A Historical Overview of Joint Stock Company Births in Greece (1830-1909): Coincidence, causality and determinants

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A Historical Overview of Joint Stock Company Births in Greece (1830-1909):
Coincidence, causality and determinants

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Abstract: Research on the history of the joint stock company has focused on advanced capitalist countries. Among the latecomer countries to be neglected is Greece. This paper is the outcome of a research project which seeks to redress this omission by constructing a historical data base from the charters of Greek Joint Stock Company (JSC) start-ups. We examine here through historical/qualitative and quantitative analysis the data for the period between 1830 and 1909. Our main findings are that:

1. The joint stock company in Greece came with nation building. Incorporation represented a small number of companies in absolute terms, but a relatively large capital commitment. It was emblematic of ‘big business units’ in what was basically a peasant economy.

2. Although the JSC was introduced from above, the legal framework for incorporation failed to evolve and adapt. Other forces in the socio-economic environment drove its evolution. Namely, the shift of JSC births from a period of incubation and ‘monoculture’ to a period (time-thread) of expanding horizons commencing circa 1870.

3. Joint stock company births came in waves. The timing of the 1870 cut-off point and of the other peaks in births coincided with exogenous so to speak shocks, among which institutional /political changes, and or geographical expansion played a primary role. These shocks raised business expectations and hence increased the supply of surplus capital towards avant-garde activities (i.e. the nascent corporate sector). It could be argued that Joint Stock Company founders seemed to prefer to ride a tide- their entrepreneurial drive being motivated by (and perhaps further feeding) ‘rising expectations’.

4. Preliminary time series analysis indicates that GDP is a trend stationary process with a low deterministic trend component while paid-in capital is a difference stationary process. Capital persistence indicates negative association implying caution on the part of the investors given the uncertain economic context. Despite the absence of a Slutsky effect, the GDP series may have been induced by applying Kuznets transformations to an otherwise white noise process. In fact, the spectral density of GDP exhibits a long-cycle of about 18 years at the lowest frequency with subsequent dampening.

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5. Further analysis provides evidence in favour of an equilibrium relationship between gross incorporation as measured by paid-in capital commitment and GDP. Short-run dynamics imply that the propensity to commit capital is positive and equal to 2.26 in case of total and 2.99 in case of agricultural GDP. Moreover, it is paid-in capital which provides evidence in favour of equilibrium adjustment as opposed to GDP. Given our preliminary finding of a deterministic trend in paid-in capital, our evidence of co-integration is restricted to the stochastic trend component of the series.

6. Despite the lack of an underlying structural economic model for gross incorporation and the macro-economy, we may exploit the efficient markets hypothesis, according to which the structural equilibrium adjustment parameter of paid-in capital should equal unity. Our empirical findings indicate that it is negative and close to one. Thus, even though economic context matters, it is paid-in capital which drives expectations.

7. There is evidence that paid-in capital is Granger-caused by GDP. Causality is mutual in case of agricultural GDP (yet marginally significant at the 10% level) since agricultural GDP is Granger-caused by paid-in capital as well. This finding implies transformation of agricultural surplus into capital value despite the rather uncertain economic environment.

8. Paid-in capital is the primary determinant of gross incorporation. There is evidence that an increase in paid-in capital increases the probability of JSC births in a year by 21-23% with associated elasticity of around 3. Moreover, there is evidence of over-dispersion in the Poisson conditional mean of 44.3%. Following our previous analysis, the source of this over-dispersion is the domination of the sectoral distribution of JSC births by financial services.

Keywords: joint-stock company birth counts, time series application, historical conjuncture, Granger causality, GDP, Greece.

JEL: N130; N830; C2; C22; C25.
Introduction

Research on the history of the joint stock company has focused on advanced capitalist countries. Among the latecomer countries to be neglected is Greece. This paper is the outcome of a research project which seeks to redress this omission by constructing a historical data base from the charters of joint stock company (henceforth JSC) start-ups. We provide a historical map of incorporation at an aggregate level and then use time series analysis to examine the dynamics which drive incorporation and GDP.

General references linking the dissemination of the joint stock company to the macro environment and the wider phenomenon of economic growth first appeared in the international literature shortly after WWII. In the last years some researchers have gone a step beyond and have turned to the arduous task of building national or local data bases of joint stock company births and have used this new material in order to explore from a statistical perspective the macro dynamics of the evolution of the corporate sector. The outcome has been cross-section international comparisons in corporate demography (notably Hannah and Foreman-Peck, 2012); and specific country case studies. Examples of work in this latter direction are: Robert E. Wright for the USA (2011); Pierangelo Toninelli (2012) for Italy and Pedro Neves for Portugal (2011). Although a common research agenda does not yet exist, this paper on Greece a latecomer country is part of this new trend.

It is useful at this point to make a brief reference to the existing historiography on the Greek JSC. Most of the scholarship on the subject has been of a legal orientation. The earliest economic analysis of the Greek JSC (or société anonyme) was undertaken by Angelos Angelopoulos in his pioneering 1928 study. He took an aggregate look at JSC births and presented some basic statistics. For many years there was silence and when rarely references appeared regarding the history of the JSC, although they would be sometimes insightful, they were generally short in length and apospasmatic. The next and most recent ‘macro’ contribution to the history of the corporate sector has been the quantitative study of Stathis Tsotsoros (1994) which offers a compiled statistical database of the balance sheets of industrial JSCs during the interwar period.
In our historical overview of joint stock company births (1830-1909) we take the analysis of JSC births to a higher level of detail. We pose the three following sets of questions: 1) Under what conditions was the joint stock company originally implanted in Greece, a largely agricultural economy at the time? 2) What was the temporal evolution in the: frequency, registered/paid in capital and sectoral distribution of joint-stock company start-ups? 3) Were joint stock company births coincident or causal with the macro-economy?

More, specifically, with regard to the latter we ask whether there is an equilibrium relation between incorporation as measured by capital liquidity and the macro-economy, in particular with agriculture? If so, is this relation mutually causal i.e. is there evidence that agricultural surplus is transformed into capital value? And finally, if capital is indeed the driving force of this equilibrium relation and drove expectations, does it predict the incidence of gross incorporation, especially at the time of the big historic-economic events?

In Section 1 of the paper we examine transformations in economy and society during the period under review. In Section 2 we discuss the historical origins and legal framework of incorporation. Section 3 offers a historical description of the database. Section 4 consists of an empirical application to the data base. In Section 5 we summarize the findings.

1 Transformations in economy and society, 1830–1909

The newborn Greek state was a small agrarian kingdom, whose population in 1830 was about one-third the size of the Greek communities still living elsewhere under Ottoman rule. The country was devastated by war and suffering intense fragmentation of both the economy and the polity – pockets of maritime commerce constituted the only escape route of Greece from backwardness and poverty. No industrial unit or factory chimney was to be seen. Banks were non-existent; hoarding and usury were the main financial activities. There was no modern framework of individual property rights. Most of the population was illiterate. With the notable exception of the heartland of currant production in the western Peloponnese, subsistence agriculture prevailed, and Greece was isolated from the expanding international market of the times (Clogg, 1992; Gallant, 2001,
Greece may have been in a situation of relative isolation, but its mercantile diaspora was in the midst of its golden age as a mediator in the expanding global trade in grain, cotton, coal and other basic commodities (Baghdiantz McCabe et al., 2005).

By 1909 although Greece remained a non-industrialised country, it had become quite a different land in many respects. Territory and population had increased substantially, with the mainland incorporating the westernised Ionian Islands (1864) and the regions of Thessaly and Arta (1881). The standard of living and level of literacy had improved. The share of agriculture in Gross Domestic Product (henceforth GDP) had declined, while monetization, commerce and shipping expanded rapidly, along with urbanisation. The subsistence economy was gradually giving way to a mercantile-type family capitalism characterised by business ventures, most of which originated or were embedded in commerce.

By the early twentieth century, the Greek economy was more integrated, monetised and outward-looking, possessing strong links with the international financial market. The nation was less capital-poor, partly due to the growing interest of diaspora bankers and merchants in their homeland from the early 1870s onwards. (Haritakis, 1927, pp. 3-40; Franghiadis, 2007, pp. 83-109; Thomadakis, 1981, p. 77-151; Kostis, 2003, pp. 17-38).

Indeed, if a turning point can be discerned in the pace of economic growth during the period under review, it was from the early 1870s onwards. At this point the country had recovered from the economic devastation of the War of Independence and it was: in the midst of its first industrial stirrings (c.1867-1874), embarking on a twenty year boom in currant exports. Indicatively, per capita GDP was also beginning to rise. (Agriantonis, 1986; Franghiadis, 2007).

There was co-evolution between economy and society. Transformation c.mid 1860s/1870s was also apparent in the political and legal spheres. Parliamentary monarchy was adopted in 1864 and the principle of governing on the basis of Parliamentary majority was introduced in 1875. Amongst the most important nineteenth century legal/institutional changes affecting the framework of economic activity was the 1871 distribution of national estates with the consequent commoditization of land and strengthening of property rights. In addition, in the last decades of the nineteenth century customary law was
superseded by a more unified legal system with the German Civil Code as its point of reference (Dacoronia, 2003; Clogg, 1992, chapter 3, pp. 47-81).

In public administration a modern type of civil service and infrastructure were built *ex nihilo*. The rise of ‘fiscal power’\(^{11}\) and the capacity to undertake public investments began to increase in the 1870s (Papageorgiou, 1988, pp. 112-162; Mavrogordatos, 2003, pp. 9-12; Lyrintzis, 2008, p. 90). This development rested on two pillars: the rise of monetary tax revenues (following the abolition of the tithe and corollary tax farming in 1882 and other measures) and renewed access to the international capital market following the lifting of the embargo which had been placed on Greek government loans by the international capital market following the 1843 default of the government on foreign loans (Pepelasis Minoglou, 1995).

As for the social mosaic of the country, although certain features of the Ottoman past persisted, it too had become more westernized by 1909, the year of the military uprising of Goudi, the so-called ‘bourgeois revolution’ (Derilis, 1977) which was emblematic of the rising of new ‘progressive’/‘westernised’ social forces. Since 1870–1880 the importance in society of the professional bourgeoisie had become more pronounced and an urban working-class core had come into existence.

In a nutshell, during the period under review Greece embarked on economic growth. The decade 1870/1880 was a major turning point in many respects. The country made the transition from a period of recovery and slow growth to a period of rising per capita income, a quickening in internationalisation and new institutional arrangements, some of which were modernising. It was thus in this evolving environment that the JSC, a symbol of modernity, was transplanted and disseminated.

### 2 Origins, legal framework and rationale for incorporation

Before embarking on an analysis of the historical statistics of JSC births, for reasons of enhancing interpretation, it is first necessary to present the following fundamentals: origins of the JSC in Greece and the legal framework for incorporation.
The JSC was not implanted in Greece in a vacuum. The Napoleonic Commercial Code of 1807 would underpin all incorporations in the New Greek state until the eventual passing of the Company Act of 1920. The first Greek translation of the Code was published in 1815/17 by the powerful Greek traders’ coalition of Constantinople and was adopted by the Revolutionary Assembly of Epidaurus in 1822 during the early days of the War of Independence (Sklavenitis, 2000, pp. 67-75; Karavas, 1930, p. 13). As elsewhere in Europe, this Code became the gateway for the introduction of the JSC into Greece, where local enterprise was organised solely on the basis of individual proprietorships and (in) formal partnerships.

The first proper, fully fledged JSC to be established on Greek soil was not the result of private initiative. It was founded in 1828 by Governor Ioannis Kapodistrias, an ex-diplomat of the Russian Empire who had become the first head of state of Greece the previous year. This JSC was the state bank ‘Ethniki Hrimatistiki Trapeza’, which after a nebulous existence was dissolved in 1834, shortly after the assassination of its founder. Yet the idea of a joint stock bank of issue persisted, and, soon after the formal adoption of the Napoleonic Commercial Code as law in 1835, a second attempt was made with a decree enabling the establishment of such a bank. In the end, however, no proper charter was drawn up as negotiations between the project’s British backers and the state broke down.

The first successful JSC that was registered following independence was a result of private initiative. It was the marine insurance company ‘I Achaia’, established in 1836 in the port of Patras, the country’s centre for the international trade in currants – the main export item to the West. The business elite of this town had tight links with merchant-entrepreneurs in the Ionian Islands and the Adriatic, who, as already mentioned, had been the first amongst Greeks to adopt the JSC as a form of business organisation.

The royal decree for the first post independence JSC ‘I Achaia’ portrays the ‘great expectations’ which surrounded the introduction of the novel JSC institution into Greece. It included a statement from King Otto which presumed that this virgin enterprise would from its profits make contributions to the public welfare! The high performance and social responsibility expected from the JSC was not unique to Greece –it was common to countries of continental Europe in the post-
1815 restoration, while such Cameralist-type requests can be found, for example, in public documents presenting the navigation companies founded in the Lombardo-Veneto region in the 1830s. Like all pre-1920 JSCs, ‘I Achaia’ operated within the legal framework provided by Articles 29–37, 40 and 45 of the Commercial Law Act of 1835. This law did not specify a minimum capital or number of shareholders, and the conditions for company registration were sparse; nevertheless, a royal decree was required (Karavas, 1930, pp. 13-14).

By 1857–9, if not earlier, the Ministry of the Interior, responsible for the founding and operation of JSC companies, was concerned with the inability of the Code to discriminate between genuine business and fraudulent endeavours in the guise of a corporate form (Anastasopoulos, 1946, pp. 153-157). Towards the end of the century the two main political parties, the Modernist (or Neoteric) and the Nationalist, were of the view that a new legal framework was required, and two attempts were made to establish a Company Act, both fruitless. A first draft law modelled on the Italian Commercial Code of 1882 was prepared in 1889 under the premiership of the Modernist Charilaos Trikoupis, who envisioned Greece as becoming the financial centre of the Eastern Mediterranean (Tricha, 2001, p. 36). A second draft law, this time based on the Belgian amended (in 1881 and 1886) Commercial Code of 1873, was prepared in 1896, under the premiership of Trikoupis’ rival, the traditionalist head of the Nationalist Party, Theodoros Deligiannis.

Yet no change came about in the legal framework and Greece did not follow the example of other European countries that introduced Company Acts at the time. Arguably, we may speculate that such a failure was not the result of indifference and ignorance but of a combination of petty rivalries between the two main parties and disagreement within the business ‘corporate’ elite itself as to the shape a new law should take. Furthermore, the shock of the national humiliation in the Greco-Turkish War of 1897 spread demoralisation in public life and retarded the already slow process of parliamentary driven institutional change.

Although the Napoleonic commercial code of 1807 gave little protection to investors and minimal provision, its prolongation was not catastrophic for two reasons. Firstly, as time went by and especially from the 1870s onwards, founders
spontaneously -in an ad hoc manner- adopted in company charters governance rules and improved through a process of self-enforcement reporting requirements to the general assembly and internal auditing.(For details see: Aivalis and Pepelasis Minoglou, 2008). Secondly, given the small size of the country and the prevalence of personal/family type of mercantile capitalism (in an otherwise agricultural country) nearly all joint stock companies were set up as privately owned firms by founders known to each other as they belonged to family and/or business networks. This was not the case basically only for banks and railways for part of company shares were usually publicly quoted on the stock exchange (est.1876, starting date for trade in shares, 1880).

In sum, the birth of the joint stock company, in Greece coincided with nation building. Initially introduced from above it was embraced by society. As for the statistics of the dissemination of this form of business organization and interactions with the wider environment, we now turn to the core of the paper: the historical and empirical analysis of the data base of joint stock company births between 1830 and 1909.

3 Historical database description

3.1 Database

The newly compiled database on which this paper is based includes gross incorporation (births) of JSCs rather than net incorporation (births minus deaths) as, at the time, existing companies were not obliged by law to declare dissolutions. It covers the total population of 303 new JSCs (i.e. not reconstitutions of active firms) established in Greece between 1830 and 1909 and draws on information from all the (royal) legal decrees of incorporation and the 251 founding charters which have been recorded in the Greek Government Gazette and located in archives.

The following information has been drawn from the data base per start-up: date of birth; sector; registered and paid up capital. Capital information is not available for start-ups founded before 1840; yet, the sample we have is large enough and represents a major portion of the population of births.
For analysis purposes, we use 276 JSC births over the period 1840-1909, after excluding 8 self-help associations. Summary statistics, overall, by decade and sector, are provided in Tables 1-2 with associated histograms in Figure 1 while the temporal evolution of births and capital is depicted in Figures 2 (levels) and 3 (changes).

This summary relies on annual totals. The frequency/count statistic captures any missing capital values. All monetary amounts are in log-real terms (1914=100, deflator base year) and expressed in Latin Monetary Union (LMU) Drachmas, henceforth Drs.19

Finally, data on the start-up phase of companies should be treated with caution and not equated with final outcomes. This caveat is particularly relevant in the context of the discussion of the size of the nascent corporate sector and its impact on macroeconomic trends, structure and institution.

3.2 Joint stock company birth counts

The number JSC start-ups established during our period of study seems to have represented only a small fraction of the general population of enterprise births in Greece at the time.20 The great majority of the latter consisted of individual proprietorships or partnerships, usually general.21

On average, less than four new JSC births occurred per annum during the period under review. Within this rather anaemic rhythm, actual incorporation was erratic.22 There were years with none or only one JSC company birth, whereas in particular times there were leaps and bounds. However, although no consistent upward momentum can be observed in the number of births, the 1870s were a watershed. The majority of years during which there were none or only one start-up were before 1872/3 and over 75% of JSC occurred from then onwards. It should be underlined here that whereas up to this watershed there was ‘monoculture’, i.e. a near exclusive presence of insurance companies among JSC start-ups, thereafter there was a turn in sectoral allocation towards other avant garde activities. Within services banking became all important and there was a rise
in all branches of industry (especially mining, but also manufacturing and construction) (Pepelasis, 2011).

The timing of this multiple watershed in JSC births is not coincidental as there were important developments in the wider environment. As noted in Section 1, c.1870 there was: a quickening in state formation; institutional modernization and internationalization. A long boom in currant exports started and from 1881 onwards there was also a massive foreign capital inflow. In the span of 15 years over 350 million gold francs in real terms were made available to the Greek government by the international financial community (Pepelasis Minoglou, 1995, p.257). A major spin-off of this capital inflow was a boom in public works/utilities, primarily railways constructed by Greek registered JSC start-ups, partly or wholly financed by the state (Papayiannakis, 1982). No longer were public works/utilities in Greece constructed and run by Western-based JSCs start-ups, although there were some very few exceptions.23

3.3 Registered and paid in capital of joint stock company start-ups

Based on the statistics provided by Table 1 (under ‘Total’), total registered capital available for 276 start-ups amounted to 8,985 and paid-in capital to 1,249 millions Drs. The 1870s and 1880s are the decades with the highest capital values. In reality, total incorporation capital was much larger, but even this known capital commitment was significant in the capital-poor Greek economy, for the period under review and was equivalent to 60% of the credit granted to private business by the leading financial institution, the National Bank of Greece, over the same period (Dertilis, 2009). The year 1870 was a seminal watershed for capital commitment as nearly 90% of the total known registered capital of JSC start-ups belongs to the period 1870-1909. This phenomenon in itself is an indication of the fact that the JSC became a vehicle for the rise of large-scale productive units, a *sine qua non* requirement of Kuznetian economic growth. Finally, mean registered capital of JSC start-ups was consistently higher than median registered capital, the distance between the two reaching it highest in the 1880s: a decade marked by a boom in railways and banking.
For the period as a whole, the median registered start-up capital of Greek JSC companies was low by Western standards, but it was nevertheless emblematic of big business in Greece. An initial sample of the material on the founding capital of partnership-based firms suggests that the median registered capital of individual corporate entities was much higher than the capital endowment of non-corporate firms.

In sum, incorporation was relatively small in terms of JSC birth counts, but highly significant in terms of capital commitment and the introduction of large scale unitary firms in Greek business.

### 3.4 Peaks in incorporation

In total there were seven distinct peaks in the count of joint stock company births in the period under review (Figure 2) and two phases can be discerned:

**Phase I: 1830-1873**

In the first thirty years of statehood there was no such thing as a peak in incorporation. A cluster of three peaks however materialized in the 1860s (1860, 1862, and 1866) and these can be considered a preamble to the peak of 1872/3. The short time spans that separated these three peaks suggest that perhaps a cumulative spirit of rising expectations was in the air which reached its highest point in 1872/3. Why was this so? In the early to mid 1860 after a post independence thirty year readjustment phase, things were moving forward in Greece. The country was on the eve of its first industrialisation spurt (c. 1867–1873) (Agriantonis, 1986). In addition, two seminal events, both of which occurred in 1864, acted as ‘displacements’ which increased business expectations, and in fact namely altered the developmental potential of Greece. The first was the accession of the Ionian Islands –Greece’s window to the west. The second was the introduction of universal suffrage in Greece in 1864 which seems to have had a ‘liberating effect on entrepreneurial spirit’.

The highest peak of all in JSC births, the cut-off point of 1872/3 coincided with the final two years of the afore-mentioned first industrialization spurt and two major events: The first was the delayed distribution of national lands in 1871- an important event which enhanced the rise of the market economy/property rights
and acted as a ‘displacement’ enhancing the willingness of entrepreneurs to make investments. The second event was an increase in the supply of financial and human entrepreneurial capital due to the repatriation of diaspora bankers at the opening of the 1870s.

The peak of 1872/3 compared to the previous three peaks was marked by its far larger size (as already mentioned) and a departure from the near exclusive presence and a doubling in the number of sectors of registered start-ups. From this peak onwards (with the exception of the 1893 peak) the number of sectors increased from around 4/5 to 8/11. In spite of the presence of more sectoral diversity, the 1872/3 peak encompassed an intense wave of speculation in mining which came to an abrupt end with the burst of the infamous Lavrion mine bubble in 1873. This bubble was probably associated, through a process of mimicry, to a wider European phenomenon, as indicated by the 1873 boom in mining shares in Germany (Yiannitsis, 1977, p. 239; Angelopoulos, 1928, pp. 15-16; Kindleberger, 1993, pp. 195-196).

**Phase II: 1874-1907/9**

After 1872/3 there was a nearly even distribution of two repetitive peaks: a first peak is registered 10 years later in 1882/3. A second one followed 11 years later in 1893. In terms of birth counts, the 1882/3 and the 1893 peaks were higher than the three peaks of the 1860s but nevertheless lower than 1872/3, which suggests the existence of a deflating of the 1872/3 cut off point in the next two decades. Nevertheless, given the ‘shock’ of the 1873 crash in mining shares and the wide publicity it brought about, the very birth of this pattern of repetitive post 1872/3 peaks is impressive. We can probably make the hypothesis that what made this possible were two major events that stimulated an entrepreneurial drive which the forward-looking corporate sector could host. The first was Greece’s re-entrance into the international capital market in 1881, following the lifting of the long embargo on foreign loans to Greece in 1879. The second was the accession in 1881 of Thessaly and Arta which had large grain-rich plains and were in dire need of transportation and banking infrastructures. Both these events we may argue were similar to Kindlebergian displacement enhancing rising expectations particularly in connection to the first post 1872/3 peak: (i.e. that of 1882/3). It should at this point be underlined that one year before the latter peak, there was a unique/one
off climax in registered capital of 339,736,406 Drs! It is interesting that this all time high was associated with one event: the creation of the Bank of Epiros-Thessaly.

The 1893 peak was unique in that it coincided with a third seminal yet tragic event: the collapse of the Corinthian currant export sector which in turn led to the moratorium on foreign public debt in December 1893. More research has to be done at this stage, but it seems that the collapse of currants acted as a ‘displacement’ which triggered the following substitution effect: local surplus capital accumulated during the long currant export boom ‘suddenly’ diversified into new activities through the venue of incorporation (Frangiadis, 2007; Koutrouvides Pepelasis, 2013). The 1893 peak can also be partly associated with rising expectations as there was an intense sense of achievement in the building of the new Greece during this year: the national railway project was in full swing, and the Corinth Canal, the construction of which was completed by a Greek-nominal JSC company, was inaugurated (Papayiannopoulou, 1989, pp. 37-42).

After a post 1893 lull of 14 years we detect the start of a new upward movement in the peak of 1907-1909 which was nearly as high as the 1872/3 peak in birth counts. The timing of the 1907-9 peak was emblematic of the dawning of a new era: it was placed at the tail-end of a so-called ‘economic miracle’ (1905-1910) (Dertilis, 2009, pp. 863-891; Kostis and Kostelenos, 2003, pp. 17-38) and it coincided with a major displacement in the economic history of the modern Greek state: the 1909 ‘peaceful bourgeois revolution’, an event seminal for incorporation, for as studied elsewhere, its dissemination was intimately linked to the rise of the bourgeoisie.

At this point we would like to add that research on JSC births after 1909 portrays that the last peak in the period under review was in essence the starting point of the take-off of incorporation to unprecedented heights which continued unabated throughout the interwar period. Notably, median capital per start up was in 1909 the lowest registered for any peak year in the period reviewed in this paper which suggests that this last peak was emblematic of the ensuing ‘popularization’ of the JSC as a form of business organization in Greece (Pepelasis –Aivalis, 2012).

In sum, the examination of the timing of the peaks portray that though at first sight incorporation may have appeared haphazard, a specific near ‘cyclical pattern’
can be observed in joint stock company births. The cut-off point 1872/3 was preceded by a clustering of three preamble peaks in the seminal 1860s. It was followed in the next two decades by two lower level/declining peaks. After 1893 there was a longish break, only to be followed in 1907 by the beginning of a take-off period which took incorporation to unprecedented heights.29

Moreover, although each peak had its signature so to speak in terms of sectoral composition in the number of JSC births, if we focus instead on the total registered capital of start-ups during peaks an emblematic continuity was at work from 1872/3 onwards: ‘the financial sector was king’. The 1872/3 peak was driven by banks and mining; the 1882/3 peak by railways and banks; the 1893 peak solely by banks; and the 1907/9 peak by shipping and banks.30 (See again, Table 2 above).

In sum, the socio-economic context was relevant. It is by no coincidence: 1) that the cut-off point in the counts of JSC birth coincided with the 1860s/70s wider institutional changes Greece and that the climax in registered capital coincided with the starting point of a large wave in foreign borrowing in 1881. However, historical analysis needs to be complemented by empirical evidence.

4 Empirical application

The objective of our analysis in this Section is to provide evidence with respect to two empirical questions. The first empirical question (section 4.1) examines whether the temporal evolution of JSC paid-in capital was coincident and/or causal with Greece’s economy, as measured by historical GDP (no Industrial Production index is available for Greece during the sample period). For robustness, three GDP measures are employed: total, non-agricultural and agricultural GDP. The term causal is used in statistical terms to mean that capital is Granger-caused by GDP if GDP makes a difference in the forecast of the current level of capital after controlling for past values of GDP in addition to past values of capital. The second empirical question (section 4.2) examines whether capital was a primary determinant of JSC births. For robustness, two capital measures are employed: registered and paid-in capital.

For estimation purposes, we use a sample of 276 JSC births in the period 1840-1909, after excluding 8 self-help associations due to missing registered and/or
paid-in capital information. We treat the incident of a JSC birth as a Poisson random variable hence a count variable. To facilitate time series analysis, we use the annual number of births in a year including years with zero counts. Similarly, the associated capital measures are annual totals.

4.1 Were JSC births coincident or causal with the macro-economy?

We start our analysis by classifying the time series considered as either difference stationary (or stochastic) or trend stationary, and then we make inferences about persistence (or memory) using Augmented Dickey Fuller (ADF) unit root tests. Next, we use spectral analysis of the GDP series to detect any long waves in the economy indicating capital accumulation in an otherwise agricultural economy. Notably, agriculture was non-monetized with the exception of currants. We close this preliminary analysis using Kendall’s tau to establish statistical correlations between raw real series and their stationary counterparts to verify the presence of any spurious feature. The stationary or DS series are percentage annual growth rates calculated as 100 times the log-first differenced real series.

Next, we examine whether we may integrate any short-run dynamics with long-run equilibrium. In this respect, we estimate an adjustment model (provided it exists), a so-called Vector Error Correction Model (VECM) for paid-in capital and GDP. This helps establish whether the long-run evolution of the series is characterized by a common trend or the series are just drifting apart, the gap widening with time. Finally, we infer Granger causality of paid-in capital by GDP on the basis of a bivariate Structural Vector Auto-Regression (SVAR) model.

Despite the lack of an underlying structural economic model for gross incorporation and the macro-economy, we may guess the existence of such a relation or even exploit the so-called efficient markets hypothesis, according to which the structural equilibrium adjustment parameter of paid-in capital should equal unity. We choose to model paid-in capital instead of JSC counts per se, because capital liquidity reflects investor certainty about the economic environment and hence captures the economic conjuncture, especially post-1873.

_______________________ Insert Figures 3-4 here ______________________
Figure 3 shows the temporal evolution of JSC births and the annual growth rate of registered and paid-in capital. Figure 4 (bottom-right panel) reveals that the log-real GDP series tend to grow over time implying non-stationarity which is a frequent feature of macroeconomic time series. A non-stationary series may be specified as a random walk (RW) with either drift \( \mu \) or trend \( t \), as follows:

\[
\begin{align*}
    y_t &= \mu + z_t \quad \text{where } z_t = \gamma y_{t-1} + \epsilon_t \\
    y_t &= \mu + \beta t + z_t \quad \text{where } z_t = \gamma y_{t-1} + \epsilon_t
\end{align*}
\]

Or, equivalently, in auto-regressive (AR) form:

\[
\begin{align*}
    y_t &= \mu (1 - \gamma) + \gamma y_{t-1} + \epsilon_t \quad \text{RW with drift} \\
    y_t &= \mu (1 - \gamma) + \beta (1 - \gamma) + \gamma_{t-1} + \epsilon_t \quad \text{RW with trend}
\end{align*}
\]

Stationarity may be achieved by simply taking log-first differences also known as difference stationarity (DS), as in the present context. In fact, the annual growth rates of registered and paid-in capital (Figure 3, vertical lines) on the one hand, and agricultural and total GDP (Figure 4, DS series, top row panel) on the other hand, exhibit peaks which are coincident with the big events of 1871, 1872/3, 1881, 1893 and 1909 already analysed in Section 3.4.

If a series is DS, the effect of any shock is permanent (\( \gamma = 1 \)) i.e. there is persistence implied by a unit root. In general, in order to classify a series as either Difference Stationary (DS, \( H_0: \gamma = 0 \)) or Trend Stationary (TS, \( H_0: \beta = \gamma = 0 \)), we carry out the Augmented Dickey Fuller (ADF) unit root test with one lag. The ADF test is based on the following model and has the advantage to also accommodate some forms of serial correlation:

\[
\begin{align*}
    y_t &= \mu + \beta t + \gamma y_{t-1} + \gamma_1 \Delta y_{t-1} + \cdots + \gamma_p \Delta y_{t-p} + \epsilon_t \\
    \Delta y_t &= \mu + \beta t + \gamma y_{t-1} + \sum_{j=1}^{p-1} \phi_j \Delta y_{t-j} + \epsilon_t
\end{align*}
\]

The DS series requires \( \beta = 0 \) while the TS model leaves both parameters \( \beta \) and \( \mu \) free. If the ADF test suggests that the underlying series has a unit root, the model specializes to an AR(p-1) process in the first differences or, equivalently, an Integrated Auto-Regressive Moving-Average process of the first order for the levels (ARIMA(p-1,1,0)).

According to Table 3, we may conclude that the capital series are DS while the GDP series are TS yet with an almost zero trend component. Moreover, the ADF unit root tests imply persistence in the series with statistically significant AR(1).
components equal to -0.78 and -0.58 in case of log-real registered and paid-in capital respectively, and equal to -0.37, -0.70 and -0.49 in case of total, agricultural and non-agricultural GDP, respectively. This negative association, especially in case of capital, may reflect uncertainty in the general economic environment. Even though GDP is usually a DS rather than TS, the almost zero-valued trend estimate blurs the distinction. In order to clear inference, we also fit an ARIMA(1,1,0) to the log-real GDP series. The absence of an MA component is validated by the fact that first differences do not produce serial correlation i.e. there is no MA Slutsky effect.

\[ \text{Insert Table 4 here} \]

Estimates are almost identical apart from non-agricultural GDP whose AR(1) component is halved. In view of these findings, we conclude that stationarity through first-differencing is appropriate for analysis.

Before we proceed, it would be insightful to examine the presence of any long cycle in the economy as indicated by the GDP series. In this effect, we inspect the sample spectral density function of the ARIMA(1,1,0) prediction of the log-real GDP series.

\[ \text{Insert Figure 5 here} \]

The spectral density implies the following: even though the outcome (the GDP series) is not indicative of a Slutsky effect, this does not exclude the possibility that the original process were indeed a white noise process which underwent Kuznets transformation so as to generate the GDP data used in this analysis. In particular, we observe a single long cycle with a maximum length of 17.5 years occurring at the lowest frequency with subsequent dampening which reminds of a Kuznets ‘long swing’. However, caution should be taken with respect to this qualification: this long swing may have been merely statistically induced by Kuznets transformations without actually characterizing the economic system considered (p.275 in Sargent, 1987). Combining this finding with an inspection of the temporal evolution of birth counts, associated capital and GDP measures (Figures 3-4), the long 18 year cycle may be located around the 1873 peak of birth counts (see historical interpretation in section 3.4). Moreover, a test for the presence of a structural break in incorporation in 1873 (not reported here) provides positive evidence whatever the capital measure.
We close the preliminary analysis using Kendall’s tau (Kendall, 1938) to quantify statistical correlation between the raw real series and their stationary counterparts.

\[ \text{Insert Table 5 here} \]

Table 5 indicates that the high positive correlation between log-real capital and GDP with birth counts is spurious when their DS counterparts are used. Namely, the correlation with the first difference in birth counts drops to 51% in case of registered and to 38% in case of paid-in capital, while that of agricultural GDP drops to a low correlation of 1.1% (compared to 30%).

Next, we proceed to establish the presence of an equilibrium relationship between gross incorporation and the economy using VECM estimation. Assuming that this equilibrium relationship exists, we take a step further to examine whether gross incorporation, as measured by log-real paid-in capital is Granger-caused by log-real GDP using bivariate SVAR estimation. In general, if two series are cointegrated, they will be drifting according to their own trend but the difference between them will not grow over time because they are dominated by a common trend. In presence of a unit root in both series, the series are both integrated but not cointegrated; if only one of them is integrated, the series are cointegrated. In the bivariate case, if \( y_t \) and \( z_t \), say log-real paid-in capital and log-real GDP, are cointegrated and the cointegrating vector is \([1,-\theta]\) with the one indicating the unit root, then both variables, as well as their linear combination (the cointegrating vector), will be stationary: \( \Delta y_t, \Delta z_t, \) and \((y_t-\theta z_t)\). An Error Correction Model (ECM) describing the equilibrium relationship will be relevant and internally consistent only if the processes are indeed cointegrated (Engle and Granger, 1987). If the adjustment parameter of the cointegrating vector is negative, it should be interpreted as pushing \( y_t \) back to \( \theta z_t \) whenever it under-/overshoots the equilibrium level. In the present context, paid-in capital is DS and GDP is TS yet with an almost zero trend component. Even though, the rationale of co-integration assumes away the presence of a deterministic trend in the series, we may restrict our analysis to the stochastic trend component of the series.

For estimation, we rely on the reduced form of the standard ECM’s VAR representation, as follows:
\[
\begin{align*}
\{ y_t &= \Gamma y_{t-1} + \varepsilon_t \text{ VAR with } y_t = [y_t, z_t] \\
\Delta y_t &= \Pi y_{t-1} + \varepsilon_t \text{ reduced form }
\end{align*}
\]

The number of independent cointegrating vectors equals \( r < n \) as implied by the rank of matrix \( \Pi \). In the bivariate case, \( \Pi \) has restricted rank equal to \( r = 1 \). A preliminary rank test based on Johansen’s TRACE statistic (not reported) indicates that the rank of \( \Pi \) is indeed \( r = 1 \) i.e. the model is exactly identified. On the basis of this inference, estimation of the corresponding VECM produces the following estimates of \( \Pi \) and impact parameter \( \theta \) (standard errors in brackets; * \( p < 0.01 \), ** \( p < 0.005 \), *** \( p < 0.001 \)):

\[
\begin{bmatrix}
D.LRPCAP \\
D.LRGDP
\end{bmatrix} = \begin{bmatrix}
\hat{c}_1 \\
\hat{c}_2
\end{bmatrix} + \begin{bmatrix}
-1.0388^{***} & 2.3533^{***} \\
0.0249^{*} & -0.0564^{*}
\end{bmatrix} \begin{bmatrix}
L1.LRPCAP \\
L1.LRGDP
\end{bmatrix}
\]

With corresponding cointegrating vector estimated as follows:

\[
\Pi = A - I = \begin{bmatrix}
-1.0388 & 2.3533 \\
0.0249 & -0.0564
\end{bmatrix} \quad \Rightarrow \quad A = \begin{bmatrix}
-0.0388 & 2.3533 \\
0.0249 & 0.9436
\end{bmatrix} \quad \Rightarrow \quad \lambda_1 = 1.0 \text{ and } \lambda_2 = -0.0952,
\]

\[
V_A^{-1} = \begin{bmatrix}
0.0563 & 2.3488 \\
0.9488 & -2.1494
\end{bmatrix}
\]

and eigenvector (use 2nd row): \( \begin{bmatrix} 1.0 & -2.2653 \end{bmatrix} \).

In each case, the long-run propensity to invest (or incorporate) is indicated by the estimate of impact parameter \( \theta \) implied by the corresponding cointegrating vector:

\[
\hat{\theta}_{LRGDP} = -2.2653^{***}, \quad \hat{\theta}_{LRNAGDP} = -1.4020^{***} \quad \text{and} \quad \hat{\theta}_{LRAGDP} = -2.9943^{***}.
\]

The propensities are negative in all cases implying positive impact whereas the associated adjustment parameters (diagonal elements) are negative and high in
case of paid-in capital and positive but low in case of GDP. We may conclude that non-agricultural GDP does not seem to work together with paid-in capital.

Finally, structural VAR estimation of paid-in capital and GDP indicates that gross incorporation capital is Granger-caused by GDP i.e. GDP makes a difference in the forecast of the current level of capital after controlling for past values of GDP in addition to past values of capital.

However, while causation is high and significant in the aforementioned direction, it is very interesting from a historical point-of-view to observe that log-real agricultural GDP appears to be the only GDP measure which is Granger-caused by log-real paid-in capital as well, at least marginally at the 10% significance level. This finding is in line with our previous analysis: for instance, the peaks in the rate of growth of agriculture of 1871-3 and 1907 nearly coincided with the peaks in JSC births 1872/3, 1907/9.

4.2 Real paid-in capital as a predictor of JSC birth counts

Following the time series analysis of the previous section, we now proceed with our second empirical question. We use the Poisson regression model in order to examine whether log-real paid-in capital indeed predicts the incidence of gross incorporation. Log-real registered capital is also used as an explanatory variable for robustness. Moreover, we allow for a test of over-dispersion in the Poisson mean by estimating its Negative Binomial (NB) counterpart with over-dispersion. In view of the previous analysis, we expect to find evidence of over-dispersion due to the sectoral distribution of counts and capital dominated by the financial sector.

The Poisson regression assumes that the conditional mean is correctly specified as follows:

$$\mu_t = \exp(x'_t, \beta)$$

The Poisson MLE beta estimate solves the following equation:

$$\sum_{t=1}^{T} \left( y_t - \exp(x'_t, \beta) \right) x_t = 0$$

Standard errors are robust as they take into account the presence of any over-dispersion (without testing for it):
\[ V(\hat{\beta}) = \left( \sum_{t=1}^{T} \mu_t, x_t, x_t' \right)^{-1} \left[ \sum_{t=1}^{T} (x_t - \hat{\mu}_t)^2 x_t, x_t' \right] \left( \sum_{t=1}^{T} \mu_t, x_t, x_t' \right)^{-1} \]

In general, the null hypothesis of no over-dispersion, \( H_0 \), is tested against the alternative, \( H_\alpha \), where alpha is the over-dispersion parameter in the NB model:

\[ H_0 : \text{Var}(y|x) = E(y|x) \text{ against } H_\alpha : \text{Var}(y|x) = E(y|x) + \alpha^2 E(y|x). \]

Table 7 implies that an increase in paid-in (registered) capital increases the probability of JSC births in a year by 20.6% (34.2%) in case of the Poisson and by 22.9% (33.5%) in case of the NB model, with associated elasticity equal to 2.96(5) and 3.3(5), respectively. The over-dispersion alpha is statistically significant and equal to 44.3% (18.4%). Hence, there is evidence of over-dispersion in the Poisson conditional mean.

Figure 6 provides a time plot of the NB predicted incidence rates for both registered and paid-in capital against annual births (gaps indicate missing values). Following our initial guess, the spikes of the predicted incidence rates closely follow the peaks in the actual birth count while both capital measures tend to evolve together pre-1873 and again in the 1900s. In particular, registered capital captures the incidence of births at the time of the big events of 1871 (agricultural reform), 1881 (Accession of Thessaly/Foreign Loans inflow) and 1893 (Currant crisis/Default).

5 Epilogue

Our findings are that:

1. The joint stock company in Greece came with nation building; incorporation representing a small number of companies in absolute terms, but a relatively large capital commitment and ‘big business units’ in what was basically a peasant economy.

2. Although the JSC was introduced from above, as the legal framework for incorporation failed to evolve and adapt. Other forces in the socio-economic environment drove its dissemination and commencing circa 1870, the shift of
JSC births from a period of incubation and ‘monoculture’ to a period (time-thread) of expanding horizons.

3. Joint stock company births came in surges/waves. The timing of the 1870 cut-off point and of the other peaks in births coincided with ‘exogenous’ so to speak shocks (among which institutional/political changes, and or geographical expansion played a primary role). These raised business expectations and hence increased the supply of surplus capital towards avant-garde activities (i.e. the nascent corporate sector). It could be argued that Joint Stock Company founders seemed to prefer to ride a tide- their entrepreneurial drive being motivated by (and perhaps further feeding) ‘rising expectations’.

4. Preliminary time series analysis indicates that GDP is a trend stationary process with a low deterministic trend component while paid-in capital is a difference stationary process with memory. Capital persistence indicates negative association implying caution on the part of the investors given the uncertain economic context. Despite the absence of a Slutsky effect, the GDP series may have been induced by applying Kuznets transformations to an otherwise white noise process. In fact, the spectral density of GDP exhibits a long-cycle of about 18 years at the lowest frequency with subsequent dampening.

5. Further analysis provides evidence in favour of an equilibrium relationship between gross incorporation as measured by paid in capital commitment and GDP. Short-run dynamics imply that the propensity to commit capital is positive and equal to 2.26 in case of total and 2.99 in case of agricultural GDP. Moreover, it is paid-in capital which provides evidence in favour of equilibrium adjustment (error correction) as opposed to GDP. Given our preliminary finding of a deterministic trend in paid-in capital, our evidence of co-integration is restricted to the stochastic trend component of the series.

6. Despite the lack of an underlying structural economic model for gross incorporation and the macro-economy, we may exploit the efficient markets hypothesis, according to which the structural equilibrium adjustment parameter of paid-in capital should equal unity. Our empirical findings indicate that it is negative and close to one. Thus, even though economic context matters, it is paid-in capital which drives expectations.
7. Bivariate structural VAR estimation provides evidence that paid-in capital is Granger-caused by GDP. The direction of causation also holds on the part of agricultural GDP (yet marginally significant at the 10% level) since agricultural GDP is Granger-caused by paid-in capital as well. This implies transformation of agricultural surplus into capital value despite the rather uncertain economic environment.

8. Paid-in capital is the primary determinant of gross incorporation. There is evidence that an increase in paid-in capital increases the probability of JSC births in a year by 20.6% in case of the Poisson and by 22.9% in case of the NB model, with associated elasticity equal to 2.96 and 3.3, respectively. Moreover, there is evidence of over-dispersion in the Poisson conditional mean of 44.3%. Following our previous analysis, the source of this over-dispersion is the domination of the sectoral distribution of JSC births by financial services.

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1 In particular Britain and the USA (Walker, 1931; Shannon, 1932; Payne, 1980; Lamoreaux, 1988; Freeman, Pearson and Taylor, 2004).

2 For the concept of the latecomer country, see Gerschenkron (1962).

3 A first effort in this direction is Pepelasis(2011).

4 Most notably, starting with Joseph Schumpeter (1947, p. 151); continuing with Douglass C. North and Robert Paul Thomas (1973, pp. 17, 155) and Simon Kuznets (1966, pp. 158-159); and a more recent example being that of Andreas Colli et al (2003).

5 For example, Karavas (1930).


7 Indicatively, GDP in constant drachmas rose by 1/3; the share of agriculture in GDP dropped from over 80 % to less than 40 %. (Kostelenos et al 2007; Dertilis, 2009).
For indices of economic progress between 1880 and 1909, see: Dertilis (1977, pp. 235-245).

For a general overview of nineteenth-century political economy, which however takes a stance emphasising obstacles to growth, see Psalidopoulos and Stasinopoulos (2009).

Namely, the lands previously held by Ottomans and which had come into state ‘ownership’ following the War of Independence. See: Petmezas, 2003 (pp. 23–56); Franghiadis, 2007 (pp. 24-26).


For first share, but what appear as unincorporated, marine insurance companies see: Kardasis, 1999 (pp. 195–197, 345–356, and 419–422); Koutsis, 1944 (pp. 14–16).

See: Resolution Z of 2 February 1828, Efimeris tis Ellados: pp. 38–39; Valaoritis, 1902 (pp. 1–5); Kyrkilitsis, 1934 (pp. 3–4).

For Cameralism see: Schumpeter, 1963 (pp. 159–160). I wish to thank Giuseppe De Luca for bringing the Italian case to my notice.

Before, continuing, since here we have raised the legal issue let us note that: A rise in the fiscal demands made on JSCs by the state came from 1877 onwards, as a tax on distributed profits of JSC companies was introduced. However, although this tax is estimated as yielding at least 5% of government revenue, it does not appear to have been a major drawback for JSC births, as the second peak in JSC births occurred shortly thereafter. (See above Text: Section 3.4.) Moreover, we must note the introduction of an inheritance tax in Greece in 1898, which in spite of its being less than 1% ‘may’ have increased the attraction of the JSC as a tax-avoiding device. (Syrmaloglou, 2007, pp. 216-227).

Overall, the number of shareholders per company was small compared to what was the case in contemporary advanced economies. It fluctuated between an average 7 founders per JSC start-up in the 1890s to an average of 98 founders per JSC start-up in the 1850s. For information on company founders see: (Pepelasis, 2010).

All the legal decrees for the founding of the 303 JSC start-ups were published in the Greek Government Gazette. Of the 251 founding charters used in our database, 228 were published in the Greek Government Gazette, 21 were discovered in the Notaries Association of Athens (in the archives of the nineteenth-century notaries: Ioannis Androulakis, Georgios and Ioannis Antoniadis, Gerasimos Afentakis, Antonios Bournias, Diogenis Diogeneidis, Ilias Glykofrydis, Georgios Gryparis, Stefanos Kondylis, Argyris Peppas, K. Pitaris), and 2 were in the General State Archives of Ermoupolis.

It should be noted that in many cases more than one purpose/sector was declared for each start-up. For reasons of analytical clarity in this paper, in those cases in which more than one purpose/sector was declared, we have taken into consideration only the first purpose/sector as we consider this to have been the main one.

Based on the implicit deflator in Kostelenos (2003) and the exchange rates in Dertilis (2009).

No compilation exists at a national level of the births of non-corporate firms which form historically the majority of enterprises in Greece. These types of firms
were by law required to register at their local commercial court. A preliminary sample derived from the port of Ermoupolis on the Cycladic island of Syros reveals the following information. Whereas in the year 1850 a total of 29 non-JSC firms/partnerships were established, for all of the decade of 1850 in the Cyclades, the total number of JSC births in the Cyclades was only five (all in Ermoupolis). Furthermore, for four sample years in the 1890s (1890, 1893, 1894, 1895) a total of 24 non-JSCs/partnerships were created in the Cyclades, whereas for the whole of the 1890s there were only one JSC birth, again only in Ermoupolis. Source: Catalogue of the nominal commercial (non-JSC) firms in the islands of the Cyclades derived from the source: Companies ‘Etairikon’ 1837–1946 State Archives, Ermoupolis.

21 It would be interesting to explore why the partnership firms of a limited liability type, that is, the société en commandité, were far less frequent but at the moment a comprehensive set of data is not available.

22 These findings fit the general observations on business start-ups of Thurik and Wennekers (1999, pp. 27–55).

23 There were two exceptions of foreign-based companies in large public works: the Paris based ‘Société Internationale du Canal Maritime de Corinthe’ (1881) and the French and later British ‘Lake Copais Co. Ltd’ (1867) (Papayiannopoulou, 1989; Melios, 1987). In general for foreign investment in public utilities: Yiannitsis, 1977, pp. 248-249.

24 The median registered capital per JSC start-up was for the period as whole 34,480 pound sterling.

25 The founding charters of 67 partnership-based firms established between 1903 and 1922 have been discovered at the Judicial Series of the National Bank of Greece. These were small companies in terms of registered capital. Twenty of these partnerships had a registered capital of under 10,000 drachmas. Most were general partnerships, but the largest firm was the limited (liability) partnership ‘Sklavounis and Simitis’, which was established in Piraeus in 1908 and its registered capital was 388,889 drachmas (National Bank of Greece, Judicial Series A1, S40 Subseries 8, Legalisations, Files: 1235, 1246, 1315, 1440, 2421, 1443).

26 In this paper we use the word ‘displacement’ in order to indicate a big exogenous event which acted positively to enhance so to speak business expectations and the count of joint stock company births. In a loose sense we have been influenced in using this term by Kindleberger (1981).

27 It is interesting that all other peaks in registered capital of joint stock company start-ups coincided chronologically with the peaks in the counts of JSC births.

28 The first default was in 1843 and as a result the Greek state was excluded from the international capital market for 36 years.

29 During the twenty one years (1909 to 1929) the birth count of JSCs was 721 vis a vis only 303 for the much longer period under study here (1830-1909). See: Pepelasis and Aivalis (2012).

30 During the 1872/3 peak, banking accounted for 60% of registered capital. For the 1882/3 peak, banking accounted for 18% of registered capital. (But let us note that in the previous year registered capital reached its all time high and 9/10 of this high was accounted for by banking.) In the 1893 peak, banking accounted for 64% of registered capital. Finally, in the 1907-1909 peak banking accounted
for 5% of registered capital. This lower, but still significant on its own, share of banking can be interpreted as follows: Firstly, that the major innovation at the time in finance, i.e. the Postal Bank created in 1909 had no registered capital. Secondly, that the 1907/9 peak was the opening of a new period as regards the presence of banking in incorporation. The share of banking in total registered capital between 1909-1929 was only 11% vis a vis 52% for the period 1830-1909. Pepelasis and Aivalis (2012).
## Table 1 - Summary statistics of JSC births and paid-in capital (in 000s Drs)

<table>
<thead>
<tr>
<th>Decade</th>
<th>Variable</th>
<th>Sum</th>
<th>Min.</th>
<th>Max.</th>
<th>Range</th>
<th>Mean</th>
<th>Median</th>
<th>Stand. Dev.</th>
<th># Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1840</td>
<td>Registered capital</td>
<td>31,710</td>
<td>36</td>
<td>6,265</td>
<td>6,229</td>
<td>3,964</td>
<td>6,265</td>
<td>3,177</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Paid-in capital</td>
<td>180</td>
<td>180</td>
<td>180</td>
<td>0</td>
<td>180</td>
<td>180</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td># Births</td>
<td>34</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>1850</td>
<td>Registered capital</td>
<td>41,170</td>
<td>671</td>
<td>5,997</td>
<td>5,325</td>
<td>3,743</td>
<td>3,580</td>
<td>2,372</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Paid-in capital</td>
<td>16,907</td>
<td>307</td>
<td>2,671</td>
<td>2,365</td>
<td>1,537</td>
<td>944</td>
<td>1,100</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td># Births</td>
<td>36</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>1860</td>
<td>Registered capital</td>
<td>269,209</td>
<td>895</td>
<td>13,194</td>
<td>12,299</td>
<td>5,852</td>
<td>3,699</td>
<td>4,631</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>Paid-in capital</td>
<td>59,933</td>
<td>200</td>
<td>1,945</td>
<td>1,745</td>
<td>1,303</td>
<td>1,388</td>
<td>539</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td># Births</td>
<td>308</td>
<td>1</td>
<td>10</td>
<td>9</td>
<td>7</td>
<td>8</td>
<td>3</td>
<td>46</td>
</tr>
<tr>
<td>1870</td>
<td>Registered capital</td>
<td>4,214,533</td>
<td>222</td>
<td>99,257</td>
<td>99,035</td>
<td>59,360</td>
<td>99,257</td>
<td>44,883</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>Paid-in capital</td>
<td>86,397</td>
<td>83</td>
<td>3,894</td>
<td>3,811</td>
<td>1,440</td>
<td>607</td>
<td>1,436</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td># Births</td>
<td>1823</td>
<td>1</td>
<td>39</td>
<td>38</td>
<td>24</td>
<td>39</td>
<td>16</td>
<td>75</td>
</tr>
<tr>
<td>1880</td>
<td>Registered capital</td>
<td>2,370,097</td>
<td>448</td>
<td>272,895</td>
<td>272,448</td>
<td>69,709</td>
<td>14,600</td>
<td>92,956</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>Paid-in capital</td>
<td>64,191</td>
<td>2,858</td>
<td>5,545</td>
<td>2,687</td>
<td>4,585</td>
<td>5,545</td>
<td>1,336</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td># Births</td>
<td>189</td>
<td>1</td>
<td>9</td>
<td>8</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>35</td>
</tr>
<tr>
<td>1890</td>
<td>Registered capital</td>
<td>295,783</td>
<td>20</td>
<td>22,721</td>
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Note: Zero entries imply missing paid-in for non-missing registered capital values.
### Table 3 - ADF unit root tests and associated regression estimates for log-real GDP and capital

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Note: Based on 39 (registered capital), 26 (paid-in capital) and 70 (GDP) observations over the 70-year period 1840-1909.

### Table 4 - ARIMA(1,1,0) estimates for GDP

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### Table 5 - Kendall statistical correlations for raw and difference stationary series

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<td>**0.307 ****</td>
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Note: * p<0.010, **p<0.050, *** p<0.001.
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Note: The models are exactly identified. Parameter restrictions: $\alpha_{12} = 0.0$, $\beta_{11} = \beta_{22} = 1.0$, $b_{12} = b_{21} = 0.0$ (ones are not identified). Based on 33 (32 for estimation) non-missing paid-in capital observations in log-real terms.

### Table 7 - Poisson and Negative Binomial (NB) estimates

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<td>Estimate 0.3416</td>
<td>- Marg. Eff. 5.1664</td>
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<tr>
<td></td>
<td>St. Error 0.0947</td>
<td>- St. Error 1.4317</td>
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<tr>
<td></td>
<td>p-value 0.000</td>
<td>- p-value 0.000</td>
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<tr>
<td></td>
<td>St. Error -0.1209</td>
<td>St. Error 1.7292</td>
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<td></td>
<td>p-value 0.088</td>
<td>p-value -0.088</td>
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<tr>
<td>Constant</td>
<td>Estimate -3.6772</td>
<td>-1.1128</td>
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<td>St. Error 1.4433</td>
<td>1.9236</td>
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<tr>
<td></td>
<td>p-value 0.011</td>
<td>0.563</td>
</tr>
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</table>

Note: Dependent variable is the number of annual births. Robust estimation, based on 49 (registered capital) and 33 (paid-in capital) observations over the 70-year period 1840-1909. The conditional margins are elasticities (ey/ex) evaluated at the sample means. The alpha estimates are within 95% confidence intervals.

**Abbreviations:**
- NCAP Registered capital (year sums in Drs)
- PCAP Paid-in capital (year sums in Drs)
- GDP GDP (in Drs)
- NAGDP Non-agricultural GDP (in Drs)
- AGDP Agricultural GDP (in Drs)
- LR Log-real
Based on 276 firms observed during 1840-1909.
Top-bottom: Births, registered and paid-in capital.  
Registered and paid-in capital are year-sums in 000s Drs.  
Registered and paid-in capital are year-sums in 000s Drs.
Figure 4 - The GDP series

The raw series are in log-real terms; the DS series are % annual growth rates (see infra). Big events: 1871 Agricultural reform, 1881 Thessaly/Loans, 1893 Currant crisis/Default, 1909 Goudi.
Figure 5 - Sample spectral density for log-real GDP

Log-standardized truncated periodogram evaluated at the natural frequencies (omegas).
Highest spike implies $T/2j = 17.5$ yrs.
Figure 6 - Predicted incidence rate (NBR)

Log-real registered (solid) and paid-in capital (dash) predictions.