Effects in Portfolios of Diversified Firms:

The Role of Scale-Constrained vs Scale-Unconstrained Resources.

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Preliminary and incomplete version. Please don't quote.

Abstract

This paper advances the diversification literature by distinguishing the role of general-purpose resources between scale free and non-scale free resources. On the one hand, our predictions suggest that the more a firm diversifies by non- scale free resources, the more it generates negative correlations among firm growth rates in different product niches. On the other hand, when a firm manages diversification with a scale-free resource, the negative correlations tend to disappear and positive co-variation prevail. Exploiting data over the period 2008-2013 on companies' sales in five industries divided in 45 niches in the largest eight EU countries, our empirical evidence shows that higher diversification is associated with more negative correlation among growth rates of different niches in a firm portfolio, unless this diversification is driven by brand extension, a classical scale-free resource. Brand extension smooths out the negative correlation among growth rates in different niches and tend to generate positive externalities the more a firm uses the same brand to compete in different niches.

Keywords: Diversification, Sales Growth, Internal Portfolio Dynamics, Resources

INTRODUCTION

Diversification studies have recently taken a fine-grained perspective by focusing on how firms manage product portfolios across different niches inside a single industry (Eggers, 2012; Barroso & Giarratana, 2013; Wu, 2013; Zahavi & Lavie, 2013). This stream was mainly ignited by discovering empirical relationships between diversification and performance (Hashai, 2015) that are different from the standard inverted U-shaped of resource-based theories of diversification across industries (Markides & Williamson, 1994). Yet, these novel works still mainly ground on the existence of general-purpose resources that could be fruitfully applied into different market domains, but that cannot be sold to third parties due to transaction costs or imitation fears (Teece, 1982; Grant, Jammine, & Thomas, 1988). In order to cope with a potential inconsistency between a unique theory and different stylized facts, some scholars (Sakhartov & Folta, 2014; Aggarwal & Wu, 2015) start refining the seminal idea of Helfat & Eisenhardt (2004) who argue that there are different types of resources that could spur diversification.

These general-purpose resources are defined as non-scale free when their use is taxing them: the application of a part of a resource into a product niche precludes the application of this particular part into another niche. Managerial attention (Wu, 2013) and downstream distribution channels (Teece, 1982) are typical examples of these resources. When resources do not have this limitation, they are labeled scale-free, like a particular proprietary technology that has different final applications (i.e. see Feldman & Yoon, 2012; Thoma, 2009). From a strategic point of view, if the source of diversification is based on different type of resources, companies that are similar for diversification extent have to manage notwithstanding different decision processes. Non-scale free resources create opportunity costs, while this is not the case for scale free resources, which additionally could even generate positive spillovers across different product niches. Yet, there is

still a scarce empirical evidence and theoretical reasoning on these diverse dynamics inside a diversifiers' portfolio.

The article proposes advances on this particular point. It shows how the more a firm diversifies by non-scale free resources the more it generates negative correlations among firm growth rates in different product niches. The opposite happens when a firm manages diversification with a scale-free resource; the negative correlations tend to disappear and positive co-variation tend to prevail.

To test these predictions, we rely on sales data in five industries divided in 45 niches for the largest eight EU countries for the period 2008-2013. For every diversified firm in the sample, we correlate the growth rates in a particular niche, country and year with the rates of all the other niches in which the focal firm is present. Given the sectors under study, we then use brand extension (Wu, 2013) has a proxy for no-scale free capabilities. The results confirm the predictions; higher diversification is associated with more negative correlation among growth rates of different niches in a firm portfolio, unless this diversification is driven by brand extension. Brand extension smooth out the negative correlation among sales in different niches and tend to generate positive externalities the more the same brand competes in different niches. Results are robust to fixed effects. An analysis of the cross-sectional variance of firm portfolios supports this particular theoretical mechanism.

This paper contributes to the research on the relationship between diversification and resources (Wu, 2013; Zahavi & Lavie, 2013; Hashai, 2015) by showing the internal dynamics of a firm product portfolio. Theoretically, we use the resource approach (Helfat & Eisenhardt, 2004) to predict how different types of general-purpose resources create different processes of

diversification and a different management of product portfolios. The effects of different resources on diversification were until recently an understudied subject of the current literature, especially empirical (Sakhartov & Folta, 2014). A notable exception was proposed by Aggarwal & Wu (2015) who categorized firms' products portfolios by the overlap of input and output measures and by divisionalization of the organization structure. This paper complements this trajectory; it represents one of the first examples that shows how the correlations of growth rates in different product niches inside a firm portfolio depend from the types of resources. Using brand as a proxy of scale-free resources, this work also allows heterogeneity across products in the same portfolio, a necessary conditions to understand the fundamental mechanisms that govern firm macro-effects between diversification and performance.

THEORETHICAL BACKGROUND

Diversification has a long story of investigation. One line of research took origins in the agency cost theory and sees diversification as the outcome of an agency problem between managers and shareholders. Managers could divert cash from dividends to diversification pushing for an increase in firm size and risk reduction. In so doing, managers will increase their power, reputation and salary; accordingly, shareholders tend not to veto strategies that increase the firm growth (Goranova & al., 2007).

This view was challenged by the resource approach (Teece, 1982; Grant & al., 1988) that describes diversification as the product of general-purpose resources and non-tradability. Firms own resources, usually generated by sunk costs that could be fruitfully applied to different product domains. These resources are also difficult to trade because there are both imitation threats and

transaction costs (Stern & Henderson, 2004; Markides, 1992; Silverman, 1999). Therefore, diversification is the only viable strategy to exploit returns from these investments. Consequently, diversification is only profitable when it spurs from some general-purpose resources that usually generate patterns of related diversification (Teece, Rumelt, Dosi, & al., 1994; Markides & Williamson, 1994) and inverted U-shaped effects between the extent of diversification and performance.

Recently, diversification scholars have moved attention toward diversification patterns inside an industry, analyzing how firms manage complex portfolios of products that belong to diverse industry niches (de Figueiredo & Kyle, 2006; Eggers, 2012). Most of the works (Zahavi & Lavie, 2013; Barroso & Giarratana, 2013; Hashai, 2015) find a non-linear relationship between performance and diversification that is different from the inverted U-shape of the relatedness theory. While diversification across industry is driven more by the extent to which a firm could apply resources across diverse domains, performance in intra-industry diversification is more affected by trade-offs between adaptation costs and learning effects (Mitchell, 2000; Eggers, 2012). Therefore, hyper-specialized or hyper-diversified companies command higher performance, a result confirmed also by the population ecology literature (Negro, Hannan, & Rao, 2010). Granted, this novel evidence has pushed scholars (Sakhartov & Folta, 2014; Wu, 2013) to go back to differentiate the type of resources and capabilities at the base of diversification (Helfat & Eisenhardt, 2004).

Diversification and non-scale free resources.

No-scale free are resources that could be deployable in different niches with an economic profit, but they create opportunity costs (Wu, 2013; Helfat & Eisenhardt, 2004). If a share *X* of a resource

is used to compete in a particular niche, it cannot be employed in another niche at the same time. The most common examples are managerial attention and distribution channels; if a firm uses a share *Z* of its shelf space for a particular product, it cannot use it for another product. Non-scale firm resources create advantages by exploiting economies of scale and scope making the presence of slack in resources the main engine of diversification. If a focal resource shows decreasing returns in one niche application, when it reaches its optimal level of application, then its slack could be applied in another domain. In sum, given decreasing returns, and slack generation in the resource use, firms could increase profitability by diversifying. If 20% of managerial attention of a CEO is sufficient to reach the optimal level of performance in a product niche, there are scarce economic motivations to allocate more CEO time in that particular niche.

Granted, when this type of resources drives diversification, firms need to decide the optimal allocation across niches (Sakhartov & Folta, 2014). Firms optimize resource use by knowing important piece of information like when the resources show decreasing returns in a particular niche, the levels of returns, and the scale of a particular resource inside a firm.

Thus, a positive (negative) change of resource returns in a focal niche could push managers to reallocate this resource in order to maximize profitability. As a case point, take a firm that is present in two niches; if the returns in a niche decrease for some reasons, part of this resource will be more probably moved to the other niche, generating a negative correlation in growth rates between the two niches. This effect depends on the fact that the returns in the focal niche become lower (higher) compared the second niche. This reallocation is not granted because for example the resource could have exhausted its increasing returns in the second niche where it has returns lower than the first one.

However, the more a firm diversifies, the more it is applying a particular non-scale free resource to several potential niches. Therefore, the more the niches in which a firm competes, the higher the probability that this firm will reallocate resources in case of a change in performance in a focal niche because it should exists at least one niche with higher (lower) returns. In sum, given the constraints in the use of a non-scale free resource, the different optimal level of resource allocation in each niche, and the different levels of returns in each niche, the higher the diversification, the higher the probability that firms moving resources across niches will generate negative correlations in their portfolios. It is worth to note that this process of reallocation should also increase the cross-sectional variance of a product portfolio, given that growth rates of opposite signs are the natural outcome of resource reallocation away (towards) the less (more) profitable niches (Campa & Keida, 2002). Granted, we could state the first hypothesis:

Hypothesis 1: The more the extent of firm diversification is driven by non-scale free resources, the higher the negative correlation inside the firm portfolio of growth rates of two different niches.

Diversification and scale free resources.

Scale-free resources could be applied without exhaustion for competing in different domains; precisely the application of a share of a resource in a focal niche is not taxing the application in another niches. Examples are brands (Wu, 2013) or general-purpose technologies (Bresnahan & Gambardella, 1998; Thoma, 2009). In this diversification case, each product niche inside a firm portfolio is simultaneously linked by a common resource that creates economic returns not only

through economies of scale and scope, but also through spillovers among product niches. For example, when the scale free resource is a technology, its application in different domains could increase its overall quality and efficacy, like for example rDNA technology and its application in sectors like food, surgery, polymers, and software (Feldman & Yoon, 2012).

Compare to non-scale free, scale free resources do not pose problems of optimal allocation, given the absence of opportunity costs. Therefore, in case the returns in a niche decrease, managers are not incentivized to move part of the resource to other applications. However, it could be the case that the resource at the base of diversification act as a channel to spread the shocks of a focal niche all along the product portfolio. As an illustrative example, imagine a company that thanks to a proprietary software algorithm is both in the software product niche for courier businesses (minimizing the costs and delivering time of truck travels) and in the software consultancy business (providing consultancy to airlines for increasing the passenger load factor). Software algorithms are usually performing better the larger is the amount of data they process. If a crisis hits the airline business, reducing the demand and the sales of the company in this niche, the reduced use of the algorithm in the second niche could have a negative impact on the quality of algorithm solutions for the courier business.

The more a firm diversifies with a scale free resource, the higher the probability that exists a niche with lower (higher) returns in case of a decrease (increase) of the return in a focal niche. A scale free resource is not scarce in the use and managers do not reallocate it in case of variation in returns across niches; moreover, scale free resources tend to generate externalities inside a firm product portfolio affecting the growth rates in the same direction. It is also worth to mention that diversification by scale free resources should also decrease the cross-sectional variance of a

product portfolio because growth rates in different niches have all the same sign. Given the previous arguments, the second hypothesis reads:

Hypothesis 2: The more the extent of firm diversification is driven by scale free resources, the higher the positive correlation inside the firm portfolio of growth rates of two different niches.

METHODOLOGY

Data & Sample

We draw data from the dataset Euromonitor Passport that provides statistics, analysis, and reports on industries, countries, and brands worldwide (e.g. Chandrasekaran & Tellis 2008). We download for the period 2008-2013 data for five industries, namely Body Care, Consumer Electronics, Drugs, Home Appliances, and Homecare. The rationale was to have a variegate sample of high and low tech industries, products with different life duration, different average prices and different production techniques. We download data for the eight largest EU countries for GDP: France, Germany, Italy, Netherlands, Norway, Spain, Sweden, and UK to exploit variation in demand and competition levels. Market of reference for each industry is the country; this is true for companies that are not internationalized while for multinationals we assume the existence of a multidivisional form at country level, in which every country division is a profit center (Ghoshal & Nohri, 1993).

The number of total niches is 45; this classification corresponds to various 4/5 digit codes of NAICS classification; for example, in the Body Care industry, Deodorants corresponds to NAICS 32562, Bath and Shower to 32561. Products of these industries are mainly “shelf”

products; thus, downstream resources like distribution channels and shelf-space are the most likely non-scale free resource. According to the theory, these are resources that could be easily re-deployed across niches, but that are not significantly entitled to create synergies (Sakhartov & Folta, 2014). Conversely, a potential scale-free resource in this context is the brand (see Wu 2013: 1266); brands in the sample like Samsung, Sony, Canon, Nokia, Chanel, Colgate, Estée Lauder, Gilette, and L'Oreal among others are all present in the top 100 "2015 Most Valuable Brands" Forbes list[1]. Brands could be extended across product niches creating economies of scale at the marketing level. Additionally, brand reputation could be a source of important spillovers across product niches (Amaldoss & Jain, 2015).

For each country and niche, Passport provides sales for each brands and companies that are actual competitors in a given year. Table 1 summarizes the dataset by industry; a first look at the evidence shows heterogeneity across industries in terms of the main variables; especially, it is worth observing the presence of diffuse and scarce brand extension practices across industries.

Insert Table 1 about here

Dependent variable.

From the complete dataset, we extract all the companies that are diversified, i.e. companies that in the same year and country provide products simultaneously in at least two different niches (Column 3 Table 1). For each of those companies, our dependent variable is *Sales Growth* that

[1] http://www.forbes.com/powerful-brands/list/

represents the increase or decrease in the sales at time *t* in country *j* for company *i* in niche *k* (*Sales Growth*$_{tjkz}$ *= (Sales*$_{tjkz}$ *- Sales*$_{t-1jkz}$*) / Sales*$_{t-1jkz}$). Thus, the regression is at the level of niche-company-country-year.

Core Independent Variables.

For each diversified company, the first independent variable is the sales growth of a niche *w* of a focal firm portfolio different from the niche *k* acting as the dependent variable; precisely, *Sales Growth*$_{tjwz}$ *= (Sales*$_{tjwz}$ *- Sales*$_{t-1jwz}$ *) / Sales*$_{t-1jwz}$ where $w \neq k$. For every diversified company *i*, year *t*, and country *j*, we pair in a dependent-independent variable link the sales growth of every niche in which the company is selling products, excluding duplications. Growth rate is a classical choice of intra-industry diversification literature because it captures better correlations inside a portfolio of a diversified company. Sales are a less noisy proxy of changes due to opportunity costs (Zahavi & Lavie, 2013; Tanriverdi & Lee, 2008; Hashai, 2015) and they reduce cofounding effects of productivity gains originated at corporate level that could wrongly be attributed to just a single niche.

The second core independent variable is *Diversification*$_{ijt}$ that represents the standard Theil's Entropy index calculated for each company *i* at time *t* in country *j* from the share of sales in every niche occupied by the firm. Specifically, *Diversification*$_{ijt}$ = $1/\mathrm{N}\sum_{k=1}^{N}\left(\frac{Sales_{ijtk}}{Sales_{ijt}}\right) * \ln\left(\frac{Sales_{ijtk}}{Sales_{ijt}}\right)$; to facilitate comprehension, we flip the index so that values toward 0 represent lower level of diversification.

The third important independent variable is *Dummy Brand Extension*$_{ijtk}$ that is a dummy that takes the value one if the focal company is selling products in the two paired niches with an identical brand, and zero otherwise.

Control variables.

At niche level, we control for the size of the focal niche in term of total sales (*Niche Demand*$_{kjt}$, USD millions) and for the level of competition *Niche Competition*$_{kjt}$, that is the Theil's Entropy index calculated for the competitors' market shares; *Niche Competition*$_{kjt}$ values toward zero means monopoly. We introduce these controls both for the niche of reference of both independent and dependent variable. For demand, we also introduce a multiplication terms among the two variables (the focal niche and the corresponding linked niche) in order to control for possible spillover effects not originated by the company but by demand.

At company level, we introduce the company total sales in a country *Company Sales*$_{ijt}$ to proxy for scale effect. The number of versions of products that a company is selling inside the same niche aims to proxy versioning strategy as in Shapiro & Varian (1998) (*Versioning*$_{ijt}$), while the maximum number of niches in which a company is using an identical brand measures the extent of brand extension practices (*Brand Extension*$_{ijt}$) at the corporate level.

At country level, we control for the level of industry competition *Industry Competition*$_{jt}$ (Theil's Entropy index calculated for the competitors' market shares at industry level), total *GDP*$_{jt}$ for country economic size, *Country FDI inflows* and *outflows*$_{jt}$ for country economic internationalization, *Country Price Index*$_{jt}$ and private *Consumption Expenditure*$_{jt}$ as a proxy for actual consumption. All these data are from OECD. Niche, company, time, industry and country fixed effects are inserted to avoid unobservable heterogeneity derived from these time-invariant sources.

In sum, the base regression has following form:

$$Sales\ Growth_{tjkz} = \alpha + \beta_1\ Sales\ Growth_{tjwz} + \beta_2\ Diversification_{ijt} + \beta_3\ Dummy\ Brand\ Extension_{ijtk} + \beta_4\ Niche\ Demand_{kjt} + \beta_5\ Niche\ Demand_{wjt} + \beta_6\ Niche\ Competition_{kjt} + \beta_7\ Niche\ Competition_{wjt} + \beta_8\ Company\ Sales_{ijt} + \beta_9\ Versioning_{ijt} + \beta_{10}\ Brand\ Extension_{ijt} + \beta_{11}\ GDP_{jt} + \beta_{12}\ Country\ FDI\ inflows_{jt} + \beta_{13}\ Country\ FDI\ outflow_{jt} + \beta_{14}\ Country\ Price\ Index_{jt} + \beta_{15}\ Private\ Country\ Consumption\ Expenditure_{jt} + \varepsilon_{tjkz} \quad (1)$$

Descriptive statistics

Table 2 show basic descriptive statistics and correlations of our variable.

Insert Table 2 about here

Table 3 shows the statistics in terms of *Sales Growth*$_{tjkz}$ and *Company Sales*$_{ijt}$ for these subsamples; higher diversification and higher brand extension command a larger company size; smaller firms have higher growth rates, all standard findings in the size/growth literature (Bottazzi & Secchi, 2006 for a review).

Insert Table 3 about here

Figure 1 represents a scatter plot of *Diversification*$_{ijt}$ and *Brand Extension*$_{ijt}$; it could be noted that our sample includes a wide variation of diversified firms that use brand extension practices with diverse intensity, confirming that diversification could be driven by both scale free and no-scale free resources separately.

Insert Figure 1 about here

To provide some preliminary stylized facts of our data, we then propose more structured correlations among *Sales Growth*$_{tjkz}$ and *Sales Growth*$_{tjwz}$ according to different sub-samples. We divide the sample between high and low diversification observations compared to the median of *Diversification*$_{ijt.}$ and then we split these subsamples given the value zero or one of the dummy *Dummy Brand Extension*$_{ijtk..}$ Data in Table 4 show that correlations among the dependent variable and the main covariate tend to decrease as *Diversification*$_{ijt}$ is higher, but it is the highest in the case of higher *Diversification*$_{ijt}$ and presence of brand extension practices. A rapid interpretation reads that diversification driven by brand extension is increasing the positive correlation among growth rates in different niches inside a firm portfolio, while diversification without brand extension pushes correlation towards zero.

Insert Table 4 about here

RESULTS

Table 5 show OLS regression results with fixed effects. Model 1 is the baseline model with only the control variables; Models 2–5 add progressively each variable of interest; and Models 6-7 and 8-9 are separated regressions for subsamples with or without brand extension (*Brand Extension*$_{ijt}$ equals 0 or 1). Reading the coefficients, diversified firms tend to grow less and they show a negative correlation in sales growth among the niches in which they sell products. The effect is positive instead when diversification is driven by brand extension practices. These effects are not

only evident from the multiplication terms, but also when the sample is split between brand and no-brand extension cases; the coefficient of *Sales Growth*$_{tjwz}$ is about to double from 0.076 to 0.13 and the coefficient of *Diversification*$_{ijt}$ is dropping of more than a third from -0.41 to -0.099.

Insert Table 5 about here

To have a more clear visual effect of the results, in Graph 2 we plot the marginal effect of *Sales Growth*$_{tjwz}$ according to different values of *Diversification*$_{ijt}$ in the case of no brand extension (Graph 2.a) and with brand extension (Graph 2.b) given results of Column 5 in Table 5. In Graph 2.a, as diversification increases, the beta from positive becomes negative and significant; however, in Graph 2.b, the negative effect as diversification increase is not significant different from zero, meaning that the presence of brand extension smooth out the negative correlations in sales growth among different niches of a diversified firm portfolio. Both the hypotheses find support from data.

Insert Figure 2 about here

The estimates from controls add confirmation on the validity of this regression exercise. Competition exerts a negative effect on sale growth both at the level of the niche (*Niche Competition*$_{kjt}$) and of the industry *Industry Competition*$_{jt.}$. In terms of demand factors, both *Niche Demand*$_{kjt}$ and *Consumption Expenditure*$_{jt}$ have the expected positive impact on growth. The negative coefficient of the interaction term between the demand in niche *j* and *w* signals substitution effects probably due to differences in demand across niches: diversified firms reallocate resources also following shocks in demand. *Country FDI inflows*$_{jt}$ and *GDP*$_{jt}$ have a

negative impact on growth; while the first effect is easily interpretable with some crowding effect of international competition, the second appears at first face a bit puzzling. However, the coefficient of GDP_{jt} should be read keeping in mind that the regression controls both for country fixed effects and for country private consumption expenditures. Thus, keeping fixed the economic size of a country and the size of private consumption expenditures, an increase in GDP could signal an increasing rate of savings that depresses the investments (consistent for example with the Germany case). Other controls are not significant.

Theoretical mechanisms: An acid-test.

Until now, we have shown the existence of a relationship between a fact (diversification) and a result (sales growth correlations among different niches) that supports the presence of a non-observable theoretical mechanism, i.e. the exploitation of non-scale and scale free resources.

To "acid testing" this mechanism, we propose an analysis on the cross-sectional portfolio variance. If firms diversified by non-scale free resources, because of opportunity costs, they tend to reallocate resources across niches towards the most profitable applications generating internal portfolio dynamics from a single niche perturbation. For example, an exogenous shock in a niche due to demand or competitive motivations, should affect the other niches with an opposite sign just because firms move resources away from the focal niche. Given these opposite forces, the cross-sectional variance of a firm portfolio should increase the more the firm diversifies by non-scale free resources.

On the other hand, diversification by scale free resources not only does not create opportunity costs, but more likely, it generates spillovers across niches. Taking the same example, an exogenous shock in a niche should influence the other niches in a portfolio with the same sign

like a product boycott that is affecting products in other niches that are sold under the same brand. Given that all the niches are moving in the same direction, the cross-sectional variance of a firm portfolio should decrease the more the firm is diversified by scale free resources (i.e. if all the niche growth rates are equal to +2% the cross-sectional variance is zero). These effects on variance should only be confirmed if and only if are present i) reallocation processes of resources for non-scale free diversifiers; and ii) spillovers across niches for scale free diversifiers, as we assume, but don't observe.

To validate this idea, we calculate the cross-sectional standard deviation of a firm portfolio for each time *t* and country *j* for our dependent variable *Sales Growth*$_{tjz}$. This new variable labeled *Portfolio Variance*$_{tjz}$ shows mean equal to 0.023 and standard deviation to 0.092. We then regress this new dependent variable using as the main core variables *Diversification*$_{ijt}$ and *Brand Extension*$_{ijt}$ and the same controls of Table 5. We also add a new control, *Industry Variance*$_{tjz}$ (mean= 0.0003, standard deviation=0.0009) that is the weighted average standard deviation of *Sales Growth*$_{tjz}$ for all the competitors in a niche, in order to clear out effects due to environmental external variation on the firm portfolio. The regression now is collapsed at the level of country, year and company; since *Brand Extension*$_{ijt}$ is basically a fixed effect at the level of country and company, we perform random effect panel estimations to show also the estimated coeffiecient of *Brand Extension*$_{ijt}$ and not only the multiplicative terms.

Insert Table 6 about here

Table 6 shows the results; $Diversification_{ijt}$ has a positive impact on $Portfolio\ Variance_{tjz}$, also when controlled for $Brand\ Extension_{ijt}$. $Brand\ Extension_{ijt}$ has a positive impact, but the interaction term is strongly negative, meaning that the more a firm is diversified by brand extension practices, the less is the cross-sectional portfolio variance. Figure 3 confirms this interpretation representing the average marginal effect of $Diversification_{ijt}$ given different values of $Brand\ Extension_{ijt}$. The effect is positive when firms do not apply brand extension and negative when brand extension is the main reason for diversification. This evidence represents a significant test in support of the underling theoretical mechanism.

Insert Figure 3 about here

CONCLUSIONS

The article shows the correlation structure inside the product portfolio of diversified companies for five industries divided in 45 niches for the largest eight EU countries for the period 2008-2013. The results confirm that higher diversification is associated with more negative correlation among growth rates of different niches in a firm portfolio, unless this diversification is driven by brand extension. Brand extension creates positive correlations instead.

These conclusions speak directly to scholars (Wu, 2013; Sakhartov & Folta, 2014; Hashai, 2015) who explain diversification with the presence of non-scale and scale free resources, because it highlights the existence of different micro-processes that govern diversification. While managing a diversified firm with non-scale firm resource means more a fuzzy logic approach

directed to fine-tune resources to different niche applications, managing scale free resources resembles more a Turing machine of zero/one decisions: enter/exit of a niche. Decision processes, the type of relevant information, and the nature of costs are depicting thus different strategic approaches even if firms show the same pattern of diversification. The novelty of these findings could be the base for several future research applications and managerial implications. As said, the more straightforward evidence is the presence of diverse strategic processes beyond the diversification phenomenon. We then separate the implications according to the type of resources.

If diversification is driven by non-scale resources, the optimal allocation of resources is the most important strategic issue. The optimization problem is complex because it includes several variables that interact often dynamically such as the main constraint on the scale of resources, the level of increasing and decreasing returns of the application of a resource to a particular market niche, the different level of niche returns, the number of niches that a firm is occupying. This structure highly resembles a system of complex differential equations that both computer simulations and new advances in mathematical algorithms could help to solve (Sakhartov and Folta, 2014). This is true for new research works, but also for managers that should realize that competences in those domains could help creating long-term competitive advantages. While mathematical and simulation techniques have taken a solid foot in the financial realm, less is their use in product diversification. Additionally, managers have to take particularly in account adaptation costs (Hashai, 2015), i.e. the costs of resource reallocation. The more an organization structure is flexible to move non-scale resources across niches the better will perform. Any inertia or resistance in moving no-scale free resources quickly across different niches will hamper their economic exploitation. This is critical for managerial decisions, because not all the resources could be moved at the same pace across market applications. If the main non-scale free resource is

managerial attention for example, cognitive biases and organizational power could be determinant factors in adaptation costs (Tripsas & Gavetti, 2000).

If diversification is driven by scale free resources, the role of spillovers among niches in a firm portfolio takes central stage. Returns inside a portfolio tend to correlate positively even if niches are not linked at the level of the industry by production or demand factors. If returns fluctuate in the same direction, the attention should be focused on the entry and exit dynamics and not on the reallocation of resources across niches. Given the diffusion of negative or positive trends from a focal niche to other niches, the common wisdom suggest the exit from niches with negative returns, and the entry or the defense of promising ones.

To managers of diversifiers with scale free resources, this article suggests the constant application of standard sector analysis tools at the level of the niche; niche trend is the fundamental piece of information to know in order to frame entry and exit strategies. More accurate are the predictions and information on niche trends, the stronger is the advantage that companies could accrue from their competitors, especially if first mover advantages are present.

This implication create a natural bridge with the influential work of Klepper & Thompson (2004) who already showed in a mathematical model how industry life cycle could be explained by the life and death of industry niches. Moreover, the ecology tradition devoted to category formation (Kovács & Hannan, 2010), that in cultural industries could be associated with industry niches, could give important suggestions on how to spot nascent opportunities inside an industry. Granted, managers should be also cognizant about the costs of entry and exit from niches; this requires a careful study and comprehension of the entry and exit barriers at the level of the niche. Managers who exploit scale free resources should pay attention in avoiding the creation of sunk

costs and irreversibility at the level of the niches in which they compete and to design entry strategies that lower the existing niche entry costs.

For researchers, a prominent question for future works is the extent to which these spillovers at the portfolio level affect also industry characteristics. This depends from the dominance of diversifiers in an industry. The more an industry is controlled by diversifiers with scale free resources, the more this industry should be affected by spillovers across niches that are driven by firm portfolios. In other words, industrial ecosystem with network externalities could be endogenously created by the diversification moves of companies with scale free resources, without the existence of externalities at the industrial level (i.e. products are not complements). This article analyzes industries that are quite competitive, but new studies could address better the previous points.

To conclude, a still under-studied part in this research is the role of customers and demand in shaping the strategy of diversifiers (Ye & al., 2012). For non-scale free case, customers' preference for product novelty and saturation effects could be a main cause of dynamics and heterogeneity in niche returns inside an industry (Barroso & al., 2016). How customers' attitude is exogenously determined or can be changed by product strategies like versioning (Shapiro & Varian, 1998) and marketing campaigns is a great question that lies on the table.

The issue is even more important for the other paradigm when the scale free resources are strictly linked with customers' perceptions like a brand or a company reputation. In these cases, it is impossible to understand the general-purpose propriety of the resources without the role of customers and demand. Fosfuri et al. (2013) show how intra-industry diversification could be generated by the reputational capital that a firm accrues by investing in social values that form the

identity of a community of customers. More studies in this direction are, needless to say, more than welcomed.

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Table 1. Descriptive Statistics of the Industries

		(1)	(2)	(3)	(4)	(5)	(6)
Industry		***Company Sales***	***# Companies***	***# Diversified Companies***	***# Brands***	***# Brand extension brands***	***# Niches***
Body Care	*Mean*	365.45	771.15	180.55	93.30	59.12	10
	St.Dev.	578.36	771.70	176.66	101.51	54.26	
Consumer Electronics	*Mean*	442.42	163.25	73.18	158.45	91.25	7
	St.Dev.	702.18	151.03	55.33	165.61	76.15	
Drugs	*Mean*	83.96	374.72	165.49	25.41	22.15	7
	St.Dev.	115.71	398.81	218.25	29.19	24.21	
Home Appliances	*Mean*	258.00	486.03	106.91	162.82	67.97	13
	St.Dev.	482.03	427.42	92.98	143.99	58.27	
Homecare	*Mean*	205.69	366.34	100.49	29.85	27.34	8
	St.Dev.	285.78	281.97	78.92	30.93	30.69	

Notes: Statistics by year, niche, and country. Sales in EURO millions. Firms are diversified when they sell products in at least two different niches in the same year and country. The same applied for brand extension.

Table 2. Descriptive Statistics and Pairwise Correlation of the Variables

	Mean	*S.D.*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*
171. Sales Growth$_{tjkz}$	0.03	0.57	1																
2. Sales Growth$_{tjwz}$	0.04	0.63	0.02	1															
3. Diversification$_{ijt}$	0.62	0.23	0	0	1														
4. Dummy Brand Extension$_{ijtk}$	0.24	0.43	-0.01	-0.01	-0.05	1													
5. Niche Competition$_{kjt}$	1.33	0.24	-0.03	-0.01	-0.02	0.2	1												
6. Niche Competition$_{wjt}$	1.33	0.25	-0.01	-0.03	0	0.19	0.26	1											
7. Company Sales$_{ijt}$	410.55	587.76	-0.01	0	0.3	-0.07	0.03	0.08	1										
8. Versioning$_{ijt}$	4.01	4.24	-0.01	0	0.15	-0.31	-0.03	-0.14	0.17	1									
9. Brand Extension$_{ijt}$	3.55	3.22	-0.01	-0.01	0.17	0.64	0.27	0.28	0.1	-0.33	1								
10. Niche Demand$_{kjt}$	6.73	7.44	-0.01	-0.01	0.05	-0.05	0.03	0.03	0.34	0.3	-0.1	1							
11. Niche Demand$_{wjt}$	5.53	6.93	-0.01	-0.01	0.05	0.03	0.05	-0.01	0.27	-0.01	0.01	0.27	1						
12. Industry Competition$_{jt}$	0.85	0.29	0.01	0	0.02	0.32	0.24	0.28	0.05	-0.49	0.48	-0.48	0.01	1					
13. GDP$_{jt}$	1.93E06	855869	0.02	0.02	-0.03	0.04	-0.03	-0.06	-0.04	-0.03	0.08	-0.05	-0.05	0.06	1				
14. Country FDI inflows	25489.9	18148.1	-0.01	-0.01	0.05	-0.06	-0.01	-0.01	0.23	0.13	-0.09	0.27	0.23	-0.14	-0.19	1			
15. Country FDI outflows	40337.87	29414.08	0	0	-0.01	-0.04	0.05	0.05	0.24	0.06	-0.06	0.29	0.26	-0.07	0.06	0.48	1		
16. Country Price Index$_{jt}$	1.06	0.06	-0.04	-0.04	-0.02	-0.05	0.09	0.1	0.21	-0.01	-0.08	0.29	0.27	-0.03	-0.39	-0.03	0.13	1	
17. Consumption Expenditure$_{jt}$	989443.1	402508.3	0.02	0.01	-0.02	0.02	-0.02	-0.05	0.05	0.01	0.04	0.07	0.06	0.01	0.96	-0.04	0.18	-0.35	1

Table 3. Descriptive statistics, subsamples Pairwise correlations between *Sales Growth*$_{tjkz}$ and *Sales Growth*$_{tjwz}$

		Sales Growth$_{tjkz}$	*Company Sales*$_{ijt}$
Low Diversification	Mean	0.043	267.162
No Brand Extension	S.D.	0.914	333.401
High Diversification	Mean	0.034	480.29
No Brand Extension	S.D	0.365	621.329
High Diversification	Mean	0.031	562.16
Brand Extension	S.D.	0.350	917.91

Notes: High and low diversification is calculated according to the median of *Diversification*$_{ijt.-}$ Brand and NO Brand extension is calculated according to *Dummy Brand Extension*$_{ijtk}$.

Table 4. Pairwise correlations between *Sales Growth*$_{tjkz}$ and *Sales Growth*$_{tjwz}$

	Pairwise correlation	**Significance Test**	**Observations**
All sample	0.0244***	0.000	167,159
Low Diversification	0.0347***	0.000	84,189
High Diversification	0.0200***	0.000	82,970
High Diversification and No Brand Extension	0.0119**	0.023	65,344
High Diversification and Brand Extension	0.0618***	0.000	17,626

Notes: High and low diversification is calculated according to the median of *Diversification*$_{ijt.-}$ Brand and NO Brand extension is calculated according to *Dummy Brand Extension*$_{ijtk}$. * 10% of significance, ** 5% of significance, *** 1% of significance.

Table 5. OLS results, panel fixed effects, dependent variable *Sales Growth$_{tjkz}$*

	All Sample					*No Brand Extension*		*Brand Extension*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sales Growth$_{tjkz}$	0.0133***	0.00845**	0.00804**	0.0908***	0.0875***	0.00457	0.0763***	0.0446***	0.134***
	(0.00335)	(0.00330)	(0.00327)	(0.0212)	(0.0235)	(0.00328)	(0.0238)	(0.0121)	(0.0458)
Dummy Brand Extension$_{ijtk}$	0.00339	0.00265	0.00205	0.00241	-0.0319**				
	(0.00387)	(0.00386)	(0.00386)	(0.00386)	(0.0156)				
Sales Growth$_{tjkz}$ Dummy Brand Extension$_{ijtk}$		0.0279**	0.0275**	0.0213*	0.0300				
		(0.0118)	(0.0117)	(0.0110)	(0.0512)				
Diversification$_{ijt}$			-0.291***	-0.282***	-0.308***	-0.428***	-0.416***	-0.106***	-0.0997***
			(0.0579)	(0.0573)	(0.0653)	(0.102)	(0.101)	(0.0280)	(0.0281)
Sales Growth$_{tjkz}$ Diversification$_{ijt}$				-0.118***	-0.113***		-0.102***		-0.139**
				(0.0272)	(0.0298)		(0.0303)		(0.0598)
Dummy Brand Extension$_{ijtk}$ Diversification$_{ijt}$					0.0585**				
					(0.0258)				
Sales Growth$_{tjkz}$ Dummy Brand Extension$_{ijtk}$ Diversification$_{ijt}$					-0.0133				
					(0.0658)				
Niche Competition$_{kjt}$	-0.292**	-0.293**	-0.309**	-0.309**	-0.311**	-0.523***	-0.523***	0.0911**	0.0936**
	(0.128)	(0.128)	(0.131)	(0.130)	(0.131)	(0.201)	(0.201)	(0.0425)	(0.0425)
Niche Competition$_{wjt}$	0.0113	0.0114	-0.00157	-0.00602	-0.00725	-0.0261	-0.0286	0.0710*	0.0603
	(0.0651)	(0.0651)	(0.0654)	(0.0657)	(0.0657)	(0.0946)	(0.0949)	(0.0372)	(0.0375)
Company Sales$_{ijt}$	4.59e-05***	4.57e-05***	6.76e-05***	6.75e-05***	6.56e-05***	4.01e-05	4.35e-05	4.01e-05***	3.87e-05***
	(1.14e-05)	(1.14e-05)	(1.22e-05)	(1.22e-05)	(1.21e-05)	(2.99e-05)	(2.99e-05)	(9.71e-06)	(9.68e-06)
Versioning$_{ijt}$	-0.0128***	-0.0128***	-0.0125***	-0.0123***	-0.0122***	-0.0149***	-0.0148***	0.0240***	0.0243***
	(0.00205)	(0.00205)	(0.00202)	(0.00201)	(0.00200)	(0.00249)	(0.00248)	(0.00594)	(0.00609)
Brand Extension$_{ijt}$	0.00773	0.00770	0.0184***	0.0179***	0.0171***	0.0172**	0.0168**	0.00202	0.00177
	(0.00619)	(0.00619)	(0.00621)	(0.00620)	(0.00618)	(0.00726)	(0.00727)	(0.00927)	(0.00928)
Niche Demand$_{kjt}$	0.0159***	0.0159***	0.0160***	0.0157***	0.0157***	0.0307***	0.0299***	0.0101***	0.0100***
	(0.00205)	(0.00205)	(0.00202)	(0.00201)	(0.00200)	(0.00611)	(0.00609)	(0.00123)	(0.00123)
Niche Demand$_{wjt}$	0.00931***	0.00912***	0.00955***	0.00984***	0.00987***	0.0254***	0.0256***	0.00365***	0.00404***
	(0.00181)	(0.00181)	(0.00181)	(0.00180)	(0.00180)	(0.00529)	(0.00527)	(0.00110)	(0.00109)
Niche Demand$_{kjt}$ Niche Demand$_{wjt}$	-0.000342***	-0.000342***	-0.000343***	-0.000328***	-0.000328***	-0.000959***	-0.000926***	-6.71e-05	-6.66e-05
	(0.000121)	(0.000121)	(0.000118)	(0.000117)	(0.000117)	(0.000283)	(0.000287)	(4.55e-05)	(4.54e-05)
Industry Competition$_{jt}$	-0.233***	-0.235***	-0.253***	-0.261***	-0.262***	-0.224**	-0.232**	-0.396***	-0.402***
	(0.0632)	(0.0631)	(0.0643)	(0.0644)	(0.0644)	(0.106)	(0.106)	(0.0817)	(0.0818)
GDP$_{jt}$	-8.37e-07***	-8.35e-07***	-8.44e-07***	-8.34e-07***	-8.32e-07***	-1.03e-06***	-1.02e-06***	-4.25e-07***	-4.12e-07***
	(1.40e-07)	(1.40e-07)	(1.42e-07)	(1.41e-07)	(1.41e-07)	(2.08e-07)	(2.07e-07)	(5.79e-08)	(5.80e-08)
Country FDI inflows$_{jt}$	-1.14e-06***	-1.14e-06***	-1.13e-06***	-1.12e-06***	-1.12e-06***	-1.37e-06***	-1.36e-06***	-5.89e-07***	-5.78e-07***
	(1.54e-07)	(1.54e-07)	(1.52e-07)	(1.52e-07)	(1.53e-07)	(2.15e-07)	(2.15e-07)	(2.03e-07)	(2.03e-07)
Country FDI outflows$_{jt}$	2.29e-07***	2.28e-07***	2.23e-07***	2.19e-07***	2.18e-07***	3.00e-07***	2.99e-07***	-8.69e-10	-1.32e-08
	(6.29e-08)	(6.29e-08)	(6.25e-08)	(6.24e-08)	(6.24e-08)	(7.90e-08)	(7.90e-08)	(9.91e-08)	(9.89e-08)
Country Price Index$_{jt}$	-0.105	-0.106	-0.0909	-0.100	-0.104	-0.0978	-0.102	-0.323***	-0.339***
	(0.110)	(0.110)	(0.113)	(0.112)	(0.111)	(0.154)	(0.153)	(0.0826)	(0.0824)
Consumption Expenditure$_{jt}$	6.49e-07**	6.49e-07**	6.40e-07**	6.24e-07**	6.19e-07**	8.67e-07**	8.57e-07**	-9.60e-08	-1.13e-07
	(2.76e-07)	(2.76e-07)	(2.75e-07)	(2.74e-07)	(2.72e-07)	(3.92e-07)	(3.91e-07)	(1.40e-07)	(1.40e-07)
Constant	1.588***	1.588***	1.782***	1.796***	1.824***	2.155***	2.161***	1.422***	1.442***
	(0.150)	(0.150)	(0.176)	(0.177)	(0.183)	(0.284)	(0.285)	(0.170)	(0.169)
Observations	167,159	167,159	167,159	167,159	167,159	125,766	125,766	41,393	41,393
R-squared	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.043	0.045

Notes: *** 1% , ** 5% , * 10% significance. Robust Standard Errors in parentheses

Table 6. OLS results, panel random effects, dependent variable *Portfolio Variance*$_{tjz}$

	(1)	(3)	(4)
Diversification$_{ijt}$	0.0126***	0.00940**	0.0307***
	(0.00454)	(0.00470)	(0.00655)
Brand Extension$_{ijt}$		0.00180***	0.00517***
		(0.000696)	(0.00100)
Diversification$_{ijt}$ # *Brand Extension*$_{ijt}$			-0.00746***
			(0.00160)
Industry Variance$_{tjz}$	17.93***	17.56***	17.76***
	(1.177)	(1.185)	(1.185)
Industry Competition$_{wjt}$	-0.0118*	-0.00804	-0.00691
	(0.00638)	(0.00654)	(0.00655)
Company Sales$_{ijt}$	0.00318***	0.00293***	0.00351***
	(0.000404)	(0.000416)	(0.000434)
Versioning$_{ijt}$	-0.00452***	-0.00399***	-0.00462***
	(0.000612)	(0.000645)	(0.000659)
Niche Demand$_{kjt}$	0.00455***	0.00459***	0.00460***
	(0.000196)	(0.000196)	(0.000196)
GDP$_{jt}$	1.43e-08**	1.35e-08**	1.42e-08**
	(5.70e-09)	(5.70e-09)	(5.70e-09)
Country FDI inflows$_{jt}$	1.56e-07***	1.57e-07***	1.55e-07***
	(5.70e-08)	(5.70e-08)	(5.69e-08)
Country FDI outflows$_{jt}$	-2.82e-07***	-2.81e-07***	-2.83e-07***
	(3.09e-08)	(3.09e-08)	(3.08e-08)
Country Price Index$_{jt}$	-0.0359*	-0.0318*	-0.0352*
	(0.0186)	(0.0186)	(0.0186)
Consumption Expenditure$_{jt}$	-3.21e-08***	-3.06e-08**	-3.21e-08***
	(1.20e-08)	(1.20e-08)	(1.20e-08)
Constant	0.0461**	0.0345	0.0303
	(0.0218)	(0.0223)	(0.0223)
Observations	7,998	7,998	7,998

Notes: *** 1% , ** 5% , * 10% significance. Robust Standard Errors in parentheses

Figure 1 Scatter plot of *Diversification*$_{ijt}$ and *Brand Extension*$_{ijtk}$.

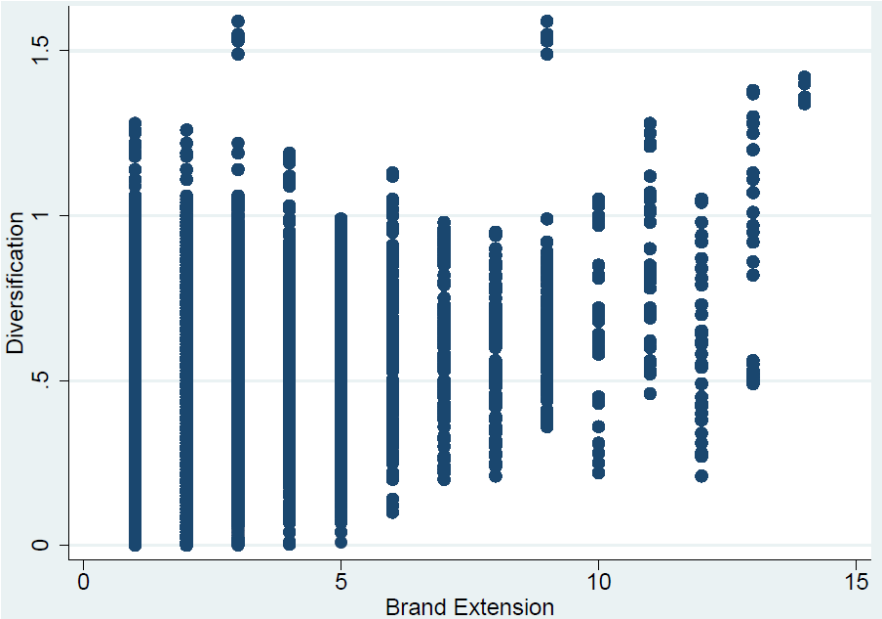
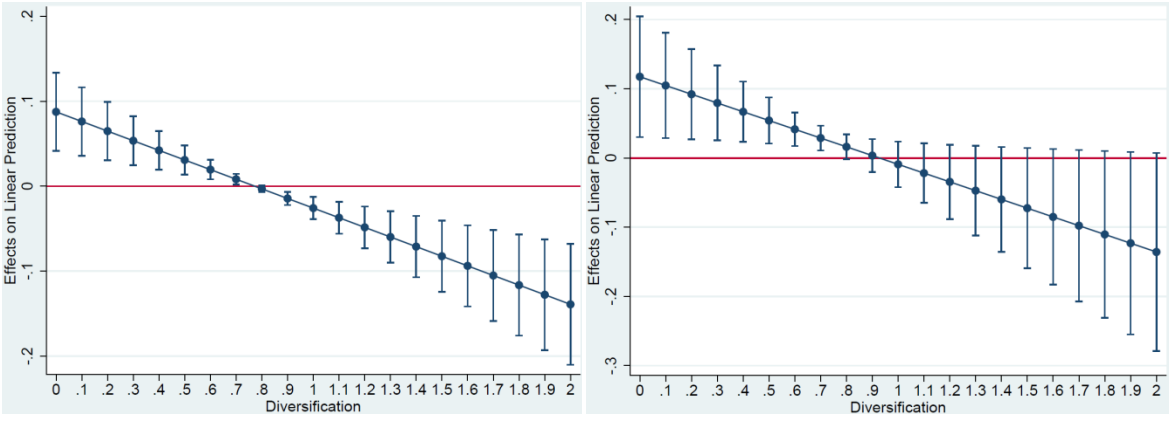


Figure 2 Average marginal effects of *Sales Growth*$_{ijwt}$ with confidence intervals, results of Column (5) Table 5.



2.a (No Brand Extension) 2.b (with Brand Extension)

Figure 2. Average Marginal Effects of *Diversification*$_{ijt}$ given *Brand Extension*$_{ijt}$ values, with confidence intervals, results of Column (3) Table 6.