Does entrepreneurial culture have historical roots?

The relationship between historical legacy, institutions, and entrepreneurialism in Greece and Turkey

Michael Cottakis

Abstract

What is the relationship between historical legacy, institutions, and entrepreneurialism? Historical institutions are often cited as important in the literature on economic development, but rarely in the burgeoning literature on entrepreneurialism. The latter represents a distinct concept to the better-known entrepreneur-ship, and can be defined not as an outcome, but rather as the attitude, or pre-disposition of an individual towards entrepreneurial activity. Though some studies show that historical legacies have had an adverse effect on entrepreneurship in the communist transition states little is known about how history affects the -ism. Does entrepreneurialism persist across time? If so, what are its drivers? This research intends to address whether entrepreneurialism can persist across time (i.e. history), whether and how historical institutions can shape entrepreneurialism in the present day, and the interaction with formal and informal institutions.

Context and framing

The literature on drivers of entrepreneurial attitudes, aspirations, and ambitions generally places emphasis on institutions that promote opportunities, skills among the wider population, and agglomeration effects, thus conditioning the incentive structure and capacity for individuals to undertake entrepreneurial activity. Within this, a growing body of literature also emphasises the importance of informal institutions (norms, cultural practices, including attitudes towards entrepreneurship). Yet, the role of entrepreneurialism, as a set of attitudes, is attended to only speculatively by the institutionalist literature on entrepreneurship. Surprisingly, almost no studies have attempted to explore the historical origins of present-day entrepreneurial culture, or how these trends are sustained, or change, across history.

Historical institutionalism provides a helpful starting point for analysing entrepreneurialism in a temporal perspective. In certain regions, history is said to cast a longer ‘shadow’. In practice

this implies that historical institutions, both formal and informal are 'sticky', or resistant to change. In Southeast Europe, it is suggested that cultural conservatism within society pervades every day activity (Todorova 1997; Ute 2010). The topic connects with a literature which sees cultural norms and economic practices as path dependent, stemming from distant trends or episodes in the past (Acemoglu 2001; La Porta et al. 1997; Engerman and Sokoloff 2002). It follows Douglass North (1978 and 1990) and others in enquiring whether informal institutions and practices persist over time, even after formal rules and governing frameworks change. This has salience for Southeast Europe, where functioning market economies and western political institutions have been established, but where underperformance on a host of developmental indicators persists (Vorley and Williams 2014). The Balkans and Turkey, for which I use the umbrella term 'Southeast Europe' are two such regions. Southeast Europe is an interesting frame through which to evaluate the possible relationship between history and entrepreneurialism, given the rich literature that attributes the present-day pathologies of the region (corruption, clientelism, and economic underperformance) to historical institutions (Teodorova 1997; Mazower 2000; Glenny 2002; Tsoucalas 1996 in particular). Given, too, the alleged stickiness of cultural and economic path dependencies in the region, this suggests a useful line of enquiry.

Puzzle

The puzzle underpinning this enquiry is conceptual and empirical. In the wider literature on historical legacies and economic performance, explanations on the link between history, cultural characteristics, and how these inform present-day outcomes in the present are conceptually ill-developed. Theories are foggy on how history informs culture, and the mechanics of this relationship. This is important in the growing business literature which seeks to explain diverging entrepreneurial outcomes. A cultural pre-disposition, or positive attitudes towards entrepreneurship are regularly cited as necessary but not sufficient conditions for successful entrepreneurial outcomes. However, in these accounts very little is said about how cultural pre-dispositions towards entrepreneurship are shaped, or how they change. Moreover, little attention has yet been afforded the temporal dimension – i.e. how trends are sustained or change across time. This is a puzzle given the considerable attention afforded to cultural explanations for economic underperformance in many parts of the world (Ute 2010; Putnam 2003). This conceptual puzzle has an empirical manifestation. In Greece and other Southeast European countries, it is regularly suggested that the historical legacies of Ottoman rule

produce particularly negative outcomes (Todorova 1997; Tsoukalas 1995; Mouzelis 1996). However, there exist diverging levels of entrepreneurship, measured by the average annual number of start-ups established as a percentage of the population, both within and across countries in the wider region, which suggests such a simple explanation is not easily upheld. In Turkey and Greece such patterns are evident. In the former, Anatolian tigers (Kayseri, Denizli, Gaziantep) are contrasted with weaker performers (Sivas, Eskishehir, Antalya). In the latter, Larissa, Thessaloniki and others perform poorly however some such as Chios, seem to buck national trends. While similarities across several other categories which might explain entrepreneurialism, each have experienced very different histories.

To the knowledge of the author, there exists no study that maps entrepreneurialism in historical perspective in Southeast Europe, beyond suggesting a possible link. By evaluating whether and how entrepreneurial cultures are sustained or change across history, the study aims to deepen the conceptual understanding of the relationship between historical legacy and culture in the present day. For countries like Greece, grappling with its recovery from economic crisis this subject carries significance.

Defining key concept: entrepreneurialism

The focus of this study is *entrepreneurialism*. This captures an attitude towards entrepreneurship as a profession, as well as an aspiration to become involved in it (Shane 2010; Davidsson 2016). By contrast entrepreneurship can be understood as the total percentage of the population engaged in entrepreneurial activity, or the number of start-ups established year on year. Entrepreneurialism represents a fundamental pre-requisite for entrepreneurship, and is indicative of a wider society's propensity towards it. To operationalise entrepreneurialism, data collection might follow the example of two Eurobarometer Flash Surveys (2009; 2012) that sought to measure 'entrepreneurial attitudes' through a series of questions. Using the definitions of Shane (2010) and Davidsson (2016), as well as the Eurobarometer Survey, the variable can be operationalised as one's attitude towards entrepreneurship as a social benefit, one's attitudes towards a career in entrepreneurship, and one's attitude towards entrepreneurs as role models.

Research Question & Objectives

The main question framing the research is: *What is the relationship between historical legacy, institutions, and entrepreneurialism?*

The following sub-questions help to address the main research question in different ways. These are roughly divided into separate chapters of the monograph:

Chapter 1: Do regional entrepreneurial aspirations persist across time? (historical legacies and persistence)
Chapter 2: Which historical institutions are important as drivers of entrepreneurialism in the present? (historical institutional drivers)
Chapter 3: What are the mechanisms by which historical institutions condition entrepreneurialism in the present day? (mechanisms)

The core objective of this research is to explore the relationship between historical legacy, institutions and entrepreneurialism. More specifically, the research intends to address whether entrepreneurialism can persist across time (i.e. history), whether and how historical institutions can shape entrepreneurialism in the present day, and the interaction with formal and informal institutions. These objectives stem from the same empirical puzzle, which sees great variation in entrepreneurial outcomes within and between Greece and Turkey, across time as well as space. The proposed structure of the PhD is a monograph, in which each sub-question forms a separate chapter of the research. The variable 'entrepreneurialism' represents a norm or set of attitudes equating to an individual's cultural predisposition towards entrepreneurial activity. The choice of dependent variable is grounded in a wider new institutionalist literature that sees present day economic performance as linked to culture, but addresses culture and history separately.

The aim behind the project's main research question is to make contributions in both a conceptual and empirical sense. Conceptually, it intends to contribute to the literature on new institutionalism, particularly the branch occupied by historical institutionalism. Of interest is the relationship between historical institutions and culture in the present day. The historical institutional literature focuses largely on institutions and how they condition behaviours over time (North 1990; Acemoglu and Robinson 2001), while sociological institutionalism suggests

the presence of a normative, or 'cultural', framework which governs actor behaviour (Stefan 2010). Yet little is said in the new institutionalist literature about how culture changes over time, or about how historical legacies inform culture. A conceptual framework within the literature that permits such analysis remains elusive. Therefore, this study tentatively explores the possibility that strands of the new institutionalist approach might be integrated to provide a historical-cultural framework for analysis.

From an empirical perspective, the study intends to improve understanding of entrepreneurialism as a phenomenon, and uses a three-level analysis to determine the conditions under which it can persist and change across time. This it does against the background of a geographical space - Greece and Turkey - that is empirically interesting given the puzzle outlined. The literature makes scant reference to the drivers of entrepreneurialism, while only few studies attempt to explore the long-term historical origins of entrepreneurialism. The conditions under which entrepreneurialism exists are of interest both to political economists as well as to policy makers. Understanding the mechanisms of persistence and change is important to the latter as it allows for better policy design, accounting for regional particularities that may be informed by specific historical legacies.

Literature Review

To my knowledge, there is no study which attempts to explore entrepreneurialism in historical perspective. However, there is a small literature which attempts to link present-day entrepreneurial outcomes to history, and connects this with the persistence of informal institutions. These studies consider the effect of Soviet or communist rule on the development of norms in the countries of eastern Europe/the former Soviet bloc. Schwartz and Bardi (1997) explain that the norms developed in the communist era were adopted mostly, not as an effect of direct indoctrination, but rather as a way of social adaptation to the prevailing economic and social conditions. Sztompka (1996) describes this legacy as a bloc 'culture' which privileged dependence over self-reliance; conformity over individualism; and rigidity and extremism in beliefs over tolerance and innovation. This implies that changes in informal institutions may be slow. Schwartz and Bardi (1997) also show that the differences between transition and comparator countries are lower for younger people, both because of the generational effect and the greater capacity of young people to learn and adapt to new conditions and cultural influences, which is confirmed by Estrin and Mickiewicz (2008). Estrin and Mickiewicz (2011)

consider the effect of this norm development on entrepreneurship in the communist transition states, which Estrin et al. also do earlier in Russia (2008).

These few historical studies connecting history, entrepreneurship, and norms use a North-ian (1990) conception of institutions, similar with the one proposed above. They discuss formal and informal institutions and relate these to historical legacies. Their core finding is that informal institutions hinder entrepreneurship and that these institutions are persistent over time. However, they do not touch in any great depth on the relationship between history and the informal institutions which are claimed to hinder entrepreneurship. Moreover, they are not clear about which norms these are.

Understanding regional entrepreneurialism

Going beyond the macro-level, there is an important set of studies which consider the persistence of regional entrepreneurship. This holds relevance for this study, given the regional focus. Once again, this is a separate dependent variable to entrepreneurialism, but it can provide some clues and allow for the generation of further empirical hypotheses. This small literature focuses on the persistence of entrepreneurship within regions. This literature again reflects a grounding in historical institutionalism, but sees this through different prisms, including opportunities, skills and agglomeration. It is suggested by some that positive attitudes are reinforced through successful entrepreneurial examples in regions. This mechanism is referred to as 'peer effects' and has been touched upon by La Fuente et al. (2007), Andersson and Koster (2011), and Shane (2010). The logic is that positive entrepreneurial examples over time sustain and reinforce entrepreneurship within a population, creating a form of path dependence through dynamic increasing returns. Another described in the literature is the family inheritance mechanism. This involves individuals continuing the activities of their parents, either by joining family businesses, or by using skills learnt in the family setting to establish new enterprises (Fritsch and Wrywich 2008). As such entrepreneurship is 'passed down' inter-generationally. Others suggest that historical awareness of past entrepreneurial success can be an important feature of persistence over time. Fritsch and Mueller (2018) discuss the example of Kaliningrad, a region with historically high levels of entrepreneurship across the period of German and post-Soviet Russian rule. The authors argue that despite a wholesale change of population, which would preclude the operation of the family inheritance mechanism, Russian

residents, well-educated in the region's past as a commercial hub, have become engaged in entrepreneurship – more than in other parts of Russia.

The emphasis is upon explaining the reproduction of entrepreneurship at the regional level, rather than the national, which is the object of earlier studies. These latter examples hold relevance for the study of entrepreneurialism. While their attention to the –ism is only tentative, the findings help inform further hypotheses that find articulation with the –ism. Hypotheses 1, 2, and 3 discuss different drivers and imply mechanisms, consistent with the question posed in the second and third chapters.

H1: Entrepreneurialism is driven and sustained across times through successful local examples of entrepreneurship.

H2: Entrepreneurialism is driven and sustained by one's close relatives, who condition one's attitude towards entrepreneurship.

H3: An historical awareness of regional entrepreneurial traditions helps inform positive attitudes towards entrepreneurship in the present day.

SECTION 2: Methodological approach and case studies

Analytical framework

To control for different categories of factors that might explain levels of entrepreneurialism, and to explore the relationship between these factors, the research uses a three-dimension analytical framework. Firstly, the temporal level (i.e. history) allows for an exploration of the historical component. History can be viewed as a long-term and more recent phenomenon. Historical legacy represents the long-term phenomenon, and the evolutionary trajectory the more recent. Secondly, the geographical level controls for topography, including features that might condition entrepreneurialism – coastal versus landlocked, urban vs rural, island vs mainland. The third level of analysis is the institutional level, which helps determine the rules of the game – reflected in ecosystem factors, skills levels, and the types of opportunities that exist in the wider environment. These can be sub-divided into national-level institutions and

regional institutions, and further into formal and informal institutions. These three levels help structure the case study selection.

Given the interest in the relationship between historical legacies and entrepreneurialism, it has been necessary to determine cases where differences are evident across the cultural (entrepreneurialism) and historical dimensions, but where other factors (geography, skills, formal institutions) remain similar. The Table outlining the case study selection is available below. Six case studies are divided into three pairs.

CASE STUDIES 1 & 2	IZMIR	THESSALONIKI
Geography	Coastal metropolis	Coastal metropolis
Country	Turkey	Greece
Skills	High HDI	High HDI
Opportunities	25% corporate tax; domestic market factor	29% corporate tax; EU factor
Ecosystem	5 universities	3 universities
Historical legacy	Ottoman commercial port	Ottoman commercial port
Evolutionary trajectory	Turkish state	Greek state; later EU
Entrepreneurship today	More commercial	Less commercial
CASE STUDIES 3 & 4	KAYSERI	LARISSA
Geography	Mid-size landlocked	Mid-size landlocked city
Country	Turkey	Greece
Skills	Low HDI	Low HDI
Opportunities	25% corporate tax; domestic market factor	29% corporate tax; EU factor
Ecosystem	1 university	1 university
Historical legacy	Silk Road; commercial hub	Agrarian past
Evolutionary trajectory	Turkish state	Greek state; later EU
Entrepreneurship today	More commercial	Less commercial
CASE STUDIES 5 & 6	GOKCEADA	CHIOS
Geography	Aegean Island	Aegean Island
Country	Turkey	Greece
Skills	Low HDI	Low HDI
Opportunities	25% corporate tax; domestic market factor	29% corporate tax; EU factor

Ecosystem	1 university	1 university
Historical legacy	Less commercial island (rural economy)	Commercial island (maritime trade)
Evolutionary trajectory	Turkish state	Greek state; later EU
Entrepreneurship today	Less commercial	More commercial

Comparative approach

The case studies are selected in pairs to effect comparison across three dimensions (the temporal, geographical, and institutional). Data will be collected and the analysis conducted for all six case studies. In the discussion, the case studies will be compared across their various levels to determine whether there exist trends common to all. This comparison is not confined to Greece vs Turkey, and case studies are designed to be compared within country as well. A discussion of cross-case comparison will emanate from the results and will be included as part of the Discussion and in the Conclusion.

How I plan to proceed

To assess the relationship between historical legacies, institutions, and entrepreneurialism, several steps must be taken. A mixed-methods approach will be employed using quantitative survey data collection and content analysis of historical material. Building on the analytical framework above, the following action plan is proposed:

1) Operationalise and collect data on entrepreneurialism today in case studies.
2) Proxy entrepreneurialism in the past and at various stages until the present to establish whether there is persistence or change. (Chapter 1)
3) Consider the institutional dimension and what drives persistence or change. Proxy skills, opportunities, ecosystems in the past, and consider against key historical turning points. (Chapter 2)
4) Explore the mechanisms underlying the relationship between history, institutional development, and culture (entrepreneurialism) (Chapter 3)
5) Compare the case studies across and within countries to determine common trends (Discussion and Conclusion)

References

Acemoglu D, Johnson S, Robinson JA. 2001. The colonial origins of comparative development: an empirical investigation. American Economic Review 91

Andersson M. and Koster S. (2011) Sources of persistence in regional start-up rates – evidence from Sweden, Journal of Economic Geography 11, 179–201.

Audretsch D. B. and Keilbach M. (2004) Entrepreneurship capital and economic performance, Regional Studies 38, 949–959.

Berna, G. (1995) Small firms and local economic development: Turkey and Southern Europe. Aldershot: Avery

Davidsson P. (1995) Culture, structure and regional levels of entrepreneurship, Entrepreneurship and Regional Development 7, 41–62.

Estrin S., Aidis, R. and Mickiewicz, T. (2008) 'Institutions and entrepreneurship development in Russia: A comparative perspective'. Journal of Business Venturing, Vol. 23.

Estrin S. and Mickiewicz, T. (2011) 'Entrepreneurship in Transition Economies: The Role of Institutions and Generational Change', in M. Minitti Dynamics of Entrepreneurship. Oxford: Oxford University Press

Fotopoulos G. and Storey D. (2017) Persistence and change in interregional differences in entrepreneurship: England and Wales, 1921–2011, Environment and Planning 49, 670–702

Fritsch et al. (2018) Historical shocks and persistence of economic activity: evidence on self-employment from a unique natural experiment, Regional Studies.

Fritsch M. and Mueller P. (2007) The persistence of regional new business formation-activity over time – assessing the potential of policy promotion programs, Journal of Evolutionary Economics 17, 299–315.

Fritsch M. and Wyrwich M. (2015) The Persistence of Regional Entrepreneurship – Are all types of Self-Employment Equally Important? Jena Economic Research Papers 2015 – 008.

Glenny, M. 1999. The Balkans, 1804-1999: nationalism, war, and the great powers. London: Granta

Grosjean, P. (2011) The institutional legacy of the Ottoman Empire: Islamic rule and financial development in South Eastern Europe. Journal of Comparative Economics, 39(1).

Henrich J. 2004. Demography and cultural evolution: how adaptive cultural processes can produce maladaptive losses - the Tasmanian case.

Huillery E. 2008a. History matters : the long-term impact of colonial public investments in French West Africa. Mimeogr., Paris School of Economics.

Mazower, M. 2000. The Balkans. London: Weidenfeld and Nicolson.

Mouzelis, N. 1996 The concept of modernization: its relevance for Greece. Journal of Modern Greek Studies. 14

Murphy KM, Shleifer A, Vishny RW. 1993. Why is rent-seeking so costly to growth. American Economic Review

Shane S. (2003) A General Theory of Entrepreneurship: The Individual-opportunity Nexus. Cheltenham, UK and Northampton, MA: Edward Elgar.

Tilly C. 1990. Coercion, Capital and European States, A.D. 990-1990. Cambridge: Blackwell

Todorova, M 1997. Imagining the Balkans. Oxford: Oxford University Press

Tsoukalas, K. (2005) State, Society, and Labour in Modern Greek Society. Athens: Themelio

Title: 'Understanding the export performance of Greek SMEs through the institutional framework of the Greek variety of capitalism'

Author: Konrad Sobczyk

Affiliation: University of Manchester, PhD (Politics Department).

Abstract :
Despite the existence of Global Europe (EU trade policy), not all EU member states and not all enterprise sizes are able to embrace free trade opportunities. Greece and its SMEs (Small and Medium Sized Enterprises) is a striking example of underperformance in terms of exports (especially exports beyond the EU) and inability to upgrade within Global Value Chains. This paper focuses on the period between 2007-2017, and argues that in order to understand this export underperformance of Greek SMEs and their inability to upgrade within GVCs, we need to focus on the institutional framework of the Greek variety of capitalism. The argument presented is that the institutional framework of the Greek variety of capitalism consists of deficiencies which constitute burdens for Greek SMEs wishing to embrace trade beyond the EU, upgrade within GVCs, and also consists of obstacles for efficient policy making.

Introduction

At the end of 2006, the European Union (EU), announced their trade policy in the form of Global Europe (GE), which resulted in free trade deals with third countries around the world. However due to heterogeneous nature of the EU member states (resulting from divergent political-economic structures; manifested in the national varieties of capitalism) not all countries possess suitable and conductive domestic environments which ensure that domestic firms can take advantages of embracing free trade beyond the EU via GE, and participating more deeply in Global Value Chains (GVCs). In order to illustrate the possible domestic limitations and obstacles which can prevent domestic firms from embracing free trade and GVCs, this paper draws on Greece as the suitable case study. This is a relevant case, as Greece is the country from the periphery of the European Single Market and the Eurozone, it also lies within more protectionist/closed economies in the EU (hence it was traditionally less open to free trade), and finally it has a national variety of capitalism which is less coherent and institutionally weaker compared to traditional capitalist varieties such as the UK or Germany. The paper focuses on the domestic conditions in Greece in the context of free trade and GVCs during 2007-2017 (the first decade of GE) specifically in relation to Small and Medium Sized Enterprises (SMEs). This is due to their importance among all firms in the European single market, and of course within Greece itself, as SMEs constitute 99.9% of all businesses in Greece, including micro firms (SBA 2017).

The internationalisation performance of Greek SMEs (in terms of trade with countries beyond the EU), was weak, as Greek SMEs consistently performed below the EU average during the investigated period. The SBA fact sheets illustrate data for internationalisation of SMEs (data for internationalisation as % of SMEs in industry) exhibit that between 2011-2014, only 5-7% of Greek SMEs in industry (on yearly basis) exported beyond the EU. However there was an increasing trend, starting with 5.46% in 2011 and reaching 7.31% in 2014, the EU average during that period was however higher around 9.9% (SBA 2012-2017). The closed nature of the Greek economy, can be seen in its positioning within GVCs. Greece as a country is having low participation rates in GVCs as can be seen in the figure 1 (attached in the appendix), Greece with 'GRC' symbol is located in the bottom left corner (Van der Marel 2015). These low Greek participation rates in GVCs indicate shallow involvement of Greece in terms of backward linkages (i.e. trading intermediate inputs imported from abroad), and forward linkages (trading intermediate inputs produced domestically and exported for another country's exports). Greece and its SMEs also struggled to upgrade within GVCs, which can be seen by looking at the exports of medium & high tech products (as a share of total products exports) which during the investigated period were often underperforming, e.g in 2016, they stood at only 22.7% compared to 56.1% in the EU average. The exports of knowledge-intensive services sectors (% of total services exports), performed better but still often lagged behind the EU peers, e.g in 2016 they stood at 51% compared to 63.1% for the EU average (EIS 2016).

In order to understand this export underperformance of Greek SMEs and their inability to upgrade within GVCs, this paper proposes to focus on the institutional framework of the Greek variety of capitalism, with Greece's capitalist model theorised as a Dependent Market Economy (DME). The DME category with its concept of 'dependency' reflects the precarious position of the Greek capitalist model during 2007-2017 (due to Eurozone and Greek sovereign debt crisis), but it acknowledges that such vulnerable position of the Greek variety of capitalism is changeable with the right set of policies and institutional configurations. The institutional frameworks analysed in this paper relate to three separate empirical spheres of the Greek variety of capitalism: business environment, finance availability, and the tripartite relations. The argument presented is that the institutional

framework of the Greek variety of capitalism (manifested in these three mentioned empirical spheres) play a crucial role in supporting SMEs to increase their exports and move towards high added value activities in GVCs (the process of upgrading). It will be presented that Greece's deficiencies and limitations (within business environment and finance) are placing burdens for Greek SMEs in embracing trade beyond the EU and in upgrading within GVCs, whereas Greece's problems within the tripartite relations realm generate obstacles for effective pro-SME policy making.

Business environment

A conducive business environment (in regulatory and administrative realms) is one of the fundaments for successful functioning of domestic SMEs and their GVC related activities e.g exporting. Mayer and Phillips (2017) highlight the role of such institutional and regulatory context as a 'facilitator' of business friendly environment in the context of GVCs. As argued by Van der Marel (2015), 'doing business' indicators and customs procedures are important for exports and country participation in GVCs, Greek capitalist model however lacked such institutional foundations for the business environment, which contributed to its weak trade performance as emphasized by Böwer et al (2014).

Especially, the 'starting business' criteria (procedures, time, cost and minimal capital to start a business) were problematic for the most part of the investigated period. During 2007-2013, the average number of procedures to start a business was 15 , time to set up a business was 38 days, subsequently dropping to 19 days, the cost to start a business (% of income per capita) was high around 20% on average, and minimum capital required (% of income per capita) was also high i.e. around 22% on average (World Bank 2007-2012). The situation in terms of 'starting business' criteria has however improved between 2014-2017. The other business environment dimensions were also problematic in Greece during 2007-2017, e.g the number of procedures needed to register/transfer property remained large around 11, the number of procedures needed for enforce contracts was around 39, and time required for it was striking 819 days, even rising to 1580 days (World Bank 2007-2017). All these regulatory dimensions resulted in burdening administration for SMEs. Worryingly specifically for trade, the 'trading across borders' dimensions posed obstacles for Greek SMEs that wished to embrace GVCs via exporting/importing. Between 2007-2017 it was very costly and more time consuming for Greek SMEs to import or export to non-EU countries. For instance, in terms of costs to export (in US$) in 2013, in Greece the cost was 1115$, compared to 1004$ for the EU average. Time required to export and import was noted by the SBA (2015) as the main source of Greek deficiency, as it was taking around a third more time to export and import than the EU average. The time to export for Greek firms was on average 20 days during the investigated period, dropping to its best- 15 days in 2015, but even that was visibly longer than the EU average of 11.57 days. Generally, this highlights burdensome customs formalities in Greece.

As previously mentioned, Greece was unable to upgrade within GVCs and underperformed in terms of exports of medium & high tech products, and exports of knowledge intensive services sectors. This underperformance can be explained with institutional deficits of business environment for the higher added value activities, namely limitations of the Greek national innovation system. As highlighted by Van der Marel (2015), innovation conducive climate is of great importance to country participation in GVCs, Greek innovation system during 2007-2017 however possessed several deficiencies. Some of these weaknesses included: human resources (lack of new graduate students), weak quality of research systems, and low public-private scientific co-publications (EIS 2007-2017). More profoundly, the R&D expenditure in the public sector (% of GDP) in Greece was limited, e.g

only 0.54% in 2016, compared to 0.72% for the EU average (EIS 2016). Similarly, the R&D expenditures in the business sector (% of GDP) were underperforming even more in Greece, e.g only 0.28% in 2016, compared to 1.30% for the EU average (EIS 2016). On the positive note, Greek SMEs performed on average with the EU in terms of innovating in-house, collaborating with other innovative SMEs, introducing marketing or organisation innovations, as well as introducing product or process innovations, however these efforts were undermined by the previously mentioned deficiencies (SBA 2012-2017).

Finance Availability

The availability of financial support for SMEs is crucial in the context of their GVC related activities such as exports. As argued by Muûls (2012) due to risk factor associated with exporting activities, exporting firms are more dependent on external financing than non-exporting firms, whereas Manova (2013) articulated that less financially constrained firms enjoy more prominent presence in exporting markets. On the other hand, OECD (2008) proposed that governments can support SMEs participation in GVCs by providing financial support. Greek variety of capitalism falls under stakeholder capitalism with bank based/credit based financial system being the dominant form for firm financing. However, given the precarious position of the Greek capitalist model and Greek banks during the Eurozone and sovereign debt crisis, this traditional bank/credit based model for firm financing was severely undermined, impacting SMEs in a highly negative way.

Since the Greek debt crisis, the access to public financial support including guarantees (% of SME respondents who indicate a deterioration), has been deteriorating rapidly in Greece from mere 14% in 2008 to over 30% in 2012, reaching its peak of 69% in 2015 (SBA 2012-2017). Similarly, negative tendency between 2007-2017, was visible within rejected loan applications and unacceptable loan offers (% of loan applications by SMEs), with around 29-39% of Greek SMEs which had their loan applications rejected or received a loan with unacceptable conditions. Greek SMEs in fact faced the harshest obstacles for receiving loans in the entire EU, as the respective EU averages were 8-17% (SBA 2012-2017). The figure 2 (attached in appendix) highlights the dire situation in Greece, with only around 30% of Greek SMEs which applied for a bank loan received the entire requested amount in 2016, such low number was related to problems of Greek SMEs to provide a required collateral (SAFE 2016). These harsh lending conditions are confirmed by looking at indicator of willingness of banks to provide a loan (% of SMEs respondents who indicated a deterioration), on average during the investigated period, between 32-51% of Greek SMEs were perceiving deterioration in bank willingness to provide credit, visibly higher than 11-26% for EU averages (SBA 2012-2017). This unwillingness of Greek banks to lend, causing liquidity issues for SMEs, was underpinned by high level of non-performing loans which exacerbated the pressure on Greek banks' balance sheets (Nassr et al 2016). Furthermore, the borrowing itself became expensive for SMEs due to rising interest rates since the crisis, e.g 5.3% in 2016, which was the highest in the EU (SBA 2012-2017). Finally, the financial position of Greek SMEs was undermined by weak cash flow conditions, as on average it took much more time to get paid on time in Greece than in EU peers, the 2012-2017 SBAs show that, total duration to get paid (days) varied between 73-115 days, which was often around double longer than in the EU.

In the context of the Greek crisis, the weakness of the financial realm of the Greek variety of capitalism became clear, namely inability to diversify firm financing methods away from reliance on bank/credit based financing. There was a clear shortage of risk capital financing (private equity, venture capital, anger investors), the venture capital investments were underdeveloped historically in Greece, but they were at dire position within the

investigated period (Nassr et al 2016), see figure 3 (attached in appendix) for 2014 figures which show that within OCED countries, venture capital investment in Greece was the lowest (OECD 2015b). The venture capital ecosystem with established links to academia research and innovation could lead to promotion of high value added products and innovative SMEs, hence enable the process of upgrading within GVCs, however Greece lacked the required institutional infrastructure for it.

Tripartite Relations

A coherent system of tripartite relations as a form of corporatist interest mediation is of visible importance to policy making realm (Fashoyin 2004; ILO 2013). By extension, effective system of tripartite relations which takes into account the interests of key social partners (such as business associations) would be conducive to effective pro-SME policy making in the context of free trade. Greek tripartite relations (between government, trade unions and employers) are however problematic and lack coherence. Lavadas (1997:4) has characterised Greece as 'disjointed corporatism' meaning 'a combination of a set of corporatist organisational features and a prevailing political modality that lacks diffuse reciprocity and remains incapable of brokering social pacts'. Essentially, in a disjointed corporatist system, interest mediation becomes difficult to manage due to problematic structuring of conflict where coordination and consensus are difficult to reach, as antagonism and mistrust are predominant features of social dialogue (Featherstone 2016). One of the implications for interest mediation in a dis-jointed version of Greek corporatism (which was also surrounded by clientelism-a feature of Greek socio-political climate) was the chaotic way of uploading preferences to the government. Essentially, through clientelist channels, certain groups enjoyed privileged access to the government. Another issue which complicates structure of social dialogue and interest mediation in Greece, is the fact that internal representation in both union and employer's federations is inclined towards certain groups. In the case of unions it is skewed towards public sector employees and in the employers' federations it is skewed towards large firms (Featherstone and Papadimitriou 2008). This leaves SMEs at potentially precarious position in terms of uploading their interests into the government, as there is no guarantee that employer's federations will sufficiently lobby for the interests of SMEs to be reflected in policy making. Within the investigated period, since 2010, Greece was subjected to bailouts provided by the Troika (International Monetary Fund, European Commission, European Central Bank), which essentially proposed an externally imposed programme of economic reforms (with an impact on the whole private sector including SMEs). Given that the bailout was externally imposed, it constrained the options for domestic coalition building even further in an already complex social dialogue system underpinned by antagonism and mistrust (Featherstone 2016). Hence, as a result of Troika's intervention, the climate of tripartite negotiations and social dialogue has been undermined further, adding extra hurdle for Greek SMEs wishing to upload their interests to the government and see policies which reflect their interests. Instead, during crisis, Greek SMEs were subjected to operate under externally imposed conditions, policies and reforms, which also reflects the 'dependent' nature of the Greek variety of capitalism during the investigated period.

References

Böwer, U., Michou, V. and Ungerer, C. (2014). The Puzzle of the Missing Greek Exports. European Commission, Directorate-General for Economic and Financial Affairs. Economic Papers 518, 1-40.

European Commission/European Central Bank, (2016). Survey on the access to finance of enterprises (SAFE), Available at: http://ec.europa.eu/growth/safe.

European Innovation Scoreboard (2007). European Commission. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. European Union: Brussels.

European Innovation Scoreboard (2008). European Commission. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. European Union: Brussels.

European Innovation Scoreboard (2009). European Commission. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. European Union: Brussels.

European Innovation Scoreboard (2010). European Commission. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. European Union: Brussels.

European Innovation Scoreboard (2011). European Commission. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. European Union: Brussels.

European Innovation Scoreboard (2012). European Commission. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. European Union: Brussels.

European Innovation Scoreboard (2013). European Commission. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. European Union: Brussels.

European Innovation Scoreboard (2014). European Commission. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. European Union: Brussels.

European Innovation Scoreboard (2015). European Commission. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. European Union: Brussels.

European Innovation Scoreboard (2016). European Commission. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. European Union: Brussels.

European Innovation Scoreboard (2017). European Commission. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. European Union: Brussels.

Fashoyin, T. (2004). 'Tripartite Cooperation, social dialogue and national development' International Labour Review, 143:4, 341-372.

Featherstone, K. and Papadimitriou, D. (2008). The limits of Europeanisation: Reform Capacity and Policy Conflict in Greece, Palgrave Studies in European Union Politics: Palgrave Macmillan.

Featherstone, K. (2016). 'Conditionality, Democracy and Institutional Weakness: the Euro-crisis Trilemma', Journal of Common Market Studies, 54, 48-64.

International Labour Organisation- ILO (2013). National Tripartite Social Dialogue: An ILO guide for improved governance. International Labour Office, Social Dialogue and Tripartism Unit, Governance and Tripartism Department. Geneva: ILO.

Lavdas, K. (1997). 'The Europeanisation of Greece: Interest Politics and the Crises of Integration'. London: Macmillan.

Manova, K. (2013). Credit Constraints, Heterogeneous Firms, and International Trade, Review of Economic Studies, 80, 711-744.

Mayer, F. W. and Philips, N. (2017). 'Outsourcing governance: states and the politics of a global value chain word', New Political Economy, 22:2, 134-152.

Muûls, M. (2012). Exporters, Importers and Credit Constraints, Center for Economic Performance Discussion Paper, No 1169, available at http://cep.lse.ac.uk/pubs/download/dp1169.pdf.

Nassr, I. K., Robano, V., and Wehinger G. (2016). 'Unleashing the Export Potential of SMEs in Greece', OECD Working Papers on Finance, Insurance and Private Pensions, No. 41, OECD Publishing, Paris.

OECD (2008). Enhancing the Role of SMEs in Global Value Chains. Paris: OECD Publishing.

OECD (2015b), Entrepreneurship at a Glance 2015, OECD Publishing, Paris. Available at: http://dx.doi.org/10.1787/entrepreneur_aag-2015-en

SBA (2012). Small Business Act for Europe Fact Sheet GREECE. European Union. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs.

SBA (2013). Small Business Act for Europe Fact Sheet GREECE. European Union. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs.

SBA (2014). Small Business Act for Europe Fact Sheet GREECE. European Union. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs.

SBA (2015). Small Business Act for Europe Fact Sheet GREECE. European Union. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs.

SBA (2016). Small Business Act for Europe Fact Sheet GREECE. European Union. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs.

SBA (2017). Small Business Act for Europe Fact Sheet GREECE. European Union. Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs.

Van der Marel, E. (2015). 'Positioning on the Global Value Chain Map: Where do You Want to Be?' ECIPE Occasional Paper No. 01/2015, 1-25.

World Bank (2007). Doing Business 2007- How to Reform. World Bank: Washington, D.C.

World Bank (2008). Doing Business 2008. World Bank: Washington, D.C.

World Bank (2009). Doing Business 2009. World Bank: Washington, D.C.

World Bank (2010). Doing Business 2010-Reforming Through Difficult Times. World Bank: Washington, D.C.

World Bank (2011). Doing Business 2011-Making a Difference for Entrepreneurs. World Bank: Washington, D.C.

World Bank (2012). Doing Business 2012-Doing business in a more transparent world. World Bank: Washington, D.C.

World Bank (2013). Doing Business 2013-Smarter Regulations for Small and Medium Sized *Enterprises* .World Bank: Washington, D.C.

World Bank (2014). Doing Business 2014. Understanding Regulations for Small and Medium Sized Enterprises. World Bank: Washington, D.C.

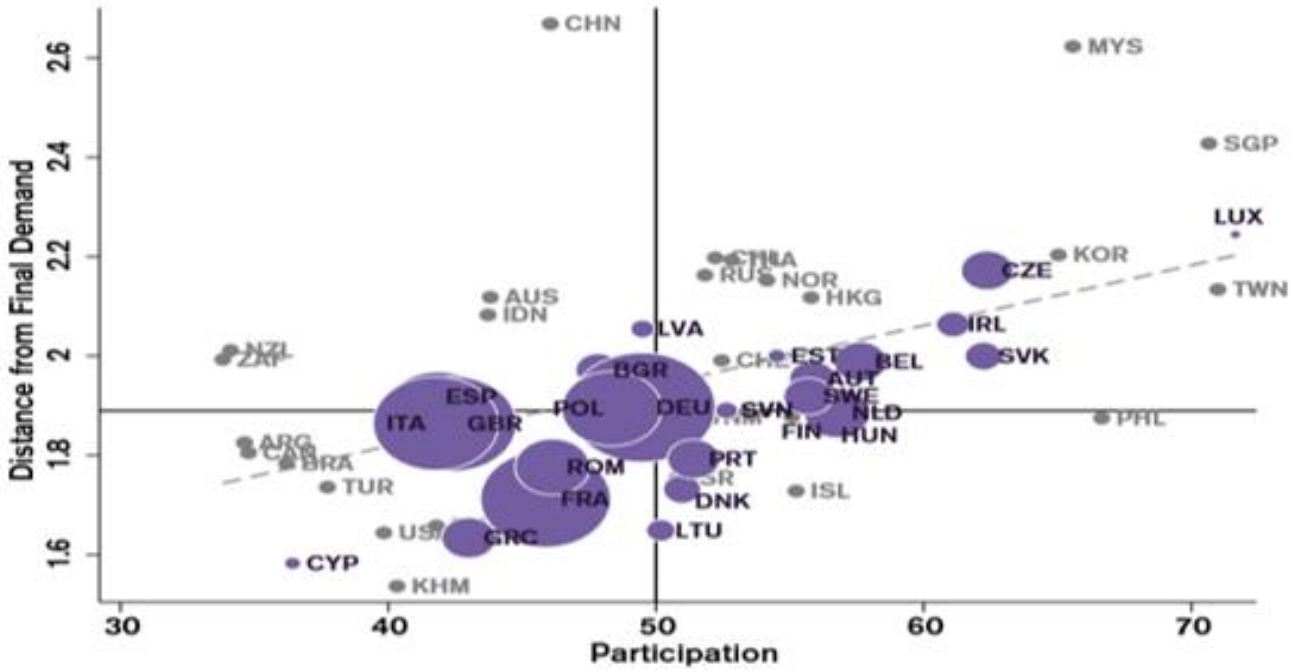
World Bank (2015). Doing Business 2015. Going Beyond Efficiency. World Bank: Washington, D.C.

World Bank (2016). Doing Business 2016. Measuring Regulatory Quality and Efficiency. World Bank: Washington, D.C.

World Bank (2017). Doing Business 2017. Equal Opportunity for All. World Bank: Washington, D.C

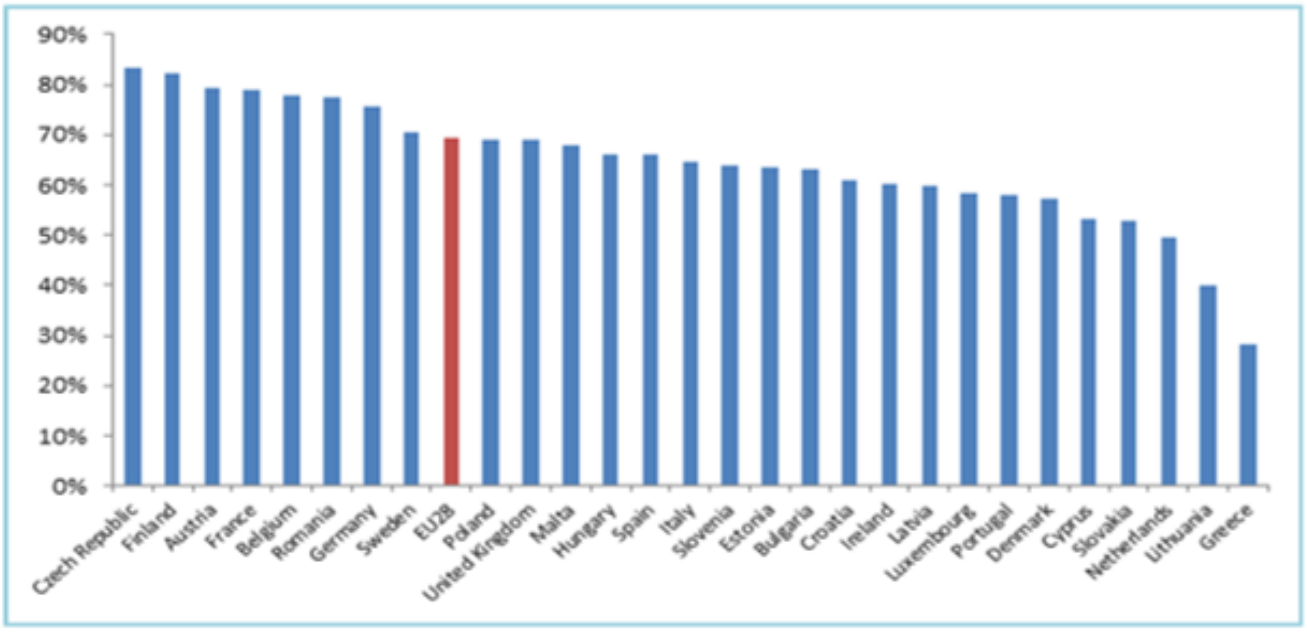
Appendix

FIGURE 1: WHERE ARE COUNTRIES POSITIONED ON THE GVC MAP?



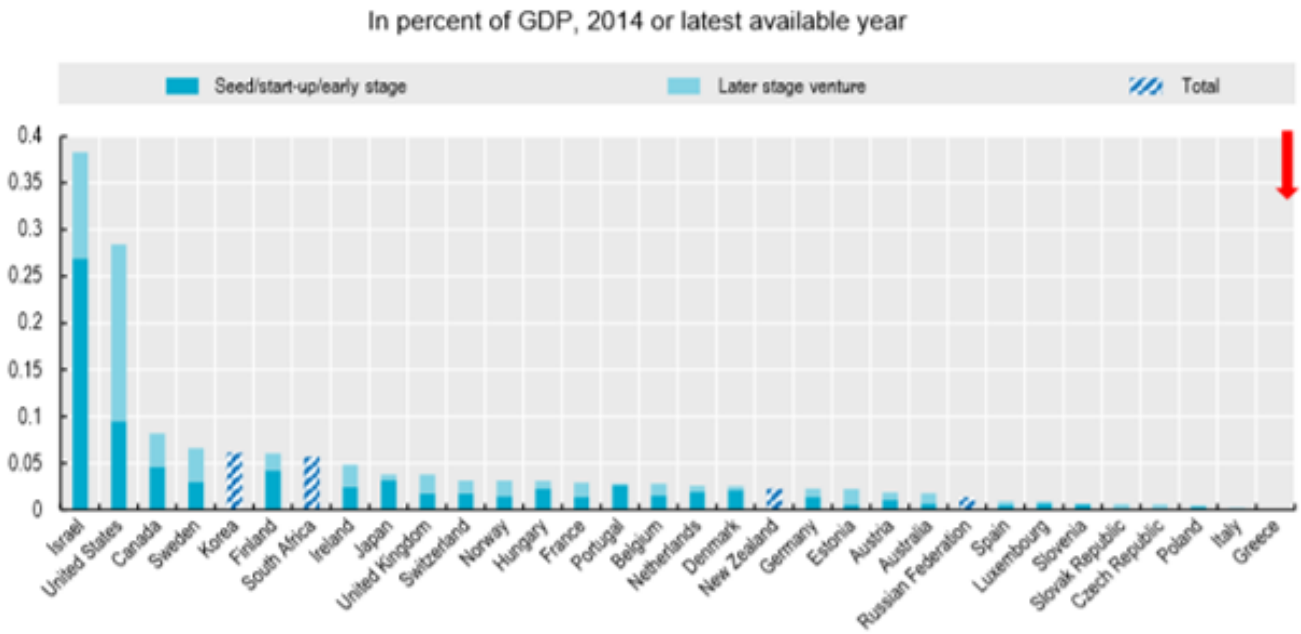
Source: Van Der Marel (2015), p4.

Figure 2 : Bank loans- SMEs that applied for an obtain the entire amount requested (2016)



Source: SAFE (2016)

Figure 3: Greece a laggard in venture capital investment



Source: OECD (2015b)

Regional innovation and patent system effectiveness: evidence from Greece

Ioannis Kaplanis [a] and Theano-Maria Tagaraki [b]

[a] Director General, Hellenic Industrial Property Organization (OBI), Greece
SERC, London School of Economics, UK

[b]Ph.D. Candidate, Department of Economics, Athens University of Economics and Business, Greece

This is a work in progress. Please do not cite without permission.

Abstract

Patent Libraries are a growing network of innovation hubs across the member states of the European Patent Organization that assist local inventors in using the patent system effectively. We examine whether local patent libraries affect knowledge generation and diffusion and provide the first systematic evidence using the opening and closure of three regional patent libraries in Greece as a quasi-natural experiment. Employing a difference-in-difference estimation framework, we show a mild asymmetric effect: whereas the opening of the local patent libraries had no significant contemporaneous effect, apart from one region, their closure induced a mild decrease on patent applications which varied significantly among regions. These results imply that the impact of such institutions on innovation takes time to build, but once in place, they could induce a positive effect which varies among regions.

Keywords: Patents; regional innovation; regional growth; Smart specialization; knowledge spillovers

JEL codes: O32; O34; R11; R58

1. Introduction

Innovation is critical for fostering economic growth (Romer 1990), and it can be a competitive advantage for a region. On the other hand, regional characteristics are essential for knowledge generation, and successful diffusion since innovation itself is considered a territorial embedded process (Crescenzi and Rodríguez-Pose 2011). Local institutions could play an important role in shaping this two-way relationship since they facilitate Research and Development (R&D) efforts and knowledge diffusion (Furman et al. 2018). In this study, we aim to shed light on the contribution of regional patent libraries centres (henceforth, PATLIB), considering their role as research-enhancing institutions, on regional innovation utilizing the operation and the quasi-random closure of PATLIB offices in Greece.

PATLIB is a growing network of regional patent information centres in Europe. They operate as "innovation hubs", aiming to guide and support local inventors to apply for a title, through each national system, protecting their novelty successfully. The users of the patent system might face a variety of difficulties that could hinder their protection efforts. Such challenges include tackling with the complexity of the patent procedure, the establishment of a successful patent strategy, evaluating the potential of the final products in a global market and how to enforce intellectual property rights (IPRs) in other countries (Artelsmair et al. 2009). Thus, PATLIB services might be essential for small and medium-sized enterprises (SMEs), which accounted for 99.7% of all enterprises in the non-financial business sector of the OECD area in 2013 (OECD 2017), or academic researchers who might lack relevant experience.

In order to investigate the role of the PATLIB offices in innovation production, we take advantage of the Greek PATLIBs' operation and especially their quasi-random closing. Hellenic Industrial Property Organisation (HIPO), the Greek Patent Office, following the European wave of opening regional patent offices, inaugurated three new PATLIBs in a short period from the November of 1995 until the July of 1996. PATLIBs were established in Thessaloniki, the second most populated city in Greece, in Patra and Heraklion. Libraries

operated until February of 2009 where the last one was closed. The reasoning behind this decision was not sufficiently provided, and no official statement was made. Interviewing the old executives of the organization informed us that the decision was not related to any efficiency concern, and it was probably related to other bureaucratic issues[1]. Thus, we consider their closing as a quasi-natural experiment to our analysis.

Obtaining exogenous variation when institutions impact is concerned, is challenging since their operation is usually based on their efficiency and the benefits that they offer. Furthermore, the choice of location is usually a strategic decision, and mostly, they are established in areas where their impact would be greater. Thus, taking into account the quasi-randomness of this PATLIBs termination, interesting results could be drawn relating to the role of these institutions innovation. To our knowledge, an analysis from this scope takes place for the first time.

We employ a difference in differences estimation framework approach for evaluating the library's effect on innovation. Year and region fixed effects are considered to account for time trends and systematic regional differences. We also add regional characteristics as controls to gain a deeper understanding of the channels that PATLIBs affected the patent activity. The opening effect is positive but not significant in many tests, which is not surprising as it could take more years for building a substantial impact on innovation, and the policy was not random. However, our analysis indicates mildly negative effects on regional innovation due to the PATLIBs closing. Our results remain similar for several robustness checks. The rest of the paper provides a related literature review, a more detailed PATLIB system description, empirical strategy, and results followed by the conclusion drawn from the analysis.

[1] The main explanation behind the closing decision, received during the interviews, was that staff in libraries was paid as freelances but according to Greek Law when a freelancer has a contract renewed constantly in the same organization and under some other conditions, he/she can claim a permanent position in the organization. However, hiring in legal entities that belong to the greater government sector, such as the Hellenic Industrial Property Organisation, is complex and demands a lot of effort. Therefore, it was preferred to close the offices instead of hiring permanent staff for their operation. Until their closing the offices operated fully.

2. Related Literature

Regions play a notable role in aggregating growth by cultivating innovation and technology development. 'Innovation is a territorially embedded process and cannot be fully understood independently of the social and institutional condition of every space' (Rodriguez-Pose and Crescenzi 2008, p. 54). Therefore, this paper illustrates further the role of institutions in regional innovation since Patent Libraries could serve as research-enhancing institutes (Furman et al. 2018). Economic institutions that aim the accumulation of knowledge, leading to innovation, using these mechanisms are the so-called research-enhancing institutions (Furman and Stern 2011).

The working paper by the Furman et al. (2018), which examines the effect of information disclosure through patents on subsequent innovation, is closer to our work. They utilize the expansion of the USPTO Patent and Trademark Depository Library system from 1975 to 1997. Using this period turns convenient for taking advantage of the pre-internet era and the regional variation in the costs of access to patent documents yielded by the opening of libraries. Main results show that after the opening of a library the local patenting increases by 17% relating to control region, local inventors tend to cite more distant and technological diverse patents and that libraries turn to be significant for young companies, local business formation, and job creation. To our knowledge, the European Patent Library system has not been studied in literature before, and this kind of exogenous closing has not been a matter of study either.

Some researchers have exploited other institutes operation for estimating their role in innovation generation. Furman et al. (2011) empirically estimated the impact of a biological resource center on knowledge production and diffusion taking advantage exogenous shifts of biomaterials across institutional setting finding that effective institutions boost the cumulative impact of individual scientific discoveries. What is more, Donges et al. (2018) investigate the effect of inclusive institutions on innovation using data for Imperial Germany. They conclude that the number of patents per capita was higher in occupied counties than in unoccupied ones and the impact of institutions on innovation is amplified when the banking sector is developed.

Our research also contributes to the general issue of the patent system effectiveness in generating innovation. Theoretically speaking, the patent effect on innovation is described by the contract and the reward theory; a patent serves as a "contract" between the inventor and the society where the inventor agrees to make his/her invention public in exchange for exclusive rights on it which play the role of the "reward". However, a great debate exists whether patent systems affect innovation generation (Williams, 2017). Arguments against them exist such as Boldrin and Levine (2013) claiming that the insufficiency of empirical evidence to support positive patent effect on innovation. On the other hand, many insist that patents facilitate the dissemination of technical information, encouraging productivity growth (Machlup and Penrose, 1950; Landes and Posner, 2003). Utilizing the exogenous variation of the Greek PATLIB offices closing, we are able to disentangle the effect of Patent Offices on innovation production.

3. Patent Libraries

Patent Information Centers or Patent Libraries (PATLIB) primary purpose is providing technological information to prospective patent applicants and support their efforts through several extra services. They operate in cooperation with the national patent offices of the member states of the European Patent Organisation (EPO). The PATLIB Network is continuously growing. During the 1995 116 Centres operated when in 2003, the network expanded in 283 centres. Today, more the 300 PATLIB centres exist across Europe working at a regional level.

PATLIB centres usual services include, apart from patent information services, technology, and competitor watches, patent statistics, patent valuation/audits, advice on patent strategy and guidance on commercialisation/technology transfer. The patent information source is national and international patent databases. Furthermore, some offices might provide additional services relating to other intellectual property rights, such as trademarks, registered designs, and utility models.

PATLIBs promote public awareness by organizing relevant events such as presentations and workshops where locals become familiar with the methods of innovation protection. Knowing the regional characteristics -economic, industrial, and social profile- of their area,

a PATLIB office is possible to work as an innovation hub that assists local inventors in producing further knowledge. Especially for small entities that they cannot afford paid counseling, such as SMEs, private inventors and students, PATLIB centres can be the catalyst in the innovation engine.

In Greece, there were three regional patent offices have been operated for approximately the same period, in Heraklion (opened at 01/11/1995 and closed at 28/02/2009), in Thessaloniki (opened at 20/02/1996 – closed at 28/02/2009) and in Patra (opened at 31/07/1996 – closed at 31/08/2008). Greek regional patent libraries offered mainly patent, utility models and designs prior art information and they supported the whole process of applying for a title by providing guidance, solving potential questions by applicants and informing about potential protection strategies.

Based on discussions with the executives of the Hellenic Industrial Property Organisation, informed us that the reasoning for the closure of the local offices of their closing was not connected to either with their efficiency or their performance. Given that there was no official explanation provided and that behind this decision. Furthermore, as their closing dates indicate, they stopped their operation before the beginning of the financial Greek economic crisis, expands. For these reasons, we assume that their closing was quasi-random, and use considered it as a quasi-natural experiment to our analysis.

4. Empirical strategy and datasets

We use a newly collected and cleaned patent dataset from the HIPO, along with Cambridge Econometrics European Regional Database to control for regional characteristics. As controls, we employed Gross Fixed Capital Formation (GFCF) (used as a proxy for local investment), employment and population data from the Cambridge Econometrics European Regional Database for the 1991-2014 period. Table 1 provides the descriptive statistics for all variables utilizes in our analysis. For the 2015 and 2016 years we use data extracted from Eurostat database (access 16/05/2019). We employ a difference in differences estimation framework for evaluating the library's effect on innovation, taking into account a seven-year window from opening (1996) and closing (2009). Year and region fixed effects are considered to account for time trends and systematic regional differences. We

also add regional characteristics as time-varying controls that would help to gain a deeper understanding of the channels that PATLIBs affected the patent activity and region-specific time trends are employed to allow treatment and control regions to follow different trends.

Table 1 Descriptive statistics of variables

	Total	Peloponnese	Central Macedonia	Crete
	1989-2003	1989-2003	1989-2003	1989-2003
Patent applications	31.29 (65.57)	21.13 (7.78)	55.72 (18.83)	23.48 (11.70)
Industrial investment	363,608,125.73 (466,047,703.06)	559,860,968.53 (141,639,245.59)	528,189,666.13 (76,969,254.62)	94,071,333.33 (26,087,795.62)
Employment	348,309.62 (394,444.15)	421,613.47 (17,966.52)	698,027.33 (20,683.90)	243,882.93 (22,808.73)
Number of observations	180.00	15.00	15.00	15.00
	2002-2016	2002-2016	2002-2016	2002-2016
Patent applications	52.93 (94.59)	38.41 (11.47)	103.47 (23.07)	35.44 (6.71)
Industrial investment	286,936,805.38 (360,104,199.36)	284,358,739.20 (107,486,121.20)	521,530,267.73 (99,974,632.34)	108,587,998.93 (45,179,348.02)
Employment	369,050.26 (436,779.98)	432,375.00 (34,885.17)	724,187.67 (63,649.11)	262,177.87 (18,423.32)
Number of observations	180	15.00	15.00	15.00
	1996	1996	1996	1996
Patent applications	32.00	24.00	49.00	23.00
Industrial investment	366,951,410.00	482,754,336.00	571,702,976.00	65,806,000.00
Employment	344,388.25	419,107.00	688,557.00	244,567.00
	2009	2009	2009	2009
Patent applications	58.17	42.00	107.00	45.08
Industrial investment	398,743,497.33	282,660,384.00	497,535,008.00	119,665,000.00
Employment	402,416.67	472,896.00	789,886.00	282,431.00

Notes: This table shows the averages of key variables in our analysis of regions with a patent library and control regions. Standard deviations are reported in parenthesis below the relevant average figures.

To investigate the role of the PATLIB offices on innovation production, we take advantage of the Greek PATLIBs' operation and their quasi-random closing. In the first place, we employ two econometric specifications that allow us to evaluate the average effect of PATLIBs opening and closing on regional innovation:

$$\ln Patents100_{rt} = a_1 + \beta_1 treat + \beta_2 post96 + \beta_3 DiD96 + D'_{rt}\gamma_1 + \rho_{rt} + d_t + d_r + \varepsilon_{rt} \quad (1)$$

$$\ln Patents100_{rt} = a_2 + \delta_1 treat + \delta_2 post09 + \delta_3 DiD09 + D'_{rt}\zeta_1 + \rho_{rt} + d_t + d_r + e_{rt} \quad (2)$$

where the r and t index region and time accordingly. The dependent variable $Patents\ 100_{rt}$is the patent applications per capita (100,000 citizens), treat indicates the regions that a PATLIB operated, post96 and post09 are the dummies for treated periods 1996 and 2009 respectively, which take the value 1 for the years following the opening and the closing of libraries, $DiD96$ and $DiD09$ are the interaction terms between treated areas and treated years, D'_{rt} are the time-varying regional characteristics such as employment, and gross fixed capital formation. The variable ρ_{rt} is the region-specific time trends which is a region-specific trend coefficient multiplying the time-trend variable, t. Finally, d_r and d_t are the binary regressors for region and time respectively for our fixed effects model in order to account for time trends and systematic differences among regions.

The coefficients β_3 and δ_3 are those of interest and they measure the average yearly change in the number of patents around a PATLIB after their opening/closing relative to the period before it was opened controlling for the logarithmic values of the regional characteristics as mentioned above. This specification allows us to use as controls the rest of the regions of Greece which is an important part of our mission. In late 2009 a deep economic crisis started in Greece which affected the majority of country's figures, this specification combined with region and year fixed effects permits us to account for the crisis impact and investigate the PATLIBs effect on regional innovation. In order to account for different trends among regions, we also add region-specific time trends.

The previous specification examines the average effect on regional patenting for all the areas that were treated simultaneously. To investigate the effect that each library stimulated to the region that it operated we separate the effect as follows:

$$\ln Patents100_{rt} = h_1 + k_1 Central\ Macedonia + k_2 Crete + k_3 Peloponnese + k_4 post09 + k_5 DiD\ of\ Central\ Macedonia + k_5 DiD\ of\ Crete + k_6 DiD\ of\ Peloponnese + D'_{rt}\lambda_1 + \rho_{rt} + d_t + d_r + u_{rt} \quad (3)$$

$$\ln Patents100_{rt} = h_2 + \kappa_1 Central\ Macedonia + \kappa_2 Crete + \kappa_3 Peloponnese + \kappa_4 post09 + \kappa_5 DiD\ of\ Central\ Macedonia + \kappa_5 DiD\ of\ Crete + \kappa_6 DiD\ of\ Peloponnese + D'_{rt}\mu_1 + \rho_{rt} + d_t + d_r + \eta_{rt} \quad (4)$$

The difference in these specifications is that instead of one aggregate treat and interaction variable that equal one when we encounter regions that libraries were operated, we employ three different treat and interaction binary regressors. For example, $Central\ Macedonia$ equals one when the region of Central Macedonia is considered and $DiD\ of\ Central\ Macedonia$ is the interaction variable between $Central\ Macedonia$ and $post09$. Similar definitions apply for Heraklion and Patra PATLIB office. In this model, we control for the rest of the regions, in order to assess the effect of each PATLIB in the region that it was closed. Similarly, to average impact approach region, year fixed effects are also employed accompanied with region-specific time trends.

5. Results

The estimation of the main specifications indicates a mildly negative effect from after the closure of local offices took place, whereas opening does not appear to be significant for most of the test. Table 2 shows the results of the first specification. Column 1 is the specification without the utilization of time-varying controls. Their addition does not

Table 2 Difference-in-Differences estimates of the average impact of the PATLIBs opening in 1996

	(1) lnpatent100	(2) lnpatent100	(3) lnpatent100	(4) lnpatent100	(5) lnpatent100	(6) lnpatent100
DiD96	0.234	0.227	0.124	0.147	0.142	0.103
	(0.201)	(0.190)	(0.147)	(0.249)	(0.231)	(0.223)
Ln of industry investment		0.196	0.241		-0.015	0.052
		(0.199)	(0.174)		(0.207)	(0.200)
Ln of employment			2.161**			3.397
			(0.955)			(1.896)
Constant	0.585***	-3.085	-30.639**	0.300**	0.588	-42.434
	(0.162)	(3.730)	(12.954)	(0.101)	(4.012)	(24.852)
Observations	180	180	180	180	180	180
Region-specific time trends	NO	NO	NO	YES	YES	YES

Notes: Robust standard errors in parentheses, ***significant at 1%, **significant at 5%, *significant at 10%. The dependent variable is the logarithmic value of patent applications per 100,000 citizens. DiD96 is the Difference-in-Differences estimator. Control regions are the rest of the Greek regions. Treatment and post variables were omitted during calculations. For all the specifications we control for region and year fixed effects, and their coefficients are not reported. Region-specific time trends coefficients are not reported.

change the results of the regression since the opening of the PATLIBs did not affect the regional innovation activity on average. Controlling for region-specific time trends delivers the same results. On the other hand, there is a mildly negative effect on average patenting, as Table 3 presents. Controlling for industrial investment and employment delivers a coefficient significant at the 10% level but adopting strictest specifications indicate an absence of significant impact.

Next, we estimate the separate influence of each office opening and closing on regional innovation Table 4 and Table 5 report the results, respectively. The opening of Cretan PATLIB induced a positive effect with a range from 74,5 % to 78,4% in the innovative activity in the more relaxed models and considering region-specific time trends, the range

Table 3 Difference-in-Differences estimates of the average impact of the PATLIBs closing in 2009

	(1) lnpatent100	(2) lnpatent100	(3) lnpatent100	(4) lnpatent100	(5) lnpatent100	(6) lnpatent100
DiD09	-0.177	-0.200	-0.223*	-0.513	-0.527	-0.161
	(0.117)	(0.115)	(0.110)	(0.938)	(0.951)	(0.225)
Ln of industry investment		0.111*	0.112		0.135	0.068
		(0.060)	(0.063)		(0.238)	(0.081)
Ln of employment			-1.046			-0.312
			(0.687)			(1.282)
Constant	1.183***	-0.916	11.927	2.470***	-0.041	4.451
	(0.147)	(1.057)	(8.873)	(0.329)	(4.299)	(16.431)
Observations	180	180	180	180	180	180
Region-specific time trendss	NO	NO	NO	YES	YES	YES

Notes: Robust standard errors in parentheses, ***significant at 1%, **significant at 5%, *significant at 10%. The dependent variable is the logarithmic value of patent applications per 100,000 citizens. DiD09 is the Difference-in-Differences estimator. Treatment and post variables were omitted during calculations. Control regions are the rest of the Greek regions. For all the specifications we control for region and year fixed effects, and their coefficients are not reported. Region-specific time trends coefficients are not reported.

for the same region is around 56,1% to 58,6%. The rest of the areas did not deliver a statistically significant result.

On the other hand, the closing impact was strong and negative in the Cretan region with and without time-varying controls, and the drop to innovation level varies from -32% to -30,2%. Also, Central Macedonia library appears to have affected the regional patent activity slightly. When region-specific time trends are not included in the econometric specification, we have a negative impact, which tends to be stronger with the addition of time-varying controls. The termination of Thessaloniki PATLIB seems to generate a drop to patent activity from -20,1% to -13,5%. However, when region-specific time trends are added in the estimated model, the previously mentioned effects fade away. When

Peloponnese library is considered in columns four to six of Table 5, a strong negative effect significant at the 1% level is suggested, which ranges from -42,7% to -41,6%.

Table 4 Difference-in-Differences estimates of the separate impact of the PATLIBs opening in 1996

	(1) lnpatent100	(2) lnpatent100	(3) lnpatent100	(4) lnpatent100	(5) lnpatent100	(6) lnpatent100
DiD of Central Macedonia, 1996	0.146	0.113	0.110	-0.008	-0.005	0.053
	(0.115)	(0.125)	(0.117)	(0.205)	(0.196)	(0.181)
DiD of Peloponnese, 1996	-0.022	0.015	-0.022	0.003	0.005	-0.066
	(0.115)	(0.116)	(0.108)	(0.205)	(0.201)	(0.200)
DiD of Crete, 1996	0.579***	0.557***	0.314	0.445*	0.461**	0.350
	(0.115)	(0.119)	(0.180)	(0.205)	(0.197)	(0.227)
Ln of industry investment		0.164	0.211		0.023	0.081
		(0.215)	(0.194)		(0.208)	(0.202)
Ln of employment			1.983*			3.348
			(0.982)			(1.947)
Constant	0.585***	-2.476	-27.897*	0.300**	-0.144	-42.399
	(0.156)	(4.040)	(13.756)	(0.105)	(4.032)	(25.279)
Observations	180	180	180	180	180	180
Region-specific time trends	NO	NO	NO	YES	YES	YES

Notes: Robust standard errors in parentheses, ***significant at 1%, **significant at 5%, *significant at 10%. The dependent variable is the logarithmic value of patent applications per 100,000 citizens. DiD of Central Macedonia, 1996, DiD of Peloponnese, 1996, DiD of Crete, 1996 are the Difference-in-Differences estimators for libraries in the respective regions. Control regions are the rest of the Greek regions. Treatment and post variables were omitted during calculations. For all the specifications we control for region and year fixed effects, and their coefficients are not reported. Region-specific time trends coefficients are not reported.

Results indicate that the regions treated were not affected in a similar pattern. The Cretan region was significantly affected by the operation of the local office, but the impact on the Central Macedonia region did not appear significant for all tests. Peloponnese region in the

strictest estimation delivered a significant negative effect on innovative local activity due to the regional PATLIB closure.

Table 5 Difference-in-Differences estimates of the separate impact of the PATLIBs closing in 2009

	(1) lnpatent100	(2) lnpatent100	(3) lnpatent100	(4) lnpatent100	(5) lnpatent100	(6) lnpatent100
DiD of Central Macedonia, 2009	-0.145*	-0.187**	-0.224**	-0.058	-0.062	-0.064
	(0.075)	(0.080)	(0.085)	(0.133)	(0.128)	(0.129)
DiD of Peloponnese, 2009	-0.026	-0.040	-0.058	-0.538***	-0.557***	-0.551***
	(0.075)	(0.069)	(0.070)	(0.133)	(0.132)	(0.161)
DiD of Crete, 2009	-0.359***	-0.372***	-0.386***	0.118	0.119	0.120
	(0.075)	(0.069)	(0.069)	(0.133)	(0.127)	(0.128)
Ln of industry investment		0.110*	0.112		0.071	0.071
		(0.061)	(0.064)		(0.084)	(0.082)
Ln of employment			-1.032			-0.091
			(0.710)			(1.296)
Constant	1.183***	-0.905	11.763	0.790***	-0.536	0.585
	(0.151)	(1.071)	(9.127)	(0.131)	(1.467)	(16.527)
Observations	180	180	180	180	180	180
Region-specific time trends	NO	NO	NO	YES	YES	YES

Notes: Robust standard errors in parentheses, ***significant at 1%, **significant at 5%, *significant at 10%. The dependent variable is the logarithmic value of patent applications per 100,000 citizens. DiD of Central Macedonia, 1996, DiD of Peloponnese, 1996, DiD of Crete, 1996 are the Difference-in-Differences estimators for libraries in the respective regions. Treatment and post variables were omitted during calculations. Control regions are the rest of the Greek regions. For all the specifications we control for region and year fixed effects, and their coefficients are not reported. Region-specific time trends coefficients are not reported.

6. Dynamic effects

The effect of research-enhancing institutes on innovation might not be instantaneous since it could take more time for a significant impact to be built. PATLIBs in Greece offered information services relating to the patent process and access to patent databases providing necessary technological knowledge for potential patentees. Assisting the local innovation ecosystem, the PATLIBs could encourage the development of an innovation culture which would be more evident in the long run. To account for short and long-run effects, we also employ a dynamic specification which is defined as follows for opening and closing respectively:

$$\begin{aligned}\ln Patents100_{rt} &= o_1 + \mu_1 treat + \varphi_1 y93 + \cdots + \varphi_6 y98 + \omega_1 Dopen^{T-3} + \cdots \\ &+ \omega_6 Dopen^{T+3} + D'_{rt}\iota\xi_1 + \rho_{rt} + d_t + d_r \\ &+ \varepsilon_{rt} \qquad (6)\end{aligned}$$

$$\begin{aligned}\ln Patents100_{rt} &= \pi_1 + \rho_1 treat + \sigma_1 y06 + \cdots + \sigma_6 y12 + \tau_1 Dclose^{T-3} + \cdots \\ &+ \tau_6 Dclose^{T+3} + D'_{rt}q_1 + \rho_{rt} + d_t + d_r \\ &+ \varepsilon_{rt} \qquad (7)\end{aligned}$$

Where $Dopen^{T-3}$ equals to one in third the year before the opening of PATLIBs, $Dopen^{T-2}$ is one in the second year before the opening and similarly for the rest of the years except the $Dopen^{T+3}$ which equals one in the third year after the opening of the PATLIBs and in all subsequent years. Each binary regressor equals zero in all other years than those specified. This specification permits to capture the short run effect ($Dopen^{T}$ to $Dopen^{T+2}$) and long run effects ($Dopen^{T+3}$). The same procedure is employed in the specification (7) where the dynamic effect of PATLIB closing is examined.

Tables 6 and 7 show the dynamic effects of opening and closing of PATLIBs. Opening affected the patenting activity positively in the short run which significance fades away as strictest versions of the specification are adopted. On the other hand, closing the negative impact on innovation in the short run remains statistically significant for all the specification examined. Specifically, during the second year after the closing, there is a

decrease in patenting activity ranging between 30% - 32% among the tested specifications due to the libraries closing.

Table 6 Dynamic effects of opening in 1996

	(1) lnpatent100	(2) lnpatent100	(3) lnpatent100	(4) lnpatent100	(5) lnpatent100	(6) lnpatent100
$Dopen^{T-3}$	0.299	0.286	0.237	0.207	0.206	0.136
	(0.218)	(0.223)	(0.228)	(0.273)	(0.266)	(0.268)
$Dopen^{T-2}$	0.131	0.114	0.047	0.002	0.000	-0.096
	(0.163)	(0.166)	(0.187)	(0.291)	(0.284)	(0.307)
$Dopen^{T-1}$	0.051	0.055	-0.025	-0.115	-0.119	-0.235
	(0.149)	(0.136)	(0.172)	(0.285)	(0.263)	(0.320)
$Dopen^{T}$	0.328	0.358	0.266	0.126	0.118	-0.016
	(0.266)	(0.276)	(0.289)	(0.393)	(0.332)	(0.337)
$Dopen^{T+1}$	0.530*	0.550*	0.438	0.291	0.283	0.121
	(0.282)	(0.286)	(0.271)	(0.277)	(0.246)	(0.302)
$Dopen^{T+2}$	0.107	0.133	0.007	-0.169	-0.178	-0.362
	(0.367)	(0.364)	(0.352)	(0.458)	(0.371)	(0.365)
$Dopen^{T+3}$	0.292	0.259	0.114	-0.095	-0.102	-0.302
	(0.189)	(0.168)	(0.114)	(0.484)	(0.434)	(0.450)
Ln of industry investment		0.203	0.254		-0.017	0.043
		(0.201)	(0.176)		(0.211)	(0.206)
Ln of employment			2.177*			3.438
			(0.994)			(1.924)
Constant	0.571***	-3.215	-31.090**	0.266**	0.590	-42.805
	(0.165)	(3.785)	(13.330)	(0.115)	(4.113)	(24.921)
Observations	180	180	180	180	180	180
Region-specific time trends	NO	NO	NO	YES	YES	YES

Notes: Robust standard errors in parentheses, ***significant at 1%, **significant at 5%, *significant at 10%. The dependent variable is the logarithmic value of patent applications per 100,000 citizens. $Dopen^{T-3}$ to $Dopen^{T+3}$ are the binary regressors that capture the dynamic effects. Control regions are the rest of the Greek regions. For all the specifications we control for region and year fixed effects, and their coefficients are not reported. Region-specific time trends coefficients are not reported.

Table 7 Dynamic effects of closing in 2009

	(1) lnpatent100	(2) lnpatent100	(3) lnpatent100	(4) lnpatent100	(5) lnpatent100	(6) lnpatent100
$Dclose^{T-3}$	-0.148	-0.141	-0.135	-0.171	-0.185	-0.182
	(0.256)	(0.257)	(0.262)	(0.336)	(0.317)	(0.328)
$Dclose^{T-2}$	-0.280	-0.261	-0.261	-0.312	-0.327	-0.324
	(0.299)	(0.301)	(0.305)	(0.308)	(0.304)	(0.309)
$Dclose^{T-1}$	-0.273	-0.261	-0.282	-0.315	-0.340	-0.338
	(0.209)	(0.216)	(0.223)	(0.303)	(0.296)	(0.296)
$Dclose^{T}$	-0.256	-0.223	-0.229	-0.306	-0.329	-0.324
	(0.148)	(0.147)	(0.140)	(0.323)	(0.315)	(0.319)
$Dclose^{T+1}$	-0.406	-0.414	-0.427	-0.465	-0.514	-0.510
	(0.303)	(0.305)	(0.311)	(0.469)	(0.444)	(0.441)
$Dclose^{T+2}$	-0.550***	-0.520***	-0.528***	-0.619	-0.657	-0.650
	(0.140)	(0.116)	(0.113)	(0.507)	(0.494)	(0.486)
$Dclose^{T+3}$	-0.201	-0.235	-0.270	-0.297	-0.387	-0.381
	(0.224)	(0.226)	(0.221)	(0.576)	(0.539)	(0.529)
Ln of industry investment		0.096	0.099		0.046	0.047
		(0.064)	(0.065)		(0.092)	(0.091)
Ln of employment			-1.027			-0.131
			(0.733)			(1.441)
Constant	1.189***	-0.625	11.960	0.781***	-0.090	1.516
	(0.139)	(1.130)	(9.473)	(0.147)	(1.633)	(18.063)
Observations	180	180	180	180	180	180
Region-specific time trends	NO	NO	NO	YES	YES	YES

Notes: Robust standard errors in parentheses, ***significant at 1%, **significant at 5%, *significant at 10%. The dependent variable is the logarithmic value of patent applications per 100,000 citizens. $Dclose^{T-3}$ to $Dclose^{T+3}$ are the binary regressors that capture the dynamic effects. Control regions are the rest of the Greek regions. For all the specifications we control for region and year fixed effects, and their coefficients are not reported. Region-specific time trends coefficients are not reported.

7. Conclusion

Our results are critically important for future policy-making in the patent system area. The mild negative effects of the Greek PATLIB offices closure could be attributed to insufficient supporting mechanisms rather than institutional ineffectiveness. Greek PATLIB offices were operating mainly as information centers; however, in order to boost innovation, they should include other mechanisms that enhance the innovation ecosystem such as patent attorney services or raising relative awareness events. Mere access to patent databases in the era of internet and immediate access to information, as results indicate, do not affect significantly and contemporaneously the innovation produced regionally. However, local stakeholders need further guidance and support as the negative effect suggests. Policy makers should consider including other supporting services that encourage local investors and SMEs to create and protect their inventions.

References

Artelsmair, G., Krestel H., and Knoth L. (2009). 'The future of PATLIB centres in a globalized patent world', World Patent Information, 31(3), 184--189.

Biasi, B., and Moser P. (2018). 'Effects of Copyrights on Science-Evidence from the US Book Republication Program', (No. w24255), National Bureau of Economic Research.

Boldrin, M., and Levine, D. K. (2013). 'The case against patents. Journal of Economic Perspectives', 27(1), 3-22.

Buesa, M., Heijs J., and Baumert T. (2010). 'The determinants of regional innovation in Europe: a combined factorial and regression knowledge production function approach', Research Policy, 39 (6), 722--735.

Cohen, W. M., Goto A., Nagata A., Nelson R. R., and Walsh J. P. (2002). 'R&D spillovers, patents and the incentives to innovate in Japan and the United States', Research Policy, 31 (8), 1349--1367.

Charlot, S., Crescenzi R., and Musolesi A. (2014). 'Econometric modelling of the regional knowledge production function in Europe', Journal of Economic Geography, 15(6), 1227--1259.

Crescenzi, R. & Rodríguez-Pose A. (2011). Innovation and regional growth in the European Union. Springer Science & Business Media.

Crescenzi, R., and Rodríguez-Pose A. (2013). 'R&D, Socio-Economic Conditions, and Regional Innovation in the U. S.', Growth and Change, 44(2), 287--320.

Donges, A., and Selgert, F. (2019). 'Technology transfer via foreign patents in Germany', 1843–77. The Economic History Review, *72*(1), 182-208.

Freeman, C. (1995). 'The 'National System of Innovation' in historical perspective', Cambridge Journal of economics, 19(1), 5--24.

Furman, J. L., Nagler M., and Watzinger M. (2018). 'Disclosure and Subsequent Innovation: Evidence from the Patent Depository Library Program', (No. w24660). National Bureau of Economic Research.

Furman, J., and Stern S. (2011). 'Climbing atop the shoulders of giants: The impact of institutions on cumulative research', American Economic Review, 101, 1933--1963.

Hall, B., H., J. H. Graham, and D. C. Mowery (2003). 'Prospects for Improving U.S. Patent Quality via Post-grant Opposition', NBER Working Paper, No. 9731.

Hall, B. H., and Harhoff, D. (2012). 'Recent research on the economics of patents. Annual Review of Economics', 4, 541--565.

Jenda, C. A. (2005). ‘Patent and trademark depository libraries and the united states patent and trademark office: A model for information dissemination. Resource Sharing & Information Networks’, 18 (1-2), 183--201.

Landes, W. M., & Posner, R. A. (2003). ‘Indefinitely renewable copyright’, U. Chi. l. Rev., 70, 471.

Machlup, F., & Penrose, E. (1950). ‘The patent controversy in the nineteenth century’, The Journal of Economic History, 10(1), 1-29.

Moser, P. (2011). ‘Do patents weaken the localization of innovations? evidence from world’s fairs’, The Journal of Economic History, 71 (2), 43--74.

OECD (2017). Small, Medium, Strong: Trends in SME Performance and Business Conditions. OECD Publishing.

Schmookler, J. (1966). ‘Invention and Ecomnomic Growth’, (1st ed.), United States of America: Harvard University Press.

Rodríguez-Pose, A., and Crescenzi R. (2008). ‘Research and development, spillovers, innovation systems, and the genesis of regional growth in Europe’, Regional studies, 42(1), 51--67.

Romer, P. M. (1990). ‘Endogenous technological change. Journal of Political Economy’, 98 (5, Part 2), S71--S102

Williams, H. L. (2017). ‘How do patents affect research investments?’, Annual review of economics, *9*, 441-469.

Π.Δ. 51/87 "Καθορισμός των Περιφερειών της Χώρας για το σχεδιασμό κ.λ.π. της Περιφερειακής Ανάπτυξης" (*Determination of the Regions of the Country for the planning etc. of regional development, ΦΕΚ A 26/06.03.1987*

Appendix

Data transformation

In this paper, we use the first time newly collected and processed data from the HIPO, along with other data on regional characteristics. Patent data utilized are annual data on patent filings made in Greece from 1988-2014, and at least one of the owners was based in Greece. Greek patent evidence base is a HIPO project that aims to foster strategic industrial and innovation policy. The existing database included data that were in an inappropriate condition for conducting statistical analysis. Data cleaning and harmonization processed took place correcting issues such as misspellings, entry errors, matching the owner address correctly with the owner country or region entry and inadvertent designation of the legal entity.

To deal with timeliness issues, we utilize patent applications instead of patent grants since it demonstrates the innovative output in a year. Patent grants rate may vary every year since it is affected by other factors such as the number of patent examiners (Schmookler, 1966). What is more, when a patent application had more than one owner, we created equal shares among the owners, and the share was distributed to the region that each owner declared. The HIPO database did not include any details about the real shares among owners. Thus, we hypothesize that the share among them is equal.

Greek NUTS2 classification follows the current official administrative regional subdivisions which differ from the historical and geographical traditional one. Greece until 1987 administrative reform was divided into nine official administrative regions (ΦΕΚ, 1987), today called geographical regions of Greece, since they are consistent with the historical and geographical borders. Administratively, today Greece consists of thirteen regions, but geographical division seems to be also extensively referred.

For evaluating the PATLIB closing effect on innovation, it is crucial to consider the regional dimension as perceived by the local stakeholders and not as it is divided for administrative purposes. Patra city is the largest economic, commercial and cultural center of the Peloponnese as defined geographically. Therefore, for our analysis, it is necessary to control for Peloponnese region using the traditionally historical – geographical

definition. The geographical region of Peloponnese is the peninsula next to the mainland of Greece when the administrative region of Peloponnese is the peninsula except for Achaia and Ileia counties. The counties above and Aitoloakarnania constitute the Western Greece administrative region. Western Greece was first established in the 1987 reform and had no previous correspondent. The geographical region that Aitolokarnania belongs to is the Central Greece region.

In this spirit, NUTS2 classification is used in our analysis, but instead of thirteen regions, we employ twelve. Western Greece it is not used Aitoloakarnania is added to Central Greece region and Achaia, Ileia counties are added to Peloponnese. Thessaloniki and Heraklion belong to regions of Central Macedonia and Crete respectively, which belong to their traditional geographical regions.