THE INTELLECTUAL ASSETS IN EUROPE

Alberto Costantiello, Lum-University
Lucio Laureti, Lum-University
Angelo Leogrande, Lum-University
Marco Maria Matarrese, Lum-University

ABSTRACT

In this article we investigate the determinants of the Intellectual Assets in Europe. We use data from the European Innovation Scoreboard of the European Commission in the period 2000-2019 for 36 countries. Data are analyzed using Panel with Fixed Effects, Random Effects, WLS, Pooled OLS, Dynamic Panel at 1 Stage. Results show that the presence of Intellectual Assets in Europe is positively associated with "Enterprise Births", "Top R&D Spending Enterprises per 10 mln Population", "Employment Share Manufacturing", "Share High and Medium high-tech Manufacturing", "Attractive Research Systems", "Finance and Support", "Innovators", "Sales Impact" and is negatively associated to "Government Procurement of Advanced Technology Products" and "Share Knowledge-Intensive Services".

Keywords: Innovation, Innovation and Invention, Processes and Incentives, Management of Technological Innovation and R & D, Diffusion Processes, Open Innovation.

INTRODUCTION

In this article we analyze the innovational and economic determinants of the intellectual assets. We collect data from the European Innovation Scoreboard for 36 countries in the period 2000-2019. Intellectual Assets are defined as the sum of three sub-variables that are "*PCT-pater applications*", "*Trademark Applications*" and "*Design Applications*". The role of intellectual assets is crucial to produce innovation. Innovation is the main force that drive economic growth. The role of innovation in the sense of economic growth has been recognized at least in three main economic theories that are: Schumpeterian economics, the Solow's growth model, and the endogenous growth theory. In Schumpeterian economics intangibles are essential to boost innovation, to implement technological change and for creative destruction. Specifically, Schumpeter (Schumpeter, 1934) considered the competitive advantage of an innovative firm as able to create a new market while at the same time destroyed an older one. The entire process of creative-destruction that is essential in the context of evolutionary economics is based on the idea of innovation and intangibles. But intangibles are relevant also in Solow's growth theory (Solow, 1956), since the only force that can boost productivity in the long run is the technology that is able to increase the productivity of labor. Finally, also the "*Endogenous Growth Theory*" (Romer, 1994) has recognized the role of intangibles and ideas in the process of technological change that is able to sustain growth also in the short run when even with fixed inputs it is possible to augment outputs.

But intellectual assets as defined by the European Innovation Scoreboard are strictly connected to the idea of "*Intellectual property rights*". In this sense it is necessary to underline

Citation Information: Costantiello, A., Laureti, L., Leogrande, A., & Matarrese, M.M. (2023). The Intellectual assets in Europe. *International Journal of Entrepreneurship*, 27(2), 1-13.

that there is no consensus about the utility of "*Intellectual property rights*" for the economic growth an economic freedom. For example, (Boldrin & Levine, 2002) criticize the idea that intellectual property rights boost innovation, competition, higher economic growth and better welfare equilibrium. In effect property rights can reduce competition creating monopolies that can persist in the long run. But, on the other side it also necessary to affirm that, especially in certain sectors such as the pharmaceutical sector, there could be low incentives to invest in Research and Development in the absence of a property right protection. Firms could decide not to invest in costly innovation without adequate support from the legislators I recognizing intellectual property rights. In this sense it is also necessary to consider the importance of the market structure. More competitive markets show a low orientation towards innovation, research and development and intangibles in respect to less competitive markets (Stiglitz & Greenwald, 2014). But, in a certain sense, also the reverse is true. In fact, if a firm can have the protection of property right than can install a sort of monopoly of a monopolistic tendency that can reduce competition and make the product or the service of the firm non imitable by other competitors in the market. This can contradict with the Schumpeterian idea of creative-destruction that was based on the assumption that innovation and technological change could produce temporary monopolies but not persistent monopolies in the evolutionary dynamics of the market. The contradiction between more libertarian economist that would reduce or eliminate the protection of intellectual property rights an the conservative and traditional economists that consider intellectual property rights as an essential protection to incentivize firms to invest in innovation and research and development cannot be solved here, and probably will not be solved anywhere. For the sake of this study, it is relevant to statue the role of intellectual assets in promoting innovation, employment, and economic growth.

The sequent parts are organized as follows: the second paragraph present a short literature review, the third paragraph explain the model and discuss the main relationships among variables, the fourth paragraph presents conclude.

Literature Review

(Ahangar, 2011) affords the question of the relationship between Intellectual Capital and firm performance. The author uses the Value-Added Intellectual Coefficient-VAICTM- to evaluate the level the financial performance of the company. Specifically, to evaluate the degree of the performance the author uses some variables such as employee, productivity, and growth in sales. A multiple regression technique has been used to evaluate the impact of intellectual capital on performance. Results show the presence of a positive relationship among intellectual capital, productivity, and profitability.

(Lu, et al., 2014) analyze the impact of intellectual capital on national innovation systems through truncated regressions. The results shows that there is a positive relationship between intellectual capital and the performance of national innovation systems. If policy makers are interested in increasing the efficiency of the national innovation system, then they should incentivize the production and accumulation of intellectual assets.

(Tamer, et al., 2014) consider intellectual assets as an essential determinant to boost competitiveness. Specifically, the authors consider the multiple relationships existing among psychological capital, intellectual capital, and social capital. Results show the presence of a positive relationship between self-efficacy and intellectual capital. Self-efficacy is defined as the

Citation Information: Costantiello, A., Laureti, L., Leogrande, A., & Matarrese, M.M. (2023). The Intellectual assets in Europe. *International Journal of Entrepreneurship*, 27(2), 1-13.

confidence of individuals in their own abilities. The greater the self-efficacy the greater the production of intellectual assets.

(Sumedrea, 2013) investigate the relationship between organizational performance and intellectual capital during economic crisis. The author uses the methodology of Valued Added Intellectual Coefficient to evaluate the impact of intellectual assets on performance in the turmoil of a crisis. Results show that, during a crisis, there is a positive relationship among financial capital, profitability and the value added intellectual capital coefficient.

(Todericiu & Şerban, 2015) define the intellectual capital of a firm as a sum of human capital, structural capital, and relational capital. The characteristics of intellectual capital can have an impact on firm performance. Specifically, the authors consider the positive relationship between intellectual capital and the performance of universities.

(Silviana, 2019) considers the relevance of identification, treatment, and classification of intangible assets for economic organizations that are oriented to invest in research and development. But to create an efficient intellectual capital that is coherent with the objectives of the firm it is also important to develop an appropriate intellectual assets management model. To fulfill this objective the author builds an intellectual asset management model based either on accounting technique to strategic ends of the firm in the long run.

(Demartini & Paoloni, 2013) afford the question of the measurement of intellectual capital and operational activities and strategies. Specifically, the authors have considered the case of a company in the field of electronics and defence that has used a new methodology to evaluate innovation in the sense of Intellectual Capital. The firm has developed a system of metrics to evaluate the impact of IC based on measurement, valuation, and reporting. Using this metric methodology, the general management of the company can have better tools to evaluate the efficiency of IC evaluated in the sense of the firm performance.

(Cantú & Ceballos, 2010) use a multiagent system to evaluate the value of research assets in knowledge oriented institutions. The main idea of the authors is to help managers to evaluate knowledge assets. Three categories of intangible assets are considered:

- *Research products:* consists in journal articles, research-based books, patents, technology licensing, trademarks, incubation of technology based startup companies;
- *Intellectual capital:* include the talent and expertise of researchers, professors and students;
- *Research programs:* consists in research programs, academic curricula, research units, research infrastructure, business incubators.

To manage research products, intellectual assets and research programs the authors propose a knowledge and information network approach that is able to promote awareness on research assets, to record scientific impact and also social benefits that intangible can produce on a communitarian bases.

(Díez, et al., 2010) investigate the impact of human capital in the creation of business value. Authors collected data through a survey among Spanish firm with more than 25 employees. To evaluate the impact of intellectual capital on the financial performance the authors use Value Added Intellectual Coefficient-VAIC. Results shows the presence of a positive relationship among human capital, structural capital, and sales growth. Intellectual capital also has a positive impact on the ability of the firm to compete. The authors find no relationship among intellectual capital, ROA, and productivity.

Citation Information: Costantiello, A., Laureti, L., Leogrande, A., & Matarrese, M.M. (2023). The Intellectual assets in Europe. *International Journal of Entrepreneurship*, 27(2), 1-13.

(Kianto, et al., 2013) analyze the impact of intellectual capital on organizational performance based on data collected from a sample of firms in Finland, Russia, and China. Results shows that intellectual capital has a a significant impact on firm performance and financial revenues. If firms are interested in boosting performance then they should invest more in Intellectual Capital.

(St-Pierre & Audet, 2011) afford the question of the relationship among intellectual capital, strategy, and performance in small and medium sized enterprises-SMEs. The authors analyze 267 SMEs. Results shows that SMEs have differentiated strategies in respect to the investment in intellectual capital. Specifically, the authors find that the IC-performance nexus depends on the global strategy of the firm.

(Maditinos, et al., 2011) analyze the impact of intellectual capital on firm's market value and financial performance. The authors collected data from 96 Greek companies listed in the Athens Stock Exchange (ASE), from four different economic sector in the period 2006-2008. Regression models are used to process data. Results show the presence of a positive relationship between human capital and financial performance. If firms are interested in boosting financial results, then they should invest in human capital.

(Al-dujaili, 2012) analyzes the role of intellectual capital to promote organizational innovation. The author has collected data from companies through questionnaires. The results show that there is appositive relationship between human capital and organizational innovation.

(Zygmunt, 2019) afford the question of the relationship among innovation activities at a firm level, competitiveness, and regional economic growth. Specifically, the authors consider external linkages and intellectual assets with a focus on Czech Republic and Poland. The authors use the Cobb-Douglas function applied to the European Innovation Scoreboard for the period 2008-2015. The results show that external linkages and intellectual assets have a positive impact on the ability of Czech and Polish firm to innovate. The authors suggest that to promote a productive environment more oriented to innovation it is relevant to create a connection among various stakeholders such as firms, universities, research organizations and the institutional environment.

(Vodák, 2011) investigates the relationship among knowledge economy, intangible assets, and company value. Specifically, the authors find that through knowledge management firms tend to traduce intangible assets in tangible results. The transformation of intangible values in tangible good and services is an essential tool to promote competitive advantage. The author considers the strategic role of intellectual capital as a tool to improve the long run competitiveness of the firm.

(Calabrese, et al., 2013) considers the essential role of Intellectual Capital-IC as a factor able to boost firm's economic growth. But firms show the absence of professional skills in the management of Intellectual Capital and in computing the expected returns from these investments. Due to the lack of managerial skills in IC firms tend to produce un-balanced IC portfolios i.e. they over-invest in some intellectual assets and under-invest in others. The authors use Fuzzy Logic to evaluate the role of intellectual capital on firm's performance. To solve the problem of un-balanced portfolios the authors create an Intellectual Capital benchmark and use the Fuzzy AHP methodology to order intellectual capital suggesting how to choose among different Intellectual Capital assets.

(Razafindrambinina & Anggreni, 2017) analyze the relationship between intellectual capital and financial performance in Indonesian listed companies. The author considers the

Citation Information: Costantiello, A., Laureti, L., Leogrande, A., & Matarrese, M.M. (2023). The Intellectual assets in Europe. *International Journal of Entrepreneurship*, 27(2), 1-13.

intangible assets as a force to boost firm's competitiveness. Data are collected from the Jakarta Stock Exchange. To evaluate the role of Intellectual Capital the author has used the Value-Added Intellectual Coefficient that is a measure able to consider either the human capital either the structural capital. The results show the presence of a positive relationship between Intellectual Capital and financial performance. But this positive relationship does not apply for all the firms in the sample, in effect it does not hold for the consumer goods firms. Additionally, the author also proves the positive relationship between the future financial performance and the actual level of Intellectual Capital.

(Chang & Hsieh, 2011) afford the question of the relationship between innovation capital and the organizational value. Specifically, the author considers the role of Intellectual Capital as a tool to promote Research and Development investments and the market performance. The author uses the Value-Added Intellectual Coefficient. Data are collected from 367 Taiwan companies. Results show on one side the negative relationship between Intellectual Capital and financial performance and on the other side the positive relationship between innovational capital and company's performance.

(Mehri, et al., 2013) analyze the role of intellectual capital on firm performance on a sample of listed Malaysian companies. The authors consider the main components of the intellectual capital that are human capital efficiency, structural capital efficiency, and capital employed efficiency. Firm performance is considered as market valuation, profitability, and productivity. Intellectual capital is analyzed with the measure of Value-Added Intellectual Capital. Results shows that the presence of a positive relationship between Intellectual Capital positively and returns on equity-ROE, return on assets-ROA, and asset turnover-ATO.

(Zeghal & Maaloul, 2010) the author considers the role of intellectual capital and its impact on firm's performance. The author uses the Value-Added Intellectual Coefficient to analyze the data about 300 UK companies operating in three different industries that are: high-tech, traditional and services. Authors uses correlations and regressions. The analysis shows the presence of a positive relationship between Intellectual capital and the economic and financial performance of the firm. The authors suggest to use VAIC methodology to decide about IC investments.

(Rexhepi, et al., 2013) afford the question of the relationship between SMEs and intellectual capital in the sense of strategy. The authors are interested in analyzing the role of intellectual capital in shaping the strategies of entrepreneurs. Data are collected from Macedonian 45 enterprises. The main objective of the authors is to describe the connections among entrepreneurs, intellectual capital, and strategy. Intellectual capital can help entrepreneurs in shaping new strategies and discovering new businesses.

(Jardon & Martos, 2012) analyze the competitive characteristics of emerging clusters formed by SMEs. Specifically, the authors investigate the relationships among intellectual capital and competitiveness in emerging clusters in Latin America. Data are collected from 113 Argentinian SMEs. Results show the presence of a positive relationship among human capital, structural capital and relationship capital that is used to build organizational capabilities. The authors suggest improving intellectual capital to boost competitiveness.

(Han & Li, 2015) investigate the relationship between intellectual assets and innovative performance. Data are collected from 217 Chinese firms and are analyzed using regression analysis. Results show the presence of a positive relationship between Intellectual capital and innovative performance at a firm's level.

Citation Information: Costantiello, A., Laureti, L., Leogrande, A., & Matarrese, M.M. (2023). The Intellectual assets in Europe. *International Journal of Entrepreneurship*, 27(2), 1-13.

(Zehri, et al., 2012) analyze the relationship among intellectual capital, business performance, financial performance, the marketplace, and economics. Authors collected data from 25 companies listed in the Tunisian Stock Market. The authors find that intellectual capital positively affect firm's economic performance, financial performance, and stock market performance.

(Shih, et al., 2010) afford the question of the creation of intellectual capital in association with knowledge management in banking. Results show that knowledge creation is positively associated with human capital, structural capital, and customer capital. The authors consider that there is a mechanism of substitution of tangible assets with intangible assets also in the banking sector.

(Garcia-Perez, et al., 2020) analyze the relationship between Knowledge management and Intellectual Capital in professional sport organizations. The authors conduct a systematic review of the literature. Results show the presence of a positive relationship between Knowledge Management and Intellectual Capital investments especially in the sense of stakeholders. A codification of Intellectual Capital Investments is proposed to evaluate the financial impact on firm's performance and to facilitate manager's choice.

(Bryan, et al., 2017) investigate how the new forms of intellectual capital such as brand names, research and development and patents have stressed the metric measures of capital accumulation. The authors consider the long run consequences of the accumulation of intellectual capital in connection with the financial and economic effects of internationalization. The analysis shows the necessity to intervene in implementing policies that can reform the accounting system to take in consideration the international and financial wealth flows that are connected to intellectual capital.

(Chareonsuk & Chansa-ngavej, 2010) afford the relationship between intangible assets and business performance. The authors concentrate their analysis on three elements of intangible assets that are: learning and growth, internal business process, external structure on the business performance of the firm. Various typologies of firms are analyzed considering business sizes, business sectors and establishment ages. The authors have implemented 3.084 questionnaires distributed to the top management and have obtained 304 qualified data. Results show that learning and growth has a positive relationship on internal business process. Managers that are interested in boosting business performance should also invest in intangible assets specially to gain competitive advantages for the firm.

The model

We have estimated the sequent model:

$$\begin{aligned}\mathrm{IntellectualAssets}_{it} &= a_1 + b_1(\mathrm{EnterpriseBirths})_{it} \\ &+ b_2(\mathrm{TopR\&DSpendingEnterprisesPer10mlnPopulation})_{it} \\ &+ b_3(\mathrm{GovernmentProcurementOfAdvancedTechnologyProducts})_{it} \\ &+ b_4(\mathrm{EmploymentShareManufacturing})_{it} \\ &+ b_5(\mathrm{ShareHighAndMediumHighTechManufacturing})_{it} \\ &+ b_6(\mathrm{ShareKnowledgeIntensiveServices})_{it} + b_7(\mathrm{AttractiveResearchSystems})_{it} \\ &+ b_8(\mathrm{FinanceAndSupport})_{it} + b_9(\mathrm{Innovators})_{it} + b_{10}(\mathrm{SalesImpacts})_{it}\end{aligned}$$

Citation Information: Costantiello, A., Laureti, L., Leogrande, A., & Matarrese, M.M. (2023). The Intellectual assets in Europe. *International Journal of Entrepreneurship*, 27(2), 1-13.

Data are collected from the European Innovation Scoreboard (EU, s.d.) of the European Commission for 36 European countries in the period 2000-2019. We use various regression models such as Panel Data with Fixed Effects, Panel Data with Random Effects, Dynamic Panel at 1 stage, Pooled OLS, WLS.

Intellectual assets in the European Innovation Scoreboard are defined the sum of various forms of intellectual property rights that are generated in connection with innovation procession such as PCT patent applications, Trademark applications and Design applications. Based on the definition of the European Innovation Scoreboard we have that:

$$\text{IntellectualAssets} = \text{PCTPatentApplications} + \text{TrademarkApplications} + \text{DesignApplications}$$

We found that the intellectual assets are positively associated to:

Enterprise Birth: is the number of births of enterprises in a certain period t. The presence of a positive association between Intellectual Assets and Enterprise Births means that if a country has the ability to generate intellectual capital than also its entrepreneurial environment is more active. The presence of intellectual asset is a sign of an economic environment that can sustain the presence of new firms, especially SMEs and start up that are more oriented to capitalize and generate intellectual assets. The presence of patents, trademarks and design application stimulate the birth of new enterprises and constitute an element able to promote the empowerment of that form of human capital that is the entrepreneurial capital. If policy makers are interested in increasing the level of enterprise birth, they should incentivize the production of intellectual assets.

Top R&D spending enterprises per 10 mln population: is number of enterprises in the top 2500 enterprises investing the largest sums in R&D in the world. Clearly, the more enterprises invest in Research and Development the greater is the impact on intellectual assets such as patents, trademarks, and design application. Since intellectual assets can be considered as the outputs of the Research and Development activity then the investment in Research and Development is a signal of the production of intangible goods. In this case is not possible to distinguish between applied and theoretical Research and Development since this distinction is not present in the analyzed data. If policy makers are interested in boosting the level of intangible assets, they should incentivize the increase in Research and Development private expenditures.

Employment share manufacturing: is the percentage of employment in manufacturing. The positive relationship between intellectual assets and the employment share in manufacturing, especially in technology and knowledge intensive sector, can be explaining considering that intellectual assets are generally associated to product innovation. Product innovation has a positive relationship with employment. New patents mean new products, new trademark can be associated to new companies or products and design can be used to re-invent existing production in a new manner. If policy makers are interested in boosting employment in manufacturing, they should incentivize the production of intellectual assets.

Share High and Medium high-tech manufacturing: is the percentage of employment in basic pharmaceutical products; computer and electronics, air, and spacecraft; chemical, weapons and

Citation Information: Costantiello, A., Laureti, L., Leogrande, A., & Matarrese, M.M. (2023). The Intellectual assets in Europe. *International Journal of Entrepreneurship*, 27(2), 1-13.

munitions, electrical equipment, machinery, motor vehicles, trailers, and semi-trailers. Clearly, intellectual assets are associated with the presence of an industrial system that has an orientation towards high-tech. But, due to the lack of specification in data it is not possible to evaluate separately the impact of intellectual assets on medium manufacturing on one side and on high-tech manufacturing on the other side. But we have also to consider that this relationship can be considered at least in part tautological. In fact, Medium and High-Tech manufacturing firms are the main producers of intellectual assets. Medium and High-Tech companies need to invest in intellectual assets since they need to improve their competitiveness and to preserve their clients.

Attractive research systems: is the accountability of the European Innovation Scoreboard is defined as the sum of three main variables that are "*International scientific co-publications*", "*Most cited publications*", "*Foreign doctorate students*". In more analytical terms it is possible to define the variable "*Attractive Research System*" as

$$\begin{aligned}\boldsymbol{A}\text{ttractiveResearchSystem}_{\text{it}} \\ = \text{InternationalScientificCoPublications}_{\text{it}} + \text{MostCitedPublications}_{\text{it}} \\ + \text{ForeingDoctoreStudents}_{\text{it}}\end{aligned}$$

The presence of a positive relationship between intellectual assets and attractive research systems can be understood consider that, generally, the production of intellectual asset is based of human capital. The greater the attractiveness of research systems the greater the level of human capital and the higher the degree of intellectual assets.

Finance and support: finance and support in the European Innovation Scoreboard is defined as the sum of two sub-variables that are "*R&D expenditure in the public sector*" and "*Venture Capital Expenditures".* Analytically it is possible to better write:

$$\begin{aligned}\text{FinanceAndSupport} = \\ \text{R\&DExpenditureInThePublicSector} + \text{VentureCapitalExpenditures}\end{aligned}$$

There is a positive impact of the private and public investment in Research and Development on the production of intellectual assets. The greater the financial support in Research and Development, either in the private either in the public sector, the greater the value of intellectual assets. The financial system has an essential role in boosting intellectual assets. Finance is not neutral in the sense of intangible. Either the public expenditure in Research and Development either the private investment in innovative and high-tech corporation are positively associated to the increase in the presence of intangible assets.

Innovators: The variable innovators as it has been classified by the European Innovation Scoreboard is defined as the sum of three sub-variables that are "*SMEs with product or process innovations*", "*SMEs with marketing or organizational innovations*", "*SMEs innovation in-house*". More analytically we can write that:

$$\begin{aligned}\text{Innovators} = \\ \text{SMEsWithProductOrProcessInnovations} + \\ \text{SMEsWithMarketingOrOrganizationalInnovations} + \text{SMEsInnovationInHouse}\end{aligned}$$

Citation Information: Costantiello, A., Laureti, L., Leogrande, A., & Matarrese, M.M. (2023). The Intellectual assets in Europe. *International Journal of Entrepreneurship*, 27(2), 1-13.

The positive relationship between innovators and the presence of intellectual assets can be understood considering that patents, trademarks, and design applications constitute the outputs of the productivity of innovative SMEs. The greater the level of SMEs' innovativeness the greater the productivity of intellectual assets. If policy makers are interested in increasing the level of intellectual assets, then they should promote the growth of innovative SMEs.

Sales impacts: in the accountability of the European Innovation Scoreboard is defined as the sum of three variables that are *"Medium and high-tech product exports", "Knowledge-intensive services exports", "Sales of new-to-market and new-to-firm product innovations".* More analytically we can write:

$$\begin{aligned}\text{SalesImpacts} &= \text{MediumAndHighTechProductExports} \\ &+ \text{KnowledgeIntensiveServicesExports} \\ &+ \text{SalesOfNewToMarketAndNewToFirmProductInnovations}\end{aligned}$$

The grater the presence of intangible assets the greater the ability of firms to export medium and high-tech products, knowledge intensive services and to sell new products. In intangible assets can improve the ability of a firm to produce more products and services. The greater the innovativeness of a product or a service the greater the probability of the exportations.

But we also found that the intellectual assets are negatively associated to:

Government procurement of advanced technology products: this variable is described in the European Innovation Scoreboard as the "*[…] extend to which government procurement decisions in a country foster technological innovation*". The presence of a negative relationship between this variable and the intellectual assets means that the governmental demand for advanced technology products is not able to sustain the investment in intellectual assets of the private sector. This can be due to the lack of a true orientation to innovation in governmental demand or in the quantitative insufficiency of the demand of technology. The negative relationship suggests that government should promote a more qualified demand for technological product and services.

Share Knowledge-intensive services (%): is defined by the European Innovation Scoreboard as the "*Knowledge intensive services exports as percentage of total services exports*". The variable measures "[…] *the ability of an economy, notably resulting from innovation, to export services with high levels of value added, and successfully take part in knowledge intensive global value chains*". The negative relationship between intellectual assets and the knowledge intensive services exports as a percentage of total services exports means that effectively the intellectual assets are not able to impact on immaterial goods. Patents, trademarks and design are more able to boost high-tech products rather than knowledge-intensive services as shown in (Figure 1 & 2).

Citation Information: Costantiello, A., Laureti, L., Leogrande, A., & Matarrese, M.M. (2023). The Intellectual assets in Europe. *International Journal of Entrepreneurship*, 27(2), 1-13.

Estimation of "Intellectual Assets" in Europe using Panel Data with Fixed Effects, Random Effects, Dynamic Panel, Pooled OLS, WLS										
Variables	**Fixed Effects**		**Random Effects**		**Dynamic Panel**		**Pooled OLS**		**WLS**	
Const	2,64262	*	2,75935		-2,2011	***	4,48188	*	4,48188	*
Enterprise births (10+ employees) (SD)	5,54987	***	5,71585	***	4,91126	***	7,49291	***	7,49291	***
Top R&D spending enterprises per 10 mln population (SD)	0,10516	**	0,11049	**	0,1636	**	0,19409	**	0,19409	**
Government procurement of advanced technology products (SD)	-0,1546	**	-0,1487	**	-0,253	***	-0,1047	*	-0,1047	*
Employment share Manufacturing (SD)	0,54653	***	0,55918	***	0,52712	***	0,64428	***	0,64428	***
Share High and Medium high-tech manufacturing (SD)	0,39846	***	0,41282	***	0,37251	***	0,50264	***	0,50264	***
Share Knowledge-intensive services (%) (SD)	-1,016	***	-1,0405	***	-0,843	***	-1,2318	***	-1,2318	***
Attractive research systems	0,27554	***	0,2693	***	0,25631	***	0,22252	***	0,22252	***
Finance and support	0,16957	***	0,17633	***	0,181	***	0,23288	***	0,23288	***
Innovators	0,16785	***	0,16162	***	0,23192	***	0,10132	**	0,10132	**
Sales impacts	0,30759	***	0,31183	***	0,29134	***	0,33609	***	0,33609	***
Intellectual assets (-1)					0,13101	***				

FIGURE 1
ESTIMATION OF "INTELLECTUAL ASSETS" IN EUROPE USING PANEL DATA WITH FIXED EFFECTS, RANDOM EFFECTS, DYNAMIC PANEL AT 1 STAGE, POOLED OLS, WLS.

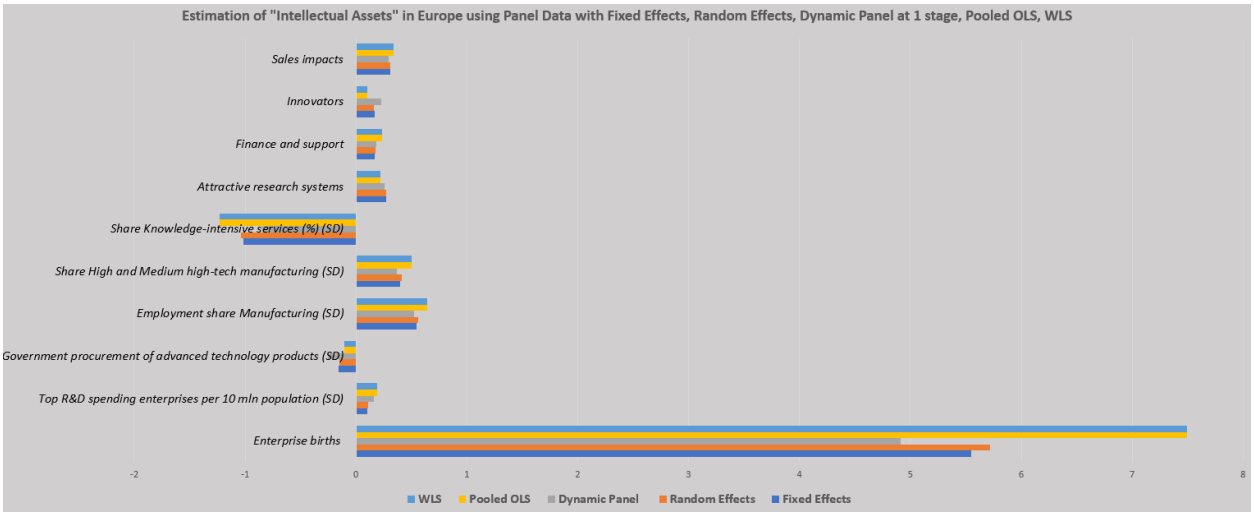

FIGURE 2
ESTIMATION OF "INTELLECTUAL ASSETS" IN EUROPE USING PANEL DATA WITH FIXED EFFECTS, RANDOM EFFECTS, DYNAMIC PANEL AT 1 STAGE, POOLED OLS, WLS.

CONCLUSION

In this article we have investigates the determinants of the Intellectual Assets in Europe. We collect data from the European Innovation Scoreboard for 36 countries in the period 2000-2019. In our approach the role of intellectual assets is essential to boost employment and economic growth through innovation coherently with the theory of Schumpeter, the Solow's growth model and the Endogenous Growth Theory. The European Innovation Scoreboard define intellectual

Citation Information: Costantiello, A., Laureti, L., Leogrande, A., & Matarrese, M.M. (2023). The Intellectual assets in Europe. *International Journal of Entrepreneurship*, 27(2), 1-13.

assets as the sum of three sub-variables that are: "*PCT-pater applications*", "*Trademark Applications*" and "*Design Applications.* The analysis of the literature in the second paragraph shows the presence of a positive relationship between intellectual assets, sometimes declined in the sense of intellectual capital, and firm performance either in the sense of productivity either in the sense of financial profitability. Intellectual assets, and intellectual capital can boost the economic performance either of listed companies either of SMEs, as reported in the second paragraph.

Data are analyzed using Panel Data with Fixed Effects, Panel Data with Random Effects, Dynamic Panel Data at 1 stage, Pooled OLS and WLS. Results show that intellectual assets are positively associated with the presence of "*Enterprise Births*", "*Top R&D Spending Enterprises per 10 mln Population*", "*Employment Share Manufacturing*", "*Share High and Medium high-tech Manufacturing*", "*Attractive Research Systems*", "*Finance and Support*", "*Innovators*", "*Sales Impact*" and negatively associated to "*Government Procurement of Advanced Technology Products*" and "*Share Knowledge-Intensive Services*". Policy makers should incentivize the investment in intellectual assets if they are interested in boosting employment in medium and high-tech sectors, in creating more attractive research systems and in improving firms' natality.

REFERENCES

Ahangar, R.G. (2011). The relationship between intellectual capital and financial performance: An empirical investigation in an Iranian company. *African journal of business management*, 5(1), 88-95.

Al-dujaili, M.A.A. (2012). Influence of intellectual capital in the organizationalInnovation. *International Journal of Innovation, Management and Technology*, 3(2), 128.

Boldrin, M. & Levine, D. (2002). The case against intellectual property. *American Economic Review*, 92(2), 209-212.

Bryan, D., Rafferty, M. & Wigan, D. (2017). Capital unchained: finance, intangible assets and the double life of capital in the offshore world. *Review of International Political Economy*, 24(1), 56-86.

Calabrese, A., Costa, R. & Menichini, T. (2013). Using Fuzzy AHP to manage Intellectual Capital assets: An application to the ICT service industry. *Expert Systems with Applications*, 40(9), 3747-3755.

Cantú, F.J. & Ceballos, H.G. (2010). A multiagent knowledge and information network approach for managing research assets. *Expert Systems with Applications*, 37(7), 5272-5284.

Chang, W.S. & Hsieh, J.J. (2011). Intellectual capital and value creation-is innovation capital a missing link?. *International Journal of Business and Management*, 2(3), 6.

Chareonsuk, C. & Chansa-ngavej, C. (2010). Intangible asset management framework: an empirical evidence. *Industrial Management & Data Systems*

Demartini, P. & Paoloni, P. (2013). Implementing an intellectual capital framework in practice. *Journal of Intellectual Capital.*

Díez, J.M., Ochoa, M.L., Prieto, M. B. & Santidrian, A. (2010). Intellectual capital and value creation in Spanish firms. *Journal of intellectual capital.*

Garcia-Perez, A., Ghio, A., Occhipinti, Z. & Verona, R. (2020). Knowledge management and intellectual capital in knowledge-based organisations: a review and theoretical perspectives. *Journal of Knowledge Management.*

Citation Information: Costantiello, A., Laureti, L., Leogrande, A., & Matarrese, M.M. (2023). The Intellectual assets in Europe. *International Journal of Entrepreneurship*, 27(2), 1-13.

Han, Y. & Li, D. (2015). Effects of intellectual capital on innovative performance: The role of knowledge-based dynamic capability. *Management decision.*

Jardon, C.M. & Martos, M. S. (2012). Intellectual capital as competitive advantage in emerging clusters in Latin America. *Journal of intellectual capital.*

Kianto, A., Andreeva, T. & Pavlov, Y. (2013). The impact of intellectual capital management on company competitiveness and financial performance. *Knowledge Management Research & Practice,* 11(2), 112-122.

Lu, W.M., Kweh, Q.L. & Huang, C.L. (2014). Intellectual capital and national innovation systems performance. *Knowledge-based systems,* Volume 71, 201-210.

Maditinos, D., Chatzoudes, D., Tsairidis, C. & Theriou, G., (2011). The impact of intellectual capital on firms' market value and financial performance. *Journal of intellectual capital.*

Mehri, M. et al., 2013. Intellectual capital and firm performance of high intangible intensive industries: Malaysia evidence. *Asian Social Science,* 9(146), 9.

Razafindrambinina, D. & Anggreni, T. (2017). Intellectual capital and corporate financial performance of selected listed companies in Indonesia. *Malaysian Journal of Economic Studies,* 48(1), 61-77.

Rexhepi, G., Ibraimi, S. & Veseli, N. (2013). Role of intellectual capital in creating enterprise strategy. *Procedia-Social and Behavioral Sciences,* 75, 44-51.

Romer, P. M. (1994). The origins of endogenous growth. *Journal of Economic perspectives,* 8(1), 3-22.

Schumpeter, J.A. (1934). *The theory of economic development: an inquiry into profits, capital, credit, interest, and the business cycle.*. New Brunswick: : Transaction Books..

Shih, K.H., Chang, C.. & Lin, B. (2010). Assessing knowledge creation and intellectual capital in banking industry. *Journal of intellectual capital.*

Silviana, B.G. (2019). Intellectual assets management model.. *Procedia Manufacturing,* Volume 32, pp. 1064-1068.

Solow, R.M. (1956). A contribution to the theory of economic growth. *The quarterly journal of economics,* 70(1), 65-94.

Stiglitz, J.E. & Greenwald, B.C. (2014). *Creating a learning society: A new approach to growth, development, and social progress.* s.l.:Columbia University Press..

St-Pierre, J. & Audet, J. (2011). Intangible assets and performance. *Journal of Intellectual Capital.*

Sumedrea, S. (2013). Intellectual capital and firm performance: a dynamic relationship in crisis time. *Procedia Economics and Finance,* 6, 137-144.

Tamer, I., Dereli, B. & Sağlam, M. (2014). Unorthodox forms of capital in organizations: positive psychological capital, intellectual capital and social capital. *Procedia-Social and Behavioral Sciences,* 152, 963-972.

Todericiu, R. & Şerban, A. (2015). Intellectual Capital and its relationship with universities. *Procedia Economics and Finance,* 27, 713-717.

Vodák, J. (2011). The Importance of intangible assets for making the company's value. *Human resources management & Ergonomics,* 5(2), 104-119.

Zeghal, D. & Maaloul, A. (2010). Analysing value added as an indicator of intellectual capital and its consequences on company performance. *Journal of Intellectual capital.*

Citation Information: Costantiello, A., Laureti, L., Leogrande, A., & Matarrese, M.M. (2023). The Intellectual assets in Europe. *International Journal of Entrepreneurship*, 27(2), 1-13.

Zehri, C., Abdelbaki, A. & Bouabdellah, N. (2012). How intellectucal capital affects firm's performance ?. *Australian Journal of Business and Management Research*, 2(8), 24.

Zygmunt, A. (2019). External linkages and intellectual assets as indicators of firms? innovation activities: results from the Czech Republic and Poland. *Oeconomia copernicana*, 10(2), 291-308.

Received: 30-Dec-2022, Manuscript No. IJE-23-13143; **Editor assigned:** 03-Jan-2023, PreQC No. IJE-23-13143(PQ); **Reviewed:** 17-Jan-2023, QC No. IJE-23-13143; **Revised:** 20-Jan-2023, Manuscript No. IJE-23-13143(R); **Published:** 28-Jan-2023

Citation Information: Costantiello, A., Laureti, L., Leogrande, A., & Matarrese, M.M. (2023). The Intellectual assets in Europe. *International Journal of Entrepreneurship*, 27(2), 1-13.