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Gibrat's Law and peer group effect: the case of Tunisian small manufacturing companies

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Abstract

To extend the empirical research on Gibrat's law in developing countries, this article uses a linear-in-means model to test how inter-firm interactions can affect the growth of small manufacturing firms in Tunisia. More specifically, we distinguish between the effects of own firm's characteristics and mean characteristics of their neighbors on its growth. Using 1389 small manufacturing firms, we show that Gibrat's law is not confirmed. In addition, the results show that the average growth rate of neighboring firms located in the same governorate and belonging to the same sector affect significantly individual firm's growth.

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1. Introduction

According to Gibrat's law of proportionate effect, the firm growth rate should be independent of firm size (Gibrat, 1931). Under this hypothesis "the probability of a given proportionate change in size during a specified period is the same for all firms in a given industry - regardless of their size at the beginning of the period" (Mansfield 1962: 1031). Although some empirical works have confirmed the Gibrat's law (Hart and Prais, 1956, Bottazzi et al, 2001, Wagner, 1994), recent empirical studies have rejected the fact that firm growth is a random process and show that small and young firms have a higher growth rate than their larger and older counterparts (Hall, 1987, Reid, 1995, Mata, 1994, Audretsch and Mahmood, 1994, Harris and Trainor, 2005). Other empirical studies on Gibrat's law reported mixed results (Audretsch et al, 1999, Lotti et al, 2001, Lotti et al, 2003, Mata and Portugal, 2004). Despite, the rich empirical literature on Gibrat's law, little empirical evidence is available for developing economies.

The motivation of this work is to provide empirical evidence of small manufacturing firm growth in a developing country such as Tunisia between 2006 and 2009. In addition, it extends previous empirical works to study how peer firm characteristics and behaviours can affect the employment growth of a typical firm. Manski (1993, 2000) shows that agents within a peer group may decide according to an observational learning process to reduce the intrinsic uncertainty. It would be rational for firm to imitate identical behaviours or decisions (eg. increasing the size, innovation, investment) as its neighbours, especially, when they are better informed. In line with Manski's argument, firm can benefit from the productive strategies of its peers to produce the same level of production with minimum cost. Moreover, it has the opportunity to observe actions of its predecessors and to balance its own private productivity and cost (Sleutjes, 2012; Shleifer, 1985). Therefore, we can hypothesize that firm growth is strongly influenced by the average growth rate of its peer group. Consequently, in the presence of positive peer effects between firms, an incentive to raise employment level of some firms will produce a positive impact on employment level of other firms in the same peer group through a social multiplier effect (see Glaeser et al., (2003, 1996) for more details on social multiplier effect). Porter and Kramer (2011) also support this idea of social multiplier effects as well as its effect on firm growth. It would be rational that firm interact with other firms within or across group boundaries (industry sectors, regions …) through market (as strategic partnerships, corporate governance,…) and non-market (as social connections between employees) ways. We infer that this is especially true in the Tunisian case where firms are more concentrated on the coastal areas of the country. Indeed, more than 80% of the country's total economic activities and 65% of public investment are concentrated in the coastal areas, which represent less than 17% of the territory. Moreover, more than one-third of all manufacturing operations are located in the capital Tunis alone. Thus, the presence of spatial agglomeration provides a fertile ground for interaction and face-to-face communication between firms.

Krugman (1991) theorizes that agglomeration of firms in the same region with many producers and potential customers will be more likely to experience high growth than firms located elsewhere. The spatial concentration of workers fosters job turnover and facilitates the diffusion of ideas and innovations process (Audretsch and Feldman, 2004; Feldman and Audretsch, 1999; Henderson, 2007). Most of the theoretical studies on agglomeration economies, explains the firm's growth as a function of Marshall-Arrow-Romer externalities[1] (MAR henceforth) and Jacobs externalities. MAR externalities can be attributed to three main

[1]In reference to contribution of Marshall (1920), Arrow (1962) and Romer (1990).

sources: labour market pooling, input-output linkages, and intra-industry knowledge spillovers (Neffke et al., 2011). The third source seems to be winning great importance in the explanation of the spatial polarization of economic activity. In contrast to MAR externalities, Jacobs' externalities arise from local diversity, external to industry or sector. Local diversification within an urban region fosters innovation and result in cross-fertilization of ideas that born in the exchange process that occurs between different fields of knowledge (Jacobs, 1969).

Using a sample of 1389 small manufacturing firms, we consider an extended version of Gibrat's model in order to distinguish between the influence of peer outcomes (endogenous effects) and the influence of exogenous peer characteristics (contextual effects). Our attentions are more focused on within-governorate[2] (and across-sector) versus within-sector (and across-governorate) analysis to examine the potential effects of firm interactions and social networks on employment growth. Our approach is based on the literature of peer effects and more specifically, the linear-in-means model (see among others, Lee (2007); Manski (1993, 2000); Durlauf and Young (2001)). Three different peer groups are used to illustrate our analysis: the administrative bond (within-governorate and across-sector), the sector of activity (within-sector and across-governorate), and a combination between the two first groups (within-governorate and within-sector).

The layout of the paper is as follows: section 2 presents the dataset, while section 3 discusses the empirical model and the estimation strategy. Section 4 provides empirical results and the 5 section concludes with several specific policy recommendations.

2. Data

The data used in this paper focuses on the evolution of all manufacturing small firms (more than 10 and less or equal to 30 employees) in Tunisia during the period between 2006 and 2009. Our data are drawn from the Agency for the Promotion of Industry and Innovation (APII). They represent the annual demographic information of 1389 manufacturing firms distributed across the national territory. The survey covers the basic information of each firm such as age (measured in years from the birth of the firm to the time of the survey), sector activity, location and the size (number of employees) in 2006 and 2009. Table 1 displays the descriptive statistics of all variables used in our empirical analysis. The mean firm's growth (expressed as the log-difference of firm size between 2006 and 2009) is about 0.024 with a maximum of 1.153. The average size in 2006 is about 16 and 16.5 in 2009. The average firm age in 2006 is equal to 11.5 years with a range of 1 to 62 years. Three different levels of peer groups are considered: 24 governorates for the first group (within-governorate and across-sector (see Figure 1)); 8 sectors for the second group (within-sector and across-governorate)[3] and 106 sub-groups for the third group (within-governorate and within-sector). For the third group, we keep only the sub-groups with at least three firms in order to have sufficient variation in group sizes (Davezies et al, 2009).

[2]The term governorate (translation of the arabic *Wilayah*) is widely used in Arabic countries to describe an administrative unit. It is the equivalent of province for the English-speaking nations.

[3]The 8 sectors are : Manufacture of Agro-food; Chemical industry; Manufacture of electrical and electronic equipment; Building Material Industry; Manufacture of leather and footwear; Mechanical and metallurgical industries; Textile and clothing; Manufacture of wood, cork and furniture.

TABLE 1 – Descriptive statistics (1389 firms)

Variable	Variable Name	Mean	Standard Deviation	Min	Max
Firm's growth	$y_{i,t} = \ln(size_{i,t}) - \ln(size_{i,t-1})$	0.02	0.28	-1.03	1.15
Size of the firm in 2006 (number of Employees in 2006)	$size_{i,t-1}$	15.94	5.43	10	29
size of the firm in 2009 (number of employees in 2009)	$size_{i,t}$	16.45	5.99	10	30
age of the firm in 2006 (in years)	$age_{i,t-1}$	11.49	10.10	1	62

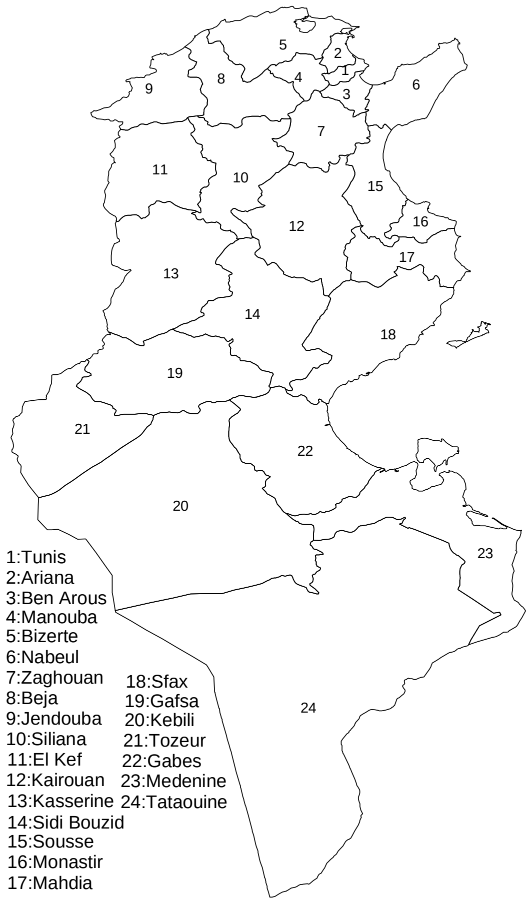

Figure 1: **The 24 governorates of Tunisia**

Tables 2 and 3 display some descriptive statistics (mean and standard deviation) for the key variables used in our empirical analysis (firm's growth, size of the firm in 2006 and age of the firm in 2006) by governorate and by sector, respectively.[4] We report, in addition, the correlation coefficient between the firm's growth rate and the firm's size and between firm's growth rate and firm's age within governorate and within sector as well as for all sample firms combined. As shown in Table 2, the number of firm as well as their growth varies greatly across governorates. It can be seen that 46% of the small manufacturing firms are concentrated in the largest agglomerations in Tunisia (Great Tunis (22%), Sfax (16%) and Sousse (8%)) and along coastal areas in general (78%).[5] Table 2 and Table 3 show that both

[4]We only present the descriptive statistics for the first and the second peer groups because the third one has 106 sub-groups.

[5]Great Tunis represents the largest urban agglomeration in Tunisia and it is formed by the four governorates of Tunis (the capital), Ariana, Ben Arous and Manouba. The coastal area of Tunisia is composed of 11

correlations, more specifically the correlation between growth rate and size, are negative and always significant at 5%.

It is important to note that small manufacturing firms seem to have a similar spatial distribution as all manufacturing firms in Tunisia. Approximately 84% of all manufacturing firms and about 88% of all manufacturing jobs are concentrated in the coastal areas of the country in 2010. This configuration can be explained by at least two factors. Firstly, Tunisia inherited a considerable infrastructure for production and distribution facilities concentrated in coastal areas, which had been set up by the French protectorate. Secondly, private capital investment, competitive poles, companies and jobs are characterized by a regional over-concentration along the coastal areas (Amara and Ayadi, 2011).

The mean growth of small manufacturing firms is the highest in Mahdia of about 0.155, followed by Sidi Bouzid, Zaghouan and Monastir. These governorates are characterized by their close proximity to large cities, such as Tunis (the capital), Sfax (the second large city) and Sousse (the third large city). The mean growth of small manufacturing firms in Tunis and Sousse is 0.045 and still above the national average (0.024). The south governorates of Tunisia (Gabes, Medenine, Tataouine, Gafsa, Tozeur and Kebili) display very low (and often negative) growth rates.

Among the 8 sectors, the agro-food industry is the largest sector with about 32% of the total number of small manufacturing firms (Table 3). The mechanical and metallurgical industries hold 15% of the total observations. Looking at the firm's growth, the industry of electrical and electronic equipment has the highest firm's growth (0.079), followed by the textile and clothing industry (0.061) and the chemical industry (0.06).

TABLE 2 – Descriptive statistics by governorate

Governorate	number of firms	Firm's rate Growth	Firm's size in 2006 (number of employees)	Correlation between firm's rate growth and size	Age of the firm in 2006 (years)	Correlation between firm's rate growth and age
Tunis	91	0.045 (0.23)	17.989 (5.85)	-0.306*	14.21 (13.03)	-0.087
Ariana	79	0.062 (0.28)	15.725 (5.27)	-0.325*	9.177 (7.66)	-0.326*
Ben Arous	114	0.069 (0.30)	17.772 (5.87)	-0.544*	12.47 (10.37)	-0.147
Manouba	19	0.044 (0.19)	18.421 (5.36)	0.016	15.26 (13.36)	0.241
Nabeul	154	0.005 (0.25)	16.416 (5.79)	-0.311*	13.11 (11.31)	-0.168*
Bizerte	64	-0.019 (0.33)	15.797 (5.57)	-0.437*	12.47 (11.60)	-0.141
Zaghouan	76	0.083 (0.31)	14.184 (5.03)	-0.465*	6.605 (6.64)	-0.093
Beja	23	0.045 (0.21)	14.957 (5.93)	-0.504*	7.696 (5.76)	-0.201
Jendouba	36	-0.101 (0.31)	14.139 (4.99)	-0.669*	8.611 (6.23)	-0.015
El Kef	21	-0.032 (0.15)	12.381 (3.56)	-0.376	10.00 (8.65)	0.028
Siliana	20	0.056 (0.31)	14.500 (5.44)	-0.541*	7.350 (6.24)	0.383
Sousse	114	0.045 (0.29)	16.404 (5.19)	-0.263*	11.254 (8.65)	-0.176
Mounastir	121	0.082 (0.34)	15.950 (5.13)	-0.379*	8.554 (7.80)	-0.274*
Mahdia	23	0.155 (0.49)	16.304 (6.96)	-0.684*	8.870 (5.33)	0.062
Sfax	229	-0.018 (0.24)	15.965 (5.06)	-0.279*	12.616 (8.56)	-0.053
Kairouan	37	-0.034 (0.27)	14.514 (4.76)	-0.240	10.649 (8.90)	-0.231
Kasserine	14	0.024 (0.19)	16.286 (4.25)	-0.469	5.786 (6.32)	0.183
Sidi Bouzid	14	0.094 (0.37)	15.500 (4.8Z)	-0.380	6.50 (6.85)	-0.699*
Gabes	29	-0.010 (0.24)	15.103 (4.99)	-0.211	13.069 (8.67)	0.033

governorates: Tunis, Ariana, Ben Arous, Manouba, Bizerte, Nabeul, Zaghouan, Sousse, Monastir, Mahdia and Sfax.

Medenine	64	-0.00 (0.27)	14.891 (5.43)	-0.525*	18.89 (16.47)	-0.088
Tataouine	5	0.027 (0.12)	13.20 (1.30)	-0.275	10.60 (9.56)	0.108
Gafsa	28	-0.083 (0.25)	14.50 (4.31)	-0.557*	10.893 (8.91)	0.304
Tozeur	5	0.000 (0.00)	13.20 (6.10)	-	11.80 (8.41)	-
Kebili	9	0.007 (0.13)	14.00 (4.64)	-0.186	8.556 (10.80)	0.237
All firms	**1389**	**0.024 (0.28)**	**15.942 (5.43)**	**-0.356***	**11.485 (10.10)**	**-0.144***

Standard deviations are given in parentheses, *correlation coefficient significant at 5%. The correlation coefficients between the mean growth rate (at the aggregate-level: the governorate) and mean size and mean growth rate and mean age were, respectively, as follows: 0.367 and -0.292, and both are not significant at 5%. The difference between the correlation coefficient obtained from the aggregate-level and the correlation coefficient obtained from the individual-level (firm) displayed at the last row of the table is mainly due to the ecological fallacy (spatial aggregation error).

TABLE 3 – Descriptive statistics by sector

Sector	number of firms	Firm's rate Growth	Size of the firm in 2006 (number of employees)	Correlation between firm's rate growth and size	Age of the firm in 2006 (years)	Correlation between firm's rate growth and age
Manufacture of Agro-food	448	0.004 (0.26)	14.605 (5.07)	-0.381*	11.134 (11.46)	-0.050
Chemical industry	167	0.060 (0.28)	16.000 (5.48)	-0.351*	12.904 (9.61)	-0.199*
Manufacture of electrical and electronic equipment	50	0.079 (0.24)	15.600 (5.74)	-0.220	8.440 (7.19)	-0.298*
Building Material Industry	151	0.030 (0.25)	16.629 (5.45)	-0.362*	12.894 (9.39)	-0.181*
Manufacture of leather and footwear	48	0.010 (0.29)	16.688 (5.21)	-0.399*	12.063 (8.22)	0.002
Mechanical and metallurgical industries	207	0.006 (0.26)	16.333 (5.61)	-0.358*	11.063 (9.23)	-0.138*
Textile and clothing	242	0.061 (0.35)	17.310 (5.49)	-0.428*	10.186 (9.06)	-0.210*
Manufacture of wood, cork and furniture	76	-0.039 (0.25)	16.658 (5.04)	-0.347*	14.553 (11.01)	-0.232*
All firms	**1389**	**0.024 (0.28)**	**15.942 (5.43)**	**-0.356***	**11.485 (10.10)**	**-0.144***

Standard deviations are given in parentheses, *correlation coefficient significant at 5%. The correlation coefficients between the mean growth rate (at the aggregate-level: the sector) and mean size and mean growth rate and mean age were, respectively, as follows: -0.077 and -0.617, and both are not significant at 5%.

3. Empirical model and estimation strategy

The standard model used in the literature to test the Gibrat's law is (Audretsch and Dohse, 2007)

$$y_{i,t} = \ln(size_{i,t}) - \ln(size_{i,t-1}) = \beta_0 + \beta_1 \ln(size_{i,t-1}) + \beta_2 \ln(size_{i,t-1})^2 + \beta_3 \ln(age_{i,t-1}) + \varepsilon_{i,t} \qquad (1)$$

Where $y_{i,t}$ is the firm's rate growth expressed as the log-difference of firm size (number of employees) between the current period t and the previous period $t-1$. $size_{i,t}$ and $size_{i,t-1}$ are the firm's size in period t and $t-1$, respectively. The squared logarithm of the size

($\ln(size_{i,t-1})^2$) is added in order to control for non-linear effects of size on growth (as in Hall, 1987; Evans, 1987).[6] Age ($age_{i,t-1}$) is measured in years from the birth of the firm to the time of the survey ($t-1$) and it is used as proxy of the learning-by-doing effect (Jovanovic, 1982). The parameter β_1 represents the effect of initial size. If $\beta_1 = 0$, the Gibrat's law holds (firm growth is independent of initial firm size). If $\beta_1 < 0$, small firms grow faster than large firms, whereas when $\beta_1 > 0$ large firms grow faster than small firms (Audretsch and Dohse, 2007). In order to estimate the Gibrat model that takes into account peer effects between firms, we consider an augmented version of the linear-in-means model when firms interact in groups. This approach allows us to estimate endogenous and contextual effects, to control for correlated effects at the group level and to solve the simultaneity (reflection) problem (Manski, 1993). In particular, we assume that the growth of firm i ($= 1,\ldots,n$) in period t in group $r(=1,\ldots,R)$ ($y_{ir,t}$) may be affected by the average growth rate in his group of reference ($\bar{y}_{-ir,t} = \sum_{j\neq i}^{n_r-1} y_{jr,t}/(n_r-1)$, n_r is the number of firms in group r), by his own characteristics at the initial period ($t-1$) $x_{ir,t-1}$ ($\ln(size_{ir,t-1})$, $\ln(size_{ir,t-1})^2$ and $\ln(age_{ir,t-1})$), and by the average characteristics in his group ($\bar{x}_{-ir,t-1} = \sum_{j\neq i}^{n_r-1} x_{jr,t-1}/(n_r-1)$). Formally, the Gibrat augmented model is

$$y_{ir,t} = \alpha_r + \beta\bar{y}_{-ir,t} + \gamma x_{ir,t-1} + \delta\bar{x}_{-ir,t-1} + \varepsilon_{ir,t} \tag{2}$$

The β parameter captures the endogenous effect, γ the individual effect and δ is the contextual effect. $\varepsilon_{ir,t}$ is a n-dimensional vector consisting of i.i.d. disturbances with zero mean and a variance σ_0^2. By applying a within transformation to equation (2), we can remove the correlated effects α_r, and focus attention on contextual and endogenous effects. More specifically, we average equation (2) over all the n_r firms in group r and subtract it from equation i. Equation (2) can be rewritten in matrix form as:

$$\mathbf{y}_{r,t} = \iota_{n_r}\alpha_r + \beta\mathbf{G}_r\mathbf{y}_{r,t} + \gamma\mathbf{X}_{r,t-1} + \delta\mathbf{G}_r\mathbf{X}_{r,t-1} + \varepsilon_{r,t} \tag{3}$$

The within reduced form of equation (3) for group r is given by:

$$\mathbf{J}_r\mathbf{y}_{r,t} = \beta\mathbf{J}_r\mathbf{G}_r\mathbf{y}_{r,t} + \gamma\mathbf{J}_r\mathbf{X}_{r,t-1} + \delta\mathbf{J}_r\mathbf{G}_r\mathbf{X}_{r,t-1} + \mathbf{J}_r\varepsilon_{r,t} \tag{4}$$

Where $\mathbf{G}_r = \frac{1}{n_r-1}(\iota_r\iota_r' - \mathbf{I}_r)$, ι_r is a vector ($n_r \times 1$) of ones, $\mathbf{I}_r$ is the identity matrix of dimension n_r and $\mathbf{J}_r = \mathbf{I}_r - \frac{1}{n_r}\iota_r\iota_r'$. It is standard to assume that $|\beta| < 1$. Since $|\beta| < 1$, $(\mathbf{I}_r - \beta\mathbf{G}_r)$ is invertible matrix (Fortin and Yazbeck, 2011; Bramoullé et al., 2009).

[6] Evans (1987) finds that the relationship between firm growth and firm size is highly nonlinear, and concludes that the growth-size relationship varies over the size distribution of firms.

Lee (2007) proposes two methods to estimate model (4): through Conditional Maximum Likelihood (CML) and Generalized two Stage Least Square (G2SLS). In this paper we adopt the CML approach which produces more efficient estimators than those based on G2SLS, though under parametric restrictions (i.e., error normality).

4. Results

We begin by testing if firm's characteristics are independent from those of neighbouring firms located in the same region and/or belonging to the same sector. We use the Moran I test (Cliff and Ord, 1981) to detect peer effects in our data (dependent and independent variables).[7] Table 4 reports the results of Moran test for the three different peer groups defined in section 2. It appears that growth, logarithm of size, logarithm of size squared and logarithm of age present a positive correlation (or peer effect) between firms since the statistics are significant with p-value = 0.01 for every peer group. This result suggests that firm growth is positively affected by the average growth rate of neighboring firms. In addition, the result indicates a globally significant tendency toward sectoral and/or geographical clustering of firms with same age and same size. However, as we can see firms located in the same governorate and belonging to the same sector present the most significant interaction (the highest value of Moran's index for all variables is observed for the third peer group (column 3 in Table 4)).

TABLE 4 – Test of peer effects

Variable	**Within-governorate Across-sectors**	**Within-sector Across-governorates**	**Within-governorate Within-sector**
Growth	0.015***	0.006***	0.037***
	(0.005)	(0.003)	(0.012)
ln(size)	0.033 ***	0.032***	0.049***
	(0.005)	(0.003)	(0.012)
ln(size)2	0.033***	0.031***	0.048***
	(0.005)	(0.003)	(0.012)
ln(age)	0.063***	0.020***	0.096***
	(0.005)	(0.003)	(0.012)
Observations	**1389**	**1389**	**1340**

Standard errors in parentheses; *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

Table 5 reports the results of conditional maximum likelihood estimates of equation (2) using the three different levels of peer groups defined in section 2. We start by interpreting the individual effects over the three peer groups. We can see that the magnitudes of the coefficients as well as their signs are largely unaffected by the choice of the peer groups. The negative and statistically significant coefficients of firm size lead us to reject the null hypothesis supporting Gibrat's law, whatever the peer group. This finding is consistent with most recent studies of firm's growth that conclude that smaller firms grow faster than larger counterparts (Audretsch and Dohse, 2007). The coefficient of firm age is negative and statistically significant at 1% level, suggesting that young firms grow faster than older ones. The coefficient of squared age term shows no statistically impact on firm growth.

[7] Moran test is widely used in the spatial econometrics literature to test the spatial correlation between regions. It gives a formal indication of the degree of linear association between each observation and the spatially weighted averages of neighboring values (Ertur and Le Gallo, 2003). In our case, we use this test to identify the network autocorrelation between firms.

TABLE 5 – Conditional Maximum Likelihood estimates of small firm's growth

Variable	Within-governorate Across-sectors	Within-sector across-governorates	Within-governorate Within-sector
Endogenous effect (β)	0.007	0.192	0.191***
	(0.143)	(0.191)	(0.054)
Individual effects			
ln(size)	-0.587*	-0.750**	-0.706**
	(0.370)	(0.378)	(0.380)
ln(size)2	0.051	0.081	0.075
	(0.067)	(0.069)	(0.069)
ln(age)	-0.028***	-0.028***	-0.029***
	(0.007)	(0.007)	(0.007)
Contextual effects (δ)			
$\mathbf{G}\times$ln(size)	0.369	0.658**	0.874**
	(0.382)	(0.400)	(0.383)
$\mathbf{G}\times$ln(size)2	0.066	-0.029	-0.124**
	(0.077)	(0.082)	(0.072)
$\mathbf{G}\times$ln(age)	-0.100	-0.029	-0.006
	(0.032)	(0.048)	(0.018)
Observations	**1389**	**1389**	**1340**

Standard errors in parentheses; *** significant at 1% level; ** significant at 5% level; * significant at 10% level.
$\mathbf{G}$ is a block diagonal matrix formed by $\mathbf{G}_1$, …, $\mathbf{G}_R$.

The contextual effect reflects how a change in the characteristics of all firms would impact the employment growth of a typical firm. The results show no significant contextual effects for the first peer group (column 1 in Table 5). Small firms belonging to different sectors and located in the same governorate, fail to take advantage of the characteristics of other firms concentrated in a diversified industrial network. This advantage looks to be more important when we consider the second and third peer groups (column 2 and 3 in Table 5, respectively). The coefficient of the average size of neighboring firms is positive and significant and two times higher than the first group. This result shows that inter-firm interactions within the same sector promote growth. This positive impact of the average size of neighboring firms on firm growth is more important for the third peer group, when the network is intra-sector and intra-governorate. The growth of one small firm is more affected by the concentration of other small firms from the same governorate and the same sector.

Our results on endogenous effect show an interesting finding, only for the third peer group. Individual's employment growth is positively affected by his peer's mean growth rate (β = 0.191, t-test = 3.537). For this group, an increase in the employment growth of any firms in the peer group should naturally encourage other firms within the same group to improve their employment level. A positive and significant endogenous effect indicates the existence of positive spillovers and creates a significant social multiplier about 1.24 (1/(1-β)).[8]

This evidence suggests that firm's growth might benefits from peers (firms) belonging to the same sector and located in the same governorate rather than these from different sectors. Consequently, our results on small Tunisian manufacturing firms show that Marshall's externalities or specialisation, restricted to the governorate administrative scope, are more beneficial rather than Jacobian externalities for firm's growth. Our results are in line with the findings by Boshuizen et al. (2009), who show that social interactions between firms within

[8]Glaeser et al. (2003) define the social multiplier as the estimated ratio of aggregate coefficients to individual coefficients. They show that if an individual's outcome rises "x" percent as his neighbor's average outcome, the social effect is equal to 1/(1-x). The social multiplier is considered only if the endogenous effect exists.

region can positively contribute to firm performance. Using three different sources of data (firm-level data, regional economic data and network data), Boshuizen et al. (2009) show that connectivity and social interaction between high-tech firms are conducive to firm's employment growth. Sleutjes (2012) uses a longitudinal dataset on firm dynamics at the micro-level during the period 1999-2006 to measure neighbourhood spillover effects. He shows that "firms will be more successful in terms of survival and employment growth in neighbourhoods with a large market and a high socio-economic status than in neighbourhoods with a small market and a low socio-economic status".

5. Conclusion

Using a recent data on all small Tunisian manufacturing firms for the period 2006 to 2009, we estimate an extended version of Gibrat's law model. We explicitly consider the inter-firm interactions as well as their effects on firm's growth. Our empirical results reject the null hypothesis supporting Gibrat's law (whatever the peer group) suggesting that smaller firms grow faster than larger counterparts. In addition, young firms grow faster than older ones. Our results show also that Marshall's externalities or specialisation industries, rather than Jacobian externalities, are more beneficial for employment growth of small manufacturing firms in Tunisia. These results indicate that small firms need a much closed network (within sector and within governorate) to growth.

Taking into account the interaction between firms and identifying endogenous and contextual effects can help policy makers and government to identify the main sources of small firm growth. The government could increase the finding of network programs such as science parks and incubators. The Technology park of El Ghazala (governorate of Ariana), specialising in Information and Communication Technologies (ICT) can be considered as one of the success strategies in Tunisia to create a higher social network environment between firms, universities and young entrepreneurs in order to stimulate innovation and employment growth.

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