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EXECUTIVE SUMMARY OF THE THESIS

Title

TESI MAGISTRALE IN MANAGEMENT ENGINEERING – INGEGNERIA GESTIONALE

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1. Introduction

This thesis is aimed at unveiling the possible relationship between the relocation of start-ups and the availability of social resources, intended as availability of graduated students. The reasons why this topic is analysed are the demographical and economic consequences of the relocations over the regions involved, (van Dijk and Pellenbarg, 2000). According to most of the scholars, usually firms that relocate are young and small because of the lack of the embeddedness in a context and lower amount of total to be moved that would imply an increase in the relocation costs. However, here the key point is that these firms are growing firms that would contribute to the future economic wealth of the region in case they remain there. So this exodus of firms entails the loss of a future growth and the shift of the richness within a country, (van Dijk and Pellenbarg, 2000), therefore firm relocation phenomenon can be identified as a possible reason of the persisting regional economic gap in a country, impacting on the regional planning policy. Other problems that may arise after firms' migration are traffic congestion & environmental pollution. Therefore, migration is a vivid problem for the policymakers that would like to attract new capitals, but also for those that would like to prevent that companies located in their region move away. This work desires to be useful for them by providing a contribution that contributes to understand which of the drivers behind firm relocation would ensure that the policies proposed are effective.

Talking about the as is situation of the literature review, it is appropriate to say that it is still scares, especially considering the European case. Moreover, the existing literature has been focused on just few potential determinants such as the age or the size of a company. In the last few years, instead, the debate concerning the migration topic is characterized by the analysis of the impact of VCs' availability on the relocation of start-ups, (Colombo et al., 2019), but the results of these studies are ambiguous and do not show a clear pattern of relocation. The decision to avoid continuing this stream of study is due to, also, the intrinsic problem related to the analysis of the VCs that is the highly heterogeneity in their distribution across the countries, both the European ones and the U.S. This is not a trivial problem because the results might depend on the specific characteristics of the regions rather than on the (higher) availability of VCs. Among the other possible

relocation determinants, the availability of universities, intended as availability of graduates, is chosen considering also that it presents a (more) homogenous distribution across the countries compared to the one that characterises the VCs. However, this is not the main reason that underpins the choice, indeed, in the last two decades, scholars have intensified their studies regarding the intersections between universities and ventures especially after the publication of an important theory that is called "The Triple Helix" where it is stressed the benefits that arise from the collaborations between universities, entrepreneurial ventures, and policymakers. Indeed, the economy is becoming, year by year, more knowledge intensive and places such as universities and laboratories increase their importance, (Etzkowitz and Leydesdorff, 2000)
Other scholars found out that the proximity to universities is a locational strategy because firms are located in order to exploit knowledge spillovers coming from the nearness to universities and in that way, they reduce the companies' knowledge acquisition costs, (Audretsch et al., 2005). It is important to underline that these results are referring to location decisions rather relocations decisions, and the latter have been undertaken in a different stage of life of the companies facing, therefore, different needs. However, despite this growing interest, relocation has never been considered as a topic to be connected to universities. It entails that the stream undertaken by this thesis is undiscovered that means the lack of comparable results coming from other studies and therefore this thesis represents a novelty in the existing literature. Actually, what just said does not represent the only novelty that has been brought by this work, indeed there are other two important new elements: first, the subjects are not established companies but start-ups, second the areas where the analyses have been conducted. Indeed, that thesis analysed the start-ups of six European countries that are: Czech Republic, Denmark, Germany, France, Netherlands, Portugal. Except for Germany and, especially, Netherlands the other countries have not been taken into account by previous studies. To conclude this introduction, it is appropriate to clearly define the purposes of that work: it is aimed at assessing if the availability of students reduces the relocation probability and if the regions characterised by a higher availability of students are targeted as destinations of these migrations. Parallelly, it is analysed how being backed by VC affects the relation availability of graduates-relocation of start-ups.

2. Dataset and Analyses

In order to answer to the questions developed by reading the academic literature an econometric analysis has been performed, using STATA software. The data used for the analysis are retrieved from three main databases: ETER, used to get information about the graduates, VICO 5.0 to get information about the companies, and EUROSTAT to have some significant characteristics that define the regions considered in the analysis. To be transparent to the readers, it is important underlining the fact ETER and VICO 5.0 might do not match, perfectly, the reality because the former does not consider universities that are smaller than a certain threshold (200 students enrolled) except for entities of national interest, and, similarly, the latter because it is aimed at monitoring the VC-backed firms that tend to be innovative (condition to be picked by VCs); therefore, even, the control sample of VICO is, by definition, composed by companies (non VC-backed) that are similar to the former entailing that some groups might be underrepresented while other groups the opposite.
Talking about the analyses performed, they can be grouped into two groups:

1. Cox with multiple events
2. T-test analysis

The Cox model is used to analyses a phenomenon that can be described by a binary logic and therefore through dummy variable: relocation occurs (1) or not (0). Moreover, the probability of relocation varies over the years of the exposition, that is the interval of time during which the firms are analysed. For instance, in the very next year after a relocation, the probability of occurrence of another relocation is much lower than other years
The Cox model is a survival model that underlines the connection between the time that passes and the probability of occurrence of some event that depends on one, or more, covariates. Moreover, as the name suggests, this model allows to analyse a phenomenon that can occur more than once within the interval of time studied, such as the relocation. This model is used to test the hypothesis 1,2,3, and 7.

The second model is the t-test that is an inferential statistic that is used to compute the mean of two groups. Considering the thesis, the two groups identified are:
a) availability of graduates before the relocation
b) availability of graduates after the relocation
The paired t-test is used to test hypotheses 4,5,6.

3. Hypotheses and Results

In order to achieve the purposes of this thesis, some hypotheses have been set and then tested through the methodologies described before.

Hypothesis 1: *companies that are located in regions where the availability of universities is lower, tend to relocate more than companies close to these institutions*

Hypothesis 2: *companies that are located in regions where the availability of specialized university, in the area of interest of the company, is lower, tend to relocate more than companies close to these institutions*.

Hypothesis 3: *companies that are located in regions where the availability of reputable universities is lower, tend to relocate more than companies close to these institutions*

Hypothesis 4: *the availability of universities of the region where the company has relocated is higher than the one characterising the previous location*

Hypothesis 5: *the availability of specialized universities, in the area of interest of the company, of the region where the company has relocated is higher than the one characterising the previous location*

Hypothesis 6: *the availability of reputable universities of the region where the company has relocated is higher than the one characterising the previous locations.*

Hypothesis 7: *VC-backed firms have a weaker inclination in relocating towards universities compared to non-VC-backed firms*.

Hypothesis 8: *after the relocation towards university, a firm increase its number of patents registered.*

The last hypothesis is not tested due to the lack of availability of the needed data, that would be the number of patents per firm before and after the relocation. Conversely, the other hypotheses have been test.
The results of the first hypothesis verify it, indeed as shown in table, the availability of graduates deter the relocation of start-ups. There is statistical reliability.

	(1) _t b/se	(2) _t b/se	(3) _t b/se	(4) _t b/se
LlnAvailability	-0.078***	-0.073***	-0.081***	-0.023
	(0.018)	(0.019)	(0.019)	(0.023)
Year Dummies	No	Yes	Yes	Yes
Industry Dummies	No	No	Yes	Yes
Geography Dummies	No	No	No	Yes
N	106866	106866	106866	106866
N_sub	21874	21874	21874	21874
N_fail	1365	1365	1365	1365

Table 1:Summary of the Cox analyses with LlnAvailability

Instead, considering the second hypothesis results seem to reject it, however it is important to specify that, in most cases, there is not statistical significancy.

Moving to the third hypothesis, results have corroborated it, as shown in the table below. Similarly to the first hypothesis, results are dependable.

	(1) _t b/se
LlnReputStudents	-0.302***
	(0.089)
LlnLessReputStudents	-0.094*
	(0.052)
Year Dummies	Yes
Industry Dummies	Yes
N	28867
N_sub	5160
N_fail	335

```
. test LlnReputStudents=LlnLessReputStudents

 ( 1)  LlnReputStudents - LlnLessReputStudents = 0

       chi2(  1) =    3.26
     Prob > chi2 =    0.0712
```

Table 2: Results Chi2-test Reputable Less Reputable

The results related to the fourth hypothesis do not have the sufficient reliability however the results seem to confute the hypothesis.

Paired t test

Variable	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
lnAvai~y	1,365	8.201091	.0394383	1.457085	8.123725	8.278457
LlnAva~y	1,365	8.169616	.0379569	1.402354	8.095156	8.244077
diff	1,365	.0314748	.0578566	2.137563	-.0820227	.1449723

mean(diff) = mean(lnAvailability - LlnAvailability) t = 0.5440
H0: mean(diff) = 0 Degrees of freedom = 1364

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.7067 Pr(|T| > |t|) = 0.5865 Pr(T > t) = 0.2933

Table 3: Paired t-test LlnAvailability-lnAvailability

The results of the fifth hypothesis are very ambiguous because the unpredictability of the measures is really high.
Conversely, the sixth hypothesis is verified by the data as observable in the following table.

Paired t test

Variable	Obs	Mean	Std. err.	Std. dev.	[95% conf.	interval]
lnRepu~s	133	8.554251	.0464531	.5357231	8.462362	8.64614
LlnRep~s	133	8.276091	.0493364	.5689748	8.178499	8.373683
diff	133	.2781603	.0633212	.7302555	.1529047	.4034158

mean(diff) = mean(lnReputStudents - LlnReputStudents) t = 4.3928
H0: mean(diff) = 0 Degrees of freedom = 132

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 1.0000 Pr(|T| > |t|) = 0.0000 Pr(T > t) = 0.0000

Table 4: Paired t-test LlnReputable-lnReputable

The seventh hypothesis is rejected by the data.

	(1) _t b/se
lnAvailability	-0.061***
	(0.014)
1.VC_Step	1.946***
	(0.428)
1.VC_Step#c.lnAvailability	-0.216***
	(0.051)
Year Dummies	Yes
Industry Dummies	Yes
N	133296
N_sub	23517
N_fail	2634

Table 5: Cox analysis VC-backed firms

4. Conclusions:

Before talking about specifically of the conclusions, it is important recall what has been considered relocation in that thesis. Relocation is every migration from one place to another that involves a change in the NUTS3 (Nomenclature of territorial units for statistics. The decision to neglect relocation intra-province is based on two reasons: the first one is the difficulty in getting the data useful for evaluating the hypothesis. The second reason is the fact that relocation intra-province can be caused by several reasons such as the needs of broader spaces, and it would be difficult identify any kind of spatial pattern considering even this kind of relocation.
Another important comment is regarding the decision to consider the graduated students rather than the enrolled students, as a parameter for the availability of universities, because the latter would also entail students that would have not completed their educational path. Then, it is considered the students rather than the number of universities per NUTS3 in order to take into account even the size of the universities. Moreover, it was much easier clustering the students considering their areas of activity compared to what would take clustering universities per type, in case it would be possible. The potential drawback of this choice is the possibility that students, after the graduation, move away. According to the literature, most students tend to remain and, in case, to start their activities in the area where they have graduated, (Larsson et al., 2017).
To conclude, in general availability of students works as a keep factor, deterring the inclination to relocate elsewhere, and this effect is emphasised when the university considered is reputable.
Instead, the availability of students in those areas afferent to the firms' business model does not seem having an impact, but the results are too ambiguous to assess this surely. Probably, the tests done were not the most proper, the groups analysed are too broad to identify some pattern and the observations are not numerically sufficient. Lastly, being backed by VC, increases the tendency to relocate, but still the availability of students deter relocation. To be precise, the deter-effect is even more intense, but the inclination to relocate remains higher for VC-backed firms compared to non-VC-backed even in case of high availability of graduates

List of Tables

Table 2: Summary of the Cox analyses with LlnAvailability
Table 2: Results Chi2-test Reputable Less Reputable
Table 3: Paired t-test LlnAvailability-lnAvailability
Table 4: Paired t-test LlnReputable-lnReputable
Table 5: Cox analysis VC-backed firms

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