. In addition, we find evidence of horizontal and backward spillovers. These, too, vary across firms, with horizontal effects more evident in manufacturing and small firms. Backward spillovers are also more in evidence for small firms. Unlike the horizontal spillovers, however, they manifest more in services and both old and young firms. Furthermore, throughout our analysis, we find evidence of asymmetries between FDI entries and exits, with the coefficients highly suggestive of an important role for transitory spillovers reflecting leaning effects instead of knowledge transfers from MNEs to local firms and of potential lags before the effects of new entries manifest themselves.

4.3 Capital Growth

In the theory, we focused on employment growth, however, it also allowed for FDI spillovers onto the capital investment of local firms (albeit in an admittedly specialized fashion due to the Leontief production technology). Thus, here we also examine the impact of FDI on the investment decision. In particular, this is worth consideration in light of studies such as Borenzstein et al. (1998) who find that greater FDI investment spurs local capital investment. With this in mind, we employ the same strategy as above, replacing our dependent variable with capital growth and calculating the spillover variables in the same fashion as before using capital stock instead of employment. Table 7 contains the summary statistics of the relevant variables. Although the foreign ownership and backward spillovers are comparable between this and the employment-based measures, there are two notable differences between this and Table 4. First, even though the net change in the horizontal spillover is comparable in the employment- and capital-based measures, the latter exhibits more churning. Second, the net forward spillover variable is more negative for the capital-based measure, something driven by markedly higher exits.

Tables 8 and 9 are the capital growth equivalents of the employment growth results in Tables 5 and 6. Overall, our findings are robust to using employment or capital growth - both measures yield consistent results. Beginning with the net effects in Table 8's column

[34]Although twice as large, a test on the equality of the two coefficients fails to reject that those coefficients are the same at standard levels of confidence.

Table 7: Summary Statistics Changes in Spillover Variables for Capital

Variable	**Mean**	**Std. Dev.**	**N**
Capital Growth	-0.03	0.87	15395
$\dot{Fgn}_i$	-0.45	8.04	15395
$\dot{Fgn}_i^+$	0.17	3.7	15395
$\dot{Fgn}_i^-$	-0.62	7.09	15395
Horizontal			
$\dot{\phi^H}$	0.01	0.19	15395
$\dot{\phi^H}^+$	0.04	0.17	15395
$\dot{\phi^H}^-$	-0.03	0.07	15395
Backward			
$\dot{\phi^B}$	-0.1	0.07	15395
$\dot{\phi^B}^+$	0	0.03	15395
$\dot{\phi^B}^-$	-0.11	0.05	15395
Forward			
$\dot{\phi^F}$	-0.17	0.15	15395
$\dot{\phi^F}^+$	0.01	0.07	15395
$\dot{\phi^F}^-$	-0.18	0.11	15395

(1), we find comparable quantitative results, although the net forward spillover coefficient is now insignificant. In column (2), as in Table 5 we find significant evidence of asymmetries. First, we find that only increases in the foreign ownership of firm i have a significant impact (where they increase growth). Similarly, we find differences in the impact of entries and exits in the industries firm i supplies where as before, the impact of exits are greater than entries. Note, that we now find some effect from entries significant at the 10% level. Forward spillovers, however, have no effect (as was true using the employment-based measures) nor do horizontal spillovers (where, unlike Table 5, we find no significant effects from exits).

In Table 9, where we allow for heterogenous impacts from the spillovers, we again provide evidence of such, although the pattern is slightly different. First, in contrast to Table 6, we find that foreign ownership in firm i has a significant effect only for services. Second, we find that entries in the backwards spillovers seem to increase investment in manufacturing, not in services. Exits in this variable, however, have an effect comparable to before, indicating some degree of persistence for manufacturing. Third, we now estimate a significant impact on horizontal exits in services, not manufacturing. Despite these differences, which may be driven by the relative importance of labour in services as compared to capital in manufacturing, we find evidence of asymmetric effects of entries and exits and that there is significant evidence of transitory effects from FDI spillovers. Turning to the firm size effects in columns

Table 8: Spillover Effects on Capital Growth

	(1) Net Effects	(2) Persistent & Transitory Effects
$F\dot{g}n_i$	0.002**	
	(0.001)	
$F\dot{g}n_i{}^+$		0.007***
		(0.002)
$F\dot{g}n_i{}^-$		0.001
		(0.001)
$\dot{\phi}^H$	0.004	
	(0.037)	
$\dot{\phi}^{H+}$		-0.018
		(0.040)
$\dot{\phi}^{H-}$		0.157
		(0.130)
$\dot{\phi}^B$	0.558***	
	(0.138)	
$\dot{\phi}^{B+}$		0.377*
		(0.221)
$\dot{\phi}^{B-}$		0.681***
		(0.200)
$\dot{\phi}^F$	0.026	
	(0.109)	
$\dot{\phi}^{F+}$		0.009
		(0.188)
$\dot{\phi}^{F-}$		0.038
		(0.189)
H_i^0	-0.000	-0.000
	(0.000)	(0.000)
Start Year	-0.000	-0.000
	(0.001)	(0.001)
Constant	0.335	0.350
	(1.352)	(1.352)
Observations	15,393	15,393
R-squared	0.016	0.016
Industry Fixed Effects	Yes	Yes
Region Fixed Effects	Yes	Yes

Notes: $\dot{F}gn_i$ denotes foreign ownership, $\dot{\phi}^H$ horizontal spillover, $\dot{\phi}^B$ backward spillover, $\dot{\phi}^F$ forward spillover and H_i^0 is firm i's initial employment level.

Table 9: Heterogenous Spillover Effects on Capital Growth

	(1) K	(2) Services	(3) Manufact.	(4) Small	(5) Large	(6) Low Rev	(7) High Rev	(8) Old	(9) Young
$\dot{Fgn_i}^+$	0.007***	0.008***	0.002	0.008***	-0.000	0.009***	0.001	-0.002	0.007***
	(0.002)	(0.002)	(0.001)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
$\dot{Fgn_i}^-$	0.001	0.002	-0.001	0.001	0.001	0.003	0.001	0.003	0.001
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.001)
$\dot{\phi^H}^+$	-0.018	-0.025	1.186*	-0.021	0.542	-0.020	0.066	-0.084	0.006
	(0.040)	(0.040)	(0.629)	(0.040)	(0.379)	(0.041)	(0.137)	(0.081)	(0.045)
$\dot{\phi^H}^-$	0.157	0.266*	-0.315	0.182	0.324	0.327**	-0.128	0.378	0.097
	(0.130)	(0.158)	(0.212)	(0.139)	(0.371)	(0.152)	(0.259)	(0.287)	(0.143)
$\dot{\phi^B}^+$	0.377*	-0.243	0.579**	0.332	1.260	0.260	1.222**	0.748	0.310
	(0.221)	(1.513)	(0.231)	(0.228)	(0.768)	(0.241)	(0.490)	(0.471)	(0.247)
$\dot{\phi^B}^-$	0.681***	0.994***	0.105	0.827***	-0.661	1.002***	-0.429	0.506	0.743***
	(0.200)	(0.321)	(0.307)	(0.215)	(0.501)	(0.242)	(0.356)	(0.405)	(0.230)
$\dot{\phi^F}^+$	0.009	0.062	-0.650	-0.052	0.951*	-0.088	0.261	-0.716**	0.301
	(0.188)	(0.201)	(0.753)	(0.201)	(0.485)	(0.235)	(0.331)	(0.348)	(0.224)
$\dot{\phi^F}^-$	0.038	0.029	-0.597	0.111	-1.162*	0.174	-0.325	0.338	-0.084
	(0.189)	(0.232)	(0.491)	(0.199)	(0.689)	(0.220)	(0.406)	(0.431)	(0.215)
H_i^0	-0.000	0.000	-0.000	-0.000	-0.000**	-0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Start Year	-0.000	-0.000	0.001	0.000	0.002	-0.000	0.002	-0.000	-0.002
	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)
Constant	0.350	-0.225	-1.466	-0.164	-5.181	0.204	-3.840	0.593	3.530
	(1.352)	(1.615)	(3.301)	(1.397)	(5.341)	(1.449)	(3.832)	(3.062)	(3.186)
Observations	15,393	12,758	2,441	14,551	842	13,188	2,205	3,421	11,972
R-squared	0.016	0.018	0.022	0.018	0.071	0.021	0.031	0.025	0.016
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Small represents firms with less than 20 employees, big firms are firms with more than 20 employees, high revenue firms are firms that earn more than 80000 Jordanian Dinar and low revenue firms are firms than earn less than this threshold, old are firms founded before 1990, young firms started business afterwards.

(4) through (7), we find that whether size is measured as employment or revenue, increased foreign ownership in firm i is associated with greater investment for low revenue and small firms. As before, we only see a significant impact of horizontal spillovers for the small firms, and then only in exits. Similarly, we find that backward exits affect small and low revenue firms only. Unlike the previous results, however, we do find an impact of backward entries on high revenue firms. Testing the coefficient estimates we find a significant and persistent effect of backward spillovers.[35] Also different from the results of Table 6, we find some slight significance of the forward spillover results, although this is only for the large employers. In any case, these firm size results lend further support to asymmetric effects and transitory spillovers, particularly when FDI exits those sectors supplied by small firms. Finally, in the age results of columns (8) and (9), we find little significance of the spillovers, although as before we find a significantly positive effect from backward exits on young firms suggestive of transitory spillovers.

Thus, while there are some differences between the employment- and capital-based results, three lessons stand true. First, we provide evidence that using the net change in spillovers conceals important asymmetries between FDI entry and exit. Second, we find significant evidence of transitory leaning effects since, if spillovers were to originate from permanent learning effects, exits should have no impact on the behaviour of local firms. Third, we show that changes in the backward spillovers, and particularly when driven by exits, have the most robust impacts. Fourth, we find that the asymmetric transitory spillovers from FDI are particularly strong for service sector and smaller firms. This implies that the existing literature focusing exclusively on net changes in FDI is missing important aspects of the spillover process.

5 Conclusion

One of the prime reasons governments aim to attract foreign investment is the belief that, by bringing in new technologies, ways of doing business, and global connections, multinationals will increase the productivity, employment, and investment of local firms. Although there is a large body of evidence supporting these effects, heretofore no one has investigated whether these effects are persistent learning spillovers, remaining after the foreign firm disinvests, or transitory leaning effects, meaning that in order to maintain the spillover it is necessary to prevent exit. We fill this gap using Jordanian firm level data during a period of both entry and exit by foreign firms. On the whole, we find notable asymmetries between entry and exit of foreign firms, with the estimates indicating a significantly transitory nature of FDI

[35] F-stat(1,2175)=6.21, P-value=0.01.

spillovers. In particular, we find that exits by multinationals in the sectors a given firm supplies tends to reduce both employment and capital growth. If spillovers were entirely persistent as local firms have learned to adapt the foreign technology there should be no such effect. In addition, we find that the impact of these spillovers varies across sectors and firm size, with small firms in the services industries being particularly affected.

Recognizing the asymmetric effects of entries and exits not only provides a more nuanced understanding of the nature of spillovers (suggesting, for example, that they may be more due to demand effects for locally sourced goods and services rather than technology sharing) but also has important implications for policies. Transitory policies to attract FDI, such as tax holidays, may be useful in attracting new investment, however, once they expire that investment may well leave. If, as our evidence suggests, FDI spillovers have a strong transitory component, then a policy maker, seeking to create sustained employment and investment growth, may find such policies ineffective. Instead, it may be more beneficial to focus on more long-run policies that both attract and retain foreign firms such as low corporate tax rates and efficient regulatory environments. Furthermore, in order to maximize these benefits, such policies may find it desirable to focus on the industries supplied by smaller firms. The significant transitory nature of FDI spillovers also highlights that technology transfers from MNEs to local firms are far from being automatic and may instead require substantial investments of the local firms in, e.g, complementary skills. This would provide some justification for the FDI-attracting policies in China that forced MNEs to enter some sectors through joint ventures with local firms or in Malaysia which subsidized training provided by MNEs to local firms that can potentially supply goods and services to the MNE.[36] With this in mind, our findings contribute to an important refinement of our understanding of both FDI spillovers and the potential effect of policy.

[36]See, for example, Rodrik (2004) or Sutton (2005).

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