

The Direct effects and Spillovers Effects of the Foreign Firms on the Local Companies Labor Growth: Evidence from the Moroccan Vegetable Sector

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Abstract – We analyze the impact of foreign firms in the Moroccan vegetable sector on the growth labor of domestic farms. This analysis is based in the data collected from our survey with 240 local farms. For this purpose, we use the Ordinary Least Squares to investigate two econometric models. Our study shows that the direct relationships of foreign firms with local farmer's households via inputs and outputs markets have positive and direct effects on the domestic farms labor growth. The foreign firms have also positive horizontal spillovers effects on this growth for local farms which are nearby foreign investors and better endowed in technologies. Our results confirm the theoretical predictions of Jovanovic model. The local farmer's household's human and financial capital and their location have an important contribution to their farms growth.

Keywords – Direct Effects, Foreign Firms, Horizontal Spillovers Effects, Impact, Labor Growth, Morocco, Vegetable Sector.

I. INTRODUCTION

The impact of Foreign Direct Investment (FDI) on the domestic firms has regained interest in the last decade. Some authors see FDI as an important source of capital, technology and knowledge for poor countries. Others authors reveal the dangers of foreign firms crowding out domestic companies as well as introducing imperfect competition.

There are two main groups in the empirical studies emphasizing horizontal spillover effects of FDI on the domestic firms. A first group finds positive effects [6]-[10]-[30]-[36]. These effects come from an indirect transfer of new products, technologies and knowledge from foreign firms to domestic ones. These local companies can benefit from this through four main channels: imitation, personnel turnover, export and competition [7]-[24]. Imitation consists of copying FDI by local companies. Personnel turnover from foreign to domestic firms can diffuse spillovers effects after acquiring skills and experience within foreign companies [38]. Following the FDI export process through imitation, local companies can benefit the consumers requirements information's and export markets [26]. Increased competition with foreign companies forces local firms to make more efficient management of human resources and investment in new technologies. A second group focuses on negative effects [16]. These effects come from an increasing competition between foreign and local firms, which results in a decrease of domestic firm's market share in Developing Countries (DC).

FDI spillover effects on local companies can be diffused by three main factors: technological gap between local

and foreign companies; regional effect; size and export capacity of domestic companies. Local operators should have a low technological gap compared to foreign firms so that the domestic firms can benefit of technology transfer [34]. The spillovers effects diffusion decreases with geographical distance between local and foreign firms "regional effect". This is explained by the intensification of some spillover effects channels (personnel turnover and imitation) with the proximity between foreign and domestic firms [23]-[31]. Unlike large local companies, small ones are less able to imitate the foreign firm's technologies and compete with them [1]. The positive effects spillovers resulting from foreign firm's competition are less important for local exporting firms because they already faced to strong export markets competition [8].

Global FDI in agriculture have significantly increased from 1 to 3 billion dollars over the last decade, especially in Africa and Asia [16]. But, the fresh fruits and vegetables sector is particularly concerned by globalization [17]-[37]. This is required by the European supermarkets safety and quality purposes in their regular supplies of fresh fruits and vegetables from DC.

FDI in agriculture have positive impacts on local populations in DC: direct effects through labor market and poverty reduction as well as local infrastructures development (roads, electrification ...) and spillover effects due to an indirect transfer of new techniques and technologies [43]-[28]. These foreign investments have also generated negative impacts on the domestic small farmer's welfare, coming from extensive use of water and land resources as well as food security problems in host countries [21].

In addition to their direct effects (resulting from direct relationships via the labor market, land rent, contract farming), foreign operators may also have spillover effects on local farms. But, a large empirical literature has focused on opposite effects of foreign firm's contract farming on the farms growth of their domestic suppliers [33]-[18]-[27]-[9]-[25]. Some studies have shown positive effects through various channels: technical supervision, new technologies transfer, quality and production improvement, markets and credit facilities. Other studies have revealed negative effects due to a difficulty of domestic suppliers to comply with the higher standards requirements of Europeans customers [17]-[45]-[29].

Morocco is one of DC attracting FDI in agriculture, looking for vegetable supply for European markets. These investments have significantly grown since the 1970s, they increased from 2 million Moroccan Dirham (MDA); (1 USD = 9.58 MDA) in 1973 to approximately 24.2 million MDA in 2006 [39]. This evolution has been favored by

important FDI inflows from Europe to Morocco since the 1990s. In fact, Morocco offers various advantages for these European investors such as the geographical proximity to European markets, low country risk, production period complementarity between Morocco and Europe as well as low labor cost [3].

In Morocco, agriculture has a major role in socio-economic stability of the country due to its significant contribution in the Gross Domestic Product (15-20%) and in the employment (80% of rural population). Foreign investors in Moroccan agriculture are very concentrated in the vegetable sector (85% of FDI in agriculture). These foreign companies are likely to have significant impact on the local population, resulting from a strong pressure on the water, land and human local resources. However, the study of these impacts was not subject of detailed analysis in Morocco. This situation is explained by the lack of official information concerning FDI in agriculture and the confidentiality of these foreign investments issues [5].

The main objective of this paper is to study the impact of foreign firms in the Moroccan vegetable sector, on domestic agricultural economy. Our research is focused on their direct and horizontal spillovers effects on the local farms labor growth.

This paper is organized as follow. In section 2, we present the empirical methodology and the data collected through our survey with 240 local farmers' households in Morocco. The next section describes our conceptual econometric models and their variables. In section 4, we discuss the results of an econometric analysis of the impact of foreign firms in the Moroccan vegetable sector on the domestic farms labor growth. Finally, section 5 summarizes the main conclusions of our study.

II. EMPIRICAL METHODOLOGY AND DATA

In this section, we analyze the characteristics of FDI in the Moroccan vegetable sector and our three study zones in the Souss-Massa-Draa Region (SMDR). Then, we discuss the data collection approach adopted in our quantitative survey.

2.1. FDI in the Vegetable Sector in SMDR

Foreign operators in the vegetable sector are mainly Spanish and French, specialized in production under

greenhouse, intended for the export market [5]. Some of foreign investors relocated their European production in Morocco (green beans by Spanish operators, i.e.). This production relocation is favored by research of low production cost, required by the high land and labor costs in their origin countries.

Foreign operators can choose different implantation forms: vertical integration, contract farming or joint venture [4]. They thus developed various direct relationships with local populations [5]. First; the relationship through the labor market consists of an employment of some members of the local farmer household within the foreign firm. Then, the relationship through land market is a land partial rent of local farmer to foreign investor. Finally, contract farming is developed by foreign firms with domestic suppliers (relationships via outputs market).

FDI in the vegetable sector benefit from several advantages compared to Moroccan producers: an intensive land production, extended labor working hours, with the use of high technology as well as an easy access to European markets [11]. Foreign investors exploit between 11 and 35% of the vegetable area in the rural zones of Chtouka-Ait Baha [5]. They contribute to around 30% of fruits and vegetables total export in Morocco [2]. But, FDI are developed in a delicate local environment known by strong pressure on water and land resources since 2007 as well as significant problems in staff social management since 2008.

2.2. Study Field

For our empirical approach, we choose three zones in three provinces of SMDR: Chtouka-Ait Baha, Ait Melloul and Inzegane-Taroudant (see Table I). This region has an important contribution in the area (53%), production and export (71%) in the national early vegetables sector [2]. An empirical study [20] shows that SMDR has also a strong attractiveness for foreign investors in the national vegetable sector (63% of FDI). Our three study zones have an important contribution in the regional area and in the production of vegetable sector. While these zones are different in the characteristics of vegetable production system and attractiveness level to FDI in the vegetable sector (see Table I).

Table I. Characteristics of the study zones in the SMDR

		Zone 1	Zone 2	Zone 3
Province		Chtouka-Ait Baha	Inzegane-Ait Melloul	Taroudant
Contribution in the regional vegetable sector	Area (%)	46.7	8.26	32.3
	Production (%)	67.6	8.6	13.6
Vegetable production system		Highly demanding of labor and technicality	Moderately demanding of labor and technicality	Slightly demanding of labor and technicality
FDI attractiveness		Strong	Limited	Absence of FDI
FDI geographical distance in km (1 km= 1.60 miles)		0-9	20-30	120-160
Number of FDI Projects		89	3	0
Total area of FDI in hectares		1807	130	0

2.3. Data Collection

Our quantitative survey concerns a total sample of 240 local farms which are different in their size and location in 2000 (see Fig. 1). We interviewed three local farms categories classified according to their size measured by Utilized Agricultural Area (UAA) in 2000 in each study zone: i) small (less than 5 hectares); ii) medium (between 5 and 15 hectares); iii) large (more than 15 hectares). These farms are located in three zones with different exposure to FDI: i) zone 1 is more attractive for FDI; ii) zone 2 is exposed to foreign firms by its proximity of the first zone; iii) zone 3 is the furthest of FDI and not exposed to foreign investors.

The local farms data collection focuses on farms that developed agricultural production between 2000 and 2010. The choice of this study period is justified by a spectacular development of foreign firms in the vegetable sector in SMDR after 2000 (63% of the FDI total area in Morocco). This choice is also explained by a comparison of the domestic farms situation before and after an important development of foreign firms in the vegetable sector.

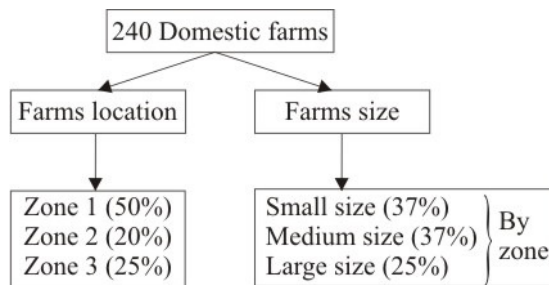


Fig. 1. Local farms surveyed by size and location in 2000

III. CONCEPTUAL MODEL

Following the previous empirical works, we investigate the Ordinary Least Squares (OLS) technique for our impact study. Contrary to abundant and existing literature, we develop foreign firm's impact analysis model [18] (i.e.). Firstly, we use the firm growth theoretical model of Jovanovic (size and age farms). Secondly, we analyze the direct effects of three direct relationships (contract farming, employment, rent land) instead of one direct relationship (contract farming). Finally, we propose specific proxies (diffusion channels and factors) of foreign firm's horizontal spillovers effects on local farms growth.

In this section, we present the firm growth theoretical model used in our study (Jovanovic Model). Then, we describe our conceptual models and their variables emphasizing the foreign firm's impact in the Moroccan vegetable sector on the domestic farms labor growth.

3.1. Firm Growth Model

To identify both direct effects and horizontal spillovers effects of foreign firms, on the local farms labor growth, we propose two models based on the Jovanovic model of firm growth and the literature of the foreign firm's impact on the domestic farms.

Abundant empirical literature considers the logarithms of the UAA and the number of employees, such as

physical size indicators of farms, relating to production factors [46]-[19]-[40] (i.e.).

Gibrat's Law [22] states that firm growth rates are independent of initial firm size. Following this law, the firm growth relationship is specified as follows (see Equation 1):

$$G_{firm} = \ln(S_{ft}) - \ln(S_{it}) = \alpha + u_i \quad (1)$$

Where G_{firm} is the firm growth, S_{it} and S_{ft} denote the initial and final firm size, α is an estimate coefficient and u_i is an error term.

The Gibrat's Law was superseded in the theoretical theory by Jovanovic's model [32] "learning model". It implies firm growth dependence on managerial efficiency (manager's skills) and output prices. This model suggests a deceleration of firm rates growth with its age (years of activities) and its determined threshold size.

Brock and Evans [13] propose a general function of the firm growth (see Equation 2).

$$G_{firm} = \ln[F(A_{it}, S_{it})] + e_i = \frac{\ln(S_{ft}) - \ln(S_{it})}{d} \quad (2)$$

$$\begin{aligned} \frac{\ln(S_{ft}) - \ln(S_{it})}{d} &= \alpha + \beta_1 \ln(S_{it}) + \beta_2 [\ln(S_{it})]^2 \\ &+ \beta_3 \ln(A_{it}) + \beta_4 [\ln(A_{it})]^2 \\ &+ \beta_5 [\ln(S_{it}) \ln(A_{it})] + \sum \delta_i X_i + u_i \end{aligned} \quad (3)$$

Where A_{it} is the firm age at the initial time (it), d is the period during which the growth is measured between the initial (it) and final (ft) times, $\ln[F(A_{it}, S_{it})]$ is a general function of firm growth, F is a function dependent on the firm size and age, e_i is an error term of the logarithmic distribution.

Recent empirical studies in agriculture have confirmed the Jovanovic's "learning model" contrary to the Gibrat's law [40] (i.e.). They estimated the general function of the firm's growth $\ln[F(A_{it}, S_{it})]$ by applying a production function Translog. These authors also introduced variables group regarding the agricultural sector and human capital characteristics " X_i " (see Equation 3).

Empirical studies have shown the influence of the farms initial size, the human capital of farmer households (age and education level of the household head, size and jobs of farmer households) on their farms growth [42]-[46]-[40].

3.2. Conceptual Models and Variables Description

To identify direct effects of foreign firms on the local farms growth, we consider the whole sample (240 observations). These effects result from their direct relationships via the inputs market (labor market and rent land) and outputs market (contract farming). These domestic farms differ in terms of exposure to FDI, size class and direct relationships development with foreign firms.

Our analysis of horizontal spillover effects of FDI on the domestic farms growth is focused on those independent of foreign operators (absence of direct relationships). Moreover, this analysis stressed local farms in the most attractive zone for foreign firms (zone 1) and their surroundings (zone 2). Indeed, the study zone 3 is not

affected by the diffusion of horizontal spillovers effects. This is explained by its important concentration in the most attractive zone for FDI and by our interest to study the local channels of horizontal spillovers effects.

As suggested in the literature, we privileged two physical size indicators of local farms in 2000: i) UAA; ii) total Agricultural Labor Unit (ALU) in SMDR. The UAA contains the arable lands, prairies and cultivated lands areas.

Total ALU equals the sum of family ALU (employments done by some members of the household) and hired ALU (jobs provided by non-family employees) recruited on farms. In the ALU calculation, we used data provided by agricultural households interviewed in the SMDR. In our study field, 1 ALU is equivalent to 2112 hours on average (see Equation 4):

$$1 \text{ ALU}_{\text{SMDR}} = [8 \text{ (hours/day)} \times 6 \text{ (day/week)} \times 4 \text{ (week/month)} \times 11 \text{ (month/year)}] = 2112 \text{ hours}$$

The endogenous variable (see Equation 5) in our models is the total ALU growth of local farms between 2000 and 2010 (GROWTH). In the conception of this variable, we use the general function of firm growth proposed by Brock & Evans [13].

The total ALU growth corresponds to a ratio of the difference between the logarithms of total ALU in 2010 (ALU2010) and in 2000 (ALU2000) over the period during which the growth is measured (2010-2000), (see Equation 5).

To determine the impact of FDI in the vegetable sector on the local farms growth, we propose two econometric models adapted to the specifications of our subject and study field. The first model (see Equation 6) concerns direct effect of foreign firms, while the second model (see Equation 7) emphasizes horizontal spillovers effects of FDI on the domestic farms growth.

The composition of our first variables group X or X' , differs depending on the model (see equations 6 and 7, Tables II and III). The group X contains direct relationships developed by foreign firms with local farms between 2000 and 2010 (relationship through inputs and outputs markets). The group X' focuses on channels and factors diffusion of the FDI horizontal spillover effects on domestic farms. Y and Z correspond to the two groups of common variables for our both econometric models analyzing direct effects and horizontal spillover effects of FDI on the local farms growth (see Equations 6 and 7, Tables II and III). The group Y includes the structural characteristics of domestic farms in 2000. The group Z represents the characteristics of human and financial capital of local farmer's households in 2000. We assume that the size and age of farms, unitary labor cost and specialization ratio of local farms in the sector vegetable under greenhouse in 2000, the human and financial capital of local households in 2000, the zone location and different levels exposure to FDI can affect the domestic farms growth between 2000 and 2010.

Where $\beta_1, \beta_2, \gamma_1, \gamma_2, \delta_1$ and δ_2 are the coefficients vectors that we are searching, u_1 and u_2 are two error terms.

To estimate equations 6 and 7 of our econometric models, we use the OLS regression technique. In our first

econometric model (see Equation 6), we consider the residuals heteroscedasticity at rural area level through a cluster, for correcting the co-variation of unobservable features at each rural area (namely the variables that we do not see, almost identical).

$$GROWTH = \frac{\ln(ALU_{2010}) - \ln(ALU_{2000})}{(2010 - 2000)} \quad (5)$$

$$GROWTH = \alpha_1 + \beta_1 X + \gamma_1 Y + \delta_1 Z + u_1 \quad (6)$$

$$GROWTH = \alpha_2 + \beta_2 X' + \gamma_2 Y + \delta_2 Z + u_2 \quad (7)$$

IV. RESULTS OF ECONOMETRIC EVIDENCE

4.1. FDI Direct Effects on the Local Farms Growth

Table II shows the estimation results for 240 local farmers which differ in term of direct relationships development with foreign firms between 2000 and 2010.

Contracts farming (relationship via the outputs market) with foreign firms (CFFF) have a significant and positive effect (10% level) on the labor growth of their large domestic suppliers (see Table II). Before, their engagement in these contracts farming; local farmers initially cultivated traditional crops, slightly demanding in labor (potatoes and carrots, i.e.). Some domestic contractual suppliers gradually cultivate highly demanding labor vegetables, with high value added (green beans and cherry tomatoes, i.e.), instead of their traditional crops. Other domestic suppliers become specialized in green beans which represent the main crop in contract farming (88% of contracts). This crop requires high labor level (5.1 ALU/ hectare/ year/ production cycle on average in 2010) and cultivated on several annual production cycles (2 to 3 cycles).

In fact, assistance programs provided by foreign operators favored the labor growth of their domestic supplier's farms. There are multiples assistance programs: best quality of inputs (seeds, fertilizers, pesticides ...), credit facilities, technologies direct transfer (new varieties, seeds, atomizers, tractors...), and technical supervision to improve crop returns and ensure easier access to export markets.

These assistance programs offered by foreign operators generated the farms growth of their domestic suppliers. These results are similar to those showed by other empirical studies in the agricultural and alimentary sectors [33]-[18]-[27]-[9]-[25].

The land rent by local farmer household to foreign firms (LRFF) increased significantly (5% level) the domestic farmer's labor growth (see Table II). This original result is explained by an important reinvestment of land rent incomes (5000 - 1200 MDA / hectare / year depending on the rent area) by domestic farmers in agriculture. These investments favored an agricultural production modernization: a development of vegetable crops highly labor demanding (green beans, peppers, i.e.) in 2010 at the detriment of traditional crops cultivated in 2000 (potatoes and carrots, i.e.). The local farmer's households privileged

this change to improve their land exploitation. This strategy induced thus the local farmer's labor growth.

The employment of at least one member of local farmer household within the foreign firm (EHEDI) has no significant influence (10% level) on the domestic farms growth (see Table II). Local farmer's households choose different strategies in the allocation of incomes generated by these jobs depending on their familial human capital. On one hand, the reinvestment of these incomes in intensive labor vegetables was privileged by domestic farmers employing qualified family members in agriculture. On the other hand, the use of FDI employments incomes in welfare improvement was favored by traditional local farmer's households who have a family human capital without agricultural qualification. These households developed crops requiring low labor level after their relationship with foreign firms via labor market.

The size (FSIZE) and the age (FAGE) of local farms in 2000 have negative and significant effects (1% level) on their labor growth (see Table II). These results suggest that smaller and newer farms grow faster than larger and older ones. This involves thus a rejection of Gibrat's law. However, our model shows a significant no linear (10% level) and positive effect of the farm size (FSIZE) on their labor growth (no linearity of size-growth relationship). This fact can be explained by considering an L-shaped long-run average cost curve, as suggested in an empirical study for the farm sector [35]. Increasing returns to scale up to some threshold level at or above which the returns to scale are constant. This would suggest that smaller farms either exist or adjust upwards towards some minimum efficient scale of production. While farms at or above the threshold scale have essentially stochastic growth characteristics.

The impact of initial size is negative for farms smaller than some threshold (about 25.26 ALU), indicating that within this group smaller farms grow faster than larger ones. For the farms above this threshold, the impact of initial farm size on farm growth is positive. These significant non-linearities in the growth paths of farms observed here cast doubt upon empirical studies assuming an identical size-growth relationship over the entire spectrum of farm sizes. This implies a "regression towards mean" for farm sizes.

In addition, our results show a negative relationship between farms age (FAGE) and their labor growth. This fact confirms the theoretical predictions of the Jovanovic Model "learning model" [32]. After getting an experience over time, farmers improve their knowledge on the farm sector (efficient management of land, water and human resources; production process; outputs marketing). Producers having older and larger farms, have thus slower labor growth rates, compared to producers having newer and smaller farms. Similar results have been advanced by other empirical studies in agriculture [40] (i.e.).

The specialization ratio of local farm in vegetable crops under greenhouse in 2000 (SVG) increased significantly (1% level) their labor growth (see Table II). These crops

are developed by domestic producer's getting an important investment capacity and opting for a gradual specialization in crops requiring a high level of labor and with high value added.

However, the average unitary daily cost of the hired occasional labor in 2000 (WLFSW) has a negative and significant effect (5% level) on their labor growth (see Table II). This result is justified by a strong pressure on the agricultural labor market, particularly in the greenhouse vegetable sector in the most attractive zone for FDI (zone 1). This situation results in an important increase in the average unitary daily cost of the hired occasional labor in local farms from 40 to 85 MDA/ day on average between 2000 and 2010.

The location and the different levels exposure to FDI have influenced the labor evolution of domestic farms (see Table II). The location in the zone around foreign firms (_Iprov_2) or in the one not affected by foreign firms (_Iprov_3) provides significant additional increase (levels of 1 and 5% respectively) of the local farms labor growth compared to those in the zone highly attractive for FDI (zone 1). In this zone, the pressure on the local resources such as land, water and staff is more important and accentuated with the important implantation of foreign investors in the vegetable sector.

The human capital characteristics of local farmer's households have an important contribution in their farms labor growth (see Table II). First, the household head age of a local farmer in 2000 (AHHF) has a positive and significant effect (10% level) on their farms' growth. This evolution is due to cumulated experience in agriculture (production, labor management, and marketing) with the local producer's age. Then, the presence of at least one household member with agricultural qualification and employed within the family farm in 2000 (FMSLF) increased significantly (1% level) the domestic farms growth. This raise is allowed by an agricultural knowledge of these local households.

Finally, the family labor endowments of local farmer household in 2000 (FLEH) resulted in a significant labor increase (10% level) of domestic farms (see Table II). After 2000, the local farmer households valued these endowments by their employment within the family farms or outside these ones. These employments generated additional revenues for domestic farmers, reinvested in agriculture. Similar results are consistent with other empirical studies [41]-[42]-[46]-[40].

Moreover, the financial capital of local farmer's households has also contributed to the labor growth of their farms (see Table II). Indeed, Off-farm incomes of local farmer households in 2000, coming from employment of at least one household member outside family farms and by land rent in 2000 (OFIH) have a positive and significant impact (5% level) on the labor growth of their farms. This result is explained by reinvestment of these incomes in the agricultural production, leading to local farms growth. The adverse results have been emphasized by other empirical works [18]-[46]-[42].

Table II. Regression model results (OLS regression) of the FDI direct effects on the local farms labor growth
Dependent variable : GROWTH (measures the local farms labor growth over the period 2000 -2010)

Variable	Description	Growth	
		Coefficient	Standard Deviation
FDI direct relationships with local farms between 2000 and 2010 (variables group X)			
CFFF	Signature of at least a contract farming of local farmer household with foreign firms between 2000 and 2010 (0 = no, 1 = yes)	0.048 (*)	0.026
EHFDI	Employment of at least one member of local farmer household within the foreign firm between 2000 and 2010 (0 = no, 1 = yes)	0.003	0.008
LRFF	Rent land by local farmer household to a foreign firm between 2000 and 2010 (0 = no, 1 = yes)	0.019 (**)	0.007
Structural characteristics of local farms in 2000 (variables group Y)			
FSIZE	Logarithm of local farm size in 2000 (indicating the farm initial size)	-0.069 (***)	0.023
FSIZE2	Squared term of the logarithm of the local farm size in 2000	0.004(**)	0.003
FAGE	Logarithm of local farm age (years of activity) in 2000 (proxy of experience in the agricultural sector)	-0.042(***)	0.012
FAGE2	Squared term of the logarithm of local farm age in 2000	0.003	0.002
FAGE*FSIZE	Cross product of FAGE and FSIZE in 2000 (functional form of the growth function estimation)	0.014	0.007
SVG	Specialization ratio of local farm in vegetable crops under greenhouse in 2000 (the ratio of the vegetable crops area under greenhouse over the total cultivated area)	0.059(***)	0.015
WLFSW	The average unitary daily cost of the hired occasional labor (MDA/day) within a local farm in 2000 (proxy for the labor pressure)	-0.002(**)	0.013
_Iprov_2	Location of local farms (control of regional effects and contrast exposure to FDI) in zone 2 (1 = yes, 0 = no)	0.048(****)	0.010
_Iprov_3	Location of local farms (control of regional effects and contrast exposure to FDI) in zone 3 (1 = yes, 0 = no)	0.044(**)	0.019
Characteristics of local farmers households in 2000 (variables group Z)			
AHMF	Household head age of local farmer in 2000 (proxy of household head experience in the agricultural sector)	0.009(*)	0.005
FMSLF	Presence of at least one household member formed in agriculture and employed in the family farm in 2000 (1 = yes, 0 = no)	0.035(***)	0.011
FLEH	Family labor endowments of local farmer household in 2000 (number of person aged over 16 years old per household)	0.005(*)	0.002
OFIH	Off-farm income of local farmer household in 2000, generated by employment for at least one household member outside family farm and by land rent in 2000 (Amounts in MDA)	3.18 e-07 (**)	1.40 e-07
Observations : 240 R ² = 0.37			
1) *** significant at(1 % level)		** significant at (5 % level)	* significant at (10 % level)
2) We consider the residuals heteroscedasticity at rural area level through a cluster.			

4.2. FDI Spillovers Effects on the Local Farms Growth

Table III shows the estimation results for only the 106 local farms located in zones 1 and 2 which do not have direct relationships with foreign firms via inputs and outputs markets.

The diffusion of horizontal spillovers effects of FDI on the labor growth of local farms depends on two main factors: the geographical distance (proximity) and the low technological gap between domestic and foreign farms.

Our results (see Table III) indicate an intensification of positive and significant horizontal spillovers effects (10% level) of FDI on the local farms growth with their geographical proximity (DFDI). These effects transferred through three main channels. The most important channel is the imitation of foreign investor's techniques and technologies by local producers. The second channel is the personnel turnover of foreign agricultural companies to domestic farms. This personnel turnover is allowed by the recruitment policy alignment (wages and working conditions) between foreign and local operators in the

agricultural sector, at least for large domestic farms. Competition between foreign and local agricultural companies is the third channel. Land pressure requires a more efficient management of local producers land. They choose a gradual development of vegetables production under greenhouse, highly demanding of labor with a great value added. This evolution was at the detriment of traditional crops, initially cultivated by local farms.

The availability of modern irrigation and fertilization station within local farm in 2000 (MIFS) increases significantly (1% level) their labor growth (see Table III). This result is due to an intensification of FDI horizontal spillover effects on domestic farms, better endowed in technology, with a low technological gap compared to foreign firms. These local producers benefited of an indirect transfer of FDI advanced technologies: new and performing varieties of vegetable crops introduced by foreign firms. They developed new varieties allowing a strong resistance to vegetable pathologies and returns improvement, especially for the crops of tomatoes (Calvi, Prestilla, Maria...) and green beans (Salamanca and Polysta). The local farmers also diversified their production through the development of new vegetable crops with high value added (square pepper and black zucchini, i.e.). These new varieties and crops improve the local farms incomes, promoting the labor growth of local farms. Studies in the industrial sector also confirmed that geographical proximity and low technological gap between domestic and foreign firms represent two main factors of spillovers effects diffusion [34] (i.e.).

The export at least part of production by local farm in 2000 (ECLF) has a positive and no significant impact (10% level) on the domestic farms growth (see Table III). Local operators involved in export in 2000 were very frequent in the most attractive zone for FDI (zone 1). They received a limited indirect transfer of FDI information concerning nature and requirements of export markets, explained by a confidential exporting process. This slightly raises labor growth of the domestic farms which do not develop direct relationships with FDI.

The traditional local farms in 2000 (TLF) have not benefited of significant horizontal spillovers effects (10% level) of FDI on their labor growth (see Table III). This is due to low technical and managerial skills as well as an important technological gap of traditional local farmers compared to foreign investors.

The size (FSIZE) and age (FAGE) of local farms in 2000 significantly reduced (1% level) their labor growth (see Table 3). These results suggest that smaller and newer local farms have got more important growth rates

compared to larger and older ones. Our model shows also a positive and significant (1% level) and no linear effect of farms size (FSIZE) on their growth. This result implies that the labor growth rises but a less extent within smaller local farms having a size below than some threshold (92.27 ALU). Smaller local farmers within this group have more important increase rates of their labor than large domestic farmers. For local farms with a size above this threshold, the influence of initial size on growth becomes positive. Our results reveal also a negative correlation between farm age (FAGE) and their labor growth. This result confirms the theoretical predictions of Jovanovic model [32] "learning model", contrary to Gibrat's law.

The specialization ratio of local farm in vegetable crops under greenhouse in 2000 (SVG) increased significantly (1% level) their farms labor growth (see Table III). The domestic farmers specialized in these crops have various advantages: a strong financial profitability of production system, an efficient management of farm workers generally provided by agronomists staff (technicians, engineers ...) and an important capacity investment.

Nevertheless, the average unitary daily cost of the hired occasional labor in 2000 (WLFSW) within local farms in 2000 (WLFSW) has significantly reduced (1% level) their farms labor growth (see Table III). This result is justified by an important demand for agricultural labor for the vegetables under greenhouses, especially in the main zone affected by FDI (zone 1) and other ones located in their surroundings (zone 2). This situation raises the average unitary daily cost of the hired occasional labor within local farms in these zones between 2000 and 2010 (an increase from 32 to 65 MDA / day on average in zone 2, i.e.).

The location of local farms (see Table III) in the zone not directly exposed to foreign firms ($_Iprov_2$), does not bring a significant effect (10% level) on their labor growth compared to those located in the most attractive zone for FDI ($prov_1$). This is due to the fact that structural variables included in our model have controlled the regional effect on the labor growth of domestic farmers.

The characteristics of human and financial capital of local farmer's households don't have a significant influence (10% level) on the labor growth of their farms (see Table III). These households have less valued their family labor endowments after 2000 compared to local households developing direct relationships with foreign firms in the labor market. This situation induced low off-farm incomes of local farmer households. These incomes do not have a significant effect on the local farms labor growth.

Table III. Regression model results (OLS regression) of the FDI spillovers effects on the local farms labor growth
Dependent variable : GROWTH (measures the local farms labor growth over the period 2000 -2010)

Variable	Description	Growth	
		Coefficient	Standard Deviation
Channels and factors of diffusion of FDI horizontal spillovers effects on local farms (variables group X ')			
DFDI	Geographical distance in km between local farm and the closest foreign farm in 2000 (proxy for diffusion channels of FDI horizontal spillovers effects through imitation, personnel turnover and local resources competition)	- 0.001 (*)	0.003
MIFS	Availability of modern irrigation and fertilization station within local farm in 2000 (proxy of technological gap) in 2000 (1 = yes, 0 = no)	0.151(***)	0.027
ECLF	Export at least part of production by local farm in 2000 (1 = yes, 0 = no)	0.054	0.040
TLF	Traditional local farm does not have the greenhouses, the modern irrigation and fertilization station, not recruiting any employee qualified in agriculture and do not export its production in 2000 (1 = yes, 0 = no)	-0.016	0.029
Structural characteristics of local farms in 2000 (variables group Y)			
FSIZE	Logarithm of local farm size in 2000 (indicating the farm initial size)	-0.118(***)	0.025
FSIZE2	Squared term of the logarithm of the local farm size in 2000	0.012(***)	0.003
FAGE	Logarithm of local farm age (years of activity) in 2000 (proxy of experience in the agricultural sector)	-0.058(***)	0.019
FAGE2	Squared term of the logarithm of local farm age in 2000	0.008	0.005
FAGE*FSIZE	Cross product of FAGE and FSIZE in 2000 (functional form of the growth function estimation)	0.003	0.008
SVG	Specialization ratio of local farm in vegetable crops under greenhouse in 2000 (the ratio of the vegetable crops area under greenhouse over the total cultivated area)	0.096(***)	0.024
WLFSW	The average unitary daily cost of the hired occasional labor (DH / day) within a local farm in 2000 (proxy for the labor pressure)	-0.011(***)	0.002
_Iprov_2	Location of local farms (control of regional effects and contrast exposure to FDI) in zone 2 (1 = yes, 0 = no)	0.036	0.106
Characteristics of local farmers households in 2000 (variables group Z)			
AHFF	Household head age of local farmer in 2000 (proxy of household head experience in the agricultural sector)	0.020	0.015
FMSLF	Presence of at least one household member formed in agriculture and employed in the family farm in 2000 (1 = yes, 0 = no)	0.011	0.021
FLEH	Family labor endowments of local farmer household in 2000 (number of person aged over 16 years old per household)	0.005	0.006
OFIH	Off-farm income of local farmer household in 2000, generated by employment for at least one household member outside family farm and by land rent in 2000 (Amounts in MDA)	-1.53 e-07	-2.90 e-07

Observations : 106
 $R^2 = 0.74$

- 1) *** significant at (1% level) ** significant at (5% level) * significant at (10% level)
 2) Regression OLS concerns only the 106 local farms located in zones 1 and 2 which do not have direct relationships with foreign firms via inputs and outputs markets.

V. CONCLUSIONS

Previous empirical studies analyzing the FDI impact on the domestic farmers growth, were mainly interested in direct effects and spillovers horizontal effects of the contract farming (link through the outputs market) developed by foreign firms with local suppliers. Our research aims to analyze the direct effects of three relationships (rent land, labor market and contract

farming) and horizontal spillover effects of foreign firms in the Moroccan vegetable sector on the labor growth of local farms. This field has not investigated in Morocco because of the lack of official information concerning FDI in agriculture and the confidentiality of these foreign investments issues.

Our results show a positive effect of contract farming developed by foreign firms on the farm growth of theirs large domestic suppliers. This growth is favored by

assistance programs provided by the foreign partners (best quality of inputs, credit facilities, technology transfer and technical supervision) and ease access to export market. The Moroccan government should encourage the contract farming as implantation form of foreign firms in agriculture, especially with small local famers. These contracts promote a strong cooperation between foreign and local producers and a modernization of Moroccan agriculture.

Foreign firms have different effects on the labor growth of the small and medium local farmers according to their direct relationships nature. On one hand, the land rent by small and medium local farms to foreign firms has a positive influence on their farms growth. This original result is explained by a reinvestment of land rent incomes in the high value added vegetables crops by local farmers. On the other hand, the FDI relationships with local farmer's households through the labor market do not have a significant effect on the labor growth of the local farms. These famer households choose different strategies in the allocation of incomes generated by these jobs depending on their familial human capital.

Our study also reveals positive horizontal spillovers effects of foreign firms on the growth of medium and large domestic farms, located nearby FDI, better endowed in technology, getting technical and managerial skills. These effects are diffused through different channels: technologies imitation, personnel turnover and competition.

However, small and medium traditional local farmers, which did not develop direct relationships with FDI, are not concerned by positive horizontal spillovers effects on their farms growth. The Moroccan public policies should improve the performance of small and medium domestic farmers (especially the most vulnerable) to enable them to benefit from foreign firms presence. These policies would aim total public subsidies of modern irrigation system, permanent technical supervision; inputs supply and ease access to credit market.

Our study confirms the theoretical predictions of Jovanovic Model [32] on the local farms growth. The human and financial capital of domestic farmer households and their location (different exposure levels to FDI) have an important impact on the labor growth of their farms.

The difficulties of staff social management in the SMDR (Morocco) induced a spectacular increase of agricultural labor cost and a negative effect on the labor growth of local farms. The Moroccan policymakers should propose a new law of agricultural labor market, adapted to the vegetable sector specificities (production seasonality, climatic hazards dependence and the labor demand fluctuations) and improving the working conditions (wage, labor hours and social security).

In further studies, we will focus more on the impact of foreign firms on the local farms productivity and production diversification level in the Moroccan vegetable sector. These points have not been highlighted in the present paper which represents the starting step of more detailed research.

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