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An Empirical Model of Joint Stock Company Births, Greece: 1840-1939

by

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An Empirical Model of Joint Stock Company Births, Greece: 1840-1939

Ioanna Sapfo Pepelasis[a] and Maria E. Vidali[b]

Abstract

This paper investigates the forces driving JSC births in Greece from 1840 to 1939. For this purpose, we combine historical descriptive statistics analysis with the construction of a negative binomial regression model in which the determinants are GDP indicators and other economic variables based on the work of other scholars in the fields of: economic growth, entrepreneurial and joint stock company history, primarily: Kuznets (1966, 1971); Hausman (2005); Broberg (2008); Ruiz and Perez-Amaral (2013); Sylla and Wright (2013); Pavese and Toninelli (2014). We have compiled a unique data base of JSC births (derived from published charters in the Greek Government Gazette and the National Bank of Greece Registry of JSC births) and of selected macro indicators (derived from Kostelenos et al, 2007; Dertilis, 2011 and others).

Our main findings are that: 1) After a long hesitant gestation period incorporation embarked on a Take-off (1917-1936); 2) GDP and other macro indicators impacted on JSC births as expected by the international literature; 3) In 1913, there was a structural break. In the long period before this, there had developed a strong sensitivity/response of incorporation to fluctuations to GDP per capita (the standard of living); 4) From the structural break onwards it was real interest rates that had a stronger impact on JSC births; 5) Last but not least, though throughout the century the impact of non-agriculture was more important for incorporation than industry, after 1913 the impact of industry increased.

We aspire through this study to contribute to the more general debate about the relationship between incorporation and economic growth and open a dialogue with other national case studies.

JEL: N13, N14, N83, N84, C22.

Keywords: Joint Stock Company births, charters, economic growth, structural break, Greece, 19th-20th centuries, Greece, Negative Binomial Regression.

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Introduction

This paper investigates a century (1840-1939) of total joint stock company births in Greece on the basis of a unique historical data base. We seek to understand through descriptive statistics and empirical modeling what quantifiable economic forces drove incorporation. For this purpose, we construct a multivariate model in which the dependent variable is gross joint stock company (JSC) births and the independent variables aka determinants are selected Gross Domestic Product (GDP)/other economic indicators and big events.

Up to now in the international literature modeling the JSC births had been confined to entrepreneurial history research measuring the supply of entrepreneurship through combing data on incorporation with macro-environment determinants. To our knowledge, this is the first time that this modeling is applied for the purpose of examining the evolution of JSC. We, also, extend the aforementioned literature by applying a more flexible model i.e. a generalized linear model (GLM) since our regressand is count variable. In addition, in order to complete our analysis, we draw ideas that lie at the cross section of economic development/economic history and business /company history (see Literature Review below and Selection of Variables, Sections 2 and 3 below).

The paper is organized as follows: In Section 1 we present briefly the political economy and corporate sector context. Section 2 provides a literature review. The choice of variables, data base construction and sources are discussed in Section 3. In Section 4 we examine the historical statistics of joint stock company births and plot variation over time vis a vis the trends of each of the selected independent variables and search for meaningful interconnections, i.e. signs for what drove incorporation and the timing of the Take-off. In order to be clearer and detailed in our analysis, we then construct the empirical multivariate model for joint stock company births and present the results in Section 5. In Section 6 we present a synthesis of the combined findings in Sections 4 and 5 and concluding remarks.

1. Political Economy and Corporate Sector Context

The state of modern Greece was established in 1830 and our starting point is 1840. At that point, Greece was a small wounded and fragmented country and although formally

ruled by a western type monarchy in essence most areas of the country were still under the stronghold of customary law. Subsistence agriculture prevailed and pockets of maritime commerce and shipping constituted the main escape route from poverty. No factory chimney was to be seen on its land, capital was scarce. The first bank was established in 1841 and hoarding and usury were the main financial activities. A major feature of this new polity/new born state was that it had to started 'from point zero' in the absence of physical and non-physical infrastructures heavily indebted due to heavy foreign borrowing during the war of independence and upon the formation of the young nation state in 1830 (Kostis and Petmezas, 1998, 2000).

By 1939, Greece was a 'different country'. Firstly, the endowment resources had expanded dramatically: The territory was almost triple and population was over seven times the size of that at independence. Secondly, the standard of living was higher (See below GDP indicators in Sections 4 and 5. Thirdly, the subsistence sector was smaller and giving way to a 'mercantile' type family capitalism and an expanding industrial core[1]. Fourthly, capital scarcity had decreased, there was now a proper banking system. Fifthly, Greece had made strides in ridding itself of some pre-modern institutional legacies of the Ottoman Empire (such as the tithe) as well as the introduction of Western institutions such as for example: more clearly defined property rights (1871); a central bank (1928) and the joint stock company in the realm of business.

The first evidence of incorporation among Greeks comes from the *Société Anonymes* (SA) or marine insurance companies that had been established abroad in Livorno and Trieste by diapsora Greeks in the 1770s.[2] Within the new founded Greek State, Articles 29-37, 40 and 45 the Commercial Law of 1835 (i.e. the formal translation of the 1807 Napoleonic Commercial Code) would underpin incorporation (i.e. SAs the equivalent in Greece to JSCs) for almost a century as the passing of a Company Act arrived late for Western European standards. The Company Act was introduced in 1920 following a long period of debates and unsuccesful legal drafts going back to the last decades of the nineteenth century. The 1920 Company Act was scant in content as it did not specify a minimum capital or number of shareholders and the conditions for company

[1] For how the rising corporate sector was in contrast to family capitalism yet embedded in it and for the use of the term mercantile. See Pepelasis Minoglou, "Entrepreneurial typologies".

[2] Katsiardi-Hering Greek Diaspora Community; Gekas, "Sector".

registration were meagre, but nevertheless a royal decree was required.[3] It was soon followed by a chain of frequent new legislation amendments up to 1935, the most important one being in 1926 which introduced the practice of setting up a JSC simply through registration and not a special legal decree as was required previously.

Throughout the period under review, most joint stock companies were private (i.e. not registered on the stock exchange). In terms of sectoral allocation, they were basically in (marine insurance) initially and as time progressed there was a rising presence of industry and commerce (Pepelasis, 2011b; Pepelasis and Aivalis, 2014; Pepelasis and Mathopoulou, 2018). One last note: JSCs were on the whole synonymous to big business, and as Greece has always been a country of basically small/tiny business, it is the case that at the time, the great majority of businesses were private proprietorships and partnerships (Angelopoulos, 1928; Annual Yearbook, 1939).

2. Literature Review

2.1. International Literature

The separate literatures of economic growth/development, entrepreneurial history and business/company history have contributed (each one in its own interesting way) to the study of joint stock company births as we show below.

a. Economic Growth

During the 1960s eminent economists became attracted to the subject of economic growth searching for regularities and common patterns among nations as for example WW Rostow (1960). Among the first economic historians to study economic growth were Alexander Gerschenkron (1962) who notably referred to the importance of big business-which can be taken as an indirect allusion to the JSC- and J.D. Gould (1972) who directly pinpointed the importance of the JSC in the transformational process of economic development. Among other more recently, Nial Ferguson (2014) has noted the importance of the JSC in the transition towards an ‘open access society’ (often seen as a prerequisite for economic development).

However, of special relevance to the significance of the rise of the joint stock company is the work of the economist Simon Kuznets was the first to contextualize the spread of

[3] Karavas, Theoretical and Practical Textbook.

the JSC in a way which allows for a quantification/modeling of international comparisons. In his seminal book in 1967 and Nobel Prize Lecture 1971 Kuznets embedded the rise of this institution in the second of his notorious six stylized facts of 'Modern Economic Growth': This was the structural transformation of GDP which he approached from two levels: At a macro level, there was the shift away from agriculture to other pursuits at first industry and at a later stage services. At a meso level, there was the change in the scale of productive units: Namely, a related shift from personal enterprise to impersonal organization of firms aka 'corporate units' (Kuznets, 1967).[4] Although there has been a revision of some of Kuznets' premises (Broadberry, 2016) we believe that his formulation can still provide a starting point for the modeling of JSC births.

b. Entrepreneurial History

Within the wider literature of entrepreneurial history of special interest to our paper is quantitative research on entrepreneurship which uses JSC births as a proxy for the supply of entrepreneurship. The scene was set with Shane (1996) who as a revisionary advocate of the 'rates school/approach' to the study of the determinants of entrepreneurship argued that entrepreneurship (as viewed from the perspective of the variations in the number of firms) was largely an "environmentally determined phenomenon". Shane explained through a Schumpeterian model with a 'large' number of determinants, the variations in the rate of entrepreneurship (annual numbers of businesses in existence) for the USA (1899-1988). His work has been followed by other empirical quantitative based national case studies on the determinants of entrepreneurship that use as their dependent variable joint stock company births (a proxy of for the supply of entrepreneurship), because they are easier to detect historically, as opposed to the births of other legal types of firms. In specific, these studies on joint stock company births are Hausman (2006) who constructed his empirical model of the rate of entrepreneurship (incorporation) for the USA (1860-1943); Valdaliso (2005) and García-Ruiz and Pérez-Amaral (2013) who did

[4] Prize Lecture December 11, 1971. Modern Economic Growth: Findings and Reflections. Technology is the *permissive* source of economic growth, but it is only a potential, a necessary condition, in itself not sufficient. If technology is to be employed efficiently and widely, and, indeed, if its own progress is to be stimulated by such use, *institutional* and ideological adjustments must be made to affect the proper use of innovations generated by the advancing stock of human knowledge.

similar studies for twentieth century Spain. Thus, there is a growing tradition in entrepreneurship which we find very useful for the modeling of JSC births.

c. Business History

The modern JSC and its 'ultimate form' the Corporation has been described as an emblem of innovation and progress, and a basic driving force for the rise of the economic supremacy of western capitalism (Schumpeter 1947, 1963; North and Thomas, 1973; and North, 1990)[5]. Scholarship on the rise of the corporation, although initially focused on national case studies of the first industrial economies, has acquired over the years a more international and comparative scope (See Amatori Chandler Hikino (1999) on business organization; Morck (2005) on corporate governance and Hannah (2014) on a global census of corporations).

Regarding the specific topic of studying JSC births it has been used as a proxy of the size -and expansion/evolution- of the corporate sector. Two early examples are Miller (1940) on Pennsylvania 1800-1860 and Kessler (1948) on the USA as a whole for 1800-1875 for the USA. From 1979 onwards, there was a widening of geographical scope: Freedman (1979) examined the period 1807-1867 for France; Broberg (2008) researched the number of JSC births for the period 1850-1938 for Sweden; Toninelli and Pavese (2014) for Italy for 1858-1914; Neves (2010) for Portugal in the nineteenth century and Gregg and Nafziger (2017) for late Imperial Russia. Moreover, recently Sylla and Wright (2013), made international comparisons between the USA, France, UK, and Prussia for the period 1790-1860. Starting with Miller (1940) this literature has given emphasis to the embeddedness of JSC births in the economic, legal, political, institutional and cultural backgrounds and with the exception of Gregg and Nafziger (2017) it relies on descriptive statistics and not quantitative methods. We find this literature helpful in understanding the wider embeddedness of JSC births in society and economy.

In a nutshell, the aforementioned three literature strands have been useful each in its own way for the formulation of our analysis and selection of the dependent variable (Gross JSC births) and independent variables. In particular, we have been guided by the

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[5] Alfred D. Chandler, Organizational Capabilities and the Economic History of the Industrial Enterprise, *The Journal of Economic Perspectives*, Vol. 6, No. 3 (Summer, 1992), pp. 79-100.

Kuznetian second stylised fact (enriched with the revisionist research of Broadberry) and have combined features from the modeling of the supply of entrepreneurship, while also taking into account elements from existing business/company history research. At this point we move onto an overview of the existing literature on Greece and underscore where our contribution stands.

2.2. Greek Literature

Business and entrepreneurial history are on the whole rather new fields of research in Greece, although there is an increasing interest in the topic.[6] Given the predominance of family capitalism little attention has been given to the JSC and its history. The initial and milestone study on the history of the JSC in Greece was that of the economist Angelos Angelopoulos (1928) which included statistics on JSC births. For many decades, thereafter the study of the evolution of the JSC basically attracted legal scholarship. The first break with this tradition came in the 1990s at which point some economic aspects of segments of the Greek corporate sector /the JSC were examined. (Bakounakis, 1995 on the Port of Patras in the 19th century; Tsotsoros, 1993 on the formation of capital in the corporate sector for 1898-1939 and Dritsas, 1990 on bank-industry relations in the interwar period).

At the opening of the 2000s, for the first time an econometric study of nineteenth century entrepreneurship in Greece was published and pointedly its data set on entrepreneurs and capital was drawn partly from company charters (Foreman-Peck and Pepelasis Minoglou, 2000, republished 2013). From the mid2000s onwards, comprehensive data sets were constructed from JSC charters and two types of publications emerged, both of which had a historical descriptive perspective: The first addressed the features of company founders, notably Pepelasis Minoglou, 2007[7]. And the second is the study of the contribution of the nascent corporate sector to the 19th century building of the public economic space (Pepelasis, 2011) its presence in the informal and formal banking sectors (Pepelasis, 2012) and its relationship to rising expectations and other qualitative factors. At this point and before embarking on a

[6] The most recent notable addition to the study of large business in industry being Kostis (2013).

[7] There has been a focus on JSC founders as a body for 1830-1909 (Pepelasis, 2010); on Jewish (1830-1909) as well as Diaspora, and Foreign (1830-1920) company founders and their presence in the nascent corporate sector (Pepelasis and Varvaritis 2016a; Pepelasis and Varvaritis, 2016b).

discussion of our selection of variables below, mention should be made that initial attempts (all in the discussion paper stage) have been made to chart through historical statistics the path of JSC births-and company features (such as registered capital and sector per start-up)[8]. In one of these, Pepelasis and Emmanouilidi (2013) there is a first quantitative attempt to explore whether there exists a reciprocal relationship between incorporation and Total GDP and also, incorporation capital and GDP for the period 1830-1909 which we consider incomplete in terms of modeling since it examines the case of an ad-hoc bivariate model. Our current work differs in the following two ways: 1) We expand chronologically the period under study; and 2) We construct an augmented dataset based on the international literature using a generalized multivariate model with the goal of investigating the macroeconomic forces that drove the spreading of incorporation.

3. Selected Indicators, Database construction and Sources

3.1. Selected Variables

Our basic research question being: 'what drove incorporation?' and how quantitative analysis can answer this question we have constructed a unique historical data base that consists of time series (plots) in which we combine annual trends (growth rates) in JSC births and retrospective GDP indicators cum other selected economic variables. Our choice and definition of each one of the indicators/variables, entailed a consulting of the quantitative and qualitative literature as discussed in Section 2. In the descriptive analysis (Section 4) and the empirical model we use the same variables making where it is necessary the appropriate adjustments/transformations.

1. Dependent Variable: Gross JSC births (annual values) as a proxy of the size -and expansion/evolution- of the corporate sector. It would have been preferable to have employed net JSC births but information does not exist regarding company deaths, as is the case historically for other countries at the time (Broberg, 2008). It should be mentioned that by using as our dependent variable Gross JSC births instead of JSC

[8] Two discussion papers have emphasized the social and political economy background of Greece and have conceptualized incorporation in the wider framework of big events, rising expectations and the empowerment of the bourgeoisie (Pepelasis, 2011b for the period 1830-1909 and Pepelasis and Aivalis, 2014 for the two decades 1909-1929). The research framework is different to ours and whatever reference to GDP-indicators was not a central part of either the data bases constructed or of the analysis.

births per Capita (as Ruiz and Amaral, 2013 examined) we differ from standard practice in entrepreneurial history modeling because the purpose of our paper is different: it is to examine what economic factors played a significant role on the rate of incorporation that increased dramatically during the period under investigation. We neither measure the individual characteristics of the decision to start a firm nor the entrepreneurial initiative related to the inhabitants of Greece.

2. Independent Variables[9]

Retrospective GDP indicators (GDP, GDP per capita, share of industry in GDP, share of non-agricultural activities in GDP):

Firstly, GDP which captures a society's wealth. This variable has been used in the econometric analysis of Valdaliso (2005) and has even been referred to Neves (2010) and Broberg (2008). Moreover, we consider it useful as it is considered that the fluctuations in aggregate demand affect directly the creation of (demand for) new organizations such as the joint stock company in our case (Shane, 1996).

Secondly, GDP per capita which captures the standard of living. This variable is also used, notably Ruiz and Amaral (2013).

Thirdly, the share of industry in GDP which captures structural change (following Kuznets, 1967, 1971).

Fourthly, the share of non-agricultural activities (i.e. services and industry) in GDP. It made sense for us to include this indicator, given the slowness of Greek industrialization and hence for us to comply with: 1) Broadberry (2016) who has questioned the universal validity of the rise of industry for the early stages of economic growth and 2) Sylla and Wright (2013) who draw attention to this indicator in their explanation of variations in incorporation among different states of antebellum USA.

Other economic indicators:[10] (Population, Financial Resources, Price Level, Tax, Technology/Education, Big Events)

Firstly, Population. For this indicator, we use the following two variables.

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[9] These indicators are estimated in annual values for the descriptive analysis and in growth rates for the econometrics.

[10] In this and the next Section, there is an asterisk for those indicators for which there are missing values. We discuss them in the Descriptive Section along with the indicators for which we have all the annual values, but in the econometric modeling they are presented along with geopolitical events and wars in the Appendix and not the main equation.

1. Total Population. We take the liberty to introduce this variable in our study of the Greek case, as we believe that it impacted on its own (and not simply through GDP per capita data and growth of population) incorporation due to geopolitical big events which brought a few abrupt rises in the level of population and would be expected to affect positively incorporation in various ways (Angelopoulos, 1928; and indirectly through the mobilization of resources in order to reduce insurgent bottlenecks, indicatively, Hisrchman, 1958).

2. Population of a working age* as a share of total population (Ruiz and Amaral, 2013). A high level is considered a sign of vitality and production capacity (especially when the literacy rate rises), both of which are viewed as necessary for JSC births.

Secondly, Financial Resources. For this indicator, we use the following two variables:

1. Real interest rates (Hausman, 2006). This is considered to have a negative relationship with incorporation as high real interest rates have a high opportunity cost and are viewed as an obstacle to new investment and vice versa. Low interest rates attract domestic investments because the investors can borrow money practically free and it is easier to pay back.

2. Foreign capital inflows.[11] We take the liberty to introduce this variable in the Greek case as it has already been discussed in the domestic literature as a factor crowding out business investments (and thus perhaps impacting negatively JSC births (Dertilis, 2014; Franghiadis, 2007).

Thirdly, Price level. For this indicator, we use the following two variables:

1. Exchange rate (Kessler 1948). In countries, chronically dependent on large imports (as is the case of Greece) when it is high it is supposed to act as a stimulus for import substitution and local production in industry (and thus indirectly JSC births). This means that the devaluation of Greek currency (Drachmas) strengthened the domestic economy and incorporation and this, increased the cost of imports boosting the domestic market.

2. General price index (Shane, 1996). Increases in this independent variable seem to affect positively the drive for incorporation.

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[11] Loans are presented as a binary, taking value 1 if there is foreign loan in Greece at year *t* (See Appendix).

Fourthly, Total Taxes as a share of GDP as a proxy for Income Taxes as a share of GDP as used in modeling in the literature (Ruiz and Amaral, 2013). Variations of Income Taxes as a share of GDP are considered in the literature to affect incorporation, in a complex way either positively or negatively.

Fifthly, Technology/education* and by this meaning not simply the level of innovation, but the capacity of the population to become part of the world of the JSC which required more knowledge capacity than the average firm. Here again we use two variables:

1. Patents* (Kuznets, 1966, 1971; Valdaliso, 2005; and Ruiz and Amaral, 2013). We use this variable as a proxy for technological change which is considered to be closely linked to the rise of the joint stock company.

2. Literacy rate* (Ruiz and Amaral, 2016) We use this variable as a proxy for the level of education which is considered important for JSC births as this type of firm is more knowledge intensive for which we have information from 1870 onwards and only sporadically.

Sixthly, Big events.[12] For this indicator, we introduce the following two variables which experienced seminal changes in the period under review:

1. Big events (Institutional and legal changes) directly related to incorporation as well as events related to the informal/formal stock exchange market (indicatively Broberg, 2008, Angelopoulos, 1928). It is the case that the Company Act holds here center stage in the literature and it is generally considered to have had a positive impact on JSC births.

2. Geopolitical events (Territorial Accessions/Wars) (indicatively, Hausman, 2005; Pepelasis, 2011; Pepelasis and Aivalis, 2014, Angelopoulos, 1928). The aftermath of these events is considered to affect positively incorporation.

In sum, in our choice of indicators and the construction of the dataset we have resorted to the international and Greek literature and have taken into consideration the specific 'idiosyncratic' conditions of the Greek economy and data availability.

[12] See Appendix for more details about big events. Institutional events are included in the main equation whereas Geopolitical events are included in the Appendix.

3.2. Sources

For the charting of JSC births we have used two sources: the legal decrees and founding charters of JSCs published in the Greek Government Gazette (ΦΕΚ) 1840-1940 and the National Bank of Greece Registry Book of the names and dates/ Legal decrees for all JSCs founded after 1933.[13]

For the retrospective GDP indicators and total population, we have relied on Kostelenos, (2007). For the population of a working age we have relied on the National Statistical Services. For size of territory, literacy, patents (Annual Economic Yearbooks for the years 1929 and 1939; for nominal interest rates, Kougeas (1994), Franghiadis (2007); for foreign loan capital inflow Pandelakis (1995)

For the general price index, for the exchange rate and taxes we have relied on Dertilis (2014). For big events, we have relied on Dertilis (2014) and Franghiadis (2007).

One last note: For the construction of a deflator for estimating the real interest we have used the ratio Nominal GDP/GDP in Constant prices 1914 as derived from Kostelenos (2007).

4. Descriptive Statistics: Time series plot of JSC births, GDP-and other economic indicators

The purpose of this section is twofold; Firstly, to plot in graphs (measure the trends between 1839 and 1940) of the dependent variable JSC_t which is the annual count of gross JSC births (Section 4.1). Secondly, to juxtapose the long-term trend of the latter to the long-term trend in each of the selected GDP and other indicators discussed in Section 4.2).

4.1. Trends in JSC births

The total number of JSC births in our data set is 1,957. On average this was a little over nineteen JSC births per annum. But, incorporation was not evenly distributed throughout time. In the nineteenth century, it was overall anaemic, the average number of the annual births of JSCs was only four; there were twelve gap years, i.e. years during which there had been zero JSC births and only in five instances (1862; 1872-3;

[13] This Book is found at the Historical Archive and is authored by the General Secretariat. Its title is: 'S*ociété Anonymes founded in Greece from 1833 onwards' and it covers the years up to*1958.

1883; 1893) did JSC births reach a double-digit number i.e. a peak. In addition, there was no steady climb upwards in the number of births per decade.

From 1900 onwards, never again was there a zero number of annual JSC births and each decade reached a higher number of births compared to the previous one. From 1917 onwards, never again was annual incorporation as low (as a single digit number). We consider this year as a structural break and the beginning of the Take-off in incorporation. A few years later, in 1924, for the first time the absolute number of births surpassed the highest nineteenth century peak of 1873. The highest point of the Take-off was 1936.

In sum, the spread of the JSC in Greece was hesitant at first and the Take-off in incorporation arrived more than eighty years after the appearance of the first JSC on Greek soil.

Figure 1

4.2. Trends in GDP and other economic indicators in comparison to JSC births

4.2.1. GDP indicators

From the beginning of the period under study there were rising long term trends in GDP, GDP per capita and the share of non-agricultural activities in GDP. The fourth GDP indicator: the share of industry in GDP remained at a low level, conforming to the expectation of Broadberry that early economic growth was not followed by a rise in industry as had been previously stated by Kuznets.

The time series plots suggest that the rising trends of GDP/GDP per capita and non-agriculture activities had to acquire a momentum (which they did circa 1912/20) in order to 'trigger' the Take-off in incorporation.

Figure 2

4.2. Other Economic Indicators

4.2.1. Population

1. Total Population. In the period under review, this variable made a few big jumps upwards as a result of: territorial accessions (Ionian islands in 1864, Thessaly and Arta in 1881; Macedonia and Epirus in 1912/13; Western Thrace in 1920) and the massive refugee influx following military defeat in Asia Minor(1922) which led to a 20% net increase in the country's population.

Notably, the first jump upwards in population proceeded by a few years the highest 19th century peak in JSC birth counts (i.e. double digit number births) in 1872-3; and the second jump upwards coincided with the second 19th century peak. But, both of these upward moves were not followed by a longer term rise in incorporation. In contrast, population jumps upwards seemed to have a lasting effect on incorporation only as a result of the Balkan Wars (which brought the largest single increase in territory and population) and the massive refugee influx of 1922. Thus, as was the case with the three GDP indicators, there seems to have been a 'strong positive relationship between this variable and incorporation (as expected from the international and Greek literature discussed in Section 3 above) but only after circa 1917.

Figure 3

2. Population of a working age as a share of total population**.*** The incomplete data (1860 to 1928) portray two upward waves: the 1860s and the 1920s.The first occurred shortly prior to the highest and brief 19th century peak in the count of JSC births (1872/3). The second upward wave was placed within the Take-off in JSC births and only in this instance (the 1920s) can we detect a positive parallel trend. This limited evidence complies with what would be expected from the international literature as discussed in Section 3 above.

Figure 4

4.2.2. Financial Resources

1. Real interest rate. Apparently, there was a long decline in real interest rates starting from 1862 onwards. The drop became consistent (i.e. there were no longer intermediate brief upward swings) from 1914 onwards and it reached rock bottom in 1922 and stayed there from then onwards. Interestingly, as the Take off in JSC births started in 1917 we can argue that JSC births seem to have responded positively to falling interest rates but only when there was a marked downward move and stabilization at an unprecedented low rate, complying then to the expectation of the international literature as discussed in Section 3 above.

Figure 5

2. Foreign loan capital inflows**.** In the period under review there were three waves of foreign loans granted to the Greek state by the international capital market: 1879-1893

(35 million Pounds Sterling); 1898-1914 (56 million Pounds Sterling); 1922-1932 (50 million Pounds Sterling) Notably, the highest nineteenth century peak (1872-3), the opening of the Take-off (1917) and 1936 - the all-time peak in JSC births- did not coincide with any of the foreign capital inflow waves. Moreover, the third wave of foreign capital inflow was chronologically embedded within only part of the Take-off (1922-1932). Hence, there is a mixed picture, and the waves of foreign capital inflows were not coincident or followed by a parallel rising trends in incorporation in the 19th century and neither were they a permanent feature during the Take-off in incorporation. Thus, there seems to have been at least for part of the time a basis for the argument (discussed in of Greek scholars that Foreign capital inflow may have crowded out business formation and hence indirectly incorporation).

Figure 6

4.2.3. Price level

1. Exchange rate (Drachmas per Pound Sterling). It was pretty stable before 1920 at which point it began to skyrocket until 1928. After that there were some oscillations and a steep rise in 1933, was followed by a small drop in value. Thus, a synchronized trend existed throughout with JSC births as would be expected from the literature (Section 3 above).

Figure 7

2. General Price Index. Amazingly the price index and JSC births were in synchronization, throughout as both began there was upward climb circa 1917, as would be expected from the international literature as discussed in Section 3 above.

Figure 8

4.2.4. Total Tax rate

Total Taxes as a share of GDP were low in the period under review, and thus the impact of this indicator on incorporation must have been overall small. In particular, in the crucial Take-off period whatever impact it may have had seems to have been both negative and positive (as registered in the international literature) for this indicator increased in the 1920s and dropped somewhat from 1932 onwards.

Figure 9

4.2.5.Technology and education*

1. Patents.* Overall patents displayed a stable upward trend in the short period for which we have data (1920-1939), namely the take-off period of incorporation, as would be expected from the literature (Section 3 above).

Figure 10

2. Literacy rate. * (Periodical data, from 1870 onwards and up to 1928) The big move upwards in this variable was after 1910 (a rise had begun already by 1907) and it continued up to 1920, thereafter it remained stable. Thus, what can be claimed is that the rise in literacy predated the Take-off in JSC births which is close to what would be expected in the international literature as discussed in Section 3 above.

Figure 11

4.2.6. Big Events

1. Big Events (Bubbles in Shares Institutional/Legal changes) directly related to incorporation. The more important Big Events in this category are: The Mining share Bubble of 1872/73; The Company Act of 1920 and New Tarriff of 1926.

Regarding the first of these Big Events (the unprecedented mining share bubble of 1872/3, the mother of all bubbles in the period under review), the evidence is straightforward. As Figure 10 shows that it coincided with a peak in JSC births that was the highest ever before the Take-off, only to be surpassed for the first time in 1924. In fact, the impact of this bubble was long term as its bursting is considered to have been a major set back for incorporation as it evolved into a traumatic and long memory of 'swindling' in the public mind.

For the second Big Event, the 1920 Company Act the evidence is less straightforward as it did not predate the Take-off in incorporation. Notably, on the one hand, the beginning of the Take –off predated it by a few years, which suggests that modernization in the Legal framework was not an instigator but basically 'followed' developments in real business of incorporation. On the other hand however, the quickening of the Take –off two years later, in 1922, suggests that institutional change via the Company Act was important (but with a small time lag) as would roughly be expected by most of the literature. However, we have to take this last observation with a 'grain of salt' as it is also the case that in 1922 (as discussed above in the comments

on Total Population there was a significant upward shift in the size of total population), namely a massive inflow of refugees from Asia Minor which is considered to have created many opportunities for business and specifically incorporation (Angelopoulos, 1928).

As for the third Big legal event, the large rise in Tarrifs in 1926, it also created an impetus (as we would expect from the literature), coinciding as it did with a marked upturn in incorporation that year. The reason being that this Reform enhanced the process of Protectionism and hence Import Substitution (1S), that had first appeared -as an unintended 'natural' phenomenon- during the War decade (1912-1922). During the Great Depression and the collapse of the international economy in the 1930s, de facto IS became even more marked

2. Geopolitical Big Events. Regarding this variable and the trends in JSC births, the picture is as follows: During the 19th century, the first two big geopolitical events were placed in upturns in JSC births, but the third was not. Things changed in the twentieth century as after the Balkan Wars there was an upturn and from 1917onwards in spite of the War situations (or in part because of this), Greece experienced a Take-off Greece suffered. In this sense from 1917 onwards the Greek case complies with the normal expectation in the international literature that after a major War there is a higher interest in incorporation, as discussed in Section 3 above.

Figure 12

In conclusion, in Section 4 we searched for patterns between JSC births and each of the independent variables. We find that: the juxtaposition confirms on the whole the expectations in the literature (the existence of a relationship).

At this point we must turn to empirical analysis in order to: 1) detect with more precision the effect of each determinant on what drove incorporation and 2) conduct test whether and when there was a significant change in our data.

5. Empirical analysis

In this section, we describe the econometric methodology we use and present the results of our empirical model which examines the impact of the selected macroeconomic indicators discussed in Sections 3 and 4 on JSC births for the century 1840-1939.

5.1. Model specification

To detect the effect of the variables on JSC births we construct a generalized model (GLM) which is more flexible than the traditional linear model which have been used in the literature (See Ruiz and Amaral, 2013) since allows the dependent variable (Y) to have a distribution other than the normal and modeling some function of the mean. This specification is more appropriate for count variable like JSC births. Note that the explanatory variables can vary depending on the case we study. The reasons why we choose these variables have been analyzed thoroughly in the previous sections (Section 3 and 4).

Therefore, we assume that the dependent variable (*JSC*) follows a Poisson distribution i.e.:

$$Y \mid X \sim Poisson(\lambda) \tag{1}$$

where λ is the mean equal to the variance; allowing the mean to be a function of matrix of explanatory variables $\boldsymbol{X}$. Therefore,

$$E(Y \mid X) = \lambda = \beta' \boldsymbol{X} \tag{2}$$

The drawback of this model is that the linear predictor on the right-hand side, can be any real value, whereas the Poisson mean on the left-hand side, which represents an expected count, has to be non-negative. To overcome this problem, we can take the logarithmic function of the mean and assume that the transformed mean follows a linear model i.e.:

$$\ln(\lambda) = \beta' \boldsymbol{X} \tag{3}$$

In this model, the regression coefficient β represents the expected change in the logarithm of the mean per unit change in the predictor $\boldsymbol{X_i}$. Exponeniating the equation (3), we obtain:

$$\lambda = \exp(\beta' \boldsymbol{X}) \tag{4}$$

Therefore, the probability distribution of the dependent variable becomes:

$$f(y|x) = \frac{e^{-\beta' X} e^{(\beta' X) y}}{y!} \quad (5)$$

To estimate this Poisson regression model, we use maximum likelihood method (ML) i.e.:

$$\mathrm{Log}L(\beta) = \sum_{t=1}^{n} \left[-\exp(\beta' x_t) + y_t(\beta' x_t) - \log(y_t!) \right] \quad (6)$$

5.2. Estimation and results

5.2.1. Variables

At this point it is reasonable to explain what is included in the matrix of explanatory variables. As we described in Sections 3 and 4, following the international literature and based on the Greek historical events of the period under investigation we select some variables that we believe affect Gross JSC births. Therefore, the matrix of explanatory variables contains our GDP indicators, i.e. per Capita GDP in constant prices 1914, growth of total GDP, share of non-agriculture in GDP, share of Industry in GDP, total population growth, real interest rate, the exchange rate of Drachmas to the Pound Sterling, the General Price Index, total taxes per total GDP. We control for structural break and big events directly related to JSC births (See Table 12 in the Appendix for a detailed list of these events).

Finally, in the Appendix we have controlled for the following variables: Geopolitical Big events and Wars (See Table 13 in Appendix for a detailed list of these events); Foreign Loans, and patents (See Table 15 in Appendix for the estimates). We are not able to detect the impact of Working Population and Literacy rate due to the large number of missing values.

5.2.2. Methodology and estimation

The first step is to test for stationarity since we have time series data. We identify the order of integration of our series using the Phillips-Perron unit-root test (1988)[14] (see Table 7 and Table 8 in Appendix). In addition, since Greece experienced a combination of exogenous shocks and structural changes/transitions during the period under

[14] Phillips, P. C. B. and Perron, P. (1988). "Testing for a Unit Root in Time Series Regression". Biometrika. **75** (2): 335–346. doi:10.1093/biomet/75.2.335.

investigation we detect a possible structural break in the data using the unit-root tests of Zivot and Andrews (1992)[15] that allow for structural breaks (See Table 9 in Appendix). Conducting these tests, we conclude that there is no evidence for unit-root (except for tax rate) and hence, we remove the deterministic trend and break from our series. Tax rate has a unit root and therefore, we make the proper transformation.

The next step is to estimate the model. As we described above, we assume a Poisson regression model and estimate the model using Maximum Likelihood Method (ML). Table 10 in the Appendix presents the results. Notice that the main assumption of this model is that the dependent variable has mean equal to variance. This assumption can be violated in practice. Thus, we test for over-dispersion i.e. the case that variance is greater than the mean (Table 10 and Table 11 in Appendix). Performing the test, we conclude there is evidence for over-dispersion and the negative binomial regression[16] is appeared to be the most appropriate method for this case. Therefore, we have:

$$Y \mid X \sim Poisson(\lambda^*) \tag{7}$$

where $\lambda^* = \exp(\beta' \boldsymbol{X} + e)$

And $\exp(e) \sim Gamma(\frac{1}{\alpha}, \alpha)$

Thus, $\lambda^* \sim Gamma(\frac{1}{\alpha}, \alpha\lambda)$

and $E(Y \mid X) = \lambda = \exp(\beta' \boldsymbol{X})$

$$V(Y \mid X) = \lambda(1 + \alpha\lambda)$$

Using maximum likelihood (ML) we can estimate the vector of parameters β and α. We refer to α as the over-dispersion parameter. The larger α is, the greater the over-dispersion. The Poisson model corresponds to $\alpha = 0$ and parameterizes α as $ln\alpha$.

Therefore, we run several regressions and the results are presented in the next subsection. The last step is to detect whether the determinants have a different impact

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[15] Zivot, Eric and Donald W. K. Andrews (1992). "Further Evidence on the Great Crash, the Oil-Price Shock, and the Unit-Root Hypothesis," *Journal of Business & Economic Statistics*, 10, 251–270. doi: 10.2307/1391541.

[16] Agresti, A., (2002). Categorical Data Analysis. Wiley, New York.

on the number of JSC births before and after the structural break of JSC births in 1913.

5.2.3. Results

In this subsection, we present the results of the Negative Binomial Regression. Table *6* in the Appendix provides the symbols and definitions of variables.

Each table displays the estimates using different combination of variables. In each table columns 1, 2 and 3 present the estimated effects using alternately the real interest rate as a measure of the financial sector, exchange rate and General Price of Index respectively as proxies for the price level. Table 1 presents the estimates using GDP per Capita as measure of standard of living in Greece whereas Table 2 presents the estimate using Growth of GPD. The results regarding the decomposition of GDP as we described above-the shares of non-agriculture and industry in GDP, are depicted in Table 3 and Table 4, respectively.

Table 1. Using GDP per Capita as GDP indicator.

ML Estimates					
I		**II**		**III**	
JSC_{t-1}	0.016*** [4.54]	JSC_{t-1}	0.030*** [2.70]	JSC_{t-1}	0.019*** [4.38]
$DGDPperCap_t$	1.957** [2.51]	$DGDPperCap_t$	3.855*** [2.64]	$DGDPperCap_t$	1.902** [2.19]
I_t	-10.854*** [-3.81]	$DLEX_t$	1.361* [1.87]	$DGPI_t$	-0.0004 [-1.02]
ΔLTR_t	-0.576 [-1.03]	ΔLTR_t	-0.888 [-1.03]	ΔLTR_t	-0.501 [-0.86]
$JSCEvents_t$ {=1, in case of related event to JSC births}	1.029** [2.32]	$JSCEvents_t$ {=1, in case of related event to JSC births}	2.087** [4.22]	$JSCEvents_t$ {=1, in case of related event to JSC births}	0.936** [2.31]
$Dummy_t$ {=1, year>=1913}	0.945*** [2.90]	$Dummy_t$ {=1, year>=1913}	2.586*** [5.60]	$Dummy_t$ {=1, year>=1913}	1.615*** [5.58]
Constant	2.190*** [8.49]	*Constant*	-	*Constant*	1.232*** [10.68]
McFadden's Adj R^2	0.172	**McFadden's Adj R^2**	-	**McFadden's Adj R^2**	0.151
AIC	532.228	**AIC**	624.114	**AIC**	545.170
BIC	551.863	**BIC**	641.295	**BIC**	564.805
Wald(6)	316.985	**Wald(6)**	322.853	**Wald(6)**	249.764
Log likelihood	-258.114	**Log likelihood**	-305.057	**Log likelihood**	-264.585

Notes: T-ratios are in the brackets. Robust standard errors are used to correct the potential heteroscedastic problem. ***, **, * denote 1%, 5%, 10%, statistical significance. *DGPI* is not omitted, though it is not statistically significant and the effect is very low. Even if we omit it, the results are robust.

Table 2. Using Growth of GDP as GDP indicator.

ML Estimates					
IV		**V**		**VI**	
JSC_{t-1}	0.020*** [6.13]	JSC_{t-1}	0.034*** [4.08]	JSC_{t-1}	0.039*** [4.24]
$Growt\ of\ GDP_t$	2.286* [1.91]	$Growth\ of\ GDP_t$	4.966*** [3.11]	$Growth\ of\ GDP_t$	4.737*** [3.09]
I_t	-17.457*** [-4.70]	$DLEX_t$	0.783 [1.13]	$DGPI_t$	-0.004** [-2.23]
$GrowthofPOP_{t-6}$	1.086* [1.94]	$GrowthofPOP_{t-6}$	4.028** [2.17]	$GrowthofPOP_{t-6}$	4.543*** [2.64]
ΔLTR_t	-1.109 [-1.56]	ΔLTR_t	-1.775* [-1.77]	ΔLTR_t	-1.942* [-1.85]
$JSCEvents_t$ {=1, in case of related event to JSC births}	0.892** [2.06]	$JSCEvents_t$ {=1, in case of related event to JSC births}	1.618* [3.06]	$JSCEvents_t$ {=1, in case of related event to JSC births}	1.507* [3.16]
$Dummy_t$ {=1, year>=1913}	-	$Dummy_t$ {=1, year>=1913}	1.884*** [4.98]	$Dummy_t$ {=1, year>=1913}	1.871*** [4.50]
Constant	2.686*** [10.10]	*Constant*	-	*Constant*	-
McFadden's Adj R^2	0.159	**McFadden's Adj R^2**	-	**McFadden's Adj R^2**	-
AIC	513.921	**AIC**	596.752	**AIC**	588.179
BIC	532.977	**BIC**	615.808	**BIC**	607.236
Wald(7)	275.536	**Wald(7)**	337.985	**Wald(7)**	367.873
Log likelihood	-248.960	**Log likelihood**	-290.376	**Log likelihood**	-286.090

Notes: T-ratios are in the brackets. Robust standard errors are used to correct the potential heteroscedastic problem. ***, **, * denote 1%, 5%, 10%, statistical significance. *DGPI* is not omitted, though it is not statistically significant and the effect is very low. Even if we omit it, the results are robust.

As expected by Kuznets stylized facts in his theory of Modern Economic Growth (1966, 1971, 1974a), the coefficient of GDP per Capita is positive and statistically significant, i.e. the estimated elasticity of expected count of JSC births with respect to GDP per Capita varies between 2 and 4 which practically means that the expected number of JSC births is very responsive to the changes of GDP per Capita for the Greek case. Also, the estimated semi-elasticity of JSC births with respect to Growth of GDP varies between 2.5 and 5 and it is statistical significant.

Table 3. Share of non-agriculture GDP.

ML Estimates					
VII		**VIII**		**IX**	
$DSNAGDP_t$	4.761* [1.84]	$DSNAGDP_t$	16.395*** [5.06]	$DSNAGDP_t$	15.540*** [4.64]
I_t	-15.077*** [-2.71]	$DLEX_t$	0.930 [0.95]	$DGPI_t$	-0.003 [-1.53]
$GrowthofPOP_{t-6}$	0.543 [1.08]	$GrowthofPOP_{t-6}$	5.508 [1.15]	$GrowthofPOP_{t-6}$	6.215 [1.05]
ΔLTR_t	-1.587* [-1.82]	ΔLTR_t	-3.430*** [-2.78]	ΔLTR_t	-3.043** [-2.59]
$JSCEvents_t$ {=1, in case of related event to JSC births}	1.152** [2.29]	$JSCEvents_t$ {=1, in case of related event to JSC births}	2.015*** [3.98]	$JSCEvents_t$ {=1, in case of related event to JSC births}	2.007*** [4.14]
$Dummy_t$ {=1, year>=1913}	1.602*** [3.27]	$Dummy_t$ {=1, year>=1913}	4.274*** [15.91]	$Dummy_t$ {=1, year>=1913}	4.350*** [15.15]
Constant	2.541*** [5.50]	*Constant*	-	*Constant*	-
McFadden's Adj R^2	0.129	**McFadden's Adj R^2**	-	**McFadden's Adj R^2**	-
AIC	532.751	**AIC**	606.733	**AIC**	605.337
BIC	551.807	**BIC**	623.407	**BIC**	622.011
Wald(6)	197.761	**Wald(6)**	351.876	**Wald(5)**	365.592
Log likelihood	-258.375	**Log likelihood**	-296.367	**Log likelihood**	-295.668

Notes: T-ratios are in the brackets. Robust standard errors are used to correct the potential heteroscedastic problem. ***, **, * denote 1%, 5%, 10%, statistical significance. *DGPI* is not omitted, though it is not statistically significant and the effect is very low. Even if we omit it, the results are robust.

Table 4. Share of industry.

ML Estimates					
X		**XI**		**XII**	
JSC_{t-1}	0.193*** [5.96]	JSC_{t-1}	-	JSC_{t-1}	0.023*** [5.64]
$DSSECMIN_t$	3.272 [0.49]	$DSSECMIN_t$	6.531 [0.80]	$DSSECMIN_t$	-1.133 [-0.15]
I_t	-11.145*** [-3.38]	$DLEX_t$	0.313 [0.57]	$DGPI_t$	-0.001 [-1.37]
$GrowthofPOP_{t-6}$	-	$GrowthofPOP_{t-6}$	-	$GrowthofPOP_{t-6}$	-
ΔLTR_t	-0.980 [-1.57]	ΔLTR_t	-1.289 [-1.39]	ΔLTR_t	-0.907 [-1.50]
$JSCEvents_t$ {=1, in case of related event to JSC births}	0.909** [2.07]	$JSCEvents_t$ {=1, in case of related event to JSC births}	0.865* [1.95]	$JSCEvents_t$ {=1, in case of related event to JSC births}	0.870** [2.11]
$Dummy_t$ {=1, year>=1913}	0.650** [2.13]	$Dummy_t$ {=1, year>=1913}	2.580*** [12.32]	$Dummy_t$ {=1, year>=1913}	1.338*** [4.92]
Constant	2.24*** [7.89]	*Constant*	1.382*** [11.75]	*Constant*	1.249*** [10.80]
McFadden's Adj R^2	0.164	**McFadden's Adj R^2**	0.113	**McFadden's Adj R^2**	0.145
AIC	536.947	**AIC**	569.798	**AIC**	549.253
BIC	556.582	**BIC**	586.978	**BIC**	568.888
Wald(6)	295.103	**Wald(5)**	180.576	**Wald(6)**	246.519
Log likelihood	-260.474	**Log likelihood**	-277.899	**Log likelihood**	-266.626

Notes: T-ratios are in the brackets. Robust standard errors are used to correct the potential heteroscedastic problem. ***, **, * denote 1%, 5%, 10%, statistical significance.

Furthermore, we find a positive and statistically significant effect of the share of non-agriculture GDP. The estimated semi-elasticity is around 16 except for the model VII. (As would be expected in accordance with Sylla and Wright, 2013 regarding their comments on incorporation differences among states in the USA).

On the other hand, the coefficient of the share of industry is not statistically significant in each model which is a contradiction with Kuznets, 1966, 1971.

An additional significant factor is the real interest rate. The results corroborate economic theory and also, the descriptive analysis; we expected that the real interest rate would have a negative impact on the average number of JSC births.

Moreover, the effect of exchange rate on JSC births is positive and in some cases, statistically significant (Kessler, 1948). The General Price Index does not have a

statistically significant impact on JSC births although they seem synchronized as we discussed in Section 4.

Furthermore, the estimated effect of the growth of the total tax rate is negative and statistically significant in most cases. A possible reason for this is that the large majority of taxes were indirect (Ruiz and Amaral, 2013).

According to the descriptive statistics, population affects positively the JSC births. Our remark is that the effect of population growth is positive and statistically significant but there is a delay. Greece is a special case because during the period under investigation it experienced several geopolitical changes. Therefore, (see Figure 3) there are jumps in the increase of population. This jump has a delayed impact (after 6 years) on JSC births.

The estimated average number of JSC births has a statistically significant increase when a big event related to JSC births (i.e. institutional) has occurred (see Table 12 in Appendix). However, we consider that all these big events did not reinforce the rise of JSC birth in the short-term and thus, this model fails to capture this effect. Furthermore, the decrease of the average number of JSC births due to Geopolitical events or Wars (see Table 15 in Appendix) is statistically significant at level 10%. This result clarifies the ambiguity/mixed picture observed in the descriptive analysis (see Table 13 and Figure 12 in Appendix).

Regarding the foreign capital inflows, we have created a binary variable, L_t, where takes value 1 if there is a foreign government loan in Greece at time t. The coefficient has a negative sign as expected from the descriptive statistic, but was not statistically significant. (See Table 15 in Appendix).

As we mentioned above, we are unable to control for Working Population and Literacy rated because of missing values.

Finally, as we described above, Greece experienced several structural shifts during the century and hence, it is rational to conduct a test for the existence of structural breaks (see Table 9 in Appendix). We observe that JSC_t has a structural break in 1913. Therefore, we examine whether the determinants have different impact on the number of JSC births before and after this year. The results are displayed in Table 5 and they indicate the existence of different impacts before and after 1913 in most cases that we examined. Analytically, there is a statistically significant difference in elasticity with

respect to GDP per Capita before and after 1913. Whilst the semi-elasticity of growth of tax rate is larger before 1913, the impact of real interest rate is significantly larger after 1913. Though the impact of the share of industry is not statistically significant for the whole century, after 1913 the effect of industry seems to have increased. Regarding the coefficient of the share of non-agriculture before and after the structural break, there is no statistically significant difference. We must note here that these results are robust in the case of excluding the outlier of 1873, namely the highest peak in JSC births prior to the Take-off.

Table 5.1840-1912, 1913-1940

ML Estimates					
1840-1939					
JSC_{t-1}	0.040* [1.83]	JSC_{t-1}	-	JSC_{t-1}	-
$DGDPperCap_t$	2.476*** [2.86]	$DSNAGDP_t$	1.740 [0.51]	$DSSECMIN_t$	11.502 [1.38]
I_t	-8.200*** [-2.96]	I_t	-9.290*** [-2.66]	I_t	-10.161*** [-3.30]
ΔLTR_t	-1.707* [-1.72]	ΔLTR_t	-2.484** [-2.52]	ΔLTR_t	-2.700*** [-2.78]
$JSCEvents_t$ {=1, in case of related event to JSC births}	1.281*** [2.93]	$JSCEvents_t$ {=1, in case of related event to JSC births}	1.303** [2.59]	$JSCEvents_t$ {=1, in case of related event to JSC births}	1.135** [2.28]
$Dummy_t$ {=1, year>=1913}	1.961*** [5.10]	$Dummy_t$ {=1, year>=1913}	2.444*** [6.74]	$Dummy_t$ {=1, year>=1913}	2.446*** [8.39]
$Dummy_t*JSC_{t-1}$	-0.028 [-1.33]	$Dummy_t*JSC_{t-1}$	-	$Dummy_t*JSC_{t-1}$	-
$Dummy_t*DGDPperCap_t$	-2.248** [-1.98]	$Dummy_t*DSNAGDP_t$	-0.190 [-0.05]	$Dummy_t*DSSECMIN_t$	29.638** [2.45]
$Dummy_t*I_t$	-32.673*** [-6.00]	$Dummy_t*I_t$	-45.263*** [-7.11]	$Dummy_t*I_t$	-58.334*** [-8.52]
$Dummy_t*\Delta LTR_t$	1.334 [1.14]	$Dummy_t*\Delta LTR_t$	2.042* [1.80]	$Dummy_t*\Delta LTR_t$	2.276** [2.09]
$Dummy_t*JSCEvents_t$	-1.179*** [-2.60]	$Dummy_t*JSCEvents_t$	-1.180** [-2.08]	$Dummy_t*JSCEvents_t$	-0.668 [-1.18]
Constant	1.791*** [.82]	*Constant*	2.110*** [6.18]	*Constant*	2.222*** [8.22]
McFadden's Adj R^2	0.189	**McFadden's Adj R^2**	0.163	**McFadden's Adj R^2**	0.174
AIC	520.947	**AIC**	537.561	**AIC**	530.825
BIC	552.854	**BIC**	564.559	**BIC**	557.822
Wald(11)	817.593	**Wald(9)**	473.923	**Wald(9)**	547.423
Log likelihood	-247.474	**Log likelihood**	-257.781	**Log likelihood**	-254.412

Notes: T-ratios are in the brackets. Robust standard errors are used to correct the potential heteroscedastic problem. ***, **, * denote 1%, 5%, 10%, statistical significance.

6. Concluding remarks

In this case study on the history of the Greek corporate sector, we have covered new grounds, we have examined the quantifiable forces that drove JSC births in Greece throughout the century 1840-1939. Whereas, up to now first attempts had been of

shorter time periods, qualitative (with one exception we discussed) and focused on JSC births peaks, highlighting the role of 'rising expectations' as a driver of incorporation.

In our selection/choice of variables, we have drawn inspiration from the literature while also making certain adjustments necessary given the data restraints and the special characteristics of the Greek historical context. To answer the main question of this paper two methods have been used.

The first was descriptive statistics and in specific, a time series plot of the trends in incorporation vis a vis the selected economic indicators. From this we basically confirmed as expected that JSC births were not a haphazard process and that the influence of the selected determinants on JSC births was on the whole in the direction as expected, with the exceptions discussed above. We also learned two more things: 1) JSC births were not evenly spread over time as from 1917 onwards a Take-off in incorporation; 2) The process of economic growth had to accelerate/ acquire a momentum for the Take-off in JSC births to begin; and 3) Company Law did not precede the Take-off.

The second method was the construction of a multivariate model of JSC births (the first in the literature to our knowledge to be constructed from the perspective of company history). We apply a Negative Binomial regression to explore the effect of the independent variables on JSC births. From this we learned that there was a structural break in 1913 and that: 1) In the long period before this there had developed a strong sensitivity/response of incorporation to fluctuations to GDP per capita (the standard of living); 2) From the structural break onwards it was real interest rates that had a stronger impact on JSC births; 3) Though throughout the century the impact of non-agriculture was more important for incorporation than industry, after 1913 the impact of industry increased.

Our purpose being to create a synthesis of the findings of the two tools/methods we would like to underline that the structural break in JSC births was in 1913 (according to the empirical analysis) , namely four years before the Take–off in JSC births that began in 1917 (according to the descriptive analysis). This perhaps suggests that an 'abnormal' shift had to occur in order for the Take-off in JSC births to materialize.

Furthermore, each of these two dates (1913 and 1917) coincided with extraordinary circumstances which directly affected our variables (and perhaps also indirectly through their impact on GDP and other macro indicators. These events were: military mobilization/war; the 'natural protection' of the domestic market; and the exogenous shocks of the largest territorial and population additions in the century under review.

We hope that our paper through quantification will incite a closer dialogue among scholars in the international community working on the history of the JSC and in particular on the evolution of JSC births. We also would like to suggest that our paper has a potential to contribute to policy discussions in Greece and other latecomer countries regarding the forces driving the creation of JSCs and start-ups in general. One last note: The finding that the Take-off materialized at a time of low real interest rates and faster economic growth is not surprising from the point of view of the literature. However, that simultaneously the Take-off occurred in an environment of trade protection, is rather 'provocative' as it contests the general premise today that internationalization and a free enterprise spirit are a prerequisite for nurturing the phenomenon of business creation.

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8. Figures

Figure 1

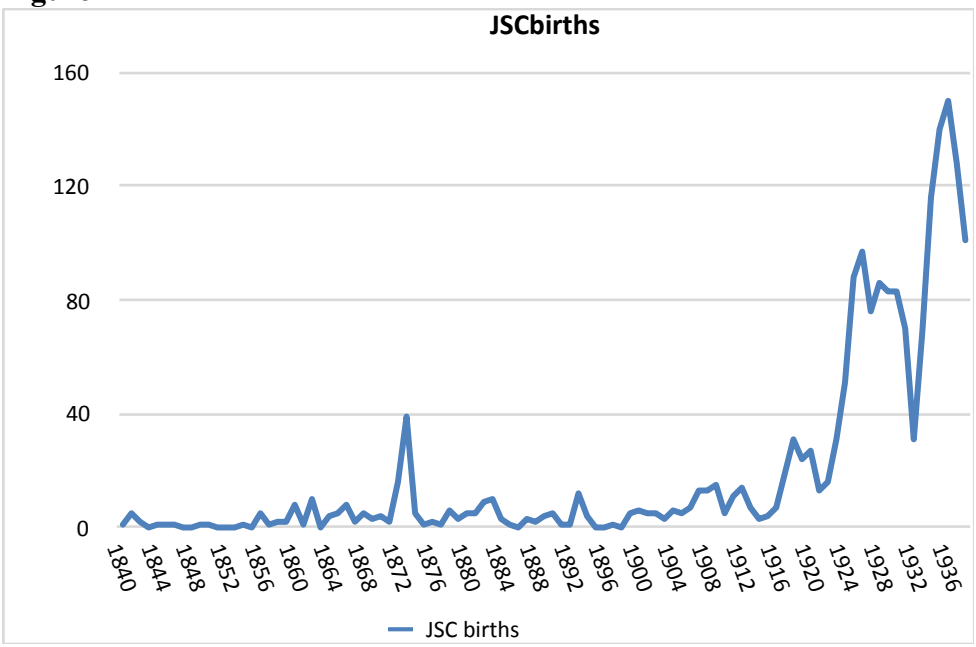
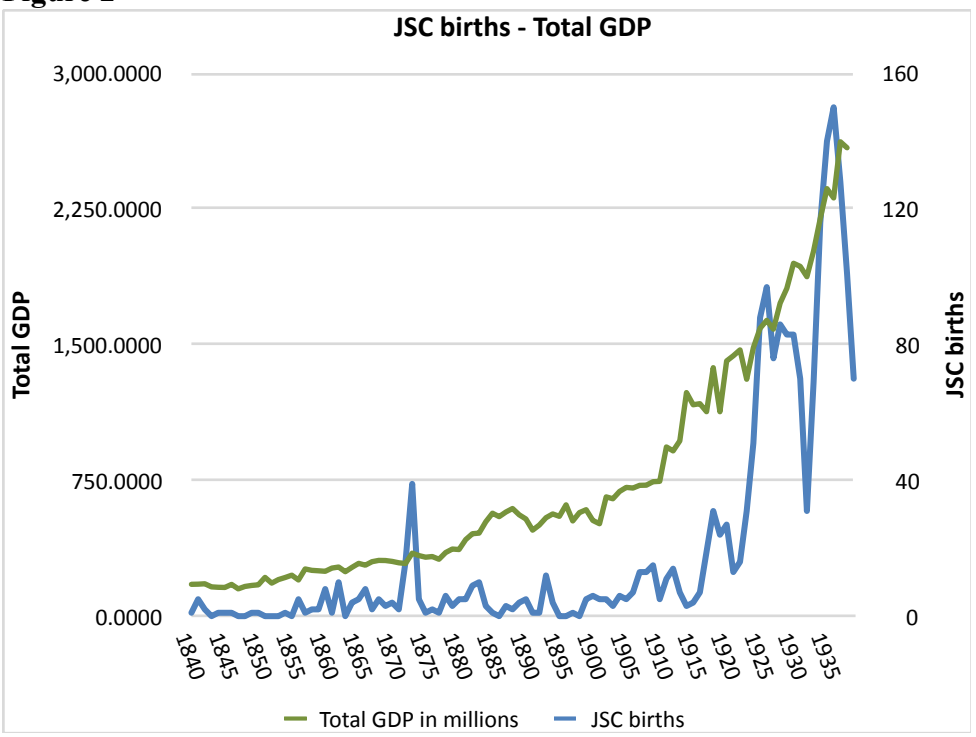
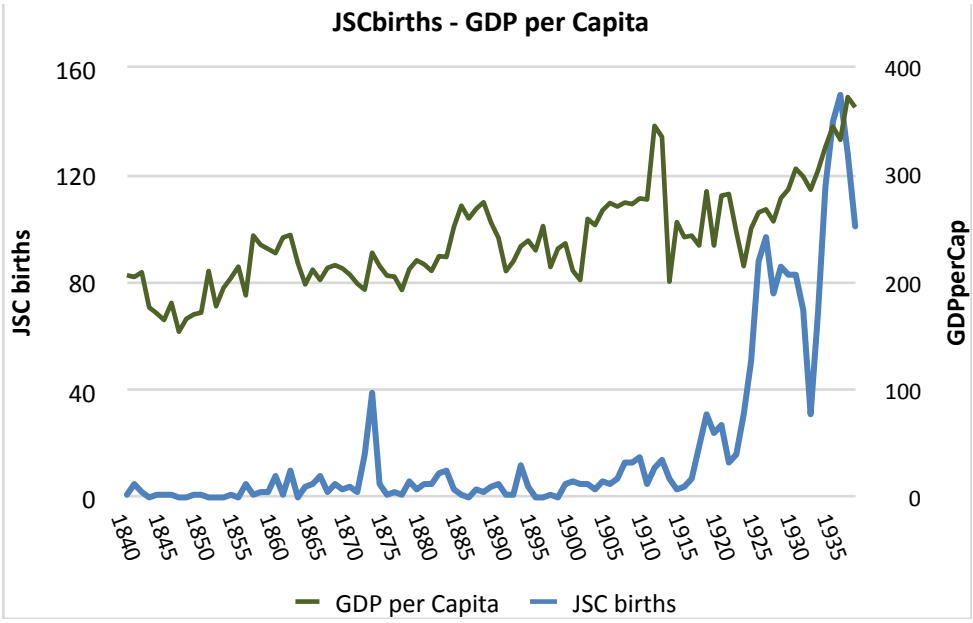
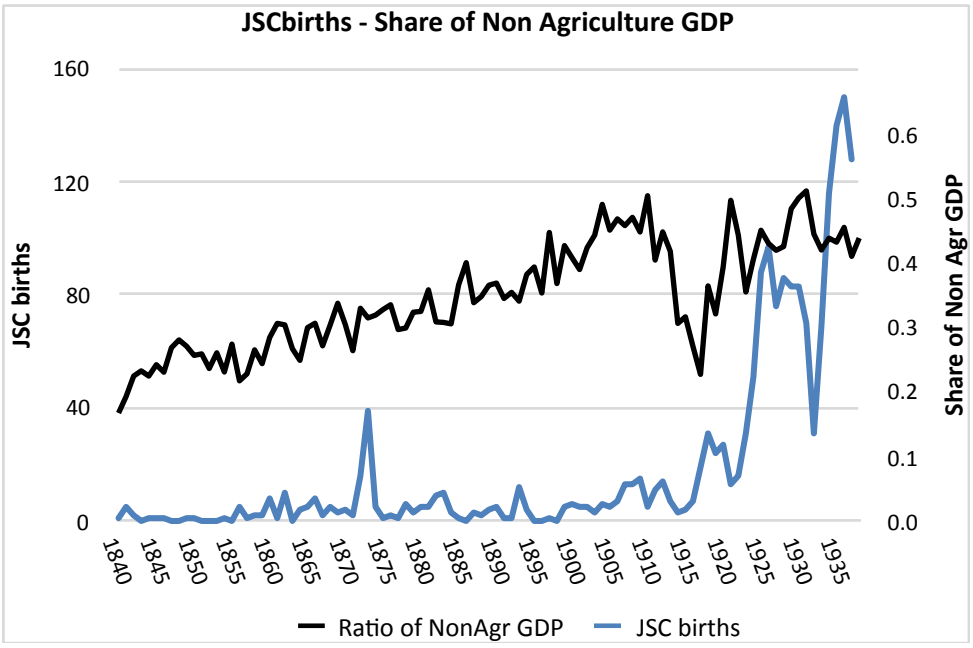


Figure 2




JSCbirths - GDP per Capita
JSC births
GDPperCap
160
120
80
40
0
400
300
200
100
0
1840 1845 1850 1855 1860 1865 1870 1875 1880 1885 1890 1895 1900 1905 1910 1915 1920 1925 1930 1935
GDP per Capita
JSC births


JSCbirths - Share of Non Agriculture GDP
JSC births
Share of Non Agr GDP
160
120
80
40
0
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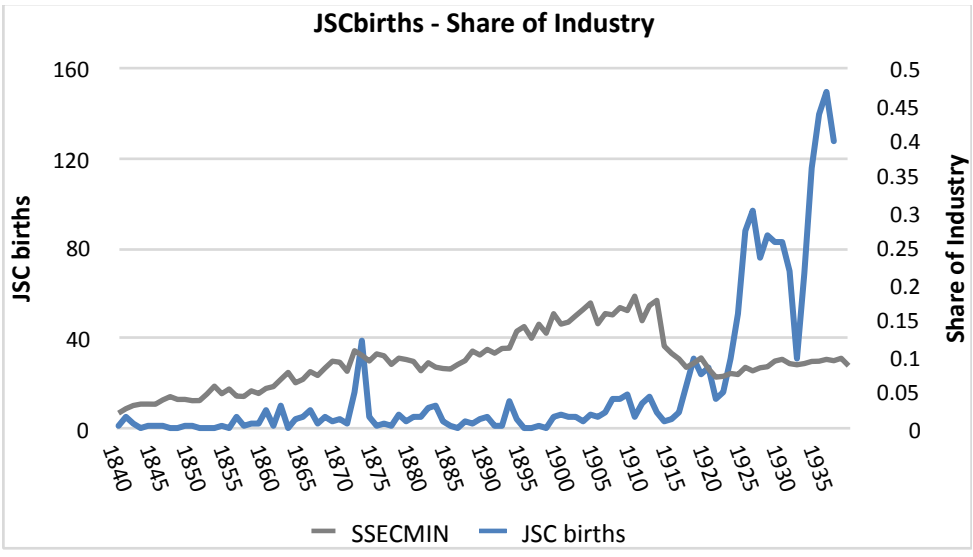
0.5
0.4
0.3
0.2
0.1
0.0
1840 1845 1850 1855 1860 1865 1870 1875 1880 1885 1890 1895 1900 1905 1910 1915 1920 1925 1930 1935
Ratio of NonAgr GDP
JSC births


JSCbirths - Share of Industry
JSC births
Share of Industry
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120
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0.5
0.45
0.4
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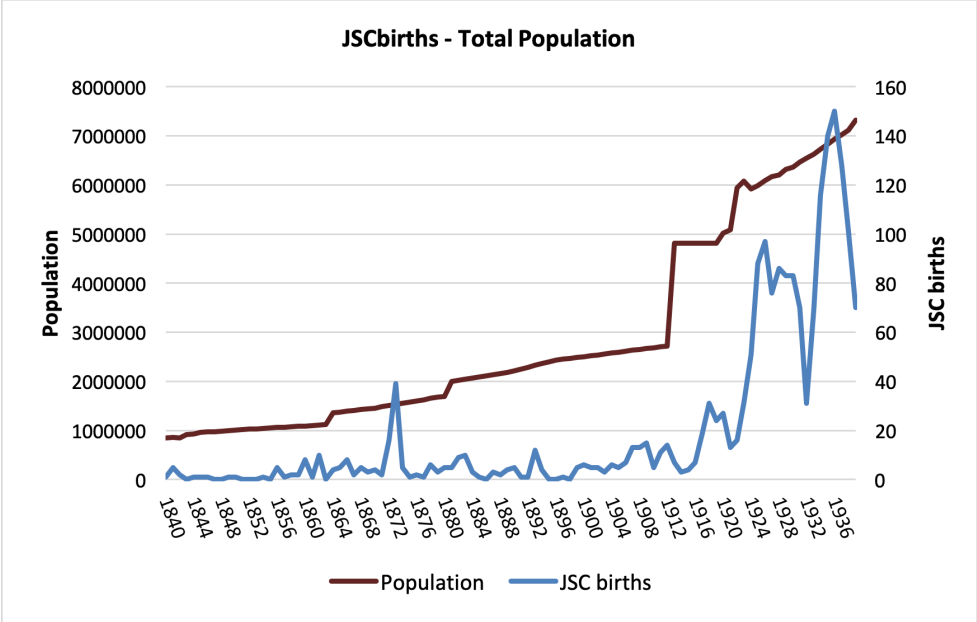
1840 1845 1850 1855 1860 1865 1870 1875 1880 1885 1890 1895 1900 1905 1910 1915 1920 1925 1930 1935
SSECMIN
JSC births

Figure 3



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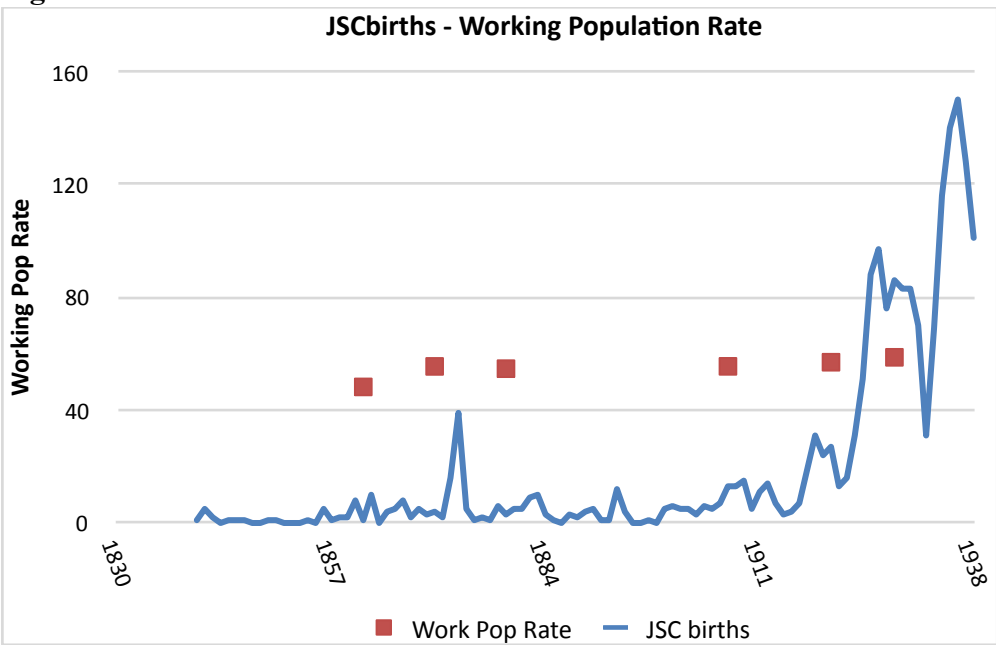

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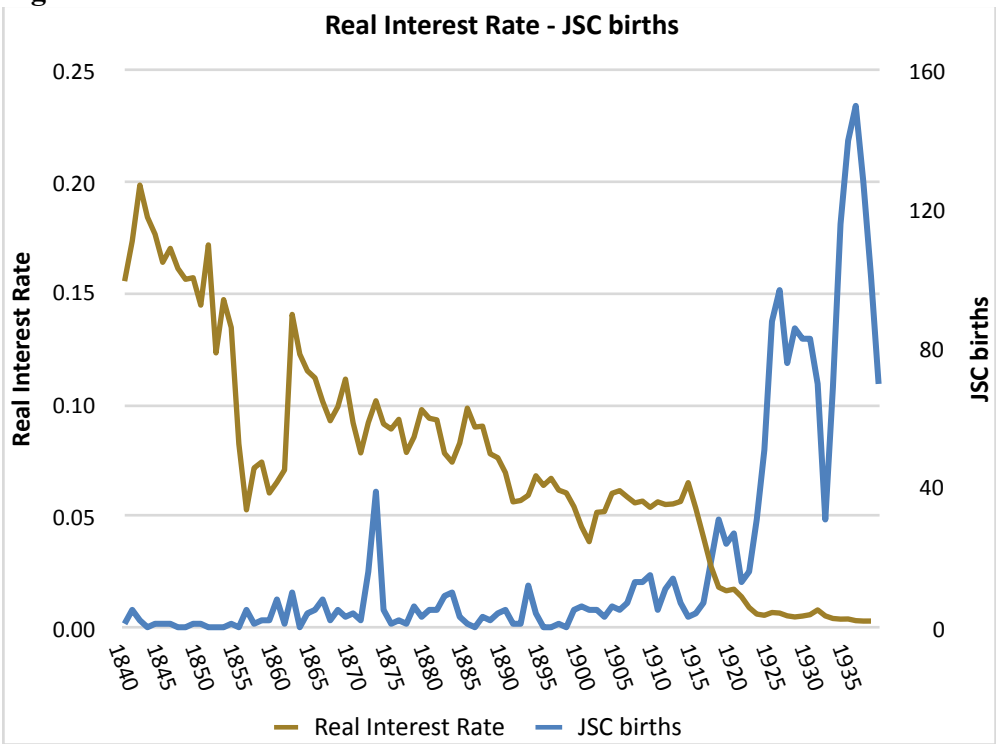


Figure 6

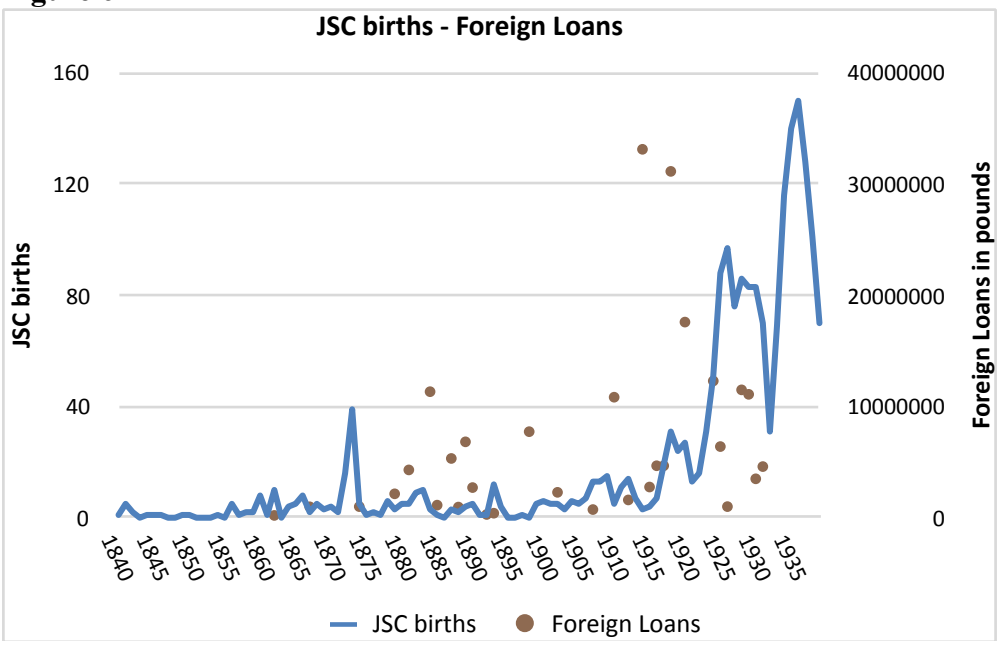


Figure 7

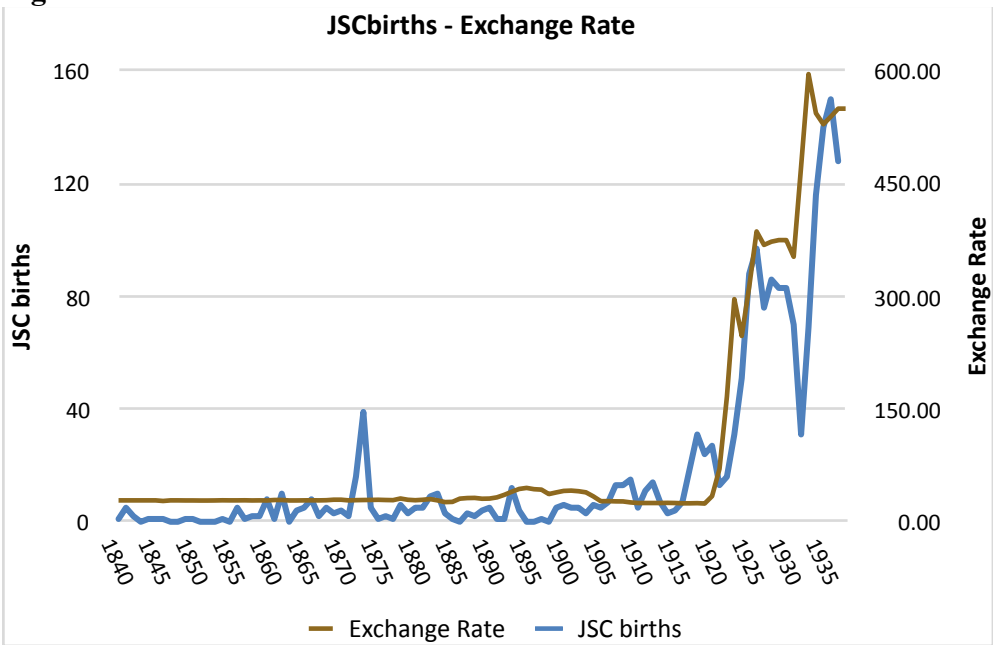


Figure 8

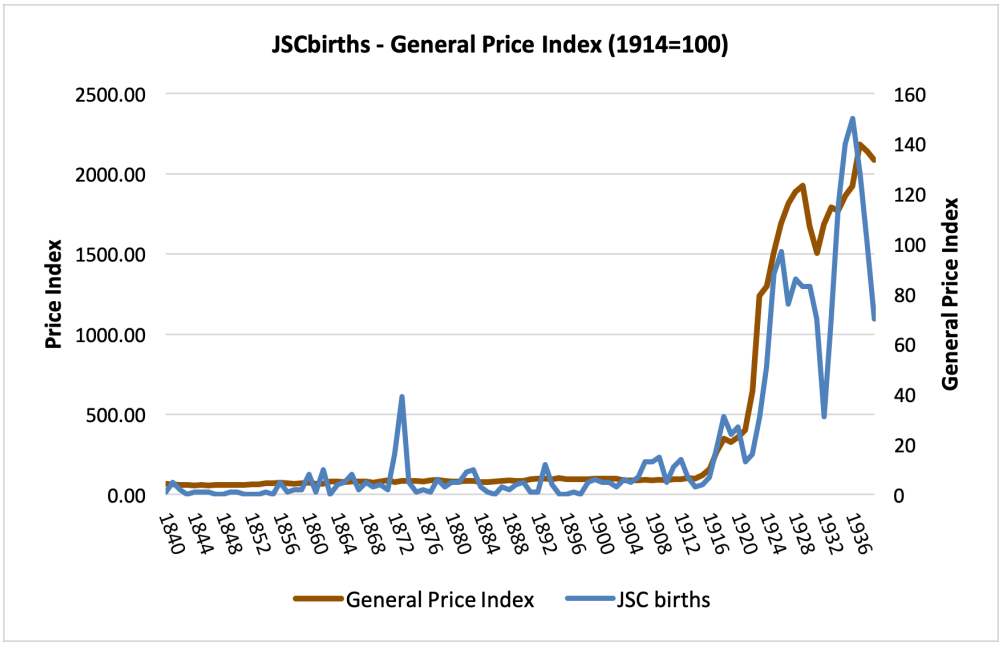


Figure 9

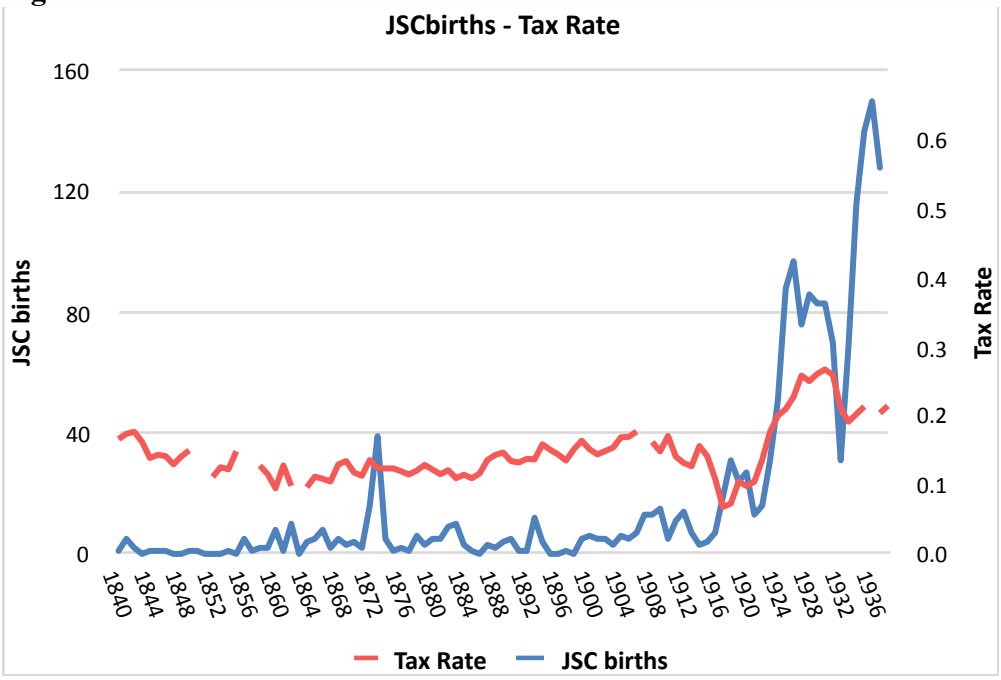


Figure 10

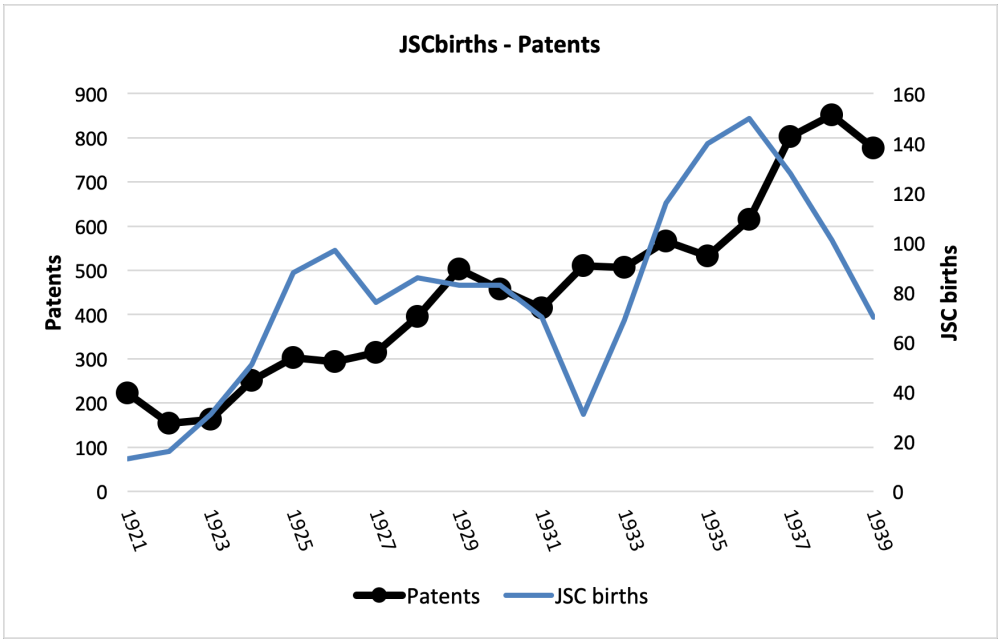


Figure 11

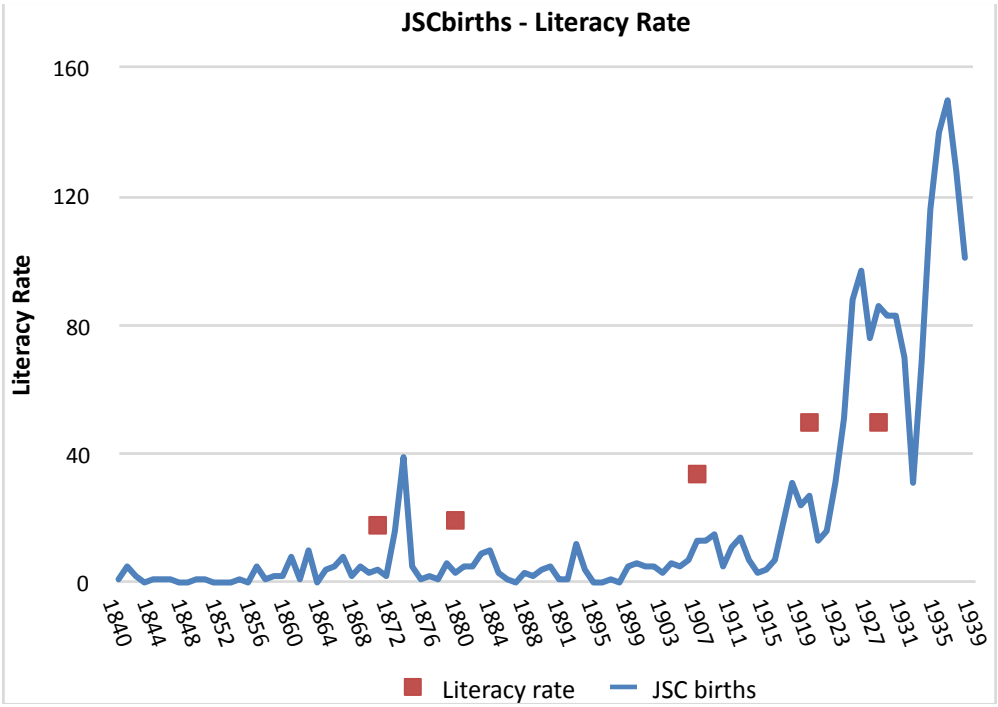
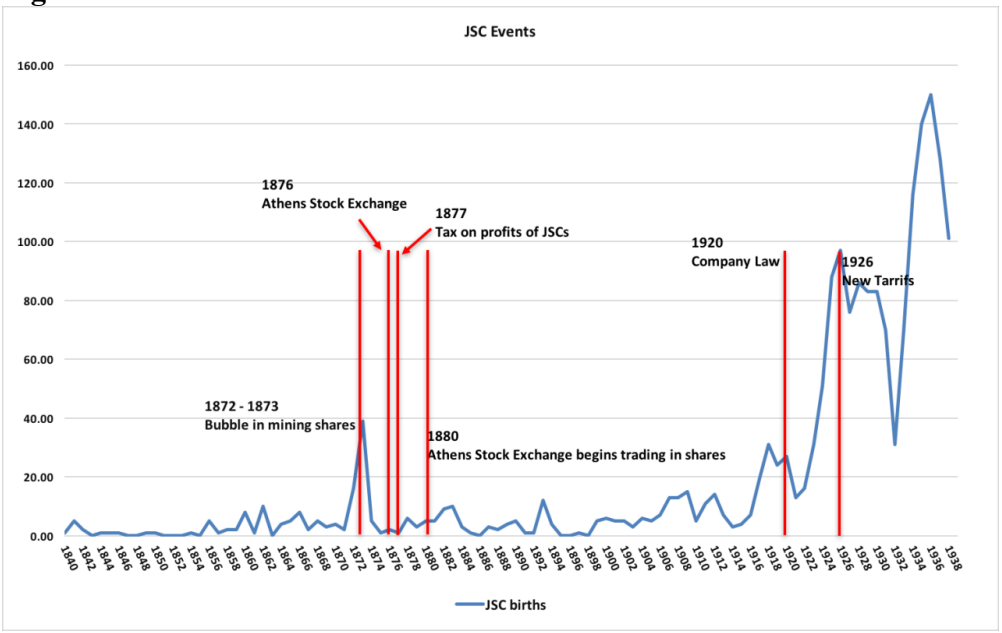
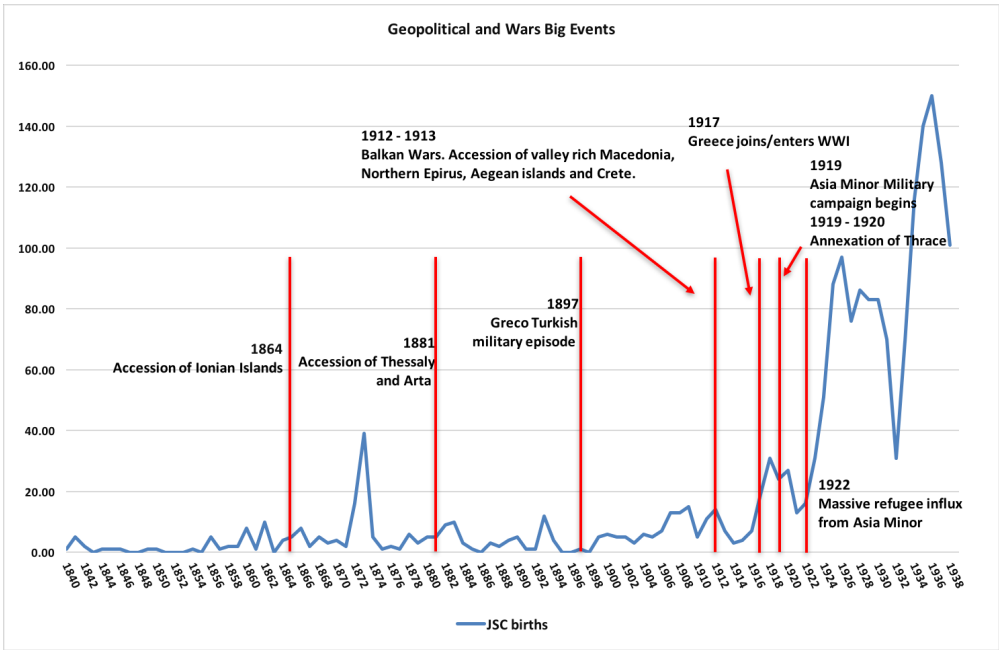


Figure 12





9. Appendix

Figure 13

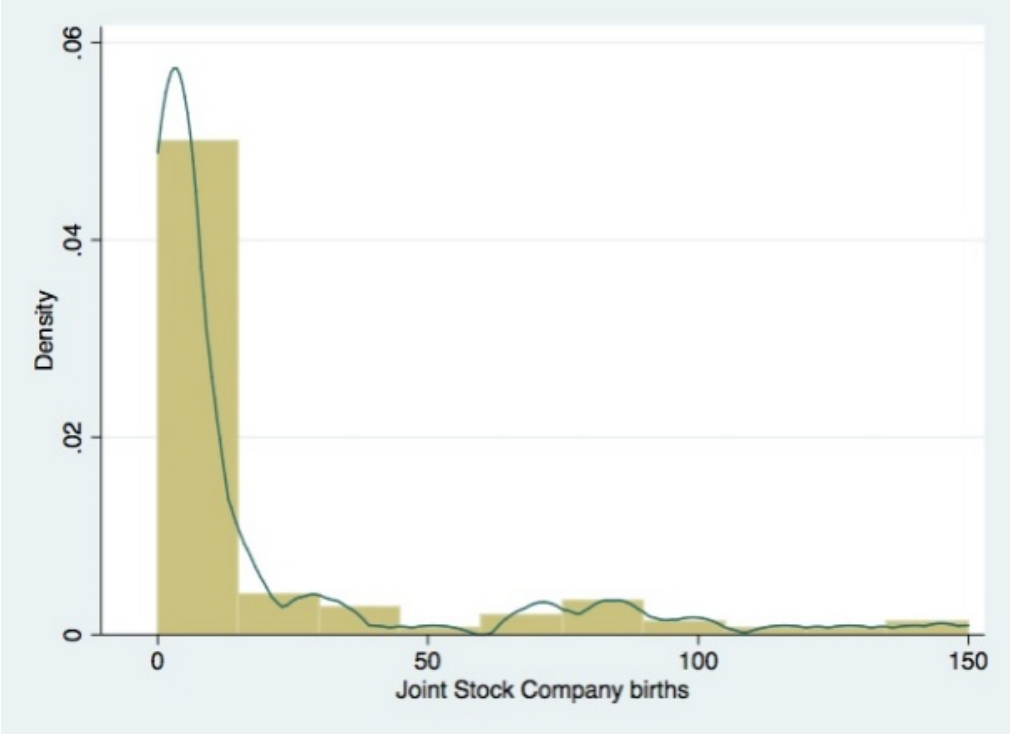


Table 6. Name of variables

Name	Description	Name	Description
JSC	Number of Joint Stock Company births	***LEX***	Natural logarithm of exchange rate (Pounds per Drachmas)
GDPperCap	Natural logarithm of GDP per Capita in constant prices 1914	***DLEX***	Detrended and adjusted for structural break natural logarithm of exchange rate
DGDPperCap	Detrended natural logarithm of GDP per Capita in constant prices 1914	***GPI***	General price index (1914=100)
GrowthofGDP	Growth of total GDP in constant prices 1914	***DGPI***	Detrended and adjusted for structural break General price index (1914=100)
SNAGDP	Share of non-Agriculture GDP in constant prices 1914	***LTR***	Natural logarithm of tax rate (taxes per total GDP)
DSNAGDP	Detrended share of non-Agriculture GDP in constant prices 1914	$\Delta^k LTR$	k^{th} difference of natural logarithm of tax rate
SSECMIN	Share of industry (Secondary production and mining) in constant prices 1914	***GrowthofPOP***	Growth of total population
DSSECMIN	Detrended and adjusted for structural break share of industry in constant prices 1914	***L***	Binary variable that takes value 1 if there is a foreign loan in Greece at time t
I	Real interest rates	***Patents***	Number of Patents
Dummy	Binary variable that takes value 1 if Year>=1913	***GW***	Binary variable that takes value 1 if there is a Geopolitical event or War in Greece at time t
JSCEvents	Binary variable that takes value 1 if an event related to JSC occurred at time t.		

Table 7. Unit root tests.

Unit root tests	JSC	GDPperCap	GrowthofGDP	SNAGDP	SSECMIN
PP (intercept)	-1.720	-1.989	-15.253	-2.678	-2.019
1% level	-3.511	-3.513	-3.514	-3.513	-3.513
5% level	-2.891	-2.892	-2.892	-2.892	-2.892
10% level	-2.580	-2.581	-2.581	-2.581	-2.581
PP (trend & intercept)	-2.699	-5.319	-15.607	-5.035	-1.534
1% level	-4.042	-4.044	-4.047	-4.044	-4.044
5% level	-3.451	-3.452	-3.453	-3.452	-3.452
10% level	-3.151	-3.151	-3.152	-3.151	-3.151

Notes: This table shows the results of the unit roots tests for each variable. The null hypothesis is that the variable has a unit root.

Table 8. Unit root tests.

Unit root tests	I	LEX	GPI	LTR	GrowthofPOP
PP (intercept)	-1.376	0.355	1.251	-2.090	-10.229
1% level	-3.513	-3.513	-3.511	-3.530	-3.513
5% level	-2.892	-2.892	-2.891	-2.901	-2.892
10% level	-2.581	-2.581	-2.580	-2.586	-2.581
PP (trend & intercept)	-3.564	-0.931	-0.371	-2.494	-10.208
1% level	-4.044	-4.044	-4.042	-4.071	-4.044
5% level	-3.452	-3.452	-3.451	-3.464	-3.452
10% level	-3.151	-3.151	-3.151	-3.158	-3.151

Notes: This table shows the results of the unit roots tests for each variable. The null hypothesis is that the variable has a unit root.

Table 9. Unit roots with structural breaks.

Unit root test allowing for structural break	JSC	GDPperCap	SNAGDP	SSECMIN	LEX	GPI
Break (in intercept & trend)	-7.238	-6.567	-7.047	-6.627	-6.399	-6.506
1% level	-5.57	-5.57	-5.57	-5.57	-5.57	-5.57
5% level	-5.08	-5.08	-5.08	-5.08	-5.08	-5.08
10% level	-4.82	-4.82	-4.82	-4.82	-4.82	-4.82
Year	[1913]	[1913]	[1914]	[1914]	[1921]	[1922]

Notes: This table exhibits the results from the unit root test with structural break of Zivot and Andrews (1992). The null hypothesis is that the variable has unit root with structural break in intercept and trend. The dates of break point are included in square brackets. All GDP variables are in logarithmic form.

Table 10. Poisson Regression vs Negative Binomial Regression

JSC	Poisson	Negative Binomial
JSC_{t-1}	0.011 [11.13]	0.016 [3.56]
$DGDPperCap_t$	1.167 [3.86]	1.957 [2.22]
I_t	-14.980 [-7.98]	-10.854 [-3.70]
ΔLTR_t	-0.074 [-0.34]	-0.575 [-0.91]
$JSCEvents_t$	0.445 [5.59]	1.029 [3.59]
$Dummy_t$ {=1, year>=1913}	0.762 [5.42]	0.945 [2.86]
Constant	2.667 [17.14]	2.190 [7.88]
Pseudo R^2	0.776	0.196
Pearson Goodness of fit	529.689	-
Log Likelihood	-373.759	-258.114

Notes: T-ratios are in brackets.

Table 11. Overdispersion test

$H_0: \alpha = 0 \; or \; ln\alpha = -\infty$	
LR $\bar{\chi}^2_{01}$	197.09
Prob>chi²	0.000

Table 12. Big Events related to JSC births

Year	Description
1872 – 1873	Bubble in mining shares.
1876	Athens Stock Exchange.
1877	Tax on profits of JSCs
1880	Athens Stock Exchange begins trading in shares
1920	Company Law
1926	New Tarrifs

Table 13. Geopolitical events and Wars

Year	Description
1864	Accession of Ionian Islands (Greece's window to the West).
1881	Accession of Thessaly and Arta (fertile cereal plains).
1897	Greco Turkish military episode
1912-1913	Balkan Wars. Accession of valley rich Macedonia, Northern Epirus, Aegean islands and Crete.
1917-1921	1917 Greece joins/enters WWI. 1919 Asia Minor Military campaign begins. 1919-1920 Annexation of Thrace.
1922	Massive refugee influx from Asia Minor.

Table 14. Number of Patents

Year	Number
1921	222
1922	154
1923	163
1924	251
1925	302
1926	293
1927	314
1928	395
1929	502
1930	458
1931	415
1932	510
1933	507
1934	566
1935	533
1936	615
1937	803
1938	851
1939	776

Table 15. Additional Models

ML Estimates					
JSC	**Negative Binomial**	**JSC**	**Negative Binomial**	**JSC**	**Negative Binomial**
JSC_{t-1}	0.015*** [4.54]	$DGDPperCap_t$	5.964** [5.17]	$DGDPperCap_t$	2.401** [2.43]
$DGDPperCap_t$	2.000** [2.56]	$DLEX_t$	1.908*** [8.27]	I_t	-24.610*** [-.9.87]
I_t	-10.888*** [-3.83]	*Patents*	-0.0005 [-0.74]	ΔLTR_t	-0.394 [-0.50]
ΔLTR_t	-0.625 [-1.10]	$JSCEvents_t$ *{=1, in case of related event to JSC births}*	0.247* [1.94]	GW_t *{=1, in case there is Geopolitical event or War in Greece}*	-0.325* [-1.71]
L {=1, in case of foreign loan}	-0.073 [-0.44]	*Constant*	4.425*** [16.76]	*Constant*	3.961*** [26.37]
$JSCEvents_t$ *{=1, in case of related event to JSC births}*	1.017** [2.33]	**McFadden's Adj R^2**	0.096	**McFadden's Adj R^2**	0.106
$Dummy_t$ *{=1, year>=1913}*	0.972*** [3.02]	**AIC**	166.943	**AIC**	574.116
Constant	2.215*** [8.42]	**BIC**	171.395	**BIC**	588.842
McFadden's Adj R^2	0.169	**Wald(3)**	100.941	**Wald(4)**	134.394
AIC	534.067	**Log likelihood**	-78.472	**Log likelihood**	-281.058
BIC	556.156				
Wald(7)	311.556				
Log likelihood	-258.033				

Notes: T-ratios are in the brackets. Robust standard errors are used to correct the potential heteroscedastic problem. ***, **, * denote 1%, 5%, 10%, statistical significance.