ΠΑΝΤΕΙΟΝ ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΟΙΝΩΝΙΚΩΝ ΚΑΙ ΠΟΛΙΤΙΚΩΝ ΕΠΙΣΤΗΜΩΝ

PANTEION UNIVERSITY OF SOCIAL AND POLITICAL SCIENCES

ΣΧΟΛΗ ΕΠΙΣΤΗΜΩΝ ΟΙΚΟΝΟΜΙΑΣ ΚΑΙ ΔΗΜΟΣΙΑΣ ΔΙΟΙΚΗΣΗΣ

ΤΜΗΜΑ ΟΙΚΟΝΟΜΙΚΗΣ ΚΑΙ ΠΕΡΙΦΕΡΕΙΑΚΗΣ ΑΝΑΠΤΥΞΗΣ

The Role of Infrastructure for Economic Growth: The Southern European Countries Case

ΔΙΔΑΚΤΟΡΙΚΗ ΔΙΑΤΡΙΒΗ

Χαράλαμπος Κ. Αράχωβας

Αθήνα, 2021

Τριμελής Επιτροπή

Ηλίας Πλασκοβίτης, Αναπληρωτής Καθηγητής Παντείου Πανεπιστημίου (Επιβλέπων)

Ματθαίος Λαμπρινίδης, Ομότιμος Καθηγητής Παντείου Πανεπιστημίου

Δημήτριος Χριστόπουλος, Καθηγητής Οικονομικού Πανεπιστημίου Αθηνών

Copyright © Χαράλαμπος Κ. Αράχωβας, 2021

All rights reserved. Με επιφύλαξη παντός δικαιώματος.

Απαγορεύεται η αντιγραφή, αποθήκευση και διανομή της παρούσας διδακτορικής διατριβής, εξ ολοκλήρου ή τμήματος αυτής, για εμπορικό σκοπό. Επιτρέπεται η ανατύπωση, αποθήκευση και διανομή για σκοπό μη κερδοσκοπικό, εκπαιδευτικής ή ερευνητικής φύσης, υπό την προϋπόθεση να αναφέρεται η πηγή προέλευσης και να διατηρείται το παρόν μήνυμα. Ερωτήματα που αφορούν τη χρήση της διδακτορικής διατριβής για κερδοσκοπικό σκοπό πρέπει να απευθύνονται προς τον συγγραφέα.

Η έγκριση της διδακτορικής διατριβής από το Πάντειον Πανεπιστήμιο Κοινωνικών και Πολιτικών Επιστημών δεν δηλώνει αποδοχή των γνωμών του συγγραφέα.

Στη Νινέττα

Ευχαριστίες

Χωρίς τη συμμετοχή, υποστήριξη και ανεκτικότητα κάποιων ανθρώπων δεν θα ήταν δυνατή η ολοκλήρωση της παρούσας διδακτορικής διατριβής. Το ευχαριστήριο αυτό σημείωμα εκφράζει ένα ελάχιστο μέρος της ευγνωμοσύνης, που αισθάνομαι για εκείνους.

Καταρχάς, οφείλω θερμές ευχαριστίες στον επιβλέποντα καθηγητή μου Ηλία Πλασκοβίτη για τις επιστημονικές του συμβουλές, την καθοδήγησή, την υπομονή και τον πολύτιμο χρόνο που μου αφιέρωσε. Επίσης ευχαριστώ τον καθηγητή Ματθαίο Λαμπρινίδη για το ειλικρινές του ενδιαφέρον, τις επισημάνσεις και την κατανόησή του. Ξεχωριστές ευχαριστίες απευθύνω στον καθηγητή μου Δημήτριο Χριστόπουλο για τις μακρές συζητήσεις μας σχετικά με ερευνητικά ζητήματα, την αδιάλειπτη ενθάρρυνση, την ουσιαστική υποστήριξη σε δύσκολες στιγμές, την πολύπλευρη συμπαράσταση αλλά και την εμπιστοσύνη που μου έδειξε.

Επιπρόσθετα, νιώθω την ανάγκη να ευχαριστήσω τον καθηγητή Αντώνη Ροβολή για την κριτική του ματιά και τις εποικοδομητικές μας συζητήσεις.

Είμαι επίσης σίγουρος πως ο αείμνηστος καθηγητής Παναγιώτης Ρέππας θα είχε συμβάλει και αυτός με κάποιον τρόπο σε αυτήν την προσπάθεια αν…

Στους Ιωάννη Κατσελίδη, αδελφικό μου φίλο, Σπύρο Μπόικο, επίκουρο καθηγητή Πανεπιστημίου Μακεδονίας και Ιωάννα Βλαστού, στέλεχος της Ευρωπαϊκής Κεντρικής Τράπεζας, οφείλω θερμές ευχαριστίες για το γεγονός ότι ήταν δίπλα μου κάθε φορά που ένιωθα ότι είχα αποκλίνει του στόχου μου, καθώς και για τις χρήσιμες συμβουλές τους.

Η ολοκλήρωση της διδακτορικής μου διατριβής δεν θα είχε επιτευχθεί χωρίς την έμπρακτη συμπαράσταση της οικογένειάς μου, στην οποία και οφείλω ένα μεγάλο ευχαριστώ.

Τέλος, βαθιά ευγνωμοσύνη οφείλω στη Νινέττα, η οποία ανέλαβε αγόγγυστα το ρόλο της συνοδοιπόρου αυτής της προσπάθειας, συμπαραστάθηκε ενεργά αναλαμβάνοντας

θυσίες που δεν της αναλογούσαν, στάθηκε πλάι μου με ιώβειο υπομονή αλλά και με ισχυρή παρότρυνση και έδειξε αμέριστο ενθουσιασμό σε κάθε νέο εύρημα, σε κάθε ολοκλήρωση ενός νέου κεφαλαίου. Για τους λόγους αυτούς, μεταξύ άλλων, της αφιερώνω την παρούσα.

Contents

Tables

Περίληψη

Ο ρόλος των Υποδομών για την Οικονομική Μεγέθυνση: Η περίπτωση των χωρών της Νοτίου Ευρώπης

Σύμφωνα με τη βιβλιογραφία, οι υποδομές αυξάνουν την παραγωγικότητα, μειώνουν το κόστος παραγωγής, προσελκύουν επιχειρήσεις και παραγωγικούς συντελεστές και ενισχύουν το παραγόμενο προϊόν. Ωστόσο, δεν λείπουν και οι επικριτές οι οποίοι χαρακτηρίζουν τις θετικές επιπτώσεις των υποδομών στη μεγέθυνση αμφισβητήσιμες, στηριζόμενοι κυρίως σε οικονομετρικές προκλήσεις, στο μέγεθος της επένδυσης, στη στην επιλογή της υπό εξέτασης περιόδου κλπ. Η παρούσα διατριβή φιλοδοξεί στο να φωτίσει λίγο το ενδιαφέρον ερώτημα σχετικά με τον αντίκτυπο των υποδομών/ δημοσίου κεφαλαίου στην οικονομική μεγέθυνση, συμβάλλοντας στη συζήτηση σχετικά με το «Γρίφο των Υποδομών». Επιπλέον, στους στόχους της παρούσας προσπάθειας περιλαμβάνεται η αξιολόγηση της ευρωπαϊκής περιφερειακής πολιτικής μέσα από την ανάλυση των επιπτώσεων των υποδομών σε τρεις χώρες της Νοτίου Ευρώπης (Ελλάδας, Ιταλίας και Ισπανίας) με διαφορετικό απόθεμα δημοσίου κεφαλαίου, ενώ επίσης φιλοδοξεί να διαπιστώσει αν η χρήση νέων, περισσότερο αξιόπιστων, δεδομένων θα επηρεάσει τα τελικά συμπεράσματα.

Ως εκ τούτου, χρησιμοποιήθηκαν δεδομένα σε περιφερειακό επίπεδο ώστε να αυξηθούν οι διαθέσιμες παρατηρήσεις και να διαπιστωθούν τυχόν διαπεριφερειακές διαφοροποιήσεις, πρακτική που ενισχύει την αξιοπιστία στην ανάλυση. Επιπρόσθετα, επελέγησαν δεδομένα από διεθνώς αναγνωρισμένες πηγές με σκοπό τη βελτίωση της συγκρισιμότητας των στατιστικών στοιχείων αλλά και την απαλλαγή του δείγματος από ασυνέχειες που προκύπτουν από τον τρόπο συλλογής των στοιχείων. Περιλήφθησαν όλα τα είδη των υποδομών που ήταν διαθέσιμα ανά χώρα για τον εντοπισμό του ολιστικού αποτελέσματος του δημοσίου κεφαλαίου πάνω στο προϊόν. Ειδικά για την Ελλάδα, καταγράφηκαν τα δεδομένα για τις υποδομές ενώ κατασκευάστηκε νέα σχετική χρονοσειρά με τη μέθοδο της Συνεχούς Απογραφής (Perpetual Inventory Method - PIM).

Η εκτίμηση των χρονοσειρών έγινε με τη βοήθεια μιας τύπου Cobb-Douglas συνάρτησης παραγωγής σε διάφορες μορφές. Τα αποτελέσματα έδειξαν ότι οι υποδομές είναι στατικά σημαντικές για όλες τις χώρες και είναι συμβατά με εκείνα άλλων ερευνών. Δεν λείπουν οι διαφοροποιήσεις μεταξύ των χωρών, με την Ιταλία να παρουσιάζει τις χαμηλότερες ελαστικότητες μεταξύ των χωρών της Νοτίου Ευρώπης. Τα παραπάνω αποτελέσματα συνηγορούν ότι υπάρχει ακόμα χώρος για περαιτέρω έρευνα με έμφαση στην εκτίμηση των επιπτώσεων των υποδομών σε περιφερειακό επίπεδο, ή στον αν μεταβάλλεται ο αντίκτυπος του δημόσιου κεφαλαίου στο προϊόν ανά είδος/ κατηγορία υποδομών. Φυσικά, τα αποτελέσματα που θα προκύψουν από την αξιοποίηση διαφορετικών οικονομετρικών τεχνικών ενέχουν μεγάλη σημασία στη διερεύνηση της σχέσης υποδομών και μεγέθυνσης. Τέλος, δεν θα πρέπει να αποκλείεται η ανάλυση ζητημάτων όπως υποδομές και διαφθορά, η χρήση φυσικών μεγεθών αντί νομισματικών, η αναζήτηση νέων τρόπων χρηματοδότησης των υποδομών, ή οι περιβαλλοντικές προκλήσεις κ.ά.

Λέξεις Κλειδιά: Υποδομές, Δημόσιο Κεφάλαιο, Οικονομική Μεγέθυνση, Περιφερειακή Πολιτική, Νότια Ευρώπη

The Role of Infrastructure for Economic Growth:

The Southern European Countries Case

Charalampos K. Arachovas

Abstract

According to the literature, infrastructure increases productivity, reduces production costs, attracts companies and producers and enhances the outcome. However, there are critics who characterize the positive effects of infrastructure on growth as questionable, based mainly on econometric challenges, the size of the investment, the choice of the period under consideration etc. This dissertation aims to shed some light on the interesting question concerning the impact of infrastructure / public capital on economic growth, thus contributing to the debate on the "Infrastructure Puzzle". In addition, the objectives of this effort include assessing European regional policy by analyzing the effects of infrastructure in three southern European countries (Greece, Italy and Spain) with different public capital stock, and also aiming to determine whether the use of new, more reliable, data will affect the final conclusions.

Therefore, regional level data were used in order to increase the available observations and to identify any interregional differences, a practice that enhances the reliability of the analysis. In addition, data from internationally recognized sources were selected in order to improve the comparability of statistical data but also to relieve the sample of discontinuities arising from the way data are collected. All types of infrastructure available per country were included to identify the holistic effect of public capital on the product. Especially for Greece, the data for the infrastructures were recorded allowing the construction of a new time series with the help of the Perpetual Inventory Method (PIM).

Time series estimation was performed using a Cobb-Douglas type production function in various forms. The results showed that the infrastructure capital is statically important for all countries and is compatible with those of other surveys. Some differences between countries were observed, with Italy showing the lowest elasticities among the countries of Southern Europe. The above results suggest that there is still room for further research with emphasis on assessing the impact of

infrastructure at the regional level, or whether the impact of public capital on the product varies by type / category of infrastructure. Of course, the results that will emerge from the use of different econometric techniques are of great importance in exploring the relationship between infrastructure and growth. Finally, the analysis of issues such as infrastructure and corruption, the use of physical quantities instead of monetary ones, the search for new ways of financing infrastructure or environmental challenges etc. should not be ruled out.

Keywords: Infrastructure, Public Capital, Economic Growth, Regional Policy, South Europe

«Τόδε έργον αέξεται, ᾧ επιμίμνω»

— Οδύσσεια, Ξ΄, στ. 66

Chapter 1
Introduction

1.1 The Infrastructure Discussion

Every government wishes to improve living standards for its citizens and promote inclusive growth, or at least this is what is supposed to do. For this reason, the official state tries to increase income, attract private foreign investment, introduce new and promising health programs, protect the environment, support the weak, provide equal chances, enhance human capital by spending more on education and of course focus more on the stock of public capital. However, it is a common belief that during the last few decades most of the E.U.'s governments and also the US have been paying less and less attention to public capital.

This negligence on public capital can be explained in various ways. Many economists believe that the reasons for this decline may be found in policies of fiscal restraint, since the lack of pressure groups related to public capital makes it a lot easier to cut down public capital expenditures than any other category of public spending. Especially during periods which are characterized by scarce resources or economic crisis. Besides, the consequences of reducing public capital are not noticed but until after a long run period. That is that reducing public investment has no immediate impact on the productivity of the economy or the wage size and this makes it an extremely «vulnerable victim» in times of fiscal discipline.

Another reason explaining why investing in public capital stock often serves as a "scape goat" can be found in demographic data. Since the population growth in most developed countries is lower than it used to be after World War II, some assume that there is no need for extensive capital spending by the state. It is obvious that there are also some other possible explanations for the reduction of public capital spending, mainly institutional, such as the electoral strength of a government, its political ideology, its policy horizon etc.

Of course, nobody can argue that investing in public capital is a “panacea”, and thus it is important to make clear how this capital works. Many researchers believe that public and private capital is complementary. Reducing private investment can cause a reduction in public investment and vice versa. Higher levels of public spending can boost private investment. On top of that, some in favor of this complementary relation argue that the more the stock of a public capital in an economy, the higher the return of private investment projects.

On the other hand, there is also the argument that public spending might also behave as a substitute for the private one. This arises from the fact that investing in public capital actually pushes private investment away, since the state undertakes projects which would have been made by the private sector (the so called «crowding out effect»), making thus the net effect a priori ambiguous.

It is true that a rise in public capital stock influences private investment in two ways: **a)** on neoclassical grounds, higher public spending increases the national rate of capital accumulation more than (from the rational point of view) the private sector agents would like. This means that the private sector agents will depress private sector’s investment and **b)** public capital and particularly infrastructure capital work in a complementary way with private capital in the private production function so as to raise the marginal productivity on private capital.

Focusing our attention on empirical research concerning the importance of public capital investment on economic growth, we have to mention shortly five different methods which are widely used for this purpose. We begin with the:

1) *Production Function Approach*, where the stock of public capital enters the production either through the multifactor productivity or directly as a third factor (besides private capital and labour).
2) Instead of adding the public capital stock as another input factor a researcher can use the *Behavioural Approach*, that is a cost or profit function. Given the cost function we want to derive a unique production function by maximizing

profits or minimizing costs and introduce the public capital stock as an unpaid fixed input.

3) An alternative way to examine the influence of public capital upon economic growth is by applying the *Vector Auto Regressions (VAR) Approach* which faces fewer restrictions than the previous methods. VAR model works with the help of a small number of variables which are explained by their own lags and the lags of the other included variables, suggesting that all variables are jointly determined.

4) When it comes to cross section data *Government Investment Spending in Cross-Section Regressions* can be considered as a good suggestion. The characteristic feature of this kind of studies is the fact that the growth model is transformed into a single equation model by log-linearization around the steady state.

5) The fifth and final method uses *Structural Econometric Models* which include linearized macroeconomic models.

Needless to say, all five of the above techniques have their advantages and disadvantages. Each researcher chooses the most appropriate method according to his judgment, the type and the availability of the relevant data.

1.2 What can be actually considered as Public Infrastructure Capital or just Infrastructure?

Hitherto, it was assumed that the term «Infrastructure» is crystal clear and it's meaning very well known. The literature however seems to treat Infrastructure in various different ways and thus, it would be rather useful to shed some light on the definition of the term «infrastructure».

Efforts in analysing this term can be traced back in the early sixties, since Infrastructure was divided into Infrastructure for e.g. roads, railways, education etc and «Superstructure» which referred to agricultural, mining, manufacturing etc. activities (Tinbergen 1962). Of course, there have been several others attempts, such as the one from Jochimsen (1966), who stated that «Infrastructure is defined as the sum of material, institutional and personal facilities and data which are available to the economic agents and which contribute to realizing the equalization of the remuneration of comparable inputs in the case of a suitable allocation of resources, that is complete integration and maximum level of economic activities". The interesting thing here is the «institutional and personal» facilities which underline that Infrastructure is not just roads, bridges and ports but something broader and even more important that it is essential in economic activity.

In the same context World Bank (1994a) defines Infrastructure as services from: **a)** Public utilities such as power, telecommunications, piped water supply, sanitation and sewerage, solid waste collection and disposal, piped gas **b)** Public works-roads and major dam and canal works for irrigation and drainage and **c)** Other transport sectors-urban and interurban railways urban transport, ports and water- ways, and airports. However, the Bank notes that Infrastructure is an umbrella term for many activities referred to as "social overhead capital" as described by a series of «development economists as Paul Rosenstein Rodan, Ragnar Nurkse, and Albert Hirschman». It concludes that «neither term is precisely defined, but both encompass activities that share technical features (such as economies of scale) and economic features (such as spillovers from users to nonusers)».

The latter is in line with more recent efforts to define Infrastructure, like the one made by Nijkamp (2000) where he sees Infrastructure not only as material public capital (ports and airports, roads and railways etc.) but also as suprastructure, i.e. immaterial public capital (education and culture, communication and knowledge). On top of that, Buhr (2003) distinguishes three Infrastructure categories: **a)** *Institutional Infrastructure* («all customary and established rules of the community as well as the facilities and procedures for guaranteeing and implementing these rules by the state»), **b)** *Personal Infrastructure* (human capital) and **c)** *Material Infrastructure* (capital goods in the form of transportation, health facilities energy equipment, water provision, facilities for administration purposes etc.). However, Buhr accepts the argument of Hanushek and Kimko (2000) that the category described as material infrastructure works in a complementary way with the rest infrastructure categories and thus, he focuses on the material one.

Another critical issue which could help in better understanding the term «Infrastructure» is the differences between «Infrastructure» and «Public Capital». Gramlich (1994) steps in to introduce the «*Technical Infrastructure*», which actually comprises communication, and transportation infrastructure, energy and water provision as well as sewage systems etc.

On the other hand, Tatom (1993) distinguishes the «*Social Infrastructure*» which includes police and fire departments facilities, publicly owned hospitals and schools, courts and prisons etc. implying that this type is as much as important as the technical one. The confusion arises from the fact that the above mentioned infrastructure categories can also be owned by the private sector or been built under public-private partnership schemes, which are actually boldly encouraged by the E.U. funds. This difficulty of distinguishing private infrastructure stock from the rest of private capital has led some countries, especially those belonging to the OECD group, to use the term public capital when it comes to infrastructure owned by the state (Rosik, 2006).

1.3 Research Target and Thesis Structure

However, the main question insists: «What is the exact relationship between public infrastructure capital and economic growth? » This is the so called *Infrastructure Puzzle*, which has been spinning around the mind and research of many economists. Whether infrastructure promotes growth significantly or not is what this thesis wishes to examine in three different Southern European countries, i.e. Greece, Italy and Spain, in similar time periods.

This effort is not challenge-free. As has already been discussed, some researchers suggest that public infrastructure capital enhances private investment and promotes growth while others believe that there is a substitution effect among infrastructure and private capital, which generates just a few, if any, positive effects for growth. The main reason for this peculiar effect is the fact that public capital does not affect all aspects of the private activity in the same way, especially when spatial analysis is taken into consideration.

On top of that, the choice of the econometric approach might also influence the outcome concerning infrastructure effects. This means that the impact and magnitude of Infrastructure capital on the economy might depend on the techniques of econometrics employed and, of course, on the quality of the data used. Furthermore, the definitions of the term Infrastructure can narrow or expand the assets it includes, thus making it more difficult to assess the effect of Infrastructure capital on growth.

Shedding light on this puzzle is not a new effort. There is a formidable body of literature, which has actually been triggered mainly by the work of David Aschauer in the late 1980s concerning the impact of public capital in the US productivity and growth. Since then, there has been a series of similar discussions and work and extremely rich literature [Munnel, (1992), Gramlich (1994), and more recently Romp and de Haan (2007) and Pereira and Andraz (2013)] but the outcome is not yet neither clear nor undisputable. This is indirectly summarized by the World Bank (1994b) which considers public capital as the «wheels – if not the engine – of economic activity». On the other hand, the Bank also concludes that «infrastructure investment is not sufficient on its own to generate sustained increases in economic growth».

However, the E.U. insists on financing Infrastructure projects and has guided, until today, a great deal of its budget to public capital investment (in this thesis, Infrastructure, Infrastructure capital and public capital are considered to have the similar meaning and content), especially in its poorest regions (financed by the Cohesion Fund). Furthermore, it has been encouraging the governments of its member-states to invest separately in this kind of projects, suggesting that these investments have clearly beneficial outcomes for the economy. In this context, it is of vital importance to examine what was the exact impact of such policies, i.e. whether investing in infrastructure capital has actually a positive and statistically significant effect on the growth rate of less developed regions of the Union such as Greece, try to learn from the experience of those countries so as to avoid possible mistakes in the future and in the end, question the direction of the E.U.'s regional policy.

The interest in this field was fired up by the slowdown of productivity growth in many OECD countries during the 1970s, 1980s and 1990s. This development has been attributed by many researchers to less infrastructure investments, due to fiscal consolidation policies, negligence etc. In fact, it was exactly this theory that gave birth to the generous European programmes for the then relatively poor countries, such as Greece Spain, Portugal and Ireland. The E.U. seemed so sure that followed the same policy by revamping Infrastructure capital in many Eastern European countries. Nowadays, focusing on Africa, the lack of infrastructure networks of almost all kinds is considered on of the fundamental reasons for the poverty of the continent.

It is also crucial to note that the interest for the E.U.'s regional policy motivated the introduction of space in this thesis. This parameter makes the research more complex, though much more interesting. The question that arises is whether using data on regional level can provide more information and better, more reliable estimations concerning the effect of public capital on national growth, since the different characteristics of each region could result in different impacts of infrastructure investment. As it is already known, Aschauer and many other researchers used national data for while other studies were based on regional data The latter choice enhances data variation, which could add more reliability to the final estimates.

So, the relationship between public capital and growth remains valid. In fact, the deep meaning of this question is not narrowed to whether an increase of public capital stock actually accelerates growth, but what is the net effect of additional infrastructure investments, since more infrastructure capital deprives resources from other uses (Canning and Pedroni 2004). Of course, one parameter that should be taken into consideration is the model used each time. Neoclassical exogenous growth models support that it is the technical progress that drives long-run growth, thus leaving little room for infrastructure to contribute. On the other hand, endogenous growth models can capture the impact of infrastructure on steady-state income per capita, especially when the economy is lower than the optimal infrastructure level.

This PhD effort tries to focus right on the above questions, especially now when the effects of infrastructure policy, after a long period of E.U. and government-funded infrastructure projects from the mid-80s, 90s and the first years of the new century has been completed and the corresponding effects are more obvious. Put differently, this Ph.D. will try to shed some light on the impact of the regional level infrastructure capital on the growth of the Southern Europe countries, namely Greece, Italy and Spain. These countries were not chosen randomly. Greece and Spain were most benefited from the E.U.'s regional policy the last years, while Italy is considered to have a higher quality and more enriched Infrastructure capital. The periods examined are similar but not the same, in order to allow for time diversity.

In order to achieve this goal, this thesis will estimate a Cobb-Douglas type production function by incorporating reliable and as possible up to date, structural breaks free data. This effort differs from earlier attempts in the sense that it uses data based on solid and clear infrastructure capital assets and it employs panel data instead of time series analysis. Of course, the use of regional (NUTS II level) data underlines the spatial dimension of this analysis.

The chapters of this thesis are structured as follows:

Chapter 2 includes the body of literature that supports the idea that public Infrastructure is the key to economic growth. This section is presented by the type of data used (cross section, time series and panel data), while at the end of the chapter the most prominent references are explained in greater extend. On top of that, there is also going to be an attempt to analyse why results differ so significantly. However, the largest part of this chapter is focused on a rather comprehensive presentation of the recent academic work on infrastructure capital.

Chapter 3 follows the same structure as the previous chapter, this time allowing for criticism on the impact of infrastructure on growth, thus indirectly questioning E.U.'s regional policy. This section is also structured by the type of data used and some key references are analysed to a greater extend at the end of the chapter. The latter also includes a discussion about the main concerns raised against the methodologies used and an attempt to further explain the differences in the results. By doing so, the reader will have an extensive literature review of all sides of the debate, and a clear view of the methods and empirical research of the Infrastructure challenge. For once again, the spatial dimension of the «Infrastructure puzzle» and its complexities are discretely underlined.

Chapter 4 refers to Methodology Challenges and Datasets used during estimations. At the first section it summarizes the pros and cons of each method. The next sections include a comprehensive presentation of the datasets for each country, i.e. Greece, Italy and Spain. It is obvious that special care was undertaken in order to gather the appropriate datasets, to ensure their reliability and comparability, to have the maximum available number of observations etc. It has to be noted that the datasets follow the regional level analysis.

Regarding for Greece, the datasets concerning public Infrastructure datasets had to be built from scratch, using the Public Investment Programme (PIPR). The latter was actually derived from various printed documents of Ministry of Finance. For the rest two countries, the datasets concerning Infrastructure capital were gathered after capitalizing reliable and well-acknowledged national sources. The use of European data sources for economic data such as GDP was preferred for comparability reasons, while national sources kicked in when necessary (data for education).

The empirical research is described in Chapter 5. For reasons explained analytically, this thesis follows the production function approach, and more precisely a Cobb-Douglas variant, which was estimated with the help of an open-source statistical package «GRETL» (Gnu Regression, Econometrics and Time-series Library). Fixed and Random effects are also employed, depending on the characteristics of the datasets, as well as lagged values, in order to avoid low quality instrumental variables and also control for potential biases arising from simultaneity or even reverse causation.

The final chapter, 6, offers a brief summary of the main empirical results of this effort. It also provides comparisons with the findings of other published works for each country, and highlights some key lessons arising from the E.U.'s regional policy and Infrastructure. Of course, proposals and ideas for future further research based on new trends and interests could not had been left out. The Appendix which follows this chapter includes the full and complete datasets used in this thesis.

Chapter 2
Public Infrastructure Capital: A Key to Economic Growth. Those in Favour, Raise Your Hand

2.1 Introduction

During the 1980s and 1990s the issue of public spending and especially the part that is related to infrastructure capital has gathered the interest of many distinguished researchers. Up to a certain point, this interest was launched by the decline in both public investment and productivity growth. This observation led many writers to support the idea that public capital investment and economic growth are closely and positively related. These economists adopted various methods in order to support, through their empirical work, public capital's influence on growth and thus they used all kinds of data sets (time series data, panel data, cross section analysis data) in order to convince for their ideas.

This chapter continues by briefly presenting papers/ studies which are in favor of the importance of public capital on economic growth divided in three broad categories: Papers based on **a)** cross-section data, **b)** time series data and **c)** panel data in this particular order. In the end of this chapter there is Table 1 which summarizes the findings.

2.2 Studies Based on Cross-Section data

Biehl (1991) focused on European regions and trying to prove that infrastructure, or social overhead capital, was one of the main determinants of regional development measured in terms of income, productivity and employment. In an effort to quantify infrastructure endowment for 168 level II regions of the Community of twelve member-states in the year 1980, he set as an objective the identification of the measurement of the capacity in physical terms and applied this idea to all infrastructure categories.

More precisely, Biehl used a version of the total infrastructure indicator, IGSF, based on the four main, directly productive categories: transportation, communication, energy and education, after, of course, the normalization and correlation-weighting of the data. Moreover, he employed a quasi-production function, a regression function based on the hypothesis there are three other determinant factors, besides infrastructure, for regional development, regional income, regional productivity and regional employment, in order to estimate the development potential of the EC regions. However, he concluded that infrastructure's impact on development was less when the full set of potentially determinants was considered for the year 1986. However, the role of infrastructure still remained significant, despite the fact that the relationship between the endowments of four potential factors (infrastructure, regional income, regional productivity and regional employment) remained unknown.

Palei (2015) followed a different approach in her effort to examine the impact of Infrastructure on economic growth and global competitiveness. Thus, at the first stage she employed regression analysis as a statistical process analysing the relation among competitiveness and ten independent variables (including infrastructure) for 124 economies in 2012. At the second stage, she examined the relation between infrastructure and its components. All data are derived from the World Economic Forum and Global Competitiveness Report. With the help of a regression function she concluded that overall infrastructure is important for competitiveness (regression coefficient 0.05), while concerning infrastructure quality of roads and quality of air transport infrastructure seem to have the highest contribution.

2.3 Studies based on Time Series Data

Public capital expenditures have seriously decreased in most OECD members since 1970 while productivity growth followed the same track. Aschauer (1988) was among the first who noticed this relation for the US economy. He noted the "apparent productivity slowdown" in the American economy due to "a falling rate of profit or profits squeeze" during the period 1953-1985. Fiscal policy, especially public deficit, was often used to explain economic growth but Aschauer insisted in distinguishing the reasons for which public deficit was created since, according to him, public capital increases the profitability of private sector.

Thus, he estimated a rate of return equation which included employment, private and public capital and capacity utilization rate by OLS, as well as by first order autoregressive and instrumental variables techniques. He reached the conclusion that higher level of public capital, ceteris paribus, raises the rate of return of private capital and hence, the negligence of public capital stock accounted for much of the downward trend in the profit rate for the USA over the recent years. "In numbers" he claimed that a 1% increase in government spending on public capital stock, while private capital stock remains unchanged, actually raises the gross rate and net rate of return to private capital by 0.191% and 0.214% respectively. On the contrary, increasing by 1% the level of private capital and hence the capital labour ratio, with employment kept fixed, lowers the gross and net rate of return to public capital by 0,384% and 0,381% respectively.

In another paper of his for the US economy over the period 1953-1986, Aschauer (1989a) provided evidence in favour of a positive role of non-military public expenditure in determining private investment and the rate of return to private capital. He basically used an equation showing the relationship between private investment and public spending which holds in general equilibrium of the neoclassical model and included private investment, private and public capital stock and capacity utilization rate. With the help of full-information maximum-likelihood methods and simulations based on a dynamic theoretical model economy he estimated the above mentioned equation again to find out that public capital, especially non-military (i.e. public infrastructure capital), has substantial explanatory power for the level of private investment in equipment and structures as well as for the return to private capital.

At a first stage, Aschauer himself accepts that a rise in public investment may be expected to reduce private investment. However, it also boosts the profitability of private capital stock and although both channels seem to operate, he supported that the net effect of a rise in public investment expenditure is more likely to raise private investment.

Aschauer (1989b) continued in the same context, emphasizing on the importance of nonmilitary public capital stock for productivity and especially on the role of core infrastructure – such as highways, streets, water systems and sewers, airports, mass transit etc. His empirical work was focused on the period 1949-1985 (annual data) for the US economy at national level. He estimated a Cobb-Douglas production function which consisted of output, private and public capital, labour, capacity utilization rate and government sector services in log level using OLS, employing a correction for first order autocorrelation and 2SLS when needed. Aschauer came up with an output elasticity of public capital at 0.39 and in the end, he underlined the great importance of core infrastructure for productivity, while other forms of infrastructure, such as public-sector hospitals and other buildings were characterized as not particularly important.

Munnell (1990a) tried to explain the reasons for the decline in productivity growth for the US economy after 1969. Therefore she estimated a Cobb-Douglas production function in logs over the period 1949-1987 for the US in national level and she came up with coefficients of 0.31 to 0.39, implying that a 1% increase in public capital would raise labor productivity by 0.31% to 0.39% - in contrast to Aschauer who estimated capital productivity – underlining the importance of public capital and confirming Aschauer's findings concerning the impact of public capital expenditures. In other words, she supported that the decline in the investment for infrastructure facilities, especially in the "core" ones (highways, airports and other mass transit facilities, electric and gas plants, water supply facilities and sewers), was responsible for much of the drop in labor productivity and thus, she focused on the need for repairing infrastructure capital and constructing new facilities.

In Spain, Bajo-Rubio and Sosvilla-Rivero (1993) employ a simple aggregate Cobb-Douglas production function in logs for private output, using Spanish data for the 1964-1988 period. In that function they include government-owned capital as a separate factor and they estimate it by cointegration techniques (for the first time). Their results show a positive and statistically significant effect of public capital on private capital productivity, with the estimated elasticity of private production with respect to public capital equals 0.19. In addition, they test for the possible endogeneity of the public capital stock in the short-run version of the model, but their tests did support the hypothesis that public capital would be affected by private capital productivity.

For a less developed economy, such as Greece's, Segoura and Christodoulakis (1997) tried to investigate the impact of publicly provided infrastructure on private sector's productivity focusing their efforts on the productivity of big, Greek, manufacturing firms over a thirty- year period (1963-1990). They worked in two ways: At first, they estimated a Cobb-Douglas production function, after having tested for the existence of constant returns to scale towards private inputs. The inputs in the production function were capital stock of big manufacturing firms (K), labor (L), public infrastructure (G), technical efficiency of production (A) and neutral technological progress (T). The latter actually allows producers to produce more output with the same capital – labour ratio. The estimation led the researchers to the conclusion that a 1% rise in public infrastructure would raise the product of manufacture by 0.42% and would reduce total sector's production cost by 0,86%.

The second technique adopted, referred to the estimation of a translog cost function which included the added value of production, input prices, public infrastructure, manufacture capital stock, labour and intermediate inputs for the same period (1963 – 1990). The results of this method revealed that a 1% rise in infrastructure would reduce production cost by 0.86%. Finally, they argued that infrastructure substitutes labor and intermediate inputs and complements private capital. This means that an increase in infrastructure would result in saving labour and intermediate inputs and in an increase in the use of private capital.

Salinas – Jimenez (2004) was also concerned about how the investment in public infrastructure could influence private productivity growth. He focused his work on the Spanish regions for the period 1965 –1995, both for the aggregate of the economy and for each of the large sectors of the private activity. For his empirical estimation he used an aggregate production function in which, besides capital and labour he had added public and human capital as inputs. He estimated it with Instrumental Variables (IV) OLS, with economic cycle asymmetries (when the economy suffers from recession productivity is low), the initial level of public capital endowment in a region and its distribution between private and public capital and the initial level of productivity as instruments.

He showed that investment in public productive capital in a region had a limited effect on Total Factor Productivity growth, unless when spillover effects were included and also noted the importance of the initial endowment in public and private capital for each region. He also underlined the fact that asymmetries in the economic cycle were found to be important explanatory variables for the observed efficiency gains and he ended up proposing that investment in infrastructure might constitute an instrument of regional development policy oriented towards reducing regional disparities.

Pereira and Pereira (2017) not only were in favour of infrastructure but they suggested that certain categories of transportation infrastructure capital (railways, ports, airports,) as well as social infrastructure capital (education and health) seem to have a larger positive impact on the economy compared to other infrastructure capital (telecommunications, electricity etc), or even road infrastructure. On top of that, they argued that the former type of infrastructure investment will, in the long run, have a favourable effect on fiscal budget through higher tax revenues, an issue of vital importance for the examined Portuguese economy.

The researchers estimated five VAR models examining, output, employment, private and infrastructure investment; one for the whole economy and the other four for every type of infrastructure (roads, other transportation, utilities and social infrastructure), using a new data set over the period 1978-2012. The idea behind this approach was that infrastructure capital affects the economy **a)** directly, **b)** as an externality to production and **c)** through the demand for private capital and labour. In the end, they concluded that total infrastructure enhances private investment (elasticity of 0.6205), output (elasticity of 0,1712) and also employment (elasticity of 0.0881).The elasticities remain positive towards output, employment and private investment when examining the four types of infrastructure at a more disaggregated level.

Alder (2019) noticed the different targets in transport infrastructure investment projects between India, where they chose to connect the four major centres and China, where they connected all intermediate size cities. He focused on the effects on growth and income distribution for 636 mainland Indian districts over the period 1999-2012, without hesitating to employ satellite data and geographic information in order to obtain data at high spatial analysis. He based his findings on a general equilibrium trade model which produced gravity equations. Finally, he concluded the Indian transport project which focused in connecting the four largest economic centres of the country, i.e. Delhi, Calcutta, Mumbai and Chennai, and Calcutta with the "Golden Quadrilateral" (GQ) and had been launched in 2001 had a favourable impact on income, However, this impact was allocated unevenly across districts, compared to a «counterfactual network», like the one China had adopted, due to the fact that it focused only to the four centres.

It has to be made clear that China had followed a different high way building tactic which allowed stronger convergence across regions in comparison to that noticed in Indian. The difference is that China gathered its efforts on the National Expressway Network (NEN), a network which aimed at connecting all intermediate-sized cities with a population above 500,000 and all provincial capitals with modern highway infrastructure and not only on four mega-cities. Therefore, Alder suggested the extension of the transport network which would promote convergence among Indian districts.

2.4 Studies Based on Panel Data

Aschauer (1989c) tried this time to investigate the impact of public investment on private investment and private output growth in the Group of Seven (G-7) for the period 1966-1985. For this purpose, he estimated a Cobb-Douglas production function in delta log and he concluded that the output elasticity of public capital ranges between 0.34 and 0.73. That is, a 1% increase in public capital raises labour productivity by somewhat between 0.34% and 0.73%. Aschauer continued by providing evidence explaining why the "reverse causation" hypothesis, which implied that low productivity growth was responsible for low public capital expenditures and not vice versa, did not hold. He ended up by suggesting that public capital (particular infrastructure) is of vital importance for economic growth.

Aschauer (1990) continued with his research for the US economy. In this work, he employed cross-sectional, state level data on gross state product and averaged public infrastructure expenditure over the period 1965-1983 for 50 states. The reason for choosing cross-sectional, time averaged data has to do with his effort to capture the long-run relationship between output and infrastructure spending. He estimated a Cobb-Douglas production function after he had substituted the elasticity of output with respect to capital and publicly provided services into the function assuming **a)** constant returns to scale over all inputs and **b)** increasing returns across all inputs. Ashauer's results showed that the elasticity of output with respect to infrastructure services was for case **a)** 0.05 and for **b)** 0.11. Thus, he suggested that core infrastructure investment affected the level of per capita output positively and significantly, while other forms of government spending had a much smaller impact. Finally, he argued that infrastructure expenditures may well have been of great importance for the after WWII "golden age" of the US economy.

Munnell (1990b) entered the discussion since she thought that **a)** the results on the importance of infrastructure were too large to be credible, **b)** the direction of causation between public investment and output growth was considered as unclear and **c)** the indications for current policy were characterized as ambiguous. She focused her efforts on tracking down the magnitude of public infrastructure capital, this time on regional economic performance. She started by “constructing” data on the stock of private or public capital on a state-by-state basis over the period 1970-1986 for 48 states. She then estimated a Cobb-Douglas production function in logs, where public capital entered as a production factor. Her results confirmed that on the state level, public capital affected private sector output significantly, positively but less bold, since the coefficient was estimated at 0.15 instead of 0.35 (Aschauer, 1989b) and 0.31 to 0.39 (Munnell 1990a) respectively.

Furthermore, she underlined the importance of some kinds of public infrastructure, such as water and sewer systems, to a lesser extend highways and argued that other types of public capital such as school and hospital buildings are found not significant, although this might be due to measurement errors or “benefits mobility”. Finally, she supported the idea that public capital had a positive influence on private investment and employment since a 1% rise in public capital would boost private investment by 0.45% and that for every 1.000$ per capita increase in infrastructure the average annual rate of employment growth would be raised by 0.2%. However, she insisted on a more careful work in the relationship between public capital and private investment, since her results were not robust enough.

The results concerning the impact of public capital stock and yet infrastructure to productivity seem to hold for Europe. Picci (1999) wanted to investigate the impact of public infrastructure on productivity in the Italian regions. For this reason he used a new data set on Italian regional capital covering the period 1970-1995 and he estimated a production function which included public capital among the regressors. Picci preferred to estimate a production function using pooled OLS and random and fixed effects techniques, since he wanted to focus his attention on a defined set of regional units, which were not depended on sampling criteria. Fixed effects however, seemed more suitable when each one of them is determined by the time invariant regional characteristics. OLS pooled regression did not provide consistent estimates while random effects estimates were biased. Core infrastructure’s elasticity estimated by fixed effects was 0.50. He also proceeded in disaggregating his analysis, just to see whether public capital elasticities were geographically uniform. This was not the case but infrastructure, especially the core one, was important.

In Greece, Mamatzakis (1999a) tried to shed some new light on this issue with the help of Vector Error Correction Model (VECM). In fact, he investigated the kind of impact/ relationship which is developed among infrastructure and productivity of private capital, focusing on the Greek industry. He employed a VECM, instead of a VAR, model so as to obtain more reliable estimates for the time period of 1959-1993. He did not used public capital investment (flow) but he preferred the public capital stock in order to capture the above bond, as well as industry's output, labour and private capital. At the end, he concluded not only that public capital enhances private capital's productivity but also no evidence was found to support the reverse causation hypothesis, i.e. that the productivity of the industrial sector boosts the demand for infrastructure.

Mamatzakis (1999b) continued in order to examine the effects of public infrastructure services on the cost structure, private input demand and productivity performance of 20 two-digit Greek manufacturing industries for a sample period 1959-1990. The model of his paper was the dual cost function. That is, he used a translog cost function with disaggregated data set since he claimed that it is better to measure productivity factor bias effects within such framework, when output can plausibly be assumed as exogenous.

More analytically, his function was in fact a second order Taylor's series approximation in logs to an arbitrary cost function augmented by public infrastructure, as a fixed, unpaid, production factor. His results suggested that public infrastructure has a significant effect on productivity, since its cost-saving impact, though it varies across industries, ranges from 0,02% to 0,78%. He also found out that for most Greek industries public capital stock was complement to private capital stock while he noticed a relationship of substitution between labour and public infrastructure, which means that an increase in public infrastructure boosts up private capital while it saves labour. His final conclusion was that if policy makers had paid the appropriate attention to public infrastructure during the late 70s and the 80s the Greek manufacturing industries would have been much more productive.

Returning to Italy, Destefanis and Sena (2005) argue that public capital has a significant impact on the evolution of total factor productivity, especially in the

Southern regions. This result is largely attributed to the core infrastructures. For the purposes of their research, they focused on the Italian industrial sector over the period 1970-1998 working on two stages. First, they tested for the existence of a long-run relationship between public capital and TFP, using panel estimates and totally allowing for regional parameter heterogeneity. In the second stage, they tested the significance of public capital within a non-parametric set-up, based on the Free Disposable Hull –variable parameter (FDH VP). They concluded that public capital significantly affects the industrial TFP, with elasticities on average at 0.17 and 0.12 for core and total infrastructures respectively with Mezzogiorno to present stronger results. This might be based on the fact that the infrastructure stocks of the Italian regions have not yet reached an adequately high level at which some sort of saturation effect may set in.

In Spain, Mas, Maudos, Pérez and Uriel (1996) extended this thought by analyzing the role of public capital, its infrastructure types and their territorial distribution in the gains of productivity of the private sector in the Spanish regions. Thus, they assumed an aggregate Cobb-Douglas production function using the fixed effects model over the period 1964-1991. They concluded that the regional stock of public capital is "relevant in accounting for the gains in productivity of the private sector of the economy", especially the infrastructures directly linked to the productive process, with output elasticity of public capital being estimated at 0.08. As they argue, the role of social type infrastructure needs further research. Spillover effects seem to work also, for the productive public capital.

Delgado and Alvarez (2000) confirmed infrastructure's positive impact. The researchers tried to find evidence from the 17 Spanish regions that would reveal the relationship between productive infrastructure and economic growth for the period 1980 –1995. They preferred to estimate a Constant Elasticity of Substitution (CES) production function instead of a Cobb-Douglas since the latter constraints the elasticity of substitution to be equal to one while the former implies the value of substitutability between production factors to be equal to one, making it thus more flexible. The estimation was carried on by OLS and fixed effects with the latter model to dominate, since it can capture the influence on productivity of factors that cannot be tracked down by the production function, such as weather conditions, productive structure etc.

They reached the conclusion that there was a wide and persistent variation of infrastructure endowments across the Spanish regions, although there had been a constant increase in infrastructure indicator for all the above regions. They also underlined the fact that the best-equipped regions were the richest ones and those with high population density and that the lack of infrastructure hindered private production in less developed regions. At the end, they argued that the productive infrastructure capital and private capital were complements, whereas productive infrastructure and labour were substitutes and that infrastructure capital formation in Spain through the years 1980-1995 encouraged private investment. This is why they suggested that infrastructure could be used as an effective regional development policy measure.

Another research towards this direction came from Ezcurra R. et al. (2005) in which they attempted to estimate the impact of infrastructure on productivity in the various Spanish regions during the period 1964-1991, for the three main sectors of the economy. They worked by employing **a)** a twice continuously total cost function which included sectorial dummy variables and also **b)** a production function, after they have substituted the variables, including the time trend t with time fixed effects.

Ezcurra and his partners included a study of spillover effects in transport infrastructure. Cost functions were estimated by Maximum Likelihood allowing for regional fixed effects, while the production function was estimated by OLS with time and regional fixed effects. They concluded that public capital increased the productivity of private factors and both sources of capital (private and public) were complements and that there was a negative relationship between better infrastructure endowment and costs with industrial and service sector being more benefited (subject to the type of function used). The findings supported the idea that infrastructure is necessary to public policy.

For Greece, Rovolis and Spence (2002) tried to investigate the impact of public infrastructure in the Greek regions. Thus, they employed a cost function for the Greek manufactures for 49 prefectures, over the period 1982-1991. The reason for the use of a cost function analysis instead of that of a production function was that the former embodies all the parameters of the latter plus the fact that it is input quantities and production costs which are endogenous, while the level of output and input prices are the exogenous ones.

It is also crucial to note that they did not employ a priori the assumption of constant returns to scale in their cost equation. Based on their results, they argued that infrastructure had not any significant role concerning "social" public capital infrastructure (Education, Health and Welfare, Housing, Public Administration and Tourism) but it was important when it came to "productive" public capital (Agriculture, Forestry, Fishery, Industry, Energy and Handicrafts, Irrigation, R&D, Special Works, Transportation Water/Sewage Works, etc.). They also found that infrastructure provision tended to save labor and other intermediate costs and to increase investment in private sector and finally suggested that this conclusion should be kept in mind when deciding the new regional policy.

Germany could not be left outside the research. Seitz (1994) investigated the impact of public capital provision on private inputs demand for W. Germany. The researcher introduced a cost function with public capital included as a fixed unpaid factor of production and applied his model to a panel data set of 31 two-digit west-German manufacturing industries over the period 1970-1989 (annual data). More specifically, he used a generalized Leontief cost function, which can be considered to be an approximation to any arbitrary cost function and it was preferred to the Cobb-Douglas function analysis because it allowed both substitutive as well as complementary relations between the inputs involved.

It is worth noting that he preferred the adjusted data form, that is multiplying the public capital stock data by the capacity utilization rate of the industry under consideration, in order to account business cycles effects. He estimated the system by Seemingly Unrelated Regression (SUR). He concluded that public capital significantly affected cost and the demand for labour and capital. In conclusion, public and private capital was estimated to have a complementary relation while public capital and private labour a substitutable. The average elasticity of the demand for private capital was 0.36 and for private labour –0.16. The results also showed that the impact of private capital on labour and capital demand differed significantly among the sample industries, leading to the conclusion that the structure of an industry could affect the magnitude of public capital's influence. Finally, he argued that public investment had a stabilizing-smoothing but steadily decreasing effect on private capital.

The importance of infrastructure made researchers from countries outside Europe to work on this subject. Ghosh Buddhadeb and De Prabir (2005) tried to investigate the role of economic and social infrastructure facilities in economic development (in terms of per capita income) across Indian states over different time spans during the last quarter century. In order to achieve this, they constructed two separate infrastructure development indexes: **a)** The Economic Overhead Capital Index (EOCI) and **b)** the Social Overhead Capital Index (SOCI) on the basis of Principal Components Analysis (PCA) from selected individual infrastructure facilities, over four different time spans 1971-'72, 1981-'82, 1991-'92, and 1991-'92.

They concluded that infrastructure capital affected economic growth through various channels, directly or indirectly. The reason for using PCA was that it could lead to an aggregate representation from various individual indicators. With the help of PCA they also constructed the Infrastructure Development Index IDI, by combining all infrastructure facilities in a single category. Finally, the researchers found strong evidence to support that differences in infrastructure facilities across the Indian states were closely related to rising income disparity, especially in the post-reform period. This evidence came up after the inefficiency of the traditional disparity in income measures, which led them to test the relationship between infrastructure and per capita income just to note in the end that infrastructure affected income disparities in India for that given period.

ECB (ECB 2016) used a different but interesting approach, highlighting the importance of infrastructure's investment financing alternatives and their impact on output and public finance. ECB staff also supported the idea that the size of fiscal multipliers hinge on time, country and status of each economy while the average output elasticity of public capital out of 68 published papers during the period 1983-2008 was estimated at 0.106 with core infrastructure being more important.

In order to examine to a higher level the relationship between infrastructure and output, this ECB work was based on the Euro Area and Global Economy (EAGLE) model, calibrated for Germany, Euro area, US and the rest of the world. ECB researchers continued with a series of simulations of an increase in public investment in Germany and reached the conclusions that investment on public capital **a)** has a positive effect on output in short and longer-term but it pushes up public debt, **b)** has also favourable results for the Euro area countries due to spillover effects but for the short-run, **c)** sustainability of public debt is more secured when paying for infrastructure through either tax increases or expenditure cuts but with losses on short-term GDP, **d)** monetary policy, investment efficiency and productivity of public capital are crucial for the impact of public investment.

Asturias et. al. (2018) shed some light to another aspect of infrastructure impact; welfare. In particular, the researchers focused on transport infrastructure in India and its improvements in the allocative efficiency of the domestic economy. They assumed that higher quality transportation reduces costs, enables firms to access cheaper intermediate goods and promotes business expectations and thus innovation and growth.

They employed plant level Indian manufacturing data for the years 2001 and 2006 as well as data for the transportation network and a static general equilibrium model of internal trade assuming constant elasticity of substitution demand and labour immobility, while they work in two steps: **a)** First, they estimated transportation costs among Indian states, using prices charged by monopolistic domestic firms, regressing them with the effective distance between the firm and the destination and **b)** They estimated the elasticity of the sectoral demand curve since this parameter determines the degree of market power. Finally, they argued that better transportation facilities (GQ project) actually paid off since real income increased by 2.7%, while the allocative efficiency could account for up to 18% of this rise, depending on the state examined each time.

Table 2.1: Public capital favors economic growth: A summary

Study	Sample	Method	Key Results
Cross-Section Data			
Biehl (1991)	168 EC level II regions for the year 1980.	Quasi production function	Infrastructure's influence on regional development was less crucial when the full set of possible determinants was employed, though still significant.
Palei (2015)	124 economies in 2012	Regression Simulations	Infrastructure is important for competitiveness (regression coefficient 0.05), while roads and quality of air transport infrastructure seem to have the highest contribution.
Time Series Data			
Aschauer (1988)	US economy over the period 1953-1985	Rate of return equation by OLS and first order autoregressive & instrumental variable technology	The rate of return to private capital is strongly & positively related to the public capital stock. An 1% increase in public capital stock would raise the gross & net rates of return for private capital by 0.191% and 0.214% respectively
Aschauer (1989a)	US economy over the period 1953-1986	Full-information Maximum likelihood & simulations based on a dynamic theoretical model economy	Public capital –especially non-military one- has substantial explanatory power for the level of private investment in equipment and structures as well as for the return to private capital.
Ashauer (1989b)	US economy over the period 1949-1985	Cobb-Douglas production function in a log level estimated by OLS, employing a correction for 1st order autocorrelation & 2SLS when necessary	Productivity is almost entirely determined by nonmilitary public capital stock compared to military or nonmilitary spending and core infrastructure is also extremely important for productivity.
Munnell (1990a)	US economy over the period 1949-	Cobb-Douglas production function in a log level	The leveling off of public capital is mainly responsible for much of the drop in multifactor productivity. The elasticity

	1987		of labour productivity with respect to public capital ranged between 0.31 and 0.39.
Bajo-Rubio & Sosvilla-Rivero (1993)	Spain over the period 1964-1988	Cobb-Douglas production function in a log level	The stock of public capital seems to positively influence private sector's productivity, with an elasticity estimated at 0.19. Public capital doesn't seem to be affected by private capital productivity.
Segoura and Christodoulakis (1997)	Big Greek manufacturing firms over the period 1963-1990	**a)** Cobb-Douglas production function in logs and **b)** cost function in logs	Both techniques underline the impact of infrastructure on private productivity focusing on the need for further public investment in infrastructure capital.
Mamatzakis (1999a)	Greek industries over the period 1959-1993	Vector Error Correction Model (VECM)	Public capital enhances private capital's productivity with no evidence in favour the reverse causation hypothesis, i.e. that the productivity of the industrial sector boosts the demand for infrastructure.
Mamatzakis (1999b)	20 selected Greek industries over the period 1959-1990	Translog cost function	A shortage in public infrastructure had a great impact on the decline in the productivity growth of most of the two-digit Greek industries. Public capital stock works as complement to private and as substitute to labour. The negligence towards public infrastructure in 70s and 80s cost in productivity in Greek manufacturing.
Salinas-Jimenez (2004)	Spanish regions over the period 1965-1995	Aggregate production function estimated by Instrumental Variables OLS	Investing in public capital in a region leads to TFP growth only when spillover effects are included. The distribution of the stock of capital between public and private is also important. Human capital, economic cycle's asymmetries and initial efficiency levels also affect TFP.
Pereira & Pereira (2017)	Portugal over the period 1978-2012	Five VAR models examining	Transportation infrastructure (railways, ports, airports) & social infrastructure (education, health) have a larger positive impact on the economy compared to other infrastructure (roads, electricity,

			telecommunications etc.). The first two types of infrastructure investment will, in the long run, have a favourable effect on fiscal budget through higher tax revenues.
Alder (2019)	636 mainland Indian districts over the period 1999-2012	General equilibrium trade model	Indian transport project «GQ» had favourable impact on income but it was allocated unevenly across districts, compared to an estimated counterfactual highway network in China. Alder suggested the extension of the already existing transport network which would promote convergence among Indian districts.
Panel Data Analysis			
Aschauer (1989c)	G-7 over the period 1966-1985	Cobb-Douglas production function in delta log	Public investment seems to be an essential determinant of labour productivity growth. He also argued against the "reverse causation" hypothesis.
Seitz (1994)	31 two-digit German manufacturing industries over the period 1970-1989	Generalized Leontief cost function by SUR	Public capital has a stabilizing but decreasing effect on private input demand due to low formation of the first. Private and public capital is complements while the latter saves labour. The structure of the industry could affect the impact of the government capital on the industry.
Aschauer (1990)	50 states of the USA over the period 1965-1983	Cobb-Douglas production function in log level with constant & increasing returns to scale	The elasticity of output with respect to infrastructure services ranged from 0.05 to 0.11. The paper suggested that core infrastructure investment affected the level of per capita output positively and significantly, much more than other forms of government spending.
Munnell (1990b)	48 states over the period 1970-1986	Cobb Douglas production function in logs	The estimation of the data which the researcher had constructed led to the conclusion that the elasticity of output with respect to infrastructure was 0.15. A

			1.000$ increase in per capita infrastructure would raise employment by 0.2%. Results on public capital and private investment were ambiguous.
Mas, Maudos, Pérez & Uriel (1996)	Spanish regions over the period 1964-1991	Aggregate Cobb-Douglas production function in logs by fixed effects	The regional stock of “productive” public capital positively affects productivity of the private sector (output elasticity of public capital at 0.08), while spillover effects seem to work. This result may not insist with the same intensity in the future.
Picci (1999)	Italian regions over the period 1970-1995	Production function with public capital among the regressors estimated by OLS, fixed & random effects	The availability of regional data had permitted a more careful robustness check of the results as well as the capability for their geographical disaggregation. Public capital and especially core infrastructure was important with elasticities ranging between 0,184 and 0,359.
Delgado & Alvarez (2000)	17 Spanish regions over the period 1980-1995	Translog production function (CES) estimated by OLS & fixed effects.	Productive infrastructure capital positively affects private investment. Investing in infrastructure, especially in less developed regions can become a useful tool for convergence. Infrastructure and private capital were found to be complements.
Rovolis & Spence (2002)	49 Greek prefectures over the period 1982-1991	Cost function for manufacturing in prefectures level	Productive infrastructure tends to reduce the manufacturing costs. On the contrary, social infrastructure was not found important for the Greek manufactures. Infrastructure and private capital are complements while infrastructure saves labour.
Ezcurra et al. (2005)	Spanish regions over the period 1964-1991	Regional cost functions for the 3 sectors of economy by MLM. Production function by OLS with regional &	Public infrastructure reduces private costs and positively affects overall productivity. Public and private capital acts as complements while public capital and labour as substitutes. The industry

		time fixed effects.	and service sector is more benefited by investing in public capital. The existence of spillover effects was confirmed.
Destefanis & Sena (2005)	Italian Regions over the period 1970-1998	Panel regressions and non-parametric set-up based on the Free Disposal Hull (FDH)	Public capital positively influences industrial total factor productivity (average elasticities at 0.17 and 0.12 for core and total infrastructure respectively). Policy implication for further investment in infrastructure capital.
Buddhadeb Ghosh & De Prabir (2005)	Indian states over the last quarter century	Three indexes were constructed (EOCI, SOCI & IDI) to assess per capita income disparity.	Infrastructure capital has an impact on economic growth both directly and indirectly. The inter-state level of development was affected by social and economic facilities.
ECB (2016)	Germany and Euro area for ten years	Simulations based on Euro Area and Global Economy (EAGLE) model calibrated for Germany	Public capital **a)** has a positive effect on output in short and longer-term but it pushes up public debt, **b)** has favourable results for the Euro area countries due to spillover effects but for the short-run, **c)** sustainability of public debt is more secured when paying for infrastructure through either tax increases or expenditure but with losses on short-term GDP, **d)** monetary policy, investment efficiency and productivity of public capital are crucial for the impact of public investment.
ASTURIAS et. al. (2018)	Indian plant-level manufactures and transport network 2001 and 2006	Static general equilibrium model of internal trade assuming constant elasticity of substitution demand and labour immobility	Transportation infrastructure work as a positive productivity shock since it reduces transportation costs, allows access to cheaper intermediate goods and could improve business expectations and promote innovation and growth while real income in India increased by 2.7%.

2.5 Brief Summary and Scepticism

The above discussion has proved that there is a broad consensus among economists that public infrastructure is a crucial parameter for productivity and growth. It was argued that infrastructure reduces costs, attracts firms and production factors and boosts output. The work of Aschauer actually triggered the discussion on public capital's contribution on economic growth. Aschauer (2000) underlined the fact that the ratio of public capital investment to gross domestic product (GDP) of OECD countries has been decreasing for a considerable period of time. Many researchers were also motivated by the theory that the negligence of public non-military capital spending in the US was responsible for the productivity slow-down in the 1970s and 1980s.

Thus, it comes as no surprise that the initial empirical estimations at national level suggest a clear and strong impact of public capital on productivity. Aschauer (1989b) suggested that a 10% rise in the public capital stock would actually boost multifactor productivity by almost 4% (3.9%). What Aschauer did was to estimate a Cobb-Douglas production function which included output, labour, capacity utilization rate, government sector services in logs, private and public capital over the period 1949-1985 (annual data) for the US economy at national level. He added the capacity utilization rate in order to control for the influence of business cycles. In fact, he focused on core infrastructure, which means that he examined assets like highways, streets, water systems and sewers, airports, mass transit etc. He also introduced a constant and a trend variable as a proxy for total factor productivity ($\ln A_t$).

During his estimations he employed OLS techniques which is a simple linear regression model, also using a correction for first order autocorrelation and 2SLS when necessary. Aschauer concluded that the impact of public capital was the highest during the period 1949-1967 and the lowest from 1953-1985. He also on came up with an output elasticity of public capital which ranges from 0.39 for the period 1949-1981 to 0,56% for 1949-1697. At the end, he underlined the great importance of core infrastructure for productivity, while other forms of infrastructure, such as public-sector hospitals and other buildings were characterized as not particularly important.

The high interest of this issue is also verified by the very rich body of literature, as well as the series of estimates. Munnell (1990b) employed too a Cobb-Douglas production function in logs, where public capital entered as a production factor, since the results of previous works was not convincing enough. She wished to examine whether the importance of infrastructure was exaggerated, to check the direction of causality and finally, to reach clear policy proposals, if possible. For this purpose she employed state-level data for 48 US states (regional level data) for the time period 1970-1986. She concluded that indeed public capital positively and significantly affects private sectors output on state level, but to a lesser extent, compared to Aschauer (1989b) estimates (0.15 instead of 0.35 respectively), roughly equal to that of private capital.

On top of that, she dug deeper and highlighted the types of infrastructure that were the most important like water and sewer systems while highways had a smaller impact. She also argued that public capital consisted of school and hospital buildings was not found significant, although she admitted that this result needed further research. However, by not addressing the endogeneity challenge she received criticism for her work and for her rather not so robust estimates.

Delgado and Alavarez (2000) put some new thoughts on the table since they argue that more attention should be given on the indirect role of public capital in boosting private investment. They focused on 17 Spanish regions and estimated a translog production function by OLS, using annual data over the period 1980-1995. In this effort, public capital includes roads, ports, airports, railways, telecommunications and energy networks. Hausman test indicated the use of a fixed-effects model. Fixed-effects refer to the impact on productivity conducted by factors which are not included in the model, e.g. technology use. The authors reached the conclusion that Infrastructure capital and private capital are complements, i.e. public capital promotes private investment.

However, they concluded that both labour and private capital are endogenous and they confronted this challenge by employing first differences. The latter refer to the changes noted in the series between adjacent observations. The authors underlined the fact that investing in infrastructure, especially in less developed regions, can become a useful tool for convergence. On top of that, they suggested that public capital and private labour are substitutes, which means that increased demand for public capital is translated to lower demand for private labour. This is exactly the policy challenge that has to be addressed, i.e. the fact that boosting public capital increases private investment but reduces private labour. In any case, further research is necessary in order to evaluate all the externalities and net effects of the above components (Infrastructure Canada, 2007).

Ezcura et.al. (2005) used a cost functions approach under the duality theory and with the help of panel data tried to estimate the impact of infrastructure on regional production costs in Spain among the production sectors over the 1964-1991 period. Public capital entered the functions as an unpaid factor of production while two other variables were also included to assess whether the categories of public capital have different effects on costs. The key conclusion of this study was the fact that infrastructure indeed reduces private costs and enhances productivity. Their estimates referred to a -0,154 impact on industrial sector costs and a -0,145 on services sector cost. This means that infrastructure reduces private costs by 0,154 cents for every dollar spent on public capital for the secondary sector, while the impact for the rest of the sectors was also negative but less bold.

The authors found results favouring infrastructure and felt confident that endogeneity was not an important impediment, based on the use of regional data. However, this justification may just not be good enough. The basic criticism on their work is focused on not addressing the potential endogeneity problem. The use of the Hausman test should have been considered necessary in order to conclude whether endogeneity was present or not.

Mamatzakis (1999a) pushed the research a bit further. He attempted to find out whether a long run relationship between infrastructure and private capital productivity does exists, using data for the Greek industry over the period 1959-1993. In his research, he employed public capital stock to represent infrastructure and he also included industry's output, labour and private capital. He estimated his dataset with the help of Vector Error Correction Model (VECM) so as to achieve consistent estimates of impulse responses and forecast errors decompositions. Probably, the most interesting conclusion was that the results confirmed the positive impact of public capital for productivity but no evidence of a reverse effect, i.e. from productivity to public capital.

Generally, studies which are based on the production-function approach, i.e. an aggregated Cobb-Douglas production function where public capital stock enters in monetary value, are usually empirically estimated in log-level or in first-difference. However, a disadvantage of this procedure is the fact that labour and capital are considered as exogenous and assumed that they are paid according to their marginal productivity, which is not always the case. But a more serious drawback is which way the causation runs. This means that the question which arises is whether infrastructure is the factor that can actually boost growth and income or is the higher income which calls and asks for more infrastructure?

Furthermore, works like Aschauer's were criticized on the grounds of implausibly high estimates concerning the impact of infrastructure on output. In fact, Aaron (1990) characterized Aschauer's results as so high that it would only take just one year for investments in non-military capital to pay for their cost through productivity gains. On top of that, Tatom (1991) actually suggested that it was the oil shock of the 1970s which led to the drop of both labour productivity and public infrastructure investment and that there is no correlation between infrastructure and productivity.

When it comes to cost functions (there are various forms of cost functions with the translog being the most popular and OLS a rather common estimation regression), the researchers conclude that infrastructure is important in reducing costs. However, the consensus is that public capital impact estimated by this approach is lower than that of the production function. This may arise from the fact that this methodology suggests that public and private capitals are substitutes, since these models incorporate factor prices and are estimated with the use of several equations, providing room for cross elasticity estimates among all models. Although cost and production functions share something common, i.e. the relationship between public and private capital and costs is a dynamic one and changes over time. The main difference is that the results in cost functions approach do not seem to vary greatly among countries nor from national to sector levels, as it is the case in production function approach.

However, it is important to underline the fact that these results are more modest and require more time in order to be realised, compared to those of the production function methodology. This means that the benefits from investing in Infrastructure would take time to be noticed and would be rather smaller. As it is the case with production functions, this type of estimations do not address concerns like equal distribution of the infrastructure benefits.

The theoretical limitations and challenges have led many researchers to narrow the use of economic theory as much as possible, and prefer Data Oriented Models. These models usually employ Granger-causality tests (tests which show whether a time series can help in forecasting another) in a multi-equation framework so as to shed some light on the relationships among variables. Tests like these are usually conducted through Vector Auto Regression (VAR) models. In these cases, no causality direction is necessarily assumed before the estimation effort. However, this does not mean that the VAR models come with no specifications at all.

Thus, VAR models can test for the direction of causality (public capital to output or the other way around). They also capture potential indirect effects of infrastructure on output by enhancing the return to private capital. A VAR without restrictions can be estimated by simple Ordinary Least Squares (OLS). The major benefit might arise from the fact that OLS provides consistent and asymptotically normally distributed estimates, even under possibly cointegrated and integrated variables (Sims et.al.). On the other hand, impulse responses and forecast errors variance arising from VAR models without restrictions could be proven inconsistent when are based on non-stationary data in the long-run (Phillips, 1998). This is the reason why Vector Error Correction Models (VECMs) are more preferable it terms of consistent estimates of impulse responses and forecast errors.

Chapter 3

How sure are we when it comes to the impact of Public Infrastructure Capital on economic growth?

3.1 Introduction

Many researchers, through their empirical work, found an anything but a leading role or even no evidence at all that public capital and infrastructure can significantly and positively affect economic productivity and thus economic growth. This of course, should not necessarily lead to the conclusion that public capital is irrelevant. On the contrary, there are many reasons for which the effects of public capital are not easily detected. First, the likely effect of infrastructure capital could be on variables that are not considered in the usual definitions of output. Better quality of living due to an uncongested transportation system could be an example. On the other hand, public capital could be effective but with a time delay concerning its formation. Moreover, certain effects of public capital are indirect, since they influence other factors of production.

However, voices rejecting public capital’s impact on economic growth are getting louder and louder, making at the same time the discussion more interesting. One issue to be addressed is causality. A substantial part of the bibliography argued that not only public capital has no effect on growth but also it is economic growth that enhances investment in public capital. This is known as the causality problem – did the leveling off of infrastructure capital reduced the growth of output, or did the reduced growth of output decrease the demand for infrastructure capital (Eisner 1991). Of course there was also criticism on methodological grounds. That is, the form of the estimated function, the type and the source of the data, the econometrics used etc.

Hence, their arguments cannot be ignored and a part of their work is being presented in the next few pages. As before, their work is presented according the type of data used, i.e. (time series and panel data). Unfortunately, we were not able to find any relevant paper based on cross-section data. In the end, all this work is briefly presented in Table 2.

3.2 Studies Based on Time Series Data

Cullison (1993) was among the first who questioned the effect of infrastructure capital. He tried to estimate the role of public investment for economic growth for the US economy through a sample period from mid-50s to early 90s. In order to do this, he used Granger-causality tests to see what kind of public investment was correlated with economic growth and simulations from a Vector Autoregressive (VAR) model, to test the effects on economic growth from a reduction in federal debt by cutting defense spending. Besides, it was difficult to isolate, a priori, the role of government spending for human capital through an aggregate production function. Granger-causality tests over the period 1955-1992 were estimated by OLS and showed that: **1)** Transportation spending was not statistically significant for economic growth, maybe due to the fact that he dealt with the flow highway capital instead of the stock and **2)** Education and labour training were the types of government spending that were more likely to affect economic growth.

Cullison used the VAR model over the period 1953-1991 and he estimated the system of equations with one-, two- and three-year lags just to come to the conclusion that education, labour training and civilian safety enhanced private output. Granger causality tests and simulations from a VAR model have the advantage of requiring data only for investment flows rather than stock of capital. However, due to the fact that the analysis in his article used past data to stimulate future events, it was subject to doubt.

The critic continued with Tatom (1991) when he tried to evaluate the evidence supporting the public capital hypothesis using data for the US economy over the period 1949-1989. He briefly presented the conventional approach as it was raised from Ratner's model, which is the model that explicitly added public capital to the production function in order to test whether the marginal product of public capital was positive. Tatom criticized Ratner's findings and methods because he believed that energy prices were very important and thus they should be included in the analysis, since the conventional measures of the flow of capital services were not able to reflect the differential effect of energy price changes on the capital stock and its services.

Moreover, studies like Ratner's omitted a significant time trend or they contained non stationary variables, leading thus to spurious estimations. He, on the other hand, estimated a Cobb-Douglas production function in first difference with time trend in order to avoid non-stationarity problems and he used a method which allowed testing a long-run relationship among non-stationary variables over the period 1949-1989. He reached the conclusion that public capital stock had no significant effect on private sector output, with capital-labour ratio and the relative price of energy given. This result holds even after omitting energy prices from the estimated production function. Finally, he argued that nonmilitary public capital did not affect business sector output.

Research in Sweden from Berndt and Hansson (1991) joined the public infrastructure-capital sceptical side. Their effort was to evaluate and measure the effects of public infrastructure capital on private sector output and productivity growth for the Swedish economy over the years 1960-1988. For this reason they employed a general Leontief cost function which was estimated by Maximum Likelihood method just to find rather mixed and implausible results. In the beginning, they followed Aschauer's and Munnell's approach (production function) employing data for the Swedish economy. The results of this method did not satisfy them because the robustness was low.

However, when they estimated their own cost function they found out that during the 1960s and late 1980s private capital and labour were at short run substitutes while labour and public capital were complements. During the '70s and until the mid '80s the situation was reversed. The researchers also employed simulations in order to assess the impact of public infrastructure capital stock changes in private sector's productivity growth. They found that while infrastructure capital was decreasing in Sweden since 1974, it had affected the productivity slowdown but to a rather modest extent. Finally, they argued that there was excess amount of this infrastructure capital than what could rationalize the cost savings incurred by the private sector, although this excess capital had been falling since the 1980s.

Sturm and de Haan (1995) also expressed their doubts concerning infrastructure's role in modern economies. They reviewed empirical evidence for the US economy for the years 1949-1985 concerning the impact of the public capital stock on productivity and tried to find out what was the case for the Netherlands for the period 1960-1990. In order to do this, they applied the production function approach (Cobb-Douglas) for the US economy which was also used by Aschauer and presented new estimations for both countries. However, the researchers employed different econometric techniques in order to get more plausible, from econometrics point of view, results.

Thus, they had to filter the time series so as to turn them into stationary ones by differentiation (i.e. Aschauer did not estimate his model in first differences which was necessary due to non-stationary and co-integrated variables, as the lack of unit roots and augmented Engle-Granger test revealed). After running some tests they concluded that public capital and productivity's positive relationship was not well founded in the case of the USA. Applying similar procedure for the Netherlands, they suggested the construction of three estimators (low, middle and high) of the capital stock variable based on the length of asset lives. The results were similar to the first ones and in the end, they supported the idea that findings concerning public infrastructure capital which are based on the production function approach were rather fragile and should be viewed with extreme skepticism. However, they underlined the fact that there is still room for research and alternative approaches have to be adopted in order to test whether public capital has a significant impact on private sector.

Kavanagh (1997) tried to explore the importance of public capital for private sector productivity in Ireland, for the period 1958-1990. Her efforts include the use of an aggregate Cobb Douglas production function in log level and various time series techniques. She tested for cointegration by employing the Dickey-Fuller and the Johansen method and she also use an ECM after taking into account the Capacity Utilization rate. All indications led to the conclusion that public capital was statistically insignificant and thus it did not affect private sector's output. Although she appeared to have second thoughts about her data This might happen due to wrongly measured and time limited data set, as well as misspecification of the model used, though suggesting an extremely cautious public capital investment policy.

3.3 Studies Based on Panel Data

Hulten and Schwab (1984) were among the first who seriously question the role of public infrastructure in output growth. They chose to adopt a logarithmic differentiation of a Hicks-neutral production function in order to seek whether the national productivity slowdown is connected to the decline in economic efficiency of the older regions of the U.S. (Snow Belt) in comparison to the newer (Sun Belt) over the period 1951-1978. Furthermore, they disaggregated the growth in manufacturing value added for nine census divisions into its components and concluded that the output growth variation in regional level was a result of differences in the growth of capital and labour. This point of view actually left no argument in favor of the role of public infrastructure in affecting regional output growth differences. Munnell (1990b) however, criticized this interpretation on the grounds of “no measure of infrastructure is included in their equation and total factor productivity is calculated as a residual.”

Ford and Poret (1991) stood on the opposite side of the common belief concerning the importance of public capital. They started by wanting to explore the “Aschauer hypothesis”, (i.e. infrastructure capital has a very strong and positive effect on private-sector Total Factor Productivity – TFP). They investigated the relationship between public capital and TFP for 12 OECD countries and again the US separately over different time periods, depending on the data for each country and ranging from 1957 to 1989. They applied Aschauer’s methodology to a broader range of data: They introduced a Cobb-Douglas technology equation to produce private-sector output, using a bundle of private-sector inputs and infrastructure capital. TFP of about half the countries had roughly the same pattern, implying that the productivity slowdown was due to the fall of the infrastructure investment rate. However, the importance of capacity utilization indicated that the bond between infrastructure and productivity was not as strong as other researchers had suggested. Infrastructure was statistically significant in some countries and not at all significant in some others. In conclusion, the regression results showed that the effects of infrastructure on productivity were not robust enough to support a policy recommendation of a strong acceleration of infrastructure investment. However, multifactor productivity was also computed using a compounded variable, which implied a number of additional restrictions that they never had tested for.

Holtz-Eakin (1992), entered the discussion suggesting that a careful estimation of the elasticity of private output or productivity with respect to state and local government capital is practically zero. His work employed state but also regional level government capital data for the US economy during the period 1969-1986. His estimations were conducted by OLS on a state production function controlling for fixed state specific effects, by GLS on an unrestricted state production function and instrumental variables estimators. The estimations on regional level were also based on instrumental variables. His following research added more arguments on the skeptics' side (such as Holtz-Eakin, 1993 or Holtz-Eakin and Lovely, 1996).

In the same pattern, Garcia-Milà and McGuire (1992) doubted the impact of core infrastructure on productivity. They specified a regional production function that, among labour and private capital, included publicly provided highways and education and tried to estimate their productive effect. For this reason they used a panel data set consisting of 24 annual observations on the 48 contiguous states for the period 1969-1983. They employed Gross State Product (GSP) along with other constructed measures (i.e. population of the state and a measure of annual industrial mix of a state, so as to account for potential important differences across states) and reached the conclusion that education played an important role in the states' economies, while highways did not seem to have a large impact on GSP. In this paper, they did not use state dummy variables because they did not want the cyclical variation overtime to dominate the long-run relationship, since time observations were just a few relative to the number of cross section elements. However, they used yearly dummy variables in order to account for business cycle effects. It is worth mentioned that this research was criticized on the grounds that they employed OLS estimation techniques which are accused for ignoring state-specific effects.

However, Garcia-Mila et al. (1996) in another paper, systematically tested for various specifications problems, such as non-stationarity of the data. They introduced a Cobb-Douglas production function which they estimated in first differences by fixed states effects model. This time they found that public capital has no significant effect on productivity and thus on economic growth. Needless to say, with this work they actually refuted their previous work (Garcia-Mila et. al. (1992), which offered to public capital a modest impact on private output.

Evans and Karras (1994) added their skeptical thoughts when they investigated whether there was a significant contribution of government capital to production, for seven OECD countries (Belgium, Canada, Finland, Germany, Greece, the UK and the USA) over the period 1963-1988. They used panel data in their investigation and introduced a Cobb-Douglas production function, which was estimated by OLS and included average annual employment, the beginning-of-year private and government net capital stock, as well as other parameters and they considered 3 specifications for the country and time effects. The researchers also used an alternative approach, since the use of instrumental variables was not a viable way of eliminating potential simultaneity. That is, that their function referred to an aggregate economy with fixed and random effects. They proceed in modified Solow residual regressions for GDP model, which was also estimated by OLS. The results led them to conclude that there was no evidence that government capital was highly productive and underprovided in the seven countries in their sample.

Nadiri and Mamuneas (1994) raised their voice and lined up with the opponents of the magnitude of public capital's impact. They accepted the significance of infrastructure's capital but they argued that investing in R&D was of greater importance. They started examining the effects of publicly financed infrastructure and R&D capital on the cost structure and productivity performance of twelve two-digit U.S. manufacturing industries for the period 1956-1986. The researchers disaggregated the public sector capital into two components: **a)** infrastructure and **b)**

R&D capital and they estimated the effects of these two types of capital on the twelve industries.

In order to achieve this, they employed an average cost function and share equations for both labour and capital. Finally, they used duality theory in order to track down the effects of these capitals on industry demand for materials, labour and capital, by estimating the average cost function and input equation shares for labour and capital simultaneously. Nadiri and Mamuneas also modified the cost function in order to include the externalities associated with capital services. They reached the conclusion that an increase in infrastructure capital services led to a decline in the demand for labour and capital in each industry, while it boosted the demand for intermediate inputs. On the other hand, an increase in the stock of public R&D capital reduced the demand for capital and materials and increased it for labour. In the end, they argued that there were significant productive effects from infrastructure and R&D capital although the first kind of capital did not have such a great effect on the cost and productivity as previous papers had supported.

The doubts went on, this time with Crihfield and Panggabean (1995). They tried to estimate the productivity of public investment within the context of a neoclassical growth model. The growth model, which they adopted, was based on the original Solow growth model and they used disaggregated data for the US states and 282 US metropolitan areas for the period 1960-1977. More specifically, the researchers actually adopted a two-stage estimation technique, since exogeneity of labour and capital was rejected in most of the cases. As a first step, they estimated reduced form equations for population and investment, including of course data for public capital by 2SLS. These were the explanatory variables. As a second step, they used these estimated values in the GDP per capita equation.

They suggested that growth in per-capita income increased with technological change, high education and private sector's investment (with increasing returns to scale) and fell with population growth and capital depreciation. In the end, the results concerning public investment's impact on metropolitan economies were weak (modest effect in labor markets and none in capital markets) as well as its effect on growth in per-capita income. On the contrary, returns to labour and human capital were much more significant. Public infrastructure might be important to metropolitan economies; however its marginal contribution was not above other forms of investment.

Boarnet's (1997) voice came to reinforce the skeptical part concerning infrastructure's importance. Through his work, Boarnet examined the relationship among highway congestion, labour productivity and output from a sample of counties of California, US. for the years 1977-1988. He distinguished two policies: **a)** constructing more highway and street capital and **b)** reducing congestion on the existing stock, through better use of infrastructure. To achieve this, he used a county Cobb-Douglas production function in logs, which included both the value of each county's street and highway capital stock and a measure of the congestion on each county's highway network and was estimated by 2SLS. After running many tests in order to control for various econometric problems such as unit roots, which demanded for first order differentiation, he reached the conclusion that congestion reduction can affect county output. However, evidence supporting that the productivity of street and highway capital stock was high, were rather weak. Boarnet suggested that transportation policies should focus at least as much on reducing congestion as on building more street and highway capital, implying an insufficient use of transportation facilities instead of a shortage.

Towards this direction headed the research in France by Charlot and Schmitt (1999). They tried to investigate whether public capital had any effect on regional economic growth and also whether public infrastructure could reduce the interregional disparities, using panel data, for the 22 French regions over the period 1982-1993. The two researchers started by evaluating the presence of public capital externalities, using a Cobb-Douglas regional production function and introducing the same type of production function in a simultaneous equation system, in order to explain regional public capital by regional output and local taxation rate. They also tested a trans-log production function (which is more flexible than a Cobb-Douglas) and distinguished between public sector capital elasticities by region.

Simple regressions, OLS, fixed and random effects models were employed but the application of the Hausman and Fischer test led them to adopt the constrained (i.e. constant returns in private inputs) fixed effects model. The conclusion that they derived was that in France, public capital appeared to affect private output positively. However, it seemed that the richest and most developed French regions enjoyed a greater impact on production due to public capital than the poor ones, implying a threshold after which public capital affects private output positively. They based this conclusion on the fact that rich and productive regions are capable of financing and maintaining a rather significant amount of public capital stock and thus, it is the region's wealth that actually allows the size of the public capital stock. Moreover, it was clear that public capital did not help reduce interregional disparities in terms of production. In the end, they underlined the fact that public capital helped private output in France but not in the US, due to the different type of public capital that each country had at its disposal (French education share in public capital is higher than that of the US', with the US to overpower on transportation share.)

Kalyvitis and Vella (2014) did not actually question the impact of infrastructure but they focused more on operation and maintenance spending (O&M), i.e. repair and operation expenditure rather than capital spending. This idea came up since typical estimates of infrastructure stocks paid no attention to a substantial part of new literature while the researchers wished to see what the impact of O&M really was. Therefore, they employed a general production function for 48 contiguous USA states over the period 1978-2000, which besides capital, labour, state own capital and O&M capital, it included capital and O&M spending by other states, in order to examine potential spillover effects. They were based on semi-parametric smooth coefficient methods to confront potential nonlinearities and their findings suggested that the interstate spillover effect of O&M spending was not only positive but also higher than the direct impact of state own capital and O&M inside each state.

Table 3.1: Public Capital does not affect economic growth: A Summary

Study	Sample	Method	Key Results
Cross-Section Data			
-	-	-	-
Time Series Data			
Tatom (1991)	U.S. economy over the period 1949-1989	Cobb-Douglas production function in first difference	Public capital's influence on economic growth was found insignificant. The same holds for nonmilitary public capital. Results in support of the role of public capital have arisen from probably spurious estimates.
Berndt & Hansson (1991)	Sweden over the period 1960-1988	Generalized Leontief production function by ML & simulations techniques.	Implying Aschauer's and Munnell's models for the Swedish economy led to senseless results but dual cost function models showed that increases in infrastructure reduce private costs, although for private sector and not the final consumer.
Cullison (1993)	US economy over the period from mid-50s to early 90s	Granger-causality tests by OLS & VAR simulations	Government spending on education and labour training had a significant effect on economic growth while transport infrastructure was not found important.
Sturm & de Haan (1995)	US economy (1949-1985) & the Netherlands1960-1990 at national level	Cobb-Douglas production function in log level & delta log by OLS	The link between and private sector productivity is not well founded. Implementing more advanced econometric techniques such as first differentiation, underlined even more the ambiguity of the results.
Kavanagh (1997)	Ireland over the period 1958-1990	Cobb-Douglas production function in logs	The results suggest a rejection of the Public Capital Hypothesis for Ireland. Implications of public capital investment policies should be viewed with extreme caution.

Panel Data Analysis			
Hulten & Schwab (1984)	U.S. manufacturing in regional level over the period 1951-1978	Logarithmic differentiation of a Hicks neutral production function	Regional variation in output growth was due to variations of the rate of growth of capital and labor. Variations in public infrastructure do not seem to affect regional differences in output growth.
Ford & Poret (1991)	12 OECD countries for a period ranged from 1957 to 1989	Cobb-Douglas production function in delta logs	Infrastructure was not significant for all countries and the results were not robust enough to encourage a public capital investment acceleration.
Holtz-Eakin (1992)	US Economy and 48 contiguous states from 1969 to 1986	Production function estimated by OLS, GLS and IVs.	The elasticity of private output or productivity with respect to state and local government capital is practically zero.
Garcia-Mila & Mc Guire (1992)	48 States over the period 1969-1983	Cobb-Douglas in log level by OLS	Public core infrastructure seems to be important for economic growth but investing in education is of greater interest.
Evans and Karras (1994)	7 OECD countries over the period 1963-1988	Cobb-Douglass production function in logs by OLS	Estimates were fragile and rather insignificant. No evidence for the importance of public capital or that it was underprovided was found.
Nadiri & Mamuneas (1994)	12 two-digit US manufacturing industries over the period 1956-1986	Average cost function and share equations for capital and labour	Cost elasticities with respect to infrastructure capital ranged from -0.11 to -0.21. R&D and private capital have higher rates of return than infrastructure. Results hold even if CU*G is incorporated.
Crihfield & Panggabean (1995)	282 US metropolitan areas over the period 1960-1977	Reduced form equation for population & investment & GDP equation by 2SLS	The elasticities of public capital were found to be negative for both local and state public capital and ambiguous for most types of public capital
Garcia-Mila et al. (1996)	48 States over the period 1970-1983	Cobb-Douglas production function in delta log	After testing for many restrictions they ended up saying that public capital was not important for economic growth.
Boarnet	California counties	Aggregate Cobb-	The reduction of congestion is

(1997)	over the period 1977-1988	Douglas production function	productive; however efforts should be concentrated on the more efficiently use of the existing highway infrastructure.
Charlot & Schmitt (1999)	22 French regions over the period 1982-1993	Cobb-Douglas & translog regional production function	They implied a threshold after which public capital affects private output positively. Public capital did not help reduce interregional disparities in terms of production. The kind of public capital matters for productivity.
Kalyvitis and Vella (2014)	48 US contiguous states over the period 1978-2000	General Production function estimated by semi-parametric methods	Interstate spillover effects of O&M spending were not only positive but also higher than the direct impact of state own capital and O&M inside each state.

3.4 Brief Summary and Scepticism

The body of literature questioning the impact of infrastructure capital on productivity and growth is rather shorter than that of the side supporting the positive role of public capital for growth. However, this part of the literature has done its homework and criticizes infrastructure effects on solid ground. The discussion above proves that those who underline their scepticism concerning the results of infrastructure on growth are not deprived of good arguments.

Tatom (1991) was among the first who expressed his doubts about the public capital hypothesis, i.e. the idea that the US productivity slowdown was a result of the public capital negligence. His whole effort was triggered by the work of Ratner (1983), who explicitly added public capital to the production function in order to test whether the marginal product of public capital was positive, bringing thus, Tatom into doubts.

Tatom was sure that energy prices movements along with the slowing trend rate of technological change were responsible for the deteriorating productivity rates. In fact, he supported that taking into consideration the latter (energy prices and technological change) the effect of infrastructure on private sector is less than a half from Ratner's and others researchers findings or even not significant at all. His innovation in this field is spotted on the fact that he used a different specification including energy prices and capacity utilisation entered multiplicatively to both the private and public capital stock.

On top of that, Tatom considers results praising the impact of infrastructure as output of spurious regression bias. This means that the results seem to be statistically significant but they are actually not. From his side, Tatom used data for the US economy over the period 1949-1989 and estimated a Cobb-Douglas production function in first difference with time trend in order to avoid non-stationarity problems, allowing for long-run relationship testing among the above, non-stationary variables. His results showed that public capital stock had no significant effect on private sector output, while this result remains in place even after omitting energy prices from the estimated production function. Put differently, the researcher notes that the rhythm of infrastructure formation has nothing to do with the US productivity changes.

However, Duggal et al. (1999) opposed to Tatom's (1991) approach supporting the idea that the relative price of energy is a market cost factor which is actually included in each enterprise's cost function and, thus in the factor input demand functions. They have based their research on the concept of incorporating infrastructure into the production function as part of the technological constraint and not as an additional input. Therefore, their model specified a technological growth rate as a non-linear function of infrastructure and a time trend, which actually helped in tracing the impact of the rest variables on the technological changes.

Sturm and de Haan (1995) can be easily found among the economists who were pretty sceptical towards infrastructure's impact on productivity. They focused their interest on econometric grounds, criticizing Aschauer for not estimating his models in first differences, due to lack of cointegration and stationarity, as Voss (2002) also did a few years later. Thus, they tried to shed some light on this issue by estimating infrastructure's impact for the Netherlands for the time period 1960-1990. They used a similar to Aschauer's production function taking into consideration cointegration and stationarity challenges. This would allow them to «cross-check» their results with the one's of Aschauer, making comparisons more direct and easy and to obtain more reliable outcomes.

Their contribution in research was the fact that they estimated the production function in first differences in order to correct for stationarity for the US economy. The estimations on the new data set showed that the positive relationship arising between public capital and productivity had not been well founded in the USA. In the Netherlands, they constructed three estimators (low, middle and high) of the capital stock variable based on the length of asset lives. Following the same estimation technique, they reached the idea that results based on the production function approach were fragile and should be viewed with extreme caution. They also mentioned that there is still pretty room for further research, while alternative approaches could be proven helpful in order to get more reliable outcomes on the public capital hypothesis.

Nevertheless, the basic element of Sturm's and de Haan's work, i.e. the lack of taking the stationarity of the data properly into account, in many previous studies does not come without criticism. It is true that unit root tests often indicate that output and public capital contain a unit root. However, the problem arises from the fact that unit root tests have narrow power to distinguish among unit root and near unit root cases. This challenge becomes even harder to overcome when the sample's size is small. One way to deal small sized samples is to utilize the cross-sectional dimension of the data and to apply panel data techniques.

A great part of the criticism on the relationship between public capital and productivity of the private sector/ growth is based on the estimation techniques used each time. However, as discussed above, there a lot of challenges yet to be addressed in the literature. These challenges have to do with causality issues, simplistic modelling approaches appropriate only to diagnose the direction of the impact of infrastructure and not its size. This note does not mean that the research work in favour of the infrastructure – growth relationship is meaningless, but underlines the formidable need for more attention on the econometrics. However, this task is nothing but easy since the vast majority of the econometric challenges cannot be resolved without high cost, arising mainly from data limitations (Infrastructure Canada, 2007).

One of the most prominent econometric challenges for policy makers is the *lack* of a clear and jointly accepted *infrastructure definition*. The variety of definitions leads to models with different public capital indicators and variables and thus, to a series of non-comparable estimates. This result makes almost impossible to sustain a consistent public capital policy.

Another basic problem in the literature called «*missing variables*» arises when the research is too much focused on the lack of infrastructure as the reason for the productivity slowdown. Other explanatory variables which could help in better understanding this slowdown are usually omitted. Neglecting such variables, like public infrastructure expenditures, the price of energy or its quantity, investment incentives, etc. (Gramlich 1994, Morrison-Paul and Schwartz, 1996), raises the impact of public capital on growth and productivity. This negligence however may not result in purpose but it may be the outcome of poor availability or quality of data.

The *direction of causality* can also hurt the results, since possible endogeneity makes the direction rather dubious. This means that investing in infrastructure could result in bolder growth and productivity but also robust economic growth may enhance the demand for public capital and finally raise its supply. This issue is usually resolved with the help of a Granger causality test but even then, the results are not that clear. Tatom (1991) suggests that causality runs from growth to infrastructure, while others (Fernald 1999) disagree. The use of VAR models could be considered as a good alternative.

The *time framework* is also characterized as extremely important. A great part of the research results refers only to short-term impacts of infrastructure. This problem is observed when the authors use first-differencing methods in order to correct stationarity obstacles. For this reason, a two-step treatment is proposed: At first step, researchers are encouraged to check the causality direction and seek the length of the lagged relationship developed in the data, while the second step refers to model specification and selection of the appropriate estimation technique.

Challenges and impediments on research are also found on data. *Stationarity* is certainly one of them. This problem steps in when an adequate part of the data series moves towards the same direction over time, which shows positively correlation behaviour, making the estimations at least dubious. The use of year-to-year changes data instead of data in levels could be a solution but it comes with a handicap: The narrow the effect of infrastructure on growth (in fact, they downsize the marginal rate of return of infrastructure investments), thus underestimating public's capital impact on productivity and growth.

There are two other econometric challenges. The first is *Multicollinearity*, especially in production functions and cost functions, while only a few papers have addressed this problem appropriately. This behaviour is often noticed among labour and public capital, i.e. they are close related and it is difficult to distinguish the impact of each of the above in growth or productivity. In other words, this close relationship can lead to misleading estimates and biased results and of course to not perfect infrastructure investment decisions. The second challenge is *Spurious Correlation*, which arises when the independent variable (public capital) and the dependent (growth) follow the same pattern because they are both influenced by other variables, which are not included in the function. This effect jeopardizes the effort of estimating the impact of infrastructure and can lead to wrong investment decisions.

Last but surely not least, *Limited Data Availability* can cause a series of problems during estimations and result in wrong conclusions. Reliable data on public capital are not only hard to be found but even when they are, it is likely to suffer from quality issues. The challenges arising from limited data availability usually refer to small data size, which in turn brings constraints on the types of models, which are allowed to be used and the corresponding econometric methods, as well as the hypothesis tested each time. Put differently, regressions on regional data can generate results which underestimate the impact of infrastructure on growth due to the narrow capability of the data to quantify the implied relationship.

3.5 Some Key Conclusions on the Literature Review

The above discussion proves that the final effect of public investment on private investment and growth is rather blurred. There are two competing and self-cancelling impacts which make the aggregate outcome rather ambiguous. On the one hand, there is the «*crowding out*» effect, which means that enhancing public investment actually deteriorates public finance and harms private investment. On the other hand, the «*crowding in*» effect suggests that public investment raises productivity and private returns, thus attracting private investments and accelerating growth (European Commission, 2017).

However, it is hard to guess the final outcome on growth since there are plenty of parameters which could enter and affect the impact on the whole economy. A critical factor is time, since public capital positive impact needs time to be capitalized. Thus, it is important to distinguish effects in the short-run and in the long-run.

This note needs further clarifications. In the short-run, «crowding in» and «crowding out» effects on private investment are both trying to prevail on another. A higher demand for example could trigger the «crowding in» effect in the sort-run. The challenge occurs in financing this higher public investment, when it comes to increased taxation, which is translated to narrower capacity of the private agents to invest. On top of that, increased demand for public investment could also result in upward pressures in interest rates, which inflates the borrowing cost for the private sector. These series of actions could lead «crowding out» effect to offset the impact of «crowding in» effect.

In the long-run, public investment improve productivity and profitability and work in favour of the «crowding in» effect on private investment. Building more infrastructures is a good example. However, the findings of various empirical efforts cannot provide a clear conclusion. Research results and conclusions are obviously affected by a group of parameters and seem to depend on: **a)** The time periods examined, **b)** the countries or sectors under research (implying that the existing stock of public capital is indeed important) and **c)** the chosen methodology approach and variables, i.e. models chosen, the use of lagged effects or not, endogeneity challenges, causality issues etc. (Núńez-Serrano and Velázquez, 2017 and Bom and Ligthart, 2014), **d)** The successful addressing of the Estimation Related Problems (lack of Infrastructure definition, missing variables, causality direction, model specifications), **e)** The confrontation of Data Shortcomings (stationarity, spurious correlation, multicollinearity, limited data availability) and **f)** The kind of infrastructure examined. The work of Afonso and St. Aubyn (2009), where public investment led to both «crowding in» for the majority of the countries examined and also «crowding out» for some of the countries effects for private investment underlines the challenges that the research still has to overcome.

Which of the two effects («crowding in» or crowding out») will be proven stronger depends also from a series of country-specific factors. Among them one could find: the condition of the business environment, the macroeconomic developments and outlook, the sectors of the economic activity examined, the type of the public capital/ infrastructure, the degree of economic confidence, the initial public stock (the lower the stock, the higher the «crowding in» effect), the existence of a robust and well-founded banking system and financial market, the econometric methods used each time, the quality of the data, the length of the time series, the appropriate addressing of the econometric challenges etc. These factors explain to a great extend the significant differences among the results of various studies, while at the same time underline the need for further research.

Chapter 4
Methodology Challenges and Datasets

4.1 Introduction

The purpose of the above literature review was to present a comprehensive analysis of the empirical research conducted so far on the importance of public infrastructure capital stock and public investment in infrastructure projects for economic growth and performance. The interest of infrastructure impact on the economy in the academia and policy-makers was raised some thirty years ago and judging by the number of papers and researches published so far, is well founded.

Aschauer's work (1988 and 1989) on the effects of public infrastructure investment on economic performance led to a blossom of the literature. Public capital was initially characterized so extremely significant that the corresponding tax revenues would over-compensate the cost of the investment (Reich, 1991). However, the following literature on the one hand rather failed to verify the magnitude of infrastructure impact and on the other tried to distinguish the most productive among the different types of infrastructure capital. On top of that, econometrics kicked in, questioning the methods implemented so far (OLS of static equations), or even causality between infrastructure and growth. These developments gave birth to further research, this time including new and modern econometric techniques (multivariate vector autoregressive (VAR) models, multivariate static functions etc.).

Overall, it is quite clear that actually, there has been no consensus deriving from the literature. Most of the researchers question the impact size of the infrastructure capital but only a few disagree that it has a positive effect on the economic performance. In fact, the poorer a country is, the bolder seems to be the impact of infrastructure capital, although the literature on poor or less developed countries is significantly limited (Pereira and Andraz, 2013).

Truth is that there is still plenty of room for further research. Even if everybody accepts that infrastructure capital is crucial for the economy, it has to be examined whether infrastructure investments undertaken either by the private or by the public sector, are indeed among the most or are themselves the most productive form of investment. On the other hand, different types of infrastructure seem to have a different impact on the economic performance and thus, this is another field for future research. Financing issues seems also to arise, especially nowadays when the European and western economy seems vulnerable and the corresponding Chinese has been decelerating for some period. And it has to be underlined that this is a very important challenge for countries which have just recently recovered from the harsh and prolonged economic crisis, such as Greece, or the less developed ones.

A very interesting area remains the geographic focus. As the analysis moves towards a smaller geographic area, i.e. regions, the impact of public capital diminishes. This implies the existence of regional spillover effects. On top of that, a body of literature suggested than since public capital investment affects the performance of the economy and that of the private sector in the long-run, public capital investment could be responsible for distortions in the concentration of the economic activity in favour of areas and sectors with higher level of capital. In terms of data quality, the potential existence of structural breaks has received few or no attention at all. Different data sources corresponding to different time periods could quite possibly suggest the presence of structural breaks which could crucially affect the quality of the results.

4.2 A few words on the Econometrics

Public infrastructure is considered to produce positive externalities for the private sector, boosting its productivity and enhancing households' living quality. Not surprisingly, many countries tried to improve their economic performance by focusing on infrastructure investments, since the slowdown of growth rates in OECD countries was often attributed to short provision of infrastructure capital due to the negligence of the corresponding governments towards public capital stock (Sturm 1998). This is actually the reason for which EU focused its efforts on infrastructure projects from the early 1990s, especially for its less developed member-states.

Initially, the research effort focused on estimating a static single-equation production function. This approach is about regressing output on labour, private capital while public capital/ infrastructure enters as additional input since it considered to have an essential impact on multifactor productivity. The magnitude of this impact derives from the coefficient of the public capital variable, known as the elasticity. There are of course many variations in applying this method but the co-linearity problems caused by the nature of the data widespread the use of the log-linear Cobb-Douglas production function.

However, this approach has some impediments to overcome. By definition, the production function method refers to a single equation, which can be characterized as a rather static approach, not taking into consideration the simultaneity bias among the variables or the non-contemporaneous effects. On top of that, the causality issue remains a challenge. The latter arises between public capital and private output due to two different and contradictory components:

a) On the one hand, public capital has an impact on the private input demand, productivity, and production costs and therefore on production level. Put differently, when a government increases public investment outlays can cause a short-run demand for private inputs. Of course, higher public capital stock may stimulate the private investments return in the long-run. This is the case where public and private investments work in a complementary way (Buiter 1977, Erenburg 1993). **b)** On the other hand, private sector withdrawal which could reflect in higher unemployment rates could trigger a bold government intervention through major investment projects or a firms' initiative of constructing a road could mean less investment spending for the government. In this case, public and private investments work as a substitutes and it is when the «reverse causality» arises.

In order to overcome these econometric impediments, researchers came up with dual cost functions (or even profit functions) and the derived input demand systems. The basic idea behind this approach was that, under the assumption that firms produce a given output level at minimum cost, public capital, although an exogenous variable, could essentially affect private output and thus interfere with the firms' decisions. In this case, the impact of public capital on output could be estimated by the narrowing of production costs due to the increase of public capital provision, having the same meaning as the marginal product in the production function approach. This framework can lead to the estimation of the shadow price of public capital and can reveal the indirect impact of public capital on private inputs and generally the extent of the connections between inputs.

Nevertheless, the same obstacles as the production function remain. The «causality issue» is not resolved, since public capital is considered to be exogenous and thus causality could run both ways. Furthermore, the analysis provided by this method is still static, without addressing the non-contemporaneous effects, spurious correlation as well as nonstationarity and noncointegration challenges (Pereira and Andraz, 2013).

Researchers then focused on VAR models since they promise to address the above econometric challenges. The general belief is that through this framework new light can be shed on whether public capital is indeed essential for the economic activity, since it captures the comprehensive feedbacks among private inputs and public capital, including the dynamic impacts on all the inputs. This method actually allows for better estimations, since it can overtake the rejections of the null hypothesis arising from the static production function approach, which could in turn underestimate the impact of public capital/ infrastructure on the economic activity. VAR models actually work on the basis that the relationship between public and private capital is better described as a dynamic one.

As already described, public capital affects private production directly and indirectly. The latter can be noticed on private inputs. An increase in public capital can reduce private inputs demand but at the same time it can stimulate private inputs marginal productivity, shrink marginal costs of production and thus boost private output. If this is the case, then there will be an increase of public capital formation, often financed by the augmented tax revenues arising by the enhanced production and possible investments. At the end of the day, VAR models capture the impact of public capital on infrastructure by the accumulated impulse-response functions, including the dynamic interactions among the variables under consideration.

However, the VAR models do not come «error-free». The basic idea behind these models is that the level of the production technology determines output, according to the private inputs and the public capital involved. Public investment depends on a policy function which relates public capital formation and private inputs. Therefore, the estimated VAR model is indeed a reduced form of a dynamic model, i.e. production function, input demand and public policy functions, but even this approach is far from being characterized as perfect or forward looking. On top of that, possible exogenous shocks can influence the quality of the variables and results. Last but not least, there is the comparison obstacle against previous literature. VAR models estimates include all the changes that have taken place in each private sector variable because of a shock in public capital, while previous approaches were built on a rather «ceteris paribus» basis.

4.3 Pros and Cons of each econometric method

After examining many researches it is hard to say whether public capital has a substantial effect on private sector's output. The reasons are plenty. However, adopting different econometric techniques is an issue of vital importance for the quality of the results. All of the methods are subject to criticism.

The production function approach suffers from **a)** reverse causation doubts, **b)** restrictions which arise from the use of a Cobb-Douglas function and **c)** the time-series properties of the data usually distorts the interpretation of the results. Cost functions are more flexible than production functions but suffer from non-stationarity of the time-series and causality issues. For a VAR model approach, causality is not an issue. However, the lack of an explicit production function affects the accuracy of public capital's elasticity. On the contrary, reverse causation is a problem for cross-section growth regression technique. This method could also lead to biased estimations when several variables are omitted. Structural models method is based on imposing an effect of public capital on productivity. The accuracy of this effect is of vital importance for the results obtained.

Even if we were able to address all of the above issues and reach the conclusion that infrastructure has been actually productive during the past years, this does not surely means that it will continue the same way. Thus, we have to admit that still more research is needed in order to form a more clear and reliable picture in this field employing new data sets and modern econometric techniques, utilizing new computing technologies.

After considering all the above, we chose to estimate our model using a production function approach. In this way, we have the opportunity to estimate our new dataset using a method that could provide us with comparable results. In fact, we try to explore whether new, extended and more reliable data confirm or challenge previous results concerning the impact of infrastructure capital on growth. The data set refer to the regional (NUTS II) level for three Southern European countries, i.e. Greece, Italy and Spain over long periods of time.

4.4 Datasets for Greece

There has been a constant contact with the Hellenic Statistical Authority (EL.STAT) in order to provide us the necessary statistical data. Therefore, EL.STAT. did provide us with useful data but there were not error-free. In fact, the statistical service sent a dataset concerning the GDP per region, which was extending back until 1970, but it suffered from two serious structural breaks, in 1995 and in 2000, making thus the dataset not consistent.

This occurred due to the fact that until 1994 EL.STAT. had been following the «traditional» National Accounts System (OECD 1958) while during the period 1995 – 1999 it followed the European System of Accounts ESA – 1995. In 2000 the latter was replaced by the ESA -2010, which EL.STAT. had to follow and it has been following since then. Putting the data on a graph, the problem was more than obvious. For this reason, the provided dataset by EL.STAT. had to be left behind, since it would take tons of efforts and time to improve the dataset for a result which could be reasonably questioned in any time. Thus, we followed the idea provided by the Cambridge Econometrics European Regional Database which draws data from the European Commission's Urban and Territorial Dashboard Platform and used it thoroughly in order to obtain regional and «break-free» GDP datasets.

According to the official source, «the European Regional Database of Cambridge Econometrics is derived from the territorial dashboard of the European Commission's Joint Research Centre (ISPRA). This database is a wide-ranging, sub-national, pan-EU database of economic indicators, providing a complete and consistent, historical time series of data starting in 1980. With regional (NUTS 2 and 3) and sectoral disaggregation, it offers a unique database relevant to academic, policy and trend analysis. It is particularly useful for analysing historical regional trends across Europe, through econometric regression modelling or regional analysis. Researchers have used this data in analysis published in high-impact academic journals such as research policy, applied economics and regional studies». Therefore, Cambridge Econometrics Regional database/ European Commission's Database has been extensively used throughout this project and for all countries that was considered necessary.

In this context, the European Commission's Urban and Territorial Dashboard defines GDP as «Total Gross Value Added plus taxes less subsidies on products. Taxes and subsidies are taxes or subsidies payable (resp. receivable) per unit of some good or service produced or transacted. They include in particular value added taxes, taxes and duties on imports, and taxes such as stamp taxes on the sale of alcohol and tobacco. When calculating value added, output is valued at basic prices whereas intermediate consumption is valued at purchaser's prices, and thus the difference between taxes and subsidies on products has to be put on top of value added. The resulting GDP is then valued at market prices before being deflated to 2005 constant price Euros.»

Employment and (primary, secondary and tertiary) Education data per region were provided by EL.STAT. in regional level until 1988. The previous years until 1981 were also provided but in different geographical categories and not in the 13 modern regions. For this reason, we estimated the corresponding data based on the average share each region had during the first three years, i.e. 1998, 1989 and 1990, after the regions format change has taken place.

It is true that capital stock is considered to be of vital importance, since it is one of the basic production function inputs. Thus, the estimation of infrastructure capital impact on the economy cannot be analysed without capital stock data. In order to overcome the lack of such dataset, appropriate techniques have to be applied in order to construct measures of capital stock.

This gap has been noticed on time, thus forcing many developed countries to focus on building up capital stocks. Such evidence comes from Statistics Canada (2001), which suggested a methodology in order to produce measures of gross and net capital stock by industry for broad categories of components (assets). A few years later followed the US Department of Commerce and the Bureau of Economic Analysis (2003), which estimated the US stocks of private and government fixed assets and consumer durables for the 1925-1999 time period, as well as the underlying investment expenditures. There is of course the constantly improving Penn World Table (PWT 9.1) database which covers 182 countries during 1950-2017, along with explanatory details (Feenstra et.al. 2015), while a more general view can be derived from World Bank PPI Reports.

Despite all efforts made so far, the lack of internationally comparable datasets remain, since the available data comes from various sources and are produced under different methodologies (OECD, 2011). Therefore, the OECD actually recommends using all this data with caution, especially for international comparisons, due to the fact that the assumptions and corrections applied each time are far from making the datasets error-free.

The unavailability of reliable capital stock data on international level, which is considered as necessary for empirical research, focused the interest on various proxies for capital accumulation. Barro's gross investment rates as a proxy for physical accumulation of capital (Barro, 1991) can serve as a good example. Generally, the proxy approach is based on the Perpetual Inventory Method (PIM), a method accepted by many statistical authorities and followed by researchers, while it is quite common among the developed countries (Albala-Bertrand, 2010). Griliches (1980) constructed capital stock using data from 3-digit manufacturing industry in the USA, Nehru and Dhareshwhar (1993) worked for the same purpose using data from World's bank database and more recently Kamps (2006) used data from OECD's Analytical Database so as to end up with capital stock estimates.

Derbyshire et.al. (2013) took research a step further since they tried to estimate regional capital stock for each of the 27 EU member states on NUTS II level, using various sources and the PIM. Unfortunately, the method used for generating data for Greece and especially the base year estimates were based on capital-output ratios from «similar» countries, thus leading to relatively high capital stock in some Greek regions, while the lack of data could not produce a continuous time series. Therefore, the researchers concluded that «the estimates for Greece, Bulgaria and Malta should be recalculated using capital stock estimates from each country's national statistical office for the base-year once these become available.»

This actually leaves us with no statistical data concerning public (infrastructure) capital for Greece as well as with the obligation of constructing our own proxies. Real Infrastructure capital stock was indirectly derived from the Public Investment Programme (PIPR) during the 1972-2009 period. It was decided to stop the dataset at 2009 due to the fact that the prolonged and extremely harsh economic crisis has been hitting Greece disproportionally hard. According to Eurostat database, Greek product had been shrunk during the period 2008 to 2016 by 26,2% in real terms. The Public Investment Programme, directly connected to the performance of the economy, followed this rapid drop and thus, including those years to the analysis, could just seriously bias the estimation, without adding any further explanatory conclusions. For those interested in the development of public spending patterns in Greece during the pre-crisis period could read Psycharis (2008).

The data for PIPR for Greece were derived by the Ministry of Finance. The dataset for the period 2000-2009 was provided by the Ministry in electronic form while the dataset for the period 1972 – 1999 was available only in long paper sheets. Thus, it was necessary to visit the Ministry for a long period in order to copy these data and insert them to laptop, since there was no ability to use a photocopier. For a careful description of the PIPR included data concerning in the following categories:

- **i.** Fisheries
- **ii.** Forests
- **iii.** Roads
- **iv.** Ports
- **v.** Water-Sanitation
- **vi.** Education
- **vii.** Health-Welfare
- **viii.** Land Improvement
- **ix.** Housing
- **x.** Tourism
- **xi.** Prefectures Works
- **xii.** Olympic Projects
- **xiii.** Industry-Crafts
- **xiv.** Special Works

xv. Research
xvi. Training
xvii. Rails
xviii. Communications
xix. Airports
xx. Regional Programmes

All data concerning the PIPR were deflated to 2010 prices using the World's Bank Deflators (World Bank Database).

After considering all the above, we decided to employ the Perpetual Inventory Method (PIM) in order to construct data for public infrastructure capital for the NUTS II level of Greek regions. The idea behind the PIM describes the stock of capital as an inventory, which increases over time as the economy invests (accumulates capital formation). Once an investment is made, it provides returns to the economy, while the value of the investment depreciates as time goes by, by a certain rate. However, this value is never eliminated and this is why it is considered to have perpetual use (Berlemman and Wesselhöft, 2014).

Thus, the net capital stock at the initial period t, K_t, can be described as a function of the net capital stock of the previous period t-1, K_{t-1}, enhanced by the gross investment of the previous period I_{t-1} and reduced by the consumption of the previous period D_{t-1}, as described by many researchers (Kamps, 2006, Gupta et.al, 2014).

$$K_t = K_{t-1} + I_{t-1} - D_{t-1} \qquad (5.1)$$

If we assume that the depreciation rate is a constant rate d, we can rewrite equation (1) as:

$$K_t = (1-d)K_{t-1} + I_{t-1} \qquad (5.2)$$

If we keep substituting equation 2 for the capital stock at period t-1, Kt-1, then we extract the following equation:

$$Kt=\sum_{i=0}^{\infty} (1-d)^i I_{t-(i+1)} \qquad (5.33)$$

Equation (5.3) reveals that the capital stock at period t depends on the capital stock investments, weighted by the depreciation rate. We were based on this method using a 7% (Oulton and Wallis, 2016, Melachroinos and Spence, 2000) as depreciation rate. Of course, this approach requires a very long time series of previous investments.

We did not consider the steady state approach proposed by Harberger (1978) since we could not support the idea that the Greek economy is in its steady state. This approach however suggested that, according to neoclassical growth theory and under the assumption that the economy has reached its steady state, the output grows with the same pace as the capital stock. That is:

$$g_{GDP} = g_k = (K_t - K_{t-1})/(K_{t-1)} = I_t/K_{t-1} - d \qquad (5.4)$$

This actually can be described as:

$$Kt\text{-}1 = It/(g_{GDP} + d) \qquad (5.5)$$

We applied the Perpetual Inventory Method in our dataset as described by equation (5.3). In fact, we applied the equation (5.3) on two types of the Program of Public Investments set. Since the format of the Program disaggregates the data to the NUTS III level, we had to add up the corresponding NUTS III geographical areas in order to build the NUTS II (region) data. The first estimation included only the data we were absolutely certain that they were allocated to the specific NUTS III areas which formed the whole region. The second, incorporated investments that were allocated in brooder geographical areas, which belong to more than one NUTS II regions.

Finally, in order to fill in the private investment variable, we used as a good proxy the Gross Fixed Capital Formation (GFCF) data from the European Commission’s Urban and Territorial Dashboard. According to the source, the GFCF consists of «resident producers' acquisitions, less disposals, of fixed assets during a given period plus certain additions to the value of non-produced assets realised by the productive activity of producer or institutional units. Fixed assets are tangible or intangible assets produced as outputs from processes of production that are themselves used repeatedly, or continuously, in processes of production for more than one year. Disposals of fixed assets are treated as negative acquisitions. Current price GFCF is deflated to 2005 constant price Euros.»

4.5 Datasets for Italy

For Italy, the dataset for Gross Fixed Capital Formation (GFCF) was provided also by the European Commission’s Urban and Territorial Dashboard, as it was the case for Greece, following the above definition. That is, «GFCF consists of resident producers' acquisitions, less disposals, of fixed assets during a given period plus certain additions to the value of non-produced assets realised by the productive activity of producer or institutional units. Fixed assets are tangible or intangible assets produced as outputs from processes of production that are themselves used repeatedly, or continuously, in processes of production for more than one year. Disposals of fixed assets are treated as negative acquisitions. Current price GFCF is deflated to 2005 constant price euros.»

Unfortunately, we could not find reliable data for education. The official Statistical Office - Instituto Nazionale di Statistica – Istat has not a full education dataset in regional level. Instead, Istat could only provide regional education data decennially (once every ten years, 1971, 1981, 1991 etc.), and for this reason neither Eurostat could be of any help. Our contacts with the Italian Ministry of Education were also fruitless, since the level of data disaggregation referred to North East, North West, Central, South and Islands and not to regions. This is why estimations on Italian regions were conducted without regressing any educational data.

Access to datasets about regional product was easier since there has been a rich concern (Felice, 2009). However, data for the regional GDP, the Capital Stock and the Employment were provided for consistency reasons by the same source, CRENoS (Centre for North South Economic Research/ Centro Ricerche Economiche Nord Sud), a database of the University of Cagliari and the University of Sassari. This is a «rich and up-to-date territorial database containing data and indicators at regional, provincial, sub-provincial (Local Labor System) and municipal scale. The sources of the data are various: from official statistics (ISTAT) and from administrative sources (Bank of Italy, Unioncamere, etc.) in databases developed by CRENoS, in particular for macroeconomic variables (GDP, Value Added, Consumption, Investment and Employment). Given the available data, it is possible to develop socio-economic analysis aimed at identifying the characteristics of the territorial context of interest and the strengths and weaknesses.»

The regional GDP dataset was in 1995 constant prices. The capital stock for the Italian regions was derived by the CRENoS Databank on Public Capital and Infrastructure (Paci and Saddi, 2002). The dataset used included the following types of Public Capital:

- **i.** Roads and Airports
- **ii.** Railroad and alternative Transport
- **iii.** Maritime
- **iv.** Lake and Communications Infrastructures
- **v.** Public and Social Building
- **vi.** Hydraulics and Electrics
- **vii.** Sanitary Infrastructure and
- **viii.** Reclamation.

All the above infrastructure values were converted from liretas to euros at 1990 constant prices.

4.6 Datasets for Spain

The dataset concerning regional GDP, Employment and Education provided for Spain by the Instituto Nacional de Estadistica – INE, either suffered from structural breaks or the time series provided were too short. For this reason, the data used for our estimation, including those for the Gross Fixed Capital Formation (GFCF), were derived from the European Commission's Urban and Territorial Dashboard.

According to the above source, «GDP is defined as Total Gross Value Added plus taxes less subsidies on products. Taxes and subsidies are taxes or subsidies payable (resp. receivable) per unit of some good or service produced or transacted. They include in particular value added taxes, taxes and duties on imports, and taxes such as stamp taxes on the sale of alcohol and tobacco. When calculating value added, output is valued at basic prices whereas intermediate consumption is valued at purchaser's prices, and thus the difference between taxes and subsidies on products has to be put on top of value added. The resulting GDP is then valued at market prices before being deflated to 2005 constant price euros.»

In the same context, «GFCF consists of resident producers' acquisitions, less disposals, of fixed assets during a given period plus certain additions to the value of non-produced assets realised by the productive activity of producer or institutional units. Fixed assets are tangible or intangible assets produced as outputs from processes of production that are themselves used repeatedly, or continuously, in processes of production for more than one year. Disposals of fixed assets are treated as negative acquisitions. Current price GFCF is deflated to 2005 constant price euros.»

According to the European Commission's Urban and Territorial Dashboard, «Employment covers all persons engaged in some productive activity (within the production boundary of the national accounts). Employed persons are either employees (working by agreement for another resident unit and receiving remuneration) or self-employed (owners of unincorporated enterprises). Employment is a workplace based measure and therefore attributes people to the region in which they work rather than where they live. **Methodology**: Missing data is filled by scaling up data from sub-regions, extrapolation and interpolation. Manual fixes are implemented and the data is scaled to AMECO totals.»

However, the Education datasets were derived from (Eurostat Database for Education) and referred to students «in the ordinary school and university system, as defined in the International Standard Classification of Education (ISCED-1997). The data cover full- and part-time-students in public and private establishments. They cover school-based general education and vocational education/training (including combined school- and work-based programmes such as dual system apprenticeship). Exclusively (initial and continuing) work-based training is not included in the statistics».

The stock of the Net Public Capital was provided by the BBVA Foundation and Ivie (Valencian Institute of Economic Research) database. This BBVA Foundation «focuses its activity on the analysis of emerging issues in five strategic areas: Environment, Biomedicine and Health, Economy and Society, Basic Sciences and Technology, and Culture.» The Ivie Institute is a center devoted to developing, fostering and projecting economic research at a national and international level, founded in 1990 by the Valencian Regional Government. Today, it is being supported by Bankia, the BBVA Foundation, the Caja Mediterráneo Foundation, Ford-España, the Cajas de Ahorros Foundation and the Cañada Blanch Foundation. It conducts its research projects in close collaboration with universities in the Valencian region (University of Valencia with which Ivie is officially associated, the University of Alicante and the Jaume I University). The Net Public Capital Stock used in regressions in constant 2005 prices includes:

- **i.** Road Infrastructure
- **ii.** Hydraulic Infrastructure
- **iii.** Railway Infrastructure of the Public Administration and other Entities
- **iv.** Airport Infrastructure of the Public Administration and other Entities
- **v.** Port Infrastructures
- **vi.** Urban Infrastructure
- **vii.** Public Education

- **viii.** Public Health and
- **ix.** Other investments of the Public Administration

It has to be noted that this database covers a period of more than 100 years (1900-2012) and the series are disaggregated by investment agents, public expenditure functions, autonomous communities and provinces. This is an undoubtedly rich database which allows in depth analysis. Therefore, it shows the developments of public capital in Spain and in particular in its regions (and provinces) during a long period of time, regardless of the economic crisis that had been hitting the economy up to 2012.

Chapter 5
Public Infrastructure Capital in Southern Europe: A Production Function Approach

5.1 Introduction

During our effort to shed some new light on the impact of infrastructure capital on economic performance we applied several models and approaches. For this purpose we used the open-source statistical package «GRETL» (Gnu Regression, Econometrics and Time-series Library) and imported our datasets in Excel files. We then focused our interest on the models and estimation techniques which presented the best properties and led to the most reliable results.

When it comes to panel/cross sectional time series data, the most commonly estimated models are probably fixed effects and random effects models. There are also used population-averaged models and mixed effects models but more rarely. In this case, we use Random Effect Models since (Allison, 2009):

- Fixed Effects models work better when there are omitted variables which are correlated with the variables in the model. The reason is that Fixed Effects serve as a tool for controlling the bias arising from the omitted variables since the whatsoever effects of the latter today will be the same/ remain constant («fixed») in the future. So, in order to use Fixed Effects models the values have to remain constant (e.g. gender) and to have the same effect over time
- If there is little variability within subjects then the Fixed Effects models suffer from high standard errors. On the other hand, Random Effects models have usually lower standard errors, although their coefficients might be proven biased.

Both models where tested and we concluded that the Random Effects models best suits our datasets. The models for each country are being developed as following.

5.2 Estimations for Greece

5.2.1 Random Effects – No use of Lags

As it is well known in economics, the Cobb-Douglas production function has been widely used in order to represent the relationship of an output to inputs. It was proposed by Knut Wicksell but Charles Cobb and Paul Douglas were the first to test it against statistical evidence concerning the growth of the American economy (Cobb and Douglas, 1928). Although the form of this production function was quite simple, since it included only the labour force in the economy and the physical capital, its results were proven to be surprisingly accurate. In order to estimate the effects of public infrastructure on economic growth on the basis of regional data, we used a type Cobb-Douglas production function without steady returns to scale of the following form (5.1):

$$Y = a * A \ln K_t + b * \ln L_t + g_1 * RPS_t + g_2 * RT_t + g_3 * \ln PC_t + g_4 * T_t , \qquad (5.1)$$

where:

- **Y:** Gross Domestic Product at constant prices and at regional level (dependent variable)
- **K:** private capital (investment) at constant prices and at regional level
- **L:** Labour Force at regional level
- **RPS:** Primary and Secondary Education graduates at regional level
- **RT:** Tertiary Education graduates at regional level
- **PC:** Public Capital at constant prices and at regional level
- **A:** Total factor productivity
- **T:** Time trend capturing technological progress
- **a, b, g1, g2, g3 and g4 unknown parameters**
- The Human Capital i.e. Primary, Secondary and Tertiary Education graduates enter the function as shares of the Labour Force.

The estimation was made with the help of the Generalized Least Squares (GLS) in order to avoid the correlation between the residuals in the regression model (Baltagi, 2005). At this stage, we did not employ any time-effects. Our dataset consisted of 377 observations (13 Greek regions x 29 years). The regression showed as statistically significant/ important for the production function:

Table 5.1: Interpretation of Key Results for Greece (without the use of Lags)

- the **Private Capital** (investments), K, with an elasticity of **0,24**
- the **Tertiary Education Graduates**, RT, with an elasticity of **0,45**
- the **Labour Force**, L, with an elasticity of **0,52**
- **the Public Capital**, PC, with an elasticity of **0,13**

However, the Primary and Secondary Education graduates, RPS do not seem to be statistical important.

Among the statistical tests and criteria it is worth noting that the Residuals Sum of Squares equals to 13,55, the Akaike criterion equals to – 169,99 and the Durbin-Watson 0,36.

The amount of variance in a dataset which is not captured by the regression model is being measured by the Residual Sum of Squares (RSS). Put differently, the RSS reveals the error still remaining among the regression function and the data or how well a regression model actually explains the data. Of course, the lowest values of the RSS imply higher explanatory power of the model.

The Akaike Information Criterion (AIC) actually estimates prediction errors using information from the sample/ dataset and therefore it is considered as a quality measure of the statistical model and can be very helpful in model selection. In fact, the AIC sheds some light on the trade-off relationship between how good a model fits the data and the simplicity of the model (Enders, 2004). The lowest the Akaike criterion value the better the model fits the data.

Full Econometric Results for Greece: Random Effects – Without the of Lags

Model: Random Effects (GLS), using 377 observations

13 Cross-sectional units were included

Time series size = 29

Dependent Variable: l_Y

Beck-Katz standard errors

Table 5.2: Key Econometric Results for Greece (without the use of Lags)

	Coefficient	stan. error	z	p-value	
const	9,92976	3,90680	2,542	0,0110	**
l_K	0,241080	0,0249371	9,668	4,14e-022	***
RT	0,447867	0,170287	2,630	0,0085	***
RPS	−0,0142090	0,0433970	−0,3274	0,7434	
l_L	0,516176	0,0534926	9,649	4,94e-022	***
l_PC	0,125065	0,0285091	4,387	1,15e-05	***
YEAR	−0,00109912	0,00211836	−0,5189	0,6039	

Table 5.3: Basic Econometric Properties of the Estimation Model for Greece (without the use of lags)

Mean Depen. Variab.	15,75210	S.D. depen. Variab.	0,900197
Resid. Sum of Squares	13,54917	S.E. regression	0,191104
Log.-probability	91,99603	Akaike criterion	−169,9921
Schwarz criterion	−142,4663	Hannan-Quinn	−159,0664
p	0,822518	Durbin-Watson	0,364320

Notes on abbreviations of Model statistics:
S.D.: standard deviation
S.E.: standard error

'Between treatments' variance = 0,0241312
'Within treatments' variance = 0,00497099
theta which was used during the partial pooling (quasi-demeaning) = 0,916016
corr(y,yhat)^2 = 0,973002

Joint test on the selected regressors -
Asymptotic statistical test: χ-square (6) = 3495,72
with p-value = 0

Breusch-Pagan test -
Null hypothesis: Variation of cross-sectional errors = 0
Asymptotic statistical test: χ-square (1) = 2508,68
with p-value = 0

Hausman test -
Null hypothesis: The GLS estimators are consistent
Asymptotic statistical test: χ-square (5) = 49,1198
with p-value = 2,09763e-009

5.2.2 Random Effects with the use of Lags

A common practice in econometrics is to replace potential endogenous variable with their lagged values. This rather widespread approach aims to avoid low quality instrumental variables and also control for potential biases arising from simultaneity or even reverse causation. We followed this approach and regressed again our model. Therefore, in order to estimate again the effects of public infrastructure on the economy we employed the same simple Cobb – Douglas type production function, on the basis of regional data, without steady returns to scale of the following form (5.2):

$$Y = a * A \ln K_{t-1} + b * \ln L_{t-1} + g_1 * RPS_{t-1} + g_2 * RT_{t-1} + g_3 * \ln PC_{t-1} + g_4 * T_{t-1}, \quad (5.2)$$

Where

- **Y:** Gross Domestic Product at constant prices and at regional level (dependent variable)
- **K:** private capital (investment) at constant prices and at regional level
- **L:** Labour Force at regional level
- **RPS:** Primary and Secondary Education graduates at regional level
- **RT:** Tertiary Education graduates at regional level
- **PC:** Public Capital at constant prices and at regional level
- **A:** Total factor productivity
- **T:** Time trend capturing technological progress
- **a, b, g1, g2, g3 and g4 unknown parameters**
- The Human Capital i.e. Primary, Secondary and Tertiary Education graduates enter the function as shares of the Labour Force.

The estimation was also made with the help of the Generalized Least Squares (GLS) in order to avoid the correlation between the residuals in the regression model (Baltagi, 2005). At this stage, we did not employ any time-effects. Our dataset consisted of 364 observations (13 Greek regions x 28 years). The regression showed as statistically significant/ important for the production function:

Table 5.4: Interpretation of Key Results for Greece (with the use of Lags)

- the **Private Capital** (investments), K, with an elasticity of **0,20**
- the **Labour Force**, L, with an elasticity of **0,58**
- the **Public Capital**, PC, with an elasticity of **0,14**

However, the Primary and Secondary Education Graduates, RPS, as well as the Tertiary Education graduates, RT, do not seem to be statistical important.

Among the statistical tests and criteria it is worth noting that the Residuals Sum of Squares equals to 12,10, the Akaike criterion equals to – 192, 13 and the Durbin-Watson 0,49.

Therefore, these results, derived from the model using lag variables, seem to have better characteristics compared to the previous one. This conclusion is based on the fact that the Residual Sum of Squares (RSS) is lower, i.e. this regression model actually better explains the data. The Akaike Information Criterion’s (AIC) value is also lower, which implies that the latter model actually fits better the data. Finally, the Durbin Watson test’s value (0,49) is a little bit higher and closer to the value of 2, which indicates the absence of autocorrelation, but remains a source of concern.

Full Econometric Results for Greece: Random Effects with the use of Lags

Model No 14: T Random Effects (GLS), using 364 observations

13 Cross-sectional units were included

Time series size = 28

Dependent Variable: l_Y

Beck-Katz standard errors

Table 5.5: Key Econometric Results for Greece (with the use of Lags)

	coefficient	stan. error	z	p-value	
const	8,63976	4,50643	1,917	0,0552	*
l_K_1	0,196533	0,0303752	6,470	9,79e-011	***
RT_1	0,409135	0,201808	2,027	0,0426	**
RPS_1	0,100248	0,0542678	1,847	0,0647	*
l_L_1	0,576487	0,0611392	9,429	4,14e-021	***
l_PC_1	0,147603	0,0377030	3,915	9,04e-05	***
YEAR	−0,000527371	0,00241106	−0,2187	0,8269	

Table 5.6: Basic Econometric Properties of the Estimation Model for Greece (with the use of Lags)

Mean Depen. Variab.	15,75964	S.D. depen. Variab.	0,899738
Resid. Sum of Squares	12,09726	S.E. regression	0,183824
Log.-probability	103,0661	Akaike criterion	−192,1323
Schwarz criterion	−164,8522	Hannan-Quinn	−181,2897
p	0,754467	Durbin-Watson	0,489996

Notes on abbreviations of Model statistics:
S.D.: standard deviation
S.E.: standard error

'Between treatments' variance = 0,0265016
'Within treatments' variance = 0,00600589

theta which was used during the partial pooling (quasi-demeaning) = 0,910397
corr(y,yhat)^2 = 0,973002

Joint test on the selected regressors -
Asymptotic statistical test: χ-square (6) = 1647,43
with p-value = 0

Breusch-Pagan test -
Null hypothesis: Variation of cross-sectional errors = 0
Asymptotic statistical test: χ-square (1) = 2241,61
with p-value = 0

Hausman test -
Null hypothesis: The GLS estimators are consistent
Asymptotic statistical test: χ-square (5) = 33,3295
with p-value = 3,23694e-006

5.3 Estimations for Italy

5.3.1 Fixed Effects – No use of Lags[1]

This time, we applied the above type of Cobb-Douglas production function to Italy, so as to estimate the effects of public infrastructure on economic growth using regional data. Despite our efforts, we observed a lack of reliable time series data concerning the three education levels (primary, secondary and tertiary) for the Italian regions. This alteration had two consequences: **a)** The first was to rewrite the estimation equation in the right form (5.3), writing off the education variables (RPS and RT) and **b)** the second to follow a different econometric approach (Fixed Effects), fully utilizing this model's properties. It is worth noting that the Fixed Effects estimator is consistent even in the presence of correlation between the random error component and any of the explanatory variables (Hill et. al. 2008).

$$Y = a * A \ln K_t + b * \ln L_t + g_1 * \ln PC_t + g_2 * T_t, \qquad (5.3)$$

Where:

- **Y:** Gross Domestic Product at constant prices and at regional level (dependent variable)
- **K:** private capital (investment) at constant prices and at regional level
- **L:** Labour Force at regional level
- **PC:** Public Capital at constant prices and at regional level
- **A:** Total factor productivity
- **T:** Time trend capturing technological progress
- **a, b, g1, g2, g3 and g4 unknown parameters**

The use of Generalized Least Squares (GLS) prevented the correlation between the residuals in the regression model (Baltagi, 2005). Our dataset consisted of 480

[1] We also employed time effects (Wooldridge, 2013).

observations (20 Italian regions x 24 years). The regression showed as statistically significant/ important for the production function:

Table 5.7: Interpretation of Key Results for Italy (without the Use of Lags)

- the **Private Capital** (investments), K, with an elasticity of **0,623**
- **the Public Capital**, PC, with an elasticity of **0,021**

However, the Labour Force was not found statistically significant.

Among the statistical tests and criteria it is worth noting that the Residuals Sum of Squares equals to 2,117 the Akaike criterion equals to – 1.177,23 and the Durbin-Watson 0,143.

The Residual Sum of Squares (RSS) indicates the amount of variance in a dataset which is not captured by the regression model. In other words, the RSS reveals the error still remaining among the regression function and the data or how good is the regression model in actually explaining the data. Of course, this low values of the RSS implies high explanatory power of the model.

The Akaike Information Criterion (AIC) is a measure of the quality of the model and it can be used as a criterion when it comes to the selection between two or more models. It works through estimating prediction errors by utilizing information from the sample or dataset. What the AIC actually does is describing reliably the trade-off relationship between how good a model interprets the data and the simplicity of the model (Enders, 2004). As expected, the lower values of the Akaike criterion are more preferable since in this case the model fits the data better.

Full Econometric Results for Italy: Fixed Effects without the Use of Lags

Model: Fixed Effects, using 480 observations

20 Cross-sectional units were included

Time series size = 24

Dependent Variable: l_Y

Beck-Katz standard errors

Table 5.8: Key Econometric Results for Italy (without the use of Lags)

	coefficient	stan. error	t-ratio	p-value	
const	6,37055	0,856739	7,436	4,88e-07	***
l_PC	0,0213607	0,00340142	6,280	4,98e-06	***
l_K	0,623428	0,0290001	21,50	8,54e-015	***
l_L	0,0885776	0,129385	0,6846	0,5019	

Table 5.9: Basic Econometric Properties of the Estimation Model for Italy (without the use of Lags)

Mean Depen. Variab.	17,11134	S.D. depen. Variab.	1,071581
Resid. Sum of Squares	2,117013	S.E. regression	0,068742
LSDV R-square	0,996151	Inside R-squar.	0,747046
Log.-probability	620,6167	Akaike criterion	−1177,233
Schwarz criterion	−1043,672	Hannan-Quinn	−1124,733
p	0,879041	Durbin-Watson	0,142758

Notes on abbreviations of Model statistics:
S.D.: standard deviation
S.E.: standard error

Joint test on the selected regressors -
Statistical test: F(12, 19) = 62,7455
with p-value = P(F(12, 19) > 62,7455) = 1,14424e-012

Reliable test on various constants per group
Null Hypothesis: The groups have one common fixed term
Statistical test: Welch F(19, 169,0) = 47,4385
with p-value P(F(19, 169,0) > 47,4385) = 1,40155e-057

5.3.2 Fixed Effects with the use of Lags[2]

We could not avoid re-estimating the model by replacing potential endogenous variables with their lagged values. This approach helps us to avoid low quality instrumental variables and could also be proven useful in controlling for potential biases, which usually arise from simultaneity or even reverse causation. Thus, we employed the same simple Cobb – Douglas type production function, using regional data (noting the lack of data for education in Italian regions), without steady returns to scale of the following form (5.4):

$$Y = a * A \ln K_t + b * \ln L_t + g_1 * \ln PC_t + g_2 * T_t, \qquad (5.4)$$

where:

- **Y:** Gross Domestic Product at constant prices and at regional level (dependent variable)
- **K:** private capital (investment) at constant prices and at regional level
- **L:** Labour Force at regional level
- **PC:** Public Capital at constant prices and at regional level
- **A:** Total factor productivity
- **T:** Time trend capturing technological progress
- **a, b, g1, g2, g3 and g4 unknown parameters**

The estimation was also conducted with the help of the Generalized Least Squares (GLS) in order to avoid the correlation between the residuals in the regression model (Baltagi, 2005). Our dataset consisted of 460 observations (20 Italian regions x 23

[2] We also employed time effects

years). The regression showed as statistically significant/ important for the production function:

Table 5.10: Interpretation of Key Results for Italy (with the use of Lags)

- the **Private Capital** (investments), K, with an elasticity of **0,623**
- the **Public Capital**, PC, with an elasticity of **0,021**

We remind that the lack of data prevented us on estimating the impact of the Primary and Secondary Education Graduates and that of the Tertiary Education graduates on growth. However, the Labour Force does not seem to be statistical important.

Among the statistical tests and criteria it is worth noting that the Residuals Sum of Squares equals to 2,296, the Akaike criterion equals to – 1.068,6 and the Durbin-Watson 0,218.

Therefore, these results, derived from the model using lag variables, do not seem to have better characteristics compared to the previous one. This conclusion is based on the fact that the Residual Sum of Squares (RSS) are slightly higher, which implies that the no-lag model probably explains the data a bit better. The Akaike Information Criterion's (AIC) value is indeed low but higher compared to the no-lag regression model, which implies that the latter model actually fits better the data. Finally, the Durbin Watson test's value (0,218) is a little bit higher and closer to the value of 2, which indicates the fact that the lag-model behaves better concerning the autocorrelation challenge, but surely remains as a source of concern.

Full Econometric Results for Italy: Fixed Effects with the Use of Lags

Model: Fixed Effects, using 460 observations

20 Cross-sectional units were included

Time series size = 23

Dependent Variable: l_Y

Beck-Katz standard errors

Table 5.11: Key Econometric Results for Italy (with the use of Lags)

	coefficient	stan. error	t-ratio	p-value	
const	7,50561	1,00987	7,432	4,91e-07	***
l_PC_1	0,0210046	0,00396418	5,299	4,10e-05	***
l_K_1	0,623341	0,0391617	15,92	1,93e-012	***
l_L_1	−0,0790254	0,140587	−0,5621	0,5806	

Table 5.12: Basic Econometric Properties of the Estimation Model for Italy (with the use of Lags)

Mean Depen. Variab.	17,12014	S.D. depen. Variab.	1,071608
Resid. Sum of Squares	2,295940	S.E. regression	0,073242
LSDV R-square	0,995644	Inside R-squar.	0,693122
Log.-probability	566,3076	Akaike criterion	−1068,615
Schwarz criterion	−936,4160	Hannan-Quinn	−1016,558
p	0,824211	Durbin-Watson	0,218229

Notes on abbreviations of Model statistics:
S.D.: standard deviation
S.E.: standard error

Joint test on the selected regressors -
Statistical test: F(12, 19) = 29,6334
with p-value = P(F(12, 19) > 29,6334) = 9,74221e-010

Reliable test on various constants per group
Null Hypothesis: The groups have one common fixed term
Statistical test: Welch F(19, 161,6) = 38,2462
with p-value P(F(19, 161,6) > 38,2462) = 6,40169e-050

5.4 Estimations for Spain

5.4.1 Random Effects – No use of Lags

We worked in the same context, for Spain in order to estimate the impact of public infrastructure on economic growth. We used data on regional level and of course the above type Cobb-Douglas production function without steady returns to scale of the following form (5.5):

$$Y = a * A \ln K_t + b * \ln L_t + g_1 * RPS_t + g_2 * RT_t + g_3 * \ln PC_t + g_4 * T_t, \qquad (5.5)$$

where:

- **Y:** Gross Domestic Product at constant prices and at regional level (dependent variable)
- **K:** private capital (investment) at constant prices and at regional level
- **L:** Labour Force at regional level
- **RPS:** Primary and Secondary Education graduates at regional level
- **RT:** Tertiary Education graduates at regional level
- **PC:** Public Capital at constant prices and at regional level
- **A:** Total factor productivity
- **T:** Time trend capturing technological progress
- **a, b, g1, g2, g3 and g4 unknown parameters**
- The Human Capital i.e. Primary, Secondary and Tertiary Education graduates enter the function as shares of the Labour Force.

Again, we employed the Generalized Least Squares (GLS) approach so as to avoid the correlation between the residuals in the regression or heteroscedastic challenges (Koutsoyiannis, 1977). This time, we insisted in including data for education too. This narrowed our data to 17 regions instead of 19 (we had to exclude the regions of Ceuta and Melilla) and 15 years, since this was the period and regions with full data availability. In this model we did not use time-effects. Our dataset consisted of 255 observations (17 Spanish regions x 15 years). The regression showed as statistically significant/ important for the production function:

Table 5.13: Interpretation of Key Results for Spain (without the use of Lags)

- the **Private Capital** (investments), K, with an elasticity of **0,24**
- **the Public Capital**, PC, with an elasticity of **0,52**

However, the Primary and Secondary Education graduates, RPS do not seem to be statistical important while the Tertiary Education graduates (RT) seem to be statistically important but with strongly negative impact on growth. This result may occur due to bad education data quality for the Spanish regions, but it had been noticed again, this time for Italian Regions (Di Liberto, 2008).

Among the statistical tests and criteria it is worth noting that the Residuals Sum of Squares equals to 26,29, the Akaike criterion equals to 156,25 and the Durbin-Watson 0,40.

The Residual Sum of Squares (RSS) actually captures the amount of variance in a dataset which is not captured by the regression model. In other words, the RSS reveals the error which still remains in the estimation or how well a regression model actually explains the data. Of course, the lowest values of the RSS imply higher explanatory power of the model.

The Akaike Information Criterion (AIC) is considered as a quality measure of the statistical model and can be used in the selection process among various models. The AIC is actually derived on the basis of prediction errors using information from the sample/ dataset. In fact, this criterion clarifies the trade-off relationship between how good a model fits the data and the simplicity of the model. Of course, the lowest values of the AIC are imply better model fitting.

Full Econometric Results for Spain: Random Effects – Without the of Lags

Model: Random Effects (GLS), using 255 observations

17 Cross-sectional units were included

Time series size = 15

Dependent Variable: l_Y

Beck-Katz standard errors

Table 5.14: Key Econometric Results for Spain (without the use of Lags)

	coefficient	stan. error	z	p-value	
const	13,6757	4,29739	3,182	0,0015	***
RPS	0,00584200	0,0822506	0,07103	0,9434	
RT	−0,631898	0,199060	−3,174	0,0015	***
l_PC	0,520226	0,0646044	8,052	8,11e-016	***
l_K	0,244118	0,0159079	15,35	3,79e-053	***
YEAR	−0,00453473	0,00267005	−1,698	0,0894	*

Table 5.15: Basic Econometric Properties of the Estimation Model for Spain (without the use of Lags)

Mean Depen. Variab.	17,36458	S.D. depen. Variab.	0,914350
Resid. Sum of Squares	26,28689	S.E. regression	0,324265
Log.-probability	−72,12468	Akaike criterion	156,2494
Schwarz criterion	177,4969	Hannan-Quinn	164,7960
p	0,770192	Durbin-Watson	0,402155

Notes on abbreviations of Model statistics:

S.D.: standard deviation

S.E.: standard error

'Between treatments' variance = 0,00720621

'Within treatments' variance = 0,00045702

theta which was used during the partial pooling (quasi-demeaning) = 0,935114

corr(y,yhat)^2 = 0,957448

Joint test on the selected regressors -

Asymptotic statistical test: χ-square (5) = 3680,47

with p-value = 0

Breusch-Pagan test -

Null hypothesis: Variation of cross-sectional errors = 0

Asymptotic statistical test: χ-square (1) = 379,35

with p-value = 1,72358e-084

Hausman test -

Null hypothesis: The GLS estimators are consistent

Asymptotic statistical test: χ-square (4) = 1009,97

with p-value = 2,46381e-217

5.4.2 Random Effects with the Use of Lags

In order to confront the challenge arising from low quality instrumental variables and also to control for potential biases arising from simultaneity or even reverse causation, we replaced potential endogenous variables with their lagged values. This is a common practise in econometrics and allowed us to get more reliable results. Thus, we run again our regression, employing the same Cobb – Douglas type function without steady returns to scale, as well as data from Spanish regions, in order to estimate the impact of public infrastructure on the Spanish economy. Our function had the following form (5.6):

$$Y = a * A \ln K_{t-1} + b * \ln L_{t-1} + g_1 * RPS_{t-1} + g_2 * RT_{t-1} + g_3 * \ln PC_{t-1} + g_4 * T_{t-1}, \quad (5.6)$$

Where

- **Y:** Gross Domestic Product at constant prices and at regional level (dependent variable)
- **K:** private capital (investment) at constant prices and at regional level
- **L:** Labour Force at regional level
- **RPS:** Primary and Secondary Education graduates at regional level
- **RT:** Tertiary Education graduates at regional level
- **PC:** Public Capital at constant prices and at regional level
- **A:** Total factor productivity
- **T:** Time trend capturing technological progress
- **a, b, g1, g2, g3 and g4 unknown parameters**
- The Human Capital i.e. Primary, Secondary and Tertiary Education graduates enter the function as shares of the Labour Force.

We basically followed the same approach working with the help of the Generalized Least Squares (GLS) in order to avoid the correlation between the residuals in the regression model, without employing time effects. The lack of a full set concerning education data for the regions of Ceuta and Melilla forced us to exclude them from the regression. Our dataset consisted of 238 observations (17 Spanish regions x 14 years). The regression showed as statistically significant/ important for the production function:

Table 5.16: Interpretation of Key Results for Spain (with the use of Lags)

- the **Private Capital** (investments), K, with an elasticity of **0,26**
- the **Public Capital**, PC, with an elasticity of **0,60**

Again, the Primary and Secondary Education Graduates, RPS did not seem to be statistical important. On the contrary, the Tertiary Education graduates (RT) showed statistical significant impact on growth, which, unfortunately, was negative. However, and assuming that the quality of this dataset was at acceptable levels, this behaviour has been also noticed on regional level for other countries too.

Among the statistical tests and criteria it is worth noting that the Residuals Sum of Squares equals to 16,27, the Akaike criterion equals to 48,89 and the Durbin-Watson 0,64.

Therefore, these results, derived from the model using lag variables, indicate that the latter model has generated estimates with better and more favourable characteristics compared to the non-lag model. This conclusion is being supported by the fact that the Residual Sum of Squares (RSS) are lower, which means that this regression model actually better explains the data. The Akaike Information Criterion's (AIC) value is also lower, which proves that the model with lags actually fits better the data. Finally, the Durbin Watson test's value (0,64) is a little bit higher and closer to the value of 2, thus implying that the model with lags behaves in a better way when it comes to autocorrelation challenges, but the latter remain a source of concern.

Full Econometric Results for Spain: Random Effects – With the use of Lags

Model: Random Effects (GLS), using 238 observations

17 Cross-sectional units were included

Time series size = 14

Dependent Variable: l_Y

Beck-Katz standard errors

Table 5.17: Key Econometric Results for Spain (with the use of Lags)

	coefficient	stan. error	z	p-value	
const	33,2816	4,53741	7,335	2,22e-013	***
RPS_1	−0,117047	0,126221	−0,9273	0,3538	
RT_1	−0,976690	0,310363	−3,147	0,0016	***
l_PC_1	0,599527	0,0577749	10,38	3,16e-025	***
l_K_1	0,257589	0,0227830	11,31	1,22e-029	***
YEAR	−0,0150576	0,00269579	−5,586	2,33e-08	***

Table 5.18: Basic Econometric Properties of the Estimation Model for Spain (with the use of Lags)

Mean Depen. Variab.	17,37975	S.D. depen. Variab.	0,913537
Resid. Sum of Squares	16,27090	S.E. regression	0,264258
Log.-probability	−18,44317	Akaike criterion	48,88634
Schwarz criterion	69,71996	Hannan-Quinn	57,28266
p	0,634250	Durbin-Watson	0,644499

Notes on abbreviations of Model statistics:

S.D.: standard deviation

S.E.: standard error

'Between treatments' variance = 0,00662197

'Within treatments' variance = 0,000605649

theta which was used during the partial pooling (quasi-demeaning) = 0,919436

corr(y,yhat)^2 = 0,960456

Joint test on the selected regressors -

Asymptotic statistical test: χ-square (5) = 959,468

with p-value = 3,57604e-205

Breusch-Pagan test -

Null hypothesis: Variation of cross-sectional errors = 0

Asymptotic statistical test: χ-square (1) = 320,167

with p-value = 1,3323e-071

Hausman test -

Null hypothesis: The GLS estimators are consistent

Asymptotic statistical test: χ-square (4) = 1165,76

with p-value = 4,21258e-251

Chapter 6
Conclusions

6.1 Introduction

Undoubtedly, the so called «Infrastructure Puzzle», i.e. the kind of relationship between public infrastructure capital and economic growth, is still of great interest. The reason for characterizing this relationship as a puzzle derives from the extremely complex framework among public infrastructure capital and economic growth. This kind of capital can be important for some aspects of the economic activity, such as private sector's industrial output, but not for the non- manufacturing part of the economy. On top of that, there are a lot of other fields that can influence the impact of infrastructure capital on growth, like the time period examined since the effects, if any, cannot be detected over short time periods, the spatial level analysed, the level of the output (spatial groups with poorer output present higher impact of infrastructure), the type of infrastructure capital (the productive one had an impact on private cost while the social one had not) (Rovolis, 1999).

This is exactly the source of the dispute. Although it sounds quite reasonable that public investment on infrastructure is of great importance for economic growth, there are also voices which challenge this theory. The challenges arise from the empirical research and debate, based on the fact that there is no consensus on the size of the impact of Infrastructure on growth. Furthermore, the effect differs depending on the area examined each time or the (time) size of the sample, the method followed and the econometrics, or even the kind of infrastructure capital examined. On top of that, issues like the complementarity (or substitutability) of public capital and other productive factors have not yet been addressed (Marrocu & Paci, 2010).

Put differently, the positive, for infrastructure importance, effects have to confront the reasonable arguments and evidence of the opposite side. This means that the results are mixed and present significant variations according to the period examined each time, the country under analysis, the empirical method used, the length and the reliability of the dataset, the spatial level put on the spot, the initial endowments of capital, the level of income, the time reference, the quality of the dataset etc. After all, this inconclusive nature of the literature was actually the motivation for this thesis.

6.2 Key Concluding Results

This thesis reaches the conclusion that the Infrastructure Capital is actually statistically significant for economic growth. The employment of a Cobb – Douglas type production function approach based on regional data showed results which are in favour of positive infrastructure effects (Table 6.1). Of course, extra attention is required when it comes to international comparisons since each country has its own social and economic characteristics along with different development patterns and structures.

Table 6.1: Infrastructure Elasticities in Southern European countries

Country	**Infrastructure's Elasticities**	
	Without the use of Lags	**With the use of Lags**
Greece	0,13	0,14
Italy	0,021	0,021
Spain	0,52	0,60

The results for Greece seem quite reasonable (Infrastructure elasticity ranges between 0,13-0,14). They are very close to that of Rovolis (1999), which reached 0,20 for public infrastructure for the whole Greece. They remain in accordance with Mamatzakis results (1999b and 2007) and also Rovolis and Spence (2002) for the Greek manufacturing, although they referred to the cost saving impact. However, they are far below of a considerable body of literature such as the research of Dalamagas (1995) (0,53 but only after allowing for budget deficits), or Segoura and Christodoulakis (1997), whom estimates of elasticity reached 0,4, for the big Greek manufacture.

At this point and in order to draw safer conclusions, three special properties of the Public Investment Programme (PIPR), which was actually used as a proxy for estimating public infrastructure capital, have to be underlined (Lambrinidis et. al. 2001): **1.** The amount of the PIPR actually underestimates the real amount of Public Investment heading to Infrastructure Capital, since Investments undertaken by Public Utility Organisations («DEKO») and Local Administration Authorities («OTA») are not included. **2.** The spatial distribution of PIPR to NUTS III level («nomous») leaves a significant part of it unaddressed, thus reducing its exact determination in sub-regional and regional level. **3.** The time series data is constrained, since it starts at year 1972.

The results for Italy suggest that Infrastructure Capital positively affects economic growth but to a very limited extent. Of course, the lack of data for education might influence the results, but this cannot justify the size of infrastructure elasticity for Italy. Furthermore, the discussion concerning the impact of Infrastructure on economic growth taking the under consideration the differences between North and South is a long one (Iuzzolino et. al., 2011, Felice and Vecchi, 2015). Of course, there is always a body of literature which does not assess Infrastructure as a significant factor for growth in Italy (Aiello and Scoppa, 2008), or presents mixed results about public spending depending on the level of spatial analysis (Daniele, 2009).

Shedding some new light on the role of infrastructure capital in Italy, a solid group of research does support a positive effect of this kind of capital on productivity, but under specific preconditions. Acconia and Del Monte (1999) concluded that there is a positive relationship between regional growth and infrastructure capital. This result mainly holds for the manufacturing sector, especially for the low-income regions, with elasticities values similar to those of this thesis (they range from to 0,001 in the total economy to 0,072 for manufacture in low income regions).

On the same wavelength with this thesis, Mastromarco and Woitek (2006) came to the conclusion that the effect of the core-infrastructure investment on efficiency is always positive but that of the non-core is positive only in the North and negative in the South of Italy, thus almost offsetting each other. They suggested that a 10% raise in infrastructure investment improves efficiency by 4%, if it concerns core infrastructure, and reduces by 4% the efficiency, when it refers to the non-core. These results imply that the category of infrastructure investment is essential for the kind of impact on efficiency, for which the elasticity for the total economy does not exceed 0,006, and that the results vary considerably between large areas (Mezzogiorno and Central and Northern Italy). When analysing according to the downswings and upswings of business cycles, the impact is positive with elasticities ranging between 0,025 and 0,044 respectively.

However, it has to be noticed that a significant body of literature concludes that the effect of infrastructure capital for the Italian regions is certainly robust and more important. Percoco (2004) estimates reached definitely higher elasticities (ranging between 0,14 and 0,19) for public capital, all statistically significant at 5% level. In fact, he also commented on type of infrastructure capital and area that are more likely to support technical and allocative efficiency, pointing to railways and maritime infrastructure in the Southern Italian regions.

In the same framework, Picci (1999) analysed the performance of the Italian regions and found out that Infrastructure is important for productivity with elasticities ranging between 0,184 and 0,359. The deviation of the aforementioned figures derives from the use of various econometric methods under different assumptions each time. In any case, Picci was sure that the role of Infrastructure is crucial, especially when it comes to the Mezzogiorno and Center regions and when the type of capital includes core Infrastructure instead of the non-core one. Destefanis and Sena (2005) also argued that core infrastructure capital was more significant for total factor productivity of the industrial, this time, sector than the non-core, especially in the Southern Italian regions. They ended up with more modest average elasticities of 0,17 and 0,12 for core and total infrastructures respectively, while Mezzogiorno presented higher results, leading them to support the existence of some sort of saturation effect.

Aiello and Scoppa (2000) also estimated at the same level impact of infrastructure capital on total factor productivity for the Italian regions. Despite the fact that infrastructure capital was not considered important for convergence, it was characterized as important for productivity, with elasticities ranging between 0,13 and

0,15, depending on the econometric approach used. Bronzini and Piselli (2006) found almost similar results when they tried to see how research and development (R&D), human capital and public infrastructure capital influence productivity and growth. Their work supported the idea that all the above factors are positively correlated with Italian regions' total factor productivity but the effect of the infrastructure capital seem to be the least important, but with a worth noting elasticity of around 0,11.

Judging from the above body of literature referring to Italy, it is obvious that there is no consensus on the size of Infrastructures impact on the economy. There is a considerable part of academia which supports that the effect is positive but rather small or even negligible. On the other hand, there is also a bold research suggesting the significance of infrastructure capital for growth and productivity. The absence of unanimity concerning the magnitude of the infrastructures effect leads to the conclusion that further research is necessary in order to reach safer and more robust conclusions about Italy.

The results for the third country, Spain, show that infrastructure capital is not only significantly important for economic growth but also with very high externalities, thus contributing to the economy to a great extent. Truth is that the body of literature researching the impact of infrastructure capital on growth supports the idea of a positive and important effect. However most of the papers report elasticities far lower than in this thesis.

Pereira and Roca-Sagales (2007) unanalysed the regional effects of public infrastructure in Spain, focusing on the distribution of the effects. They concluded that public infrastructure actually crowds in both private capital and employment while the output elasticities with respect to public infrastructure reached 0,523, which is a similar estimation to our results. This result leads them to support the idea that infrastructure is a useful and bold tool to boost growth and accelerate convergence to the EU standards. In this effort, it has to be taken under account that spillover effects on output and private capital are positive and very important, while the positive effects of infrastructure are rather unevenly distributed between regions.

Puig-Junoy and Pinilla (2008), in their effort to spot the main drivers of heterogeneity in regional efficiency in the Spanish regions, they suggested that regional inefficiency depends heavily on the ratio of public to private capital. Although they did not estimated directly the output elasticity with respect to public capital (however they came up with a figure of 0,22), they concluded that the ratio of services in private capital, the ratio of transport infrastructures to public capital, the spatial spillovers etc. improve regional efficiency.

Bajo-Rubio & Sosvilla-Rivero (1993) tried to see whether public capital had any effect on Spain’s private sector productivity. They reached the conclusion that this kind of capital has a positive influence on private sector’s productivity, with an elasticity estimated at 0.19. In the same framework, Mas et.al. (1996) worked so as to analyse the role of public capital in the gains in productivity of the private sector in the Spanish regions, focusing on the types of infrastructures invested and their territorial distribution. The regional stock of “productive” public capital positively affects productivity of the private sector (output elasticity of this kind of public capital at 0.08), while spillover effects seem to work. This result may not insist with the same intensity in the future as growth continues and becomes bolder.

Alonso-Carrera et. al. (2009) analysed regional data for Spain and found out that output elasticities of infrastructures amounted up to 0,0978, although the way infrastructures projects are being developed spatially could generate the existing imbalances in regional growth. The traditional question concerning the priority of the regional policy remains: «Which should be the target of the regional policy: Reducing regional disparities or enhancing efficiency?» The authors suggest that the former target gives priority to investing in the poorest regions, whereas the later points out to the richest economies.

Ezcurra et al. (2005) shed some light concerning the impact of infrastructure on productivity in the various regions of Spain. They concluded that public infrastructure noticeably reduces private costs and increases overall productivity, since public and private capital act as complements while public capital and labour as substitutes. The public capital cost elasticities ranges between -0,154 and -0,011, with the industry sector being more benefited by investing in public capital than the services sector.

However, there is a part of the literature that although is in favour of the public capital contribution to growth, the impact is rather modest.

Delgado & Alvarez (2000) found that productive infrastructure capital positively affects private investment. In fact, although their statistical results were not bold enough, they were convinced that productive infrastructure capital and private capital work as complements and productive infrastructure and labour as substitutes. In any case, they think that investing in infrastructure, especially in less developed regions, can become a useful tool for convergence.

On top of that, Salinas-Jimenez (2004) used data from the Spanish regions in order to answer whether investing in public capital can result in TFP growth. She ended up suggesting that public investment contributes to enhance private productivity growth only when spillover effects are included. However, the lack of private capital seemed to be more important in productivity rates.

Perhaps, the main conclusion from the body of literature is that the theoretical and econometric challenges of public infrastructure capital research insist. Although those in favour of the positive impact of infrastructure on growth and productivity present a series of hard work and empirical findings, the opponents are not deprived of good arguments (Rovolis, 1999).

6.3 The Added Value of this Thesis

Regardless of the estimation results of each study, there is a broad consensus among researchers and policy-makers that public capital is a factor that cannot be ignored. However, the consensus ends here while the conclusions vary from the point where infrastructure shrinks costs, attracts firms, production factors and investments etc. and thus, boosts productivity and growth to the belief that it is just a waste of resources. These contradictory theories underline the need for further research in order to determine how the state and the private sector should stand towards public capital and still trigger author's interest in infrastructure.

According to the literature review in the first chapters of this thesis, the arguments of the studies in favour of infrastructure's effect on growth are bold and clear, although with some rather not negligible shortcomings. One key challenge is the small sample size, i.e. the relatively few available observations, while the use of national level data often fails to capture the differences of infrastructure impact on local level (regions), which may lead to biased estimates. In order to increase the number of observations and to deeply explore the effects of public capital on growth without spatial losses, this thesis uses regional regional (NUTS II) level data for three Southern European countries, namely Greece, Italy and Spain. The use of regional level data also allow the observation of positive effects on growth in some regions, without predefine the final, national level result, since the rest of the regions might not respond accordingly, thus narrowing or even counterbalancing the impact for the whole economy.

The selection of the above three states was not random. Greece, Italy and Spain share a lot in common, although someone would not find hard to trace bold differences. These countries have gathered great interest and have been many times in the heart of plenty discussions in the European level and for various reasons. However, these three countries have been through many challenges, while, especially Greece and Spain, have accessed huge European Fund resources for infrastructure purposes. For this reason, this thesis tried to shed some new light on this issue using reliable data and applying simple but clear econometric techniques.

It is true that the use of different time periods for the countries was up to certain extent the result of scarce data availability. Despite this technicality, the use of different time periods was not disastrous. On the contrary, the use of this kind of data could be considered as imposed in the pursuit of more reliable estimates. Regarding Greece, the severe economic crisis since late 2008 and especially from 2010 and onwards, combined with the formidable turbulences throughout this period, would have made the use of more recent data meaningless. Greek output was reduced by more than one fourth, while public investment plummeted, thus making it impossible to examine the relationship between the above two factors of production without serious risk of biasness.

Regional data for Spain were a bit more recent (up to 2012), since this country was not forced to implement Memoranda restrictive policies after the economic crisis, which affected the whole Europe. The data in Italy are not up to date since the corresponding source does not provide more recent data. However, Italy had started to expand its infrastructure network much earlier than the other countries, and reached an adequate magnitude of public capital well before the rest of the two states. The effort of constructing additional data set, bears the risk of using different construction techniques under various assumptions as well as dissimilar methodologies from the initial sources, thus making the new dataset non-comparable to the older one.

With a few words, this thesis tried to do was to estimate the impact of infrastructure on growth through a simple production function for three countries, with the help of reliable regional data. This would allow useful and interesting conclusions concerning the so called «infrastructure puzzle», influence the decisions of policy makers and set some new challenges for further future research.

The first major contribution was the estimation of public capital for Greece. Since there was no institution or research centre providing this dataset, it had to be constructed from scratch. Previous studies have partially concentrated some of the dataset, which, in most of the cases, could not be combined due to different accumulation techniques.

Gathering the data for the infrastructure capital was not an easy task. After a lot of efforts, the data for the Public Investment Programme (PIPR) were provided by the Ministry of Finance. With the exception of the period 2000 and onwards, the data for the rest of the years were available only in printed old type paper sheets. Thus, the datasets were converted to electronically form by typing each corresponding number. On top of that, the dataset on the education was not available in regional level but for geographical «diamerismata», and thus, the shares of the three next years had to be used in order to estimate the data for all regions. The construction of the public capital stock is described analytically in the section 4.4, and it can be considered as one of the most complete and reliable dataset for Greece for this period in regional level.

The second contribution was the effort to include almost all kinds of infrastructure data in the estimation process, in order to obtain a more clear and broader view concerning the impact of infrastructure on growth. This means that this thesis was not based on a narrow or specific kind of infrastructure capital such as transportation or human capital but it tried to take into consideration the whole range of infrastructure. This was rather more accomplished for Greece since the estimated public capital included: Fisheries, Forests, Roads, Ports, Water-Sanitation, Education, Health-Welfare, Land Improvement, Housing, Tourism, Prefectures Works, Olympic Projects, Industry-Crafts, Special Works, Research, Training, Rails, Communications, Airports, and Regional Programmes.

Efforts were also undertaken in order to obtain rich and complete Infrastructure capital datasets for Italy, in regional level. In this case, the data for public infrastructure capital referred to: Roads and Airports, Railroad and alternative Transport, Maritime, Lake and Communications Infrastructures, Public and Social Building, Hydraulics and Electrics, Sanitary Infrastructure and Reclamation. However, the corresponding datasets for Spain were also rich and reliable, including infrastructure capital such as: Road Infrastructure,
Hydraulic Infrastructure, Railway Infrastructure of the Public Administration and other Entities, Airport Infrastructure of the Public Administration and other Entities, Port Infrastructures, Urban Infrastructure, Public Education, Public Health and Other Investments of the Public Administration

The third contribution was the fact that this thesis used only official and quality data, from reliable domestic and international sources, for all three countries involved. This might not sound as a worth mentioning accomplishment, however the data quality challenges were more than just a few. Take Greece for example. Even the official data provided by the Hellenic Statistical Authority (EL.STAT) concerning GDP in regional level and was extended from 1970 until 2009 suffered from two serious structural breaks, in 1995 and in 2000. This error occurred because EL.STAT. had been following the «traditional» National Accounts System (OECD 1958) until 1994 and later, the European System of Accounts ESA – 1995, (1995-1999). In 2000 the system was replaced again, this time by the ESA -2010, making thus the data non-comparable, as it was confirmed by the «spikes» presented on a simple figure.

Without effectively confronting this kind of data, the estimation of the infrastructure impact on growth would not have been feasible. Any effort to improve the data probably result in wasting time since the techniques used would be under constant questioning. Thus, this challenge was overcome with the help of the Cambridge Econometrics European Regional Database, which draws data from the European Commission's Urban and Territorial Dashboard Platform. The use of the latter Platform gave access to regional and «break-free» GDP and other economic variables (Gross Fixed Capital Formation etc) datasets. For reasons of comparability, the Cambridge Econometrics Regional database/ European Commission's Database has been extensively used throughout this thesis and for all three countries.

On top of that, employment and (primary, secondary and tertiary) Education data per region for Greece were provided by EL.STAT. in regional level until 1988. In this thesis, we had to estimate the lacking data for the period 1981-1987, since EL.STAT. had classified the data in different geographical categories and not in the 13 today's regions. The estimation was based on the average share of each region during the three closest to 1987 years, i.e. 1998, 1989 and 1990. This is mentioned just to show that completing a dataset was not just a simple process.

The spirit is the same for the rest two countries, Italy and Spain. For Italy, this thesis trusted again the European Commission's Urban and Territorial Dashboard for various variables. The lack of reliable and complete datasets concerning the Italian Education by the official Statistical Office - Instituto Nazionale di Statistica (Istat), forced us not to regress data for Education. For consistency reasons, data for the regional GDP, the Capital Stock and the Employment were provided by the same source, CRENoS (Centre for North South Economic Research/ Centro Ricerche Economiche Nord Sud), a database of the University of Cagliari and the University of Sassari.

In Spain, the datasets for regional GDP, Employment and Education provided by the official Spanish Statistical Authority (Instituto Nacional de Estadistica – INE), either suffered from structural breaks or the time series provided were too short. The European Commission's Urban and Territorial Dashboard provided the datasets and helped overcome this impediment as well as the Eurostat Database, which covered the Education data, as defined in the International Standard Classification of Education (ISCED-1997). The stock of the Net Public Capital was provided by the BBVA Foundation and Ivie (Valencian Institute of Economic Research) database, which covers more 100 years and facilitates in depth analysis.

This data treatment allowed the creation of a reliable databank for the above three countries, the emphasis given on Greece, since it was the country which faced the most and deepest problems concerning data availability. Thus, this effort contributed to two things: **1.** To obtaining reliable databases, absolutely necessary to conduct research and **2.** To reach unbiased results which could be used in comparison to corresponding findings of other researchers' and to have a more clear view on the public capital developments and dynamics among the above three Southern European countries or even to compare their own infrastructure contributions.

6.4 Infrastructure: Useful Lessons and Food for Thought

Following regional policies, it is hard not to notice the complexity of the challenges and, in some cases, the rather mixed results, when assessing the impact of the policies implemented. The lack of adequate infrastructure seems to be significantly detrimental for growth. However, the decision on the amounts of investments, the types of infrastructure and that of timing are evenly critical, since spending endlessly on all kinds of infrastructure projects is neither a «panacea» nor feasible. Unfortunately, this has not been well understood by policymakers since the data imply that infrastructure investments are increased across prefectures in years preceding national elections (Lambrinidis et. al. 2005). The latter leads to the though that policy makers use public capital more as a re-election instrument rather than a growth/ productivity enhancement tool.

But deciding on how much to invest on infrastructure projects is not a linear procedure, since it seems that there are a lot of factors influencing the final call. According to a substantial body of the literature, the stage of economic development of a region/ country can affect the impact of infrastructure investment on growth. That is that the macroeconomic environment and economic developments can have a significant effect on infrastructure investment. Some researchers [Turrini (2004), Mehrota and Välilä (2006), Kappeler and Välilä (2008)] suggest that public investment is procyclical, i.e. goes up during times of economic growth and it is the first to be cut down during a recession.

However, the decisions of previous policy-makers and governments have formed today's level of infrastructure, which seriously affects future investments. Put differently, public infrastructure investments seem to be characterized by diminishing returns to scale, i.e. the higher the initial level of capital stock the less the impact of new infrastructure investments on growth and productivity (Heinemann, 2006).

This threshold after which investing in infrastructure produces diminishing returns in output is implied in the literature by also other studies. The fact that the initial endowment significantly affects the impact of infrastructure can also been seen in Italy, where differences in infrastructure capital and efficiency in production between the Central-North and the Mezzogiorno are more than substantial (Petraglia, 2002). This effect may have to do with how infrastructure actually works. Building a new public capital network will probably yield a boost in productivity and growth but this will happen once and can not be repeated continuously in the future.

As Fernald (1999) put it, after almost completing the highway network in the USA around 1973, the hypothesis that the marginal productivity of highways in the US is zero can not be rejected. To be more specific, Fernald implied that the highways in the US did contribute to productivity compared to pre-1973 time period but to a significantly lesser extend after 1973.

Without any doubt, the implicit assumption noticed in various studies that the impact of infrastructure is not affected by the level of public capital stock can be characterized as dubious (Kamps 2006). This means that the cumulated public stock is important for the marginal productivity of the new public capital investment. Insisting further on the law of diminishing returns, a study by Demetriades and Mamuneas (2000) suggested that a rise in infrastructure stock would have a rather narrow output impact when the capital stock in the previous period was large and a strong effect when the capital stock was scarce. This explains why relative poor countries present high marginal productivity of public capital. The methodology used by Aschauer (2000), which allows to determine whether there is adequate public capital stock or not in European countries seems an interesting idea.

Of course, the lack of data is always an impediment. The lack of long term time series, which are considered necessary to estimate public capital stock, is a major concern for developing economies. Data for economically advance countries can be found more easily from various sources, such as OECD, but usually in national level. But even when data are found, the question on which kind of data remains. Some researchers [Esfahani and Ramirez (2003)] prefer physical measure of infrastructure, e.g. kilometres of roads and not how much money and resources were invested in roads.

The idea came up due to fact that monetary values face some serious problems, especially when the infrastructure results are used for cross-country comparisons and conclusions (Pritchett, 1996). The problem arises because money value differs significantly among various countries, thus considerably affecting infrastructure prices. Besides, the level of resources spent on infrastructure does not necessarily reveal adequate information on how efficiently the resources are spent, especially in the cases where the project is conducted by the public sector and/or in developing countries.

How efficiently a country can spend resources is connected with corruption issues. For instance, public investment can be increased due to the fact that corrupt government spend more than necessary so as to benefit from the extra expenditures. On the contrary, a more careful governance would result in better planning and higher quality infrastructure projects. Put differently, higher corruption limits the quality of public capital and hinders growth (Chakraborty and Dabla-Norris, 2011). Thus, the income gap between poor and rich economies can be, up to a certain extend, attributed to quality differences in public capital. This also hold in the case where infrastructure projects are financed by the E.U. funds, since the existence of sound institutions can guarantee the effective absorption of European resources and the construction of useful and quality infrastructure projects (Becker et. al., 2013). So, it is safe to conclude that the capacity of the public administration, the effectiveness of the government, the bold functioning of institutions and regulations are necessary for the construction of quality infrastructure projects.

Besides the issue of corruption which is currently getting more attention, modern economics would like to investigate the effects of infrastructure on fields such as environment and life quality. Before the financial crisis hit Ireland, there was a decrease in government spending so as to, among others, protect the environment. Generally, the government spending was seriously questioned which led to a consultation in 2017. The target of this effort was to prepare a national planning framework (Ireland 2040) and the emphasis was given on better coordination, while environmental concerns were also boldly underlined. After all, the environmental issues are getting more and more attention worldwide.

On top of that, it is not clear whether core or social infrastructure is most important for growth, but this has to do with each country's special characteristics, since the composition of infrastructure capital influences state efficiency (Puig- Junoy, 2001). Therefore, it is very possible that investing in public capital has a different impact among different regions.

In this framework, assessing the total impact of infrastructure projects not only affects the developments in infrastructure policy in the future but provides with useful information. The latter could work by explaining the reasons why the same projects work well in some regions and not work at all in some others, implying that each country and region bears its own characteristics and peculiarities. In Greece, before the appearance of the economic crisis, core infrastructure and agriculture were without doubt top government choices for support, while and there is still plenty of room for improvements (Plaskovitis, 2008).

There are still many aspects of infrastructure investment impact that remain to be addressed through future research. On econometric grounds, the use of panel data triangular VAR system of equations, where the bias of independent variables on the basic regression will be measured and corrected based on reduced-form equations of independent variables (for stationary and non-stationary variables and / or for possible structural breaks), could bear reliable estimates. To deal with endogeneity, a new, dynamic panel data methodology will be developed that will predict the variations of independent variables. Of course, the common factor approach could be proven helpful, due to the reduction of the dimensions of the data & determination of the type of infrastructures that most affect the economic growth.

On theoretical issues, more light can be shed on the identification of "most useful" kind of infrastructure for economic growth as well as possible diffusion results. That is that infrastructure has to be broken down into its categories (core infrastructure such as Transportation, Telecommunications, Energy, Water/Sewages and social infrastructure such as schools, hospitals, R&D etc) and try to figure out which type of infrastructure investment bears more fruits, thus, offering a more clear assessment for regional policy.

On top of that, more attention could be paid on the effects that infrastructure offers to each region. Estimating output elasticities with respect to public infrastructure capital for the whole country, even when econometric challenges are addressed, results in a very useful figure for international comparisons. However, it could be more interesting for regional policy to obtain results for each region separately, thus assessing regional policy in depth.

Without any doubt, financing of infrastructure investment and the impact on fiscal budget needs further research. Especially when maintenance and repair cost is also taken into consideration, since infrastructure is not just «one shot game». This argument is particularly important for countries with budget difficulties and/ or during harsh times, not to mention the fact that competition between infrastructure projects and countries (in particularly among those recently entered the EU) has risen dramatically over the last years.

Last, but not least, a topic which has been gaining ground over the recent decades and has triggered a series of discussions is the environmental effects of infrastructure. A great impact on output or productivity is now considered as necessary but not sufficient condition in order to invest to an infrastructure problem. The latter has to be environmental friendly or neutral, if not supportive. This is already happening and the environmental side prevails steadily and boldly.

Despite the caveats and job waiting for future research, it is hoped that this thesis has provided some critical and useful conclusions along with food for better understanding of the impact of infrastructure on the economy of Greece, Italy and Spain.

APPENDIX - FULL DATASETS

GREECE

Table Appendix 1: Greece- GDP, Employment and Education

region	unit	time	Real GDP 2005=100 (000) Cam. Econ.	Employment (000)	Education: Primary (000)	Education: Higher Secondary (000)	Education: Tertiary (000)
Attica	1	1981	49.400.000,0	1.208,2	1.022,8	708,7	216,6
Attica	1	1982	48.850.000,0	1.202,5	1.034,0	754,4	231,5
Attica	1	1983	49.490.000,0	1.229,3	1.032,1	749,1	234,8
Attica	1	1984	50.230.000,0	1.218,4	1.035,6	777,9	243,8
Attica	1	1985	50.340.000,0	1.234,4	1.043,3	832,5	252,1
Attica	1	1986	51.060.000,0	1.231,3	1.054,8	874,0	262,0
Attica	1	1987	50.110.000,0	1.237,6	1.008,1	918,2	302,2
Attica	1	1988	51.690.000,0	1.236,0	998,4	957,6	333,1
Attica	1	1989	54.080.000,0	1.271,0	1.012,7	1.004,2	348,6
Attica	1	1990	54.440.000,0	1.303,7	1.014,4	1.036,2	376,0
Attica	1	1991	55.380.000,0	1.315,6	1.001,2	1.087,8	394,5
Attica	1	1992	56.800.000,0	1.350,5	1.074,4	1.097,8	431,5
Attica	1	1993	56.600.000,0	1.348,1	1.030,3	1.128,0	435,4
Attica	1	1994	57.270.000,0	1.376,1	1.067,4	1.157,5	476,2

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Attica	1	1995	59.280.000,0	1.401,9	1.077,2	1.188,9	475,9
Attica	1	1996	58.950.000,0	1.401,7	1.017,8	1.215,4	510,7
Attica	1	1997	60.840.000,0	1.406,8	1.032,0	1.261,3	520,4
Attica	1	1998	63.700.000,0	1.399,8	787,8	1.193,5	514,0
Attica	1	1999	66.640.000,0	1.411,7	759,3	1.251,4	530,3
Attica	1	2000	74.770.000,0	1.444,9	744,5	1.285,4	546,6
Attica	1	2001	77.680.000,0	1.550,6	805,8	1.359,9	578,8
Attica	1	2002	82.220.000,0	1.600,7	791,3	1.375,0	626,8
Attica	1	2003	86.930.000,0	1.620,8	777,8	1.406,8	637,5
Attica	1	2004	92.850.000,0	1.683,9	719,5	1.419,1	701,9
Attica	1	2005	94.040.000,0	1.702,3	710,8	1.458,1	693,7
Attica	1	2006	100.810.000,0	1.731,8	700,8	1.470,3	733,4
Attica	1	2007	104.640.000,0	1.746,8	680,9	1.470,4	755,2
Attica	1	2008	104.500.000,0	1.780,6	663,7	1.475,4	794,4
Attica	1	2009	101.260.000,0	1.753,5	664,1	1.462,1	792,4
Aegean North	2	1981	1.520.000,0	60,9	76,2	17,5	5,7

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Aegean North	2	1982	1.620.000,0	60,7	77,1	18,6	6,1
Aegean North	2	1983	1.430.000,0	62,0	76,9	18,5	6,2
Aegean North	2	1984	1.530.000,0	61,5	77,2	19,2	6,4
Aegean North	2	1985	1.540.000,0	62,3	77,7	20,5	6,6
Aegean North	2	1986	1.580.000,0	62,1	78,6	21,6	6,9
Aegean North	2	1987	1.550.000,0	62,4	75,1	22,7	8
Aegean North	2	1988	1.640.000,0	67,6	79,9	23,1	10,9
Aegean North	2	1989	1.520.000,0	61,8	75,3	24,6	8,5
Aegean North	2	1990	1.570.000,0	62,8	68,2	26,3	8,5
Aegean North	2	1991	1.640.000,0	61,3	71,4	29,1	11,1
Aegean North	2	1992	1.640.000,0	63,6	77,7	22,5	11
Aegean North	2	1993	1.600.000,0	54,8	86,9	22,9	8,4
Aegean North	2	1994	1.630.000,0	52,1	86	26,1	8,7
Aegean North	2	1995	1.950.000,0	54,7	83,2	24,3	9,1
Aegean North	2	1996	2.040.000,0	59,1	83,2	29,7	9,3
Aegean North	2	1997	2.220.000,0	54,6	83	29,1	10,5
Aegean North	2	1998	2.310.000,0	64,0	73,2	35,9	14,7

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Aegean North	2	1999	2.470.000,0	64,4	72,5	39,5	13,3
Aegean North	2	2000	2.210.000,0	65,4	73,4	41,8	13,9
Aegean North	2	2001	2.290.000,0	68,2	74,5	45,8	13,5
Aegean North	2	2002	2.310.000,0	67,3	71,8	46,1	15,3
Aegean North	2	2003	2.620.000,0	67,5	71,3	48	16,4
Aegean North	2	2004	2.700.000,0	70,0	64,1	48,6	22,1
Aegean North	2	2005	2.800.000,0	70,6	63,2	48,2	20,4
Aegean North	2	2006	2.940.000,0	71,5	61,6	48,1	23,3
Aegean North	2	2007	3.090.000,0	72,4	58,5	50,5	21,8
Aegean North	2	2008	3.150.000,0	70,8	54	52	22,7
Aegean North	2	2009	2.960.000,0	70,8	49,6	58,8	23,1
Aegean South	3	1981	2.830.000,0	76,8	91,4	20,1	4,3
Aegean South	3	1982	2.910.000,0	76,4	92,4	21,4	4,6
Aegean South	3	1983	2.960.000,0	78,1	92,2	21,2	4,6
Aegean South	3	1984	2.990.000,0	77,4	92,5	22,1	4,8
Aegean South	3	1985	3.020.000,0	78,5	93,2	23,6	5
Aegean South	3	1986	3.350.000,0	78,3	94,2	24,8	5,2

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Aegean South	3	1987	3.450.000,0	78,7	90,1	26	5,9
Aegean South	3	1988	3.690.000,0	83,6	94,4	26	6,9
Aegean South	3	1989	3.730.000,0	78,1	88	30,2	6,9
Aegean South	3	1990	3.780.000,0	80,5	85,4	28,8	7
Aegean South	3	1991	3.880.000,0	83,2	91,6	36,2	9,3
Aegean South	3	1992	3.900.000,0	89,8	102,4	35,9	10,3
Aegean South	3	1993	3.890.000,0	100,0	104,5	44,7	12,6
Aegean South	3	1994	3.980.000,0	102,4	107,1	42,1	12,5
Aegean South	3	1995	4.050.000,0	98,7	101,1	47,4	11,8
Aegean South	3	1996	4.400.000,0	97,5	98,9	44	12,2
Aegean South	3	1997	4.830.000,0	97,5	98,9	41	12,5
Aegean South	3	1998	4.950.000,0	105,6	109,3	51,1	13,4
Aegean South	3	1999	5.260.000,0	107,7	100,8	57,2	16,2
Aegean South	3	2000	5.600.000,0	110,4	98,9	55,9	18,5
Aegean South	3	2001	5.710.000,0	118,6	100,4	63	19,5
Aegean South	3	2002	5.620.000,0	119,6	92,8	72,2	21,3
Aegean South	3	2003	6.100.000,0	126,5	95,3	72,4	21,8

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Aegean South	3	2004	6.440.000,0	128,3	79,7	85,8	27,4
Aegean South	3	2005	6.660.000,0	130,6	79,7	87,8	27,3
Aegean South	3	2006	6.940.000,0	127,9	77,2	88,2	27,7
Aegean South	3	2007	7.180.000,0	132,9	81,9	84	27,8
Aegean South	3	2008	7.330.000,0	136,5	86	92	27,5
Aegean South	3	2009	6.630.000,0	136,8	83,3	93,4	26,6
Crete	4	1981	4.900.000,0	175,8	174,5	34,7	10,5
Crete	4	1982	5.360.000,0	192,9	180,1	35,3	9,5
Crete	4	1983	5.160.000,0	186,9	177,9	41,1	10,1
Crete	4	1984	5.000.000,0	199,9	179,2	42,6	12,5
Crete	4	1985	5.620.000,0	197,7	178,9	47	12,5
Crete	4	1986	5.590.000,0	203,0	181,4	47,5	14,1
Crete	4	1987	5.490.000,0	192,7	170,1	49,5	16,5
Crete	4	1988	5.910.000,0	197,2	172,5	55	19,5
Crete	4	1989	6.730.000,0	197,5	179,3	55,7	17,9
Crete	4	1990	6.670.000,0	198,6	178,3	57,2	18
Crete	4	1991	6.880.000,0	194,1	180,5	63,1	19,9

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Crete	4	1992	6.950.000,0	194,5	190,5	62,8	20,4
Crete	4	1993	6.810.000,0	214,5	194,3	83,5	30,8
Crete	4	1994	7.110.000,0	214,1	193,4	83,9	33,2
Crete	4	1995	6.630.000,0	210,9	191,8	89,8	34,3
Crete	4	1996	7.050.000,0	222,3	182,3	87,5	34,7
Crete	4	1997	7.280.000,0	219,1	190,8	89,4	35,3
Crete	4	1998	7.510.000,0	245,0	188,4	109,7	42,8
Crete	4	1999	7.830.000,0	252,1	181,3	113,1	45,2
Crete	4	2000	8.040.000,0	253,9	181,1	119,3	47,1
Crete	4	2001	8.510.000,0	260,4	200,1	125,8	50
Crete	4	2002	8.810.000,0	251,3	187,5	132	59,9
Crete	4	2003	9.270.000,0	257,9	187,9	141,9	60,8
Crete	4	2004	9.900.000,0	258,2	163,1	160,7	74
Crete	4	2005	9.870.000,0	263,7	166,2	162	74,1
Crete	4	2006	10.330.000,0	269,0	167,2	164,4	79,6
Crete	4	2007	10.460.000,0	272,2	157,1	175,2	83,3
Crete	4	2008	10.570.000,0	270,4	155,9	177,6	85,6

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Crete	4	2009	10.050.000,0	268,7	166,4	172,8	79,5
Greece Sterea	5	1981	7.660.000,0	176,4	206,8	36,5	10,8
Greece Sterea	5	1982	7.260.000,0	175,6	209,1	38,8	11,5
Greece Sterea	5	1983	7.030.000,0	179,5	208,7	38,6	11,7
Greece Sterea	5	1984	7.270.000,0	177,9	209,4	40	12,1
Greece Sterea	5	1985	7.320.000,0	180,3	210,9	42,8	12,5
Greece Sterea	5	1986	7.440.000,0	179,8	213,3	45	13
Greece Sterea	5	1987	7.040.000,0	180,7	203,9	47,3	15
Greece Sterea	5	1988	7.440.000,0	183,3	199,4	47,2	16,9
Greece Sterea	5	1989	7.450.000,0	189,0	204,3	53,4	17,9
Greece Sterea	5	1990	7.390.000,0	184,2	202,6	53,7	17,7
Greece Sterea	5	1991	7.620.000,0	179,4	210,2	56,7	16,3
Greece Sterea	5	1992	7.240.000,0	165,5	200,7	56,4	19,2
Greece Sterea	5	1993	7.030.000,0	169,8	207,3	67,2	20,1
Greece Sterea	5	1994	7.130.000,0	164,7	199,7	73	20,6
Greece Sterea	5	1995	9.480.000,0	166,6	194	68	21
Greece Sterea	5	1996	10.030.000,0	168,9	185,1	73,1	24,1

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Greece Sterea	5	1997	10.200.000,0	161,2	176,8	75,2	25,4
Greece Sterea	5	1998	10.290.000,0	204,3	201,4	99,9	28,4
Greece Sterea	5	1999	10.030.000,0	204,7	185,7	110,1	31,5
Greece Sterea	5	2000	9.030.000,0	197,5	181,7	116,7	34,5
Greece Sterea	5	2001	9.330.000,0	194,3	182,7	119,9	32,6
Greece Sterea	5	2002	9.290.000,0	206,8	186,7	125,9	29,5
Greece Sterea	5	2003	9.640.000,0	217,9	187,4	126,7	35,7
Greece Sterea	5	2004	9.600.000,0	204,0	173,4	133,9	44,4
Greece Sterea	5	2005	9.740.000,0	214,6	167,6	138,2	48,4
Greece Sterea	5	2006	9.770.000,0	221,1	169,1	138,4	48,9
Greece Sterea	5	2007	9.870.000,0	222,3	178,4	140,2	47,2
Greece Sterea	5	2008	9.740.000,0	220,8	171,2	144,8	50,4
Greece Sterea	5	2009	9.080.000,0	213,9	169,6	142,6	53,6
Greece Western	6	1981	6.770.000,0	248,2	241,7	60,7	18,3
Greece Western	6	1982	6.890.000,0	247,1	244,4	64,6	19,5
Greece Western	6	1983	6.740.000,0	252,6	243,9	64,1	19,8
Greece Western	6	1984	6.590.000,0	250,3	244,8	66,6	20,6

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Greece Western	6	1985	6.550.000,0	253,6	246,5	71,3	21,3
Greece Western	6	1986	6.520.000,0	253,0	249,3	74,8	22,1
Greece Western	6	1987	6.280.000,0	254,3	238,3	78,6	25,5
Greece Western	6	1988	6.620.000,0	262,0	226,6	77,8	29,9
Greece Western	6	1989	6.770.000,0	259,5	237,8	86,4	28,7
Greece Western	6	1990	6.800.000,0	261,4	244,2	92,5	30,6
Greece Western	6	1991	7.160.000,0	216,9	239,1	92,8	32,2
Greece Western	6	1992	7.260.000,0	216,8	229,8	98,1	31
Greece Western	6	1993	7.130.000,0	217,5	251,4	84,9	27,3
Greece Western	6	1994	7.340.000,0	225,9	250,2	99,5	28,5
Greece Western	6	1995	7.120.000,0	219,4	239,7	92,1	28,5
Greece Western	6	1996	7.370.000,0	228,8	249,7	97,3	26,3
Greece Western	6	1997	7.470.000,0	232,8	248,5	101,1	27,4
Greece Western	6	1998	7.670.000,0	262,6	238,8	145	48
Greece Western	6	1999	7.620.000,0	263,7	234	148	51
Greece Western	6	2000	8.030.000,0	266,0	233,3	155	50,2
Greece Western	6	2001	8.360.000,0	261,8	240,9	156,2	49,6

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Greece Western	6	2002	8.790.000,0	258,6	236,2	159,7	49,9
Greece Western	6	2003	9.240.000,0	263,6	237,2	174	56,2
Greece Western	6	2004	9.690.000,0	253,7	213,8	180,3	66,8
Greece Western	6	2005	9.730.000,0	258,4	214,2	190,5	67,9
Greece Western	6	2006	10.370.000,0	259,5	203,6	194,6	76,9
Greece Western	6	2007	10.500.000,0	263,9	197,3	194,4	81,8
Greece Western	6	2008	10.180.000,0	264,7	194,9	201,4	77,3
Greece Western	6	2009	9.510.000,0	266,2	192,5	196	77
Ionio	7	1981	1.990.000,0	76,0	81,1	13,4	3,7
Ionio	7	1982	2.000.000,0	75,6	82	14,3	3,9
Ionio	7	1983	1.990.000,0	77,3	81,9	14,2	4
Ionio	7	1984	1.990.000,0	76,6	82,1	14,7	4,1
Ionio	7	1985	2.010.000,0	77,6	82,7	15,7	4,3
Ionio	7	1986	2.000.000,0	77,5	83,7	16,5	4,5
Ionio	7	1987	2.020.000,0	77,8	80	17,4	5,1
Ionio	7	1988	2.170.000,0	78,4	85,6	18,2	5,3
Ionio	7	1989	2.130.000,0	80,3	76,2	19,3	5,7

region	unit	time	Real GDP 2005=100 (000) Cam. Econ.	Employment (000)	Education Primary (000)	Higher Secondary (000)	Tertiary (000)
Ionio	7	1990	2.160.000,0	81,0	76	19,2	7
Ionio	7	1991	2.230.000,0	71,5	69,9	20,5	8,5
Ionio	7	1992	2.290.000,0	77,9	90,4	20,8	8,4
Ionio	7	1993	2.280.000,0	73,9	80,2	21,7	7,1
Ionio	7	1994	2.330.000,0	76,0	78,5	23,3	7,2
Ionio	7	1995	2.240.000,0	76,0	80,4	24,8	7,3
Ionio	7	1996	2.330.000,0	77,0	79,9	26,7	9
Ionio	7	1997	2.660.000,0	75,4	81	26,8	9,3
Ionio	7	1998	2.690.000,0	84,7	76,8	38,9	13,4
Ionio	7	1999	2.790.000,0	86,0	74,6	41,1	14,4
Ionio	7	2000	3.130.000,0	84,1	77,6	39,5	16,3
Ionio	7	2001	3.310.000,0	82,1	78,2	40,1	14,7
Ionio	7	2002	3.240.000,0	80,6	81,8	40,9	13,5
Ionio	7	2003	3.580.000,0	81,7	84,3	40	13,9
Ionio	7	2004	3.690.000,0	80,6	75,8	49,9	13,8
Ionio	7	2005	3.790.000,0	85,4	76,8	44,3	15,2
Ionio	7	2006	3.890.000,0	81,6	77,1	46,2	16,6

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Ionio	7	2007	4.000.000,0	81,7	72,1	48,9	16,7
Ionio	7	2008	4.050.000,0	87,6	72,4	47,6	17,4
Ionio	7	2009	3.670.000,0	87,8	71,3	47,7	17,7
Ipeiros	8	1981	2.980.000,0	111,0	118,5	22,6	9
Ipeiros	8	1982	2.860.000,0	110,5	119,8	24,1	9,6
Ipeiros	8	1983	2.900.000,0	113,0	119,6	23,9	9,8
Ipeiros	8	1984	2.800.000,0	112,0	120	24,8	10,1
Ipeiros	8	1985	2.800.000,0	113,4	120,8	26,6	10,5
Ipeiros	8	1986	3.070.000,0	113,2	122,2	27,9	10,9
Ipeiros	8	1987	2.850.000,0	113,7	116,8	29,3	12,6
Ipeiros	8	1988	2.920.000,0	114,8	109,1	33,1	13,1
Ipeiros	8	1989	2.890.000,0	114,6	116,2	30,4	15,1
Ipeiros	8	1990	2.790.000,0	120,8	122	32,2	15,8
Ipeiros	8	1991	2.930.000,0	96,9	108,6	39,6	14,4
Ipeiros	8	1992	2.980.000,0	99,4	118,1	30,7	15,8
Ipeiros	8	1993	2.900.000,0	99,3	119,5	36	17,8
Ipeiros	8	1994	2.940.000,0	103,1	118,7	35,6	18,8

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Ipeiros	8	1995	2.960.000,0	105,2	121,7	42,3	18,8
Ipeiros	8	1996	3.010.000,0	97,6	117	44,8	20,8
Ipeiros	8	1997	3.350.000,0	97,8	116,4	42,1	21
Ipeiros	8	1998	3.530.000,0	114,0	117,7	59	26,1
Ipeiros	8	1999	3.690.000,0	117,7	113,1	62,7	29,9
Ipeiros	8	2000	3.960.000,0	123,3	116,7	66,7	28,5
Ipeiros	8	2001	4.100.000,0	120,7	119,1	67,1	32,1
Ipeiros	8	2002	4.330.000,0	128,1	113,7	74,6	34,9
Ipeiros	8	2003	4.540.000,0	128,5	112,3	78	36,6
Ipeiros	8	2004	4.520.000,0	130,3	110,9	77,1	39
Ipeiros	8	2005	4.510.000,0	127,3	110,9	79,6	39,1
Ipeiros	8	2006	4.630.000,0	133,8	109,7	83,2	41,7
Ipeiros	8	2007	4.700.000,0	132,9	108,2	83,6	41,2
Ipeiros	8	2008	4.620.000,0	134,6	106,8	85,2	42,3
Ipeiros	8	2009	4.390.000,0	135,2	104,4	88,6	40,7
Macedonia Central	9	1981	17.440.000,0	595,7	616,1	200,1	61,2
Macedonia Central	9	1982	16.830.000,0	592,9	622,8	213	65,4

region	unit	time	Real GDP 2005=100 (000) Cam. Econ.	Employment (000)	Education Primary (000)	Higher Secondary (000)	Tertiary (000)
Macedonia Central	9	1983	16.230.000,0	606,2	621,7	211,5	66,3
Macedonia Central	9	1984	17.220.000,0	600,8	623,8	219,6	68,9
Macedonia Central	9	1985	18.220.000,0	608,7	628,3	235	71,2
Macedonia Central	9	1986	18.090.000,0	607,1	635,4	246,7	74
Macedonia Central	9	1987	17.710.000,0	610,2	607,2	259,2	85,4
Macedonia Central	9	1988	18.920.000,0	625,6	604,4	274,3	92,3
Macedonia Central	9	1989	19.710.000,0	630,1	590,4	283,7	102,5
Macedonia Central	9	1990	19.640.000,0	623,3	611	288,3	104
Macedonia Central	9	1991	20.560.000,0	620,1	583,3	306,8	115,7
Macedonia Central	9	1992	20.730.000,0	641,7	608,2	319,5	118,3
Macedonia Central	9	1993	20.360.000,0	633,9	596,1	375,2	137,3
Macedonia Central	9	1994	20.960.000,0	655,0	601,7	394,6	151,1
Macedonia Central	9	1995	20.600.000,0	679,8	596,1	411,8	162,4
Macedonia Central	9	1996	22.470.000,0	680,4	593,3	433,6	173,5
Macedonia Central	9	1997	23.620.000,0	694,3	589,1	443	176,2
Macedonia Central	9	1998	24.350.000,0	686,0	535,6	450,2	187,1
Macedonia Central	9	1999	24.900.000,0	688,4	531,4	469,6	189,9

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Macedonia Central	9	2000	23.110.000,0	696,6	522	483,5	194
Macedonia Central	9	2001	24.230.000,0	712,3	515,2	498,7	213,9
Macedonia Central	9	2002	24.640.000,0	704,3	507,5	512,3	217,2
Macedonia Central	9	2003	25.830.000,0	734,7	505,4	533,3	218,7
Macedonia Central	9	2004	27.290.000,0	719,8	508,4	535,5	240
Macedonia Central	9	2005	26.890.000,0	731,8	496,6	539,9	249,7
Macedonia Central	9	2006	28.550.000,0	758,1	485,2	543,8	261,4
Macedonia Central	9	2007	29.850.000,0	759,2	477,5	559,6	268,8
Macedonia Central	9	2008	29.820.000,0	760,5	469,9	569,5	275,3
Macedonia Central	9	2009	28.320.000,0	741,1	467	557,9	283,6
Macedonia Eastern_Thrace	10	1981	6.470.000,0	221,9	212,6	41,3	12,7
Macedonia Eastern_Thrace	10	1982	6.640.000,0	220,8	215	44	13,5
Macedonia Eastern_Thrace	10	1983	6.460.000,0	225,8	214,6	43,7	13,7
Macedonia Eastern_Thrace	10	1984	7.250.000,0	223,8	215,3	45,4	14,3
Macedonia Eastern_Thrace	10	1985	7.680.000,0	226,7	216,9	48,5	14,8
Macedonia Eastern_Thrace	10	1986	6.620.000,0	226,1	219,3	51	15,3
Macedonia Eastern_Thrace	10	1987	6.400.000,0	227,3	209,6	53,5	17,7

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Macedonia Eastern_Thrace	10	1988	6.430.000,0	228,7	199,9	55,5	20,4
Macedonia Eastern_Thrace	10	1989	6.780.000,0	237,6	205,2	59,1	19,5
Macedonia Eastern_Thrace	10	1990	6.730.000,0	233,5	218,2	60,2	22
Macedonia Eastern_Thrace	10	1991	7.010.000,0	234,5	220,5	63,5	23,6
Macedonia Eastern_Thrace	10	1992	6.890.000,0	234,9	218,7	65,6	23,6
Macedonia Eastern_Thrace	10	1993	6.620.000,0	242,1	208,9	75,4	27,5
Macedonia Eastern_Thrace	10	1994	6.810.000,0	233,5	199,6	74,3	29,2
Macedonia Eastern_Thrace	10	1995	6.420.000,0	232,2	193,6	83,2	32,2
Macedonia Eastern_Thrace	10	1996	6.540.000,0	240,6	196,6	88,7	32,9
Macedonia Eastern_Thrace	10	1997	6.660.000,0	230,5	207,4	89,5	35,2
Macedonia Eastern_Thrace	10	1998	6.910.000,0	235,5	220,6	100	41,8
Macedonia Eastern_Thrace	10	1999	7.110.000,0	230,0	202,5	106,9	43,9
Macedonia Eastern_Thrace	10	2000	6.850.000,0	236,1	213,6	107,5	43,5
Macedonia Eastern_Thrace	10	2001	7.080.000,0	235,0	227,5	106,9	45,3
Macedonia Eastern_Thrace	10	2002	7.290.000,0	236,0	217,5	116,5	46,3
Macedonia Eastern_Thrace	10	2003	7.590.000,0	235,6	215,5	121,4	49,9
Macedonia Eastern_Thrace	10	2004	7.780.000,0	233,2	198,4	143,9	52,1

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Macedonia Eastern_Thrace	10	2005	7.870.000,0	232,3	192,5	141,7	55
Macedonia Eastern_Thrace	10	2006	7.870.000,0	233,9	196	140,1	56,4
Macedonia Eastern_Thrace	10	2007	8.320.000,0	236,5	191	139,5	62,6
Macedonia Eastern_Thrace	10	2008	8.460.000,0	235,1	187,4	134,4	65,5
Macedonia Eastern_Thrace	10	2009	8.120.000,0	232,5	178	141,5	68,6
Macedonia Western	11	1981	3.240.000,0	93,2	107,2	17,5	6,4
Macedonia Western	11	1982	3.280.000,0	92,7	108,4	18,6	6,8
Macedonia Western	11	1983	3.000.000,0	94,8	108,2	18,5	6,9
Macedonia Western	11	1984	2.940.000,0	94,0	108,6	19,2	7,2
Macedonia Western	11	1985	3.230.000,0	95,2	109,4	20,6	7,4
Macedonia Western	11	1986	3.370.000,0	95,0	110,6	21,6	7,7
Macedonia Western	11	1987	3.720.000,0	95,4	105,7	22,7	8,9
Macedonia Western	11	1988	3.780.000,0	94,1	103,4	19,3	9,7
Macedonia Western	11	1989	3.890.000,0	98,7	107	24,4	10,1
Macedonia Western	11	1990	3.870.000,0	101,1	103,9	30,4	11,3
Macedonia Western	11	1991	3.920.000,0	97,2	99,4	33,1	12,3
Macedonia Western	11	1992	3.680.000,0	95,7	114,1	31,3	13,8

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Macedonia Western	11	1993	3.440.000,0	104,3	112,8	43,1	18
Macedonia Western	11	1994	3.470.000,0	107,7	116	42,3	17,6
Macedonia Western	11	1995	3.660.000,0	101,2	110	46,4	17,5
Macedonia Western	11	1996	3.730.000,0	101,8	109,3	53,3	18,1
Macedonia Western	11	1997	4.090.000,0	103,2	108,9	51,7	20,6
Macedonia Western	11	1998	4.270.000,0	101,5	98,8	54,5	22,4
Macedonia Western	11	1999	4.270.000,0	102,4	94,9	58,8	23
Macedonia Western	11	2000	3.780.000,0	101,0	96,5	59,8	20
Macedonia Western	11	2001	3.980.000,0	103,3	99,3	64,2	23,2
Macedonia Western	11	2002	4.240.000,0	104,3	98,9	67,1	21,8
Macedonia Western	11	2003	4.560.000,0	101,8	95,5	68,7	22,2
Macedonia Western	11	2004	4.670.000,0	101,6	96,8	67,2	25
Macedonia Western	11	2005	4.760.000,0	97,8	90,8	71,3	29,2
Macedonia Western	11	2006	4.760.000,0	102,7	87,4	77,2	29,9
Macedonia Western	11	2007	4.650.000,0	103,0	89,6	79,6	28,8
Macedonia Western	11	2008	4.300.000,0	104,5	94,2	73,6	29,7
Macedonia Western	11	2009	4.400.000,0	106,5	87,5	79,5	28,8

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Peloponnese	12	1981	6.320.000,0	200,4	211,1	38,4	10,8
Peloponnese	12	1982	6.120.000,0	199,5	213,4	40,9	11,5
Peloponnese	12	1983	5.990.000,0	203,9	213	40,6	11,7
Peloponnese	12	1984	5.840.000,0	202,1	213,7	42,2	12,1
Peloponnese	12	1985	5.990.000,0	204,8	215,3	45,1	12,6
Peloponnese	12	1986	6.100.000,0	204,2	217,7	47,4	13,1
Peloponnese	12	1987	5.810.000,0	205,3	208	49,8	15,1
Peloponnese	12	1988	5.970.000,0	221,3	214,3	53,1	16,8
Peloponnese	12	1989	5.820.000,0	199,2	199,2	50	17,9
Peloponnese	12	1990	5.900.000,0	211,6	205,2	59,4	18
Peloponnese	12	1991	6.100.000,0	210,5	211,6	70,3	20,1
Peloponnese	12	1992	6.120.000,0	208,8	202,7	75,5	19,2
Peloponnese	12	1993	5.920.000,0	214,1	233,3	73,8	26,1
Peloponnese	12	1994	6.040.000,0	222,4	226,5	78,9	26,7
Peloponnese	12	1995	5.660.000,0	220,3	227,1	80,9	25,5
Peloponnese	12	1996	5.830.000,0	228,4	224,4	87,4	29,6
Peloponnese	12	1997	6.440.000,0	207,0	214,7	85,3	28,4

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Peloponnese	12	1998	6.790.000,0	237,8	214,9	114,9	39,2
Peloponnese	12	1999	6.970.000,0	234,5	208,6	118,8	38,7
Peloponnese	12	2000	7.450.000,0	236,2	205,8	130,5	41,2
Peloponnese	12	2001	7.790.000,0	218,7	201	120,4	43,3
Peloponnese	12	2002	7.960.000,0	227,7	194,7	119,1	42,4
Peloponnese	12	2003	8.200.000,0	226,4	198,7	127,6	38,8
Peloponnese	12	2004	8.310.000,0	220,3	181,4	126,8	52,5
Peloponnese	12	2005	8.360.000,0	226,5	180,3	133,9	52,6
Peloponnese	12	2006	8.820.000,0	235,3	176,5	140,4	53,4
Peloponnese	12	2007	9.150.000,0	238,2	171,8	141,5	56,2
Peloponnese	12	2008	9.050.000,0	240,4	165,8	142	59,5
Peloponnese	12	2009	8.650.000,0	238,7	166,7	147,6	53,8
Thessaly	13	1981	7.440.000,0	281,0	256,2	49,3	13,8
Thessaly	13	1982	7.010.000,0	254,4	264,5	47,1	14,2
Thessaly	13	1983	6.980.000,0	230,7	285,6	56,5	18,2
Thessaly	13	1984	7.050.000,0	258,3	288,6	56,7	19,8
Thessaly	13	1985	7.370.000,0	255,4	298,4	61,6	20,6

region	unit	time	Real GDP 2005=100 (000)	Employment (000)	Education		
			Cam. Econ.		Primary (000)	Higher Secondary (000)	Tertiary (000)
Thessaly	13	1986	7.490.000,0	270,2	271,9	72,2	22,9
Thessaly	13	1987	7.140.000,0	261,1	262,7	71,1	27,5
Thessaly	13	1988	7.500.000,0	264,7	276,9	69,1	28,5
Thessaly	13	1989	7.900.000,0	253,4	274,2	74,5	30,9
Thessaly	13	1990	7.670.000,0	256,5	260	81,8	32,9
Thessaly	13	1991	8.110.000,0	251,4	259,7	89,1	34,4
Thessaly	13	1992	7.860.000,0	245,5	256,4	89,6	36,2
Thessaly	13	1993	7.610.000,0	248,0	266	89,9	41
Thessaly	13	1994	7.840.000,0	256,6	274,4	91,2	41,9
Thessaly	13	1995	7.630.000,0	256,9	266,5	98,4	40,8
Thessaly	13	1996	7.870.000,0	267,8	282,1	103,9	45,6
Thessaly	13	1997	8.310.000,0	273,9	280,9	112,5	49,6
Thessaly	13	1998	8.760.000,0	277,0	244,6	126,9	60,7
Thessaly	13	1999	8.860.000,0	268,0	230,3	139,7	61
Thessaly	13	2000	8.690.000,0	273,1	237,1	148,2	61
Thessaly	13	2001	9.110.000,0	276,0	248	149,5	68,6
Thessaly	13	2002	9.460.000,0	279,8	236,3	157,9	66,5

region	unit	time	Real GDP 2005=100 (000) Cam. Econ.	Employment (000)	Education Primary (000)	Higher Secondary (000)	Tertiary (000)
Thessaly	13	2003	10.410.000,0	290,2	231,4	171,9	71,7
Thessaly	13	2004	10.630.000,0	305,5	209	176,7	79,5
Thessaly	13	2005	10.230.000,0	302,1	208,3	181,7	83,9
Thessaly	13	2006	10.830.000,0	301,2	206,4	178,3	95,1
Thessaly	13	2007	10.980.000,0	302,0	208,9	180,9	97,9
Thessaly	13	2008	10.910.000,0	304,0	200,6	190,6	102,9
Thessaly	13	2009	10.310.000,0	304,3	187,7	198,6	107,6

Table Appendix 2: Greece- Infrastructure Capital and GFCF

Region	unit	time	REAL Infrastructure Capital Plain (2010=100)	REAL Infrastructure Capital with "Dianomarxiaka" (2010=100)	GFCF (000) (2005=100)
Attica	1	1981	5.095.828,5	4.947.208,4	10.910.000,0
Attica	1	1982	5.189.304,0	5.051.087,3	10.460.000,0
Attica	1	1983	5.562.717,3	5.434.175,9	10.240.000,0
Attica	1	1984	6.162.591,0	6.043.047,5	9.320.000,0
Attica	1	1985	6.660.861,2	6.549.685,7	9.900.000,0
Attica	1	1986	7.196.582,9	7.093.189,6	10.350.000,0
Attica	1	1987	7.450.985,1	7.354.829,4	8.690.000,0
Attica	1	1988	7.654.456,8	7.565.032,0	9.560.000,0
Attica	1	1989	7.894.138,0	7.810.973,0	9.930.000,0
Attica	1	1990	8.025.549,8	7.948.206,3	10.080.000,0
Attica	1	1991	8.362.215,6	8.290.286,1	10.590.000,0
Attica	1	1992	8.280.890,8	8.213.996,4	10.080.000,0
Attica	1	1993	8.262.851,0	8.200.639,2	9.670.000,0
Attica	1	1994	8.394.385,3	8.336.528,3	9.380.000,0
Attica	1	1995	8.447.927,2	8.394.120,2	9.740.000,0
Attica	1	1996	8.767.777,8	8.717.737,3	10.540.000,0
Attica	1	1997	9.255.011,5	9.208.473,8	11.030.000,0

Region	unit	time	REAL Infrastructure Capital	REAL Infrastructure Capital	GFCF (000)
			Plain (2010=100)	with "Dianomarxiaka" (2010=100)	(2005=100)
Attica	1	1998	9.828.082,5	9.784.802,5	13.370.000,0
Attica	1	1999	10.817.904,8	10.777.654,3	14.480.000,0
Attica	1	2000	12.535.470,6	12.498.037,7	14.870.000,0
Attica	1	2001	14.693.730,9	14.658.918,3	16.070.000,0
Attica	1	2002	16.910.639,0	16.878.263,3	16.400.000,0
Attica	1	2003	19.511.868,6	19.481.759,1	18.170.000,0
Attica	1	2004	21.960.707,0	21.932.705,2	17.240.000,0
Attica	1	2005	22.317.889,1	22.291.847,5	15.660.000,0
Attica	1	2006	22.085.228,7	22.061.010,0	18.730.000,0
Attica	1	2007	22.015.166,0	21.992.642,6	21.450.000,0
Attica	1	2008	21.825.806,3	21.804.859,5	20.810.000,0
Attica	1	2009	21.648.761,7	21.629.281,2	19.060.000,0
Aegean North	2	1981	287.387,3	286.153,1	233.780,0
Aegean North	2	1982	337.853,0	337.033,4	247.910,0
Aegean North	2	1983	393.291,6	395.207,4	217.040,0
Aegean North	2	1984	450.265,8	452.047,5	212.680,0
Aegean North	2	1985	418.747,2	421.466,3	233.360,0
Aegean North	2	1986	471.833,9	475.611,0	252.920,0
Aegean North	2	1987	506.005,3	510.160,1	215.840,0
Aegean North	2	1988	534.369,9	540.276,7	250.460,0

Region	unit	time	REAL Infrastructure Capital	REAL Infrastructure Capital	GFCF (000)
			Plain (2010=100)	with "Dianomarxiaka" (2010=100)	(2005=100)
Aegean North	2	1989	568.468,9	576.566,0	236.350,0
Aegean North	2	1990	600.453,7	609.265,4	252.150,0
Aegean North	2	1991	657.582,7	669.400,8	277.370,0
Aegean North	2	1992	726.139,4	741.134,3	263.290,0
Aegean North	2	1993	804.320,6	826.616,6	251.960,0
Aegean North	2	1994	842.591,9	874.809,1	252.290,0
Aegean North	2	1995	886.789,7	922.236,8	309.190,0
Aegean North	2	1996	900.963,4	946.501,4	360.960,0
Aegean North	2	1997	907.447,7	961.797,3	362.840,0
Aegean North	2	1998	923.842,7	984.770,1	490.190,0
Aegean North	2	1999	952.392,2	1.025.956,4	494.720,0
Aegean North	2	2000	1.011.566,2	1.085.337,3	477.610,0
Aegean North	2	2001	1.104.833,8	1.178.869,4	513.240,0
Aegean North	2	2002	1.107.762,0	1.183.661,8	502.120,0
Aegean North	2	2003	1.114.764,3	1.209.421,4	640.950,0
Aegean North	2	2004	1.150.356,4	1.260.846,4	643.850,0
Aegean North	2	2005	1.190.824,4	1.332.386,1	557.730,0
Aegean North	2	2006	1.238.140,4	1.407.520,0	605.690,0
Aegean North	2	2007	1.288.141,8	1.499.940,1	833.790,0
Aegean North	2	2008	1.362.855,1	1.602.560,8	864.080,0

Region	unit	time	REAL Infrastructure Capital	REAL Infrastructure Capital	GFCF (000)
			Plain (2010=100)	with "Dianomarxiaka" (2010=100)	(2005=100)
Aegean North	2	2009	1.362.401,3	1.631.509,5	488.490,0
Aegean South	3	1981	483.608,0	484.931,4	378.670,0
Aegean South	3	1982	516.603,9	518.162,8	395.910,0
Aegean South	3	1983	569.534,0	573.661,8	407.810,0
Aegean South	3	1984	646.416,6	650.255,5	383.800,0
Aegean South	3	1985	693.987,5	698.620,5	428.610,0
Aegean South	3	1986	757.854,2	763.411,9	508.320,0
Aegean South	3	1987	792.548,6	798.359,3	462.380,0
Aegean South	3	1988	851.515,5	858.962,3	544.020,0
Aegean South	3	1989	893.712,8	903.242,1	564.240,0
Aegean South	3	1990	913.415,1	923.559,0	591.640,0
Aegean South	3	1991	948.691,2	961.748,3	641.290,0
Aegean South	3	1992	979.373,9	995.521,1	609.850,0
Aegean South	3	1993	1.032.211,9	1.055.579,9	595.570,0
Aegean South	3	1994	1.054.111,0	1.087.325,3	593.710,0
Aegean South	3	1995	1.087.780,7	1.124.155,1	611.210,0
Aegean South	3	1996	1.112.652,2	1.159.052,7	653.450,0
Aegean South	3	1997	1.158.681,6	1.213.832,5	676.420,0
Aegean South	3	1998	1.204.990,1	1.266.662,7	809.430,0
Aegean South	3	1999	1.217.026,0	1.291.283,1	874.370,0

Region	unit	time	REAL Infrastructure Capital	REAL Infrastructure Capital	GFCF (000)
			Plain (2010=100)	with "Dianomarxiaka" (2010=100)	(2005=100)
Aegean South	3	2000	1.291.578,9	1.369.350,2	976.400,0
Aegean South	3	2001	1.361.959,5	1.439.550,4	1.080.000,0
Aegean South	3	2002	1.367.161,6	1.440.720,3	1.230.000,0
Aegean South	3	2003	1.439.366,6	1.515.265,7	1.420.000,0
Aegean South	3	2004	1.532.154,4	1.622.264,6	1.310.000,0
Aegean South	3	2005	1.566.046,9	1.666.556,0	1.140.000,0
Aegean South	3	2006	1.623.334,6	1.738.705,0	1.420.000,0
Aegean South	3	2007	1.666.273,3	1.829.127,3	1.670.000,0
Aegean South	3	2008	1.757.923,9	1.944.815,0	1.970.000,0
Aegean South	3	2009	1.796.651,3	2.035.694,4	1.400.000,0
Crete	4	1981	671.338,8	932.791,9	566.580,0
Crete	4	1982	768.005,8	1.040.281,9	631.960,0
Crete	4	1983	916.067,9	1.203.518,0	616.230,0
Crete	4	1984	1.071.762,2	1.370.663,1	557.970,0
Crete	4	1985	1.254.376,3	1.576.498,8	697.290,0
Crete	4	1986	1.408.190,2	1.745.963,7	743.920,0
Crete	4	1987	1.504.300,6	1.849.751,6	648.850,0
Crete	4	1988	1.604.031,8	1.957.192,6	774.670,0
Crete	4	1989	1.699.668,3	2.059.408,6	912.100,0
Crete	4	1990	1.771.508,1	2.136.547,9	944.070,0

Region	unit	time	REAL Infrastructure Capital	REAL Infrastructure Capital	GFCF (000)
			Plain (2010=100)	with "Dianomarxiaka" (2010=100)	(2005=100)
Crete	4	1991	1.834.830,7	2.197.434,6	1.040.000,0
Crete	4	1992	1.932.808,8	2.311.420,2	1.010.000,0
Crete	4	1993	2.012.299,9	2.397.720,5	976.670,0
Crete	4	1994	2.054.426,9	2.435.932,7	1.010.000,0
Crete	4	1995	2.131.727,9	2.516.181,4	963.490,0
Crete	4	1996	2.160.750,8	2.551.213,0	1.010.000,0
Crete	4	1997	2.203.621,1	2.591.696,2	1.060.000,0
Crete	4	1998	2.229.140,5	2.618.579,4	1.450.000,0
Crete	4	1999	2.261.417,8	2.668.432,7	1.440.000,0
Crete	4	2000	2.314.841,5	2.727.381,5	1.650.000,0
Crete	4	2001	2.343.384,4	2.763.646,9	1.670.000,0
Crete	4	2002	2.405.443,1	2.849.097,7	1.700.000,0
Crete	4	2003	2.543.520,6	3.029.397,2	2.220.000,0
Crete	4	2004	2.724.421,1	3.277.001,7	2.490.000,0
Crete	4	2005	2.741.324,9	3.349.824,7	2.210.000,0
Crete	4	2006	2.797.724,9	3.473.275,7	2.630.000,0
Crete	4	2007	2.853.999,6	3.615.029,4	3.620.000,0
Crete	4	2008	2.968.105,5	3.786.663,9	3.420.000,0
Crete	4	2009	3.036.528,5	3.939.653,6	2.680.000,0
Greece Sterea	5	1981	710.458,1	978.168,4	984.520,0

Region	unit	time	REAL Infrastructure Capital	REAL Infrastructure Capital	GFCF (000)
			Plain (2010=100)	with "Dianomarxiaka" (2010=100)	(2005=100)
Greece Sterea	5	1982	775.559,8	1.034.125,4	953.020,0
Greece Sterea	5	1983	914.181,8	1.167.987,5	933.290,0
Greece Sterea	5	1984	1.076.218,6	1.320.819,3	908.710,0
Greece Sterea	5	1985	1.257.466,0	1.495.056,6	1.010.000,0
Greece Sterea	5	1986	1.403.882,2	1.644.582,2	1.100.000,0
Greece Sterea	5	1987	1.560.327,3	1.806.942,5	928.710,0
Greece Sterea	5	1988	1.676.592,2	1.928.181,4	1.100.000,0
Greece Sterea	5	1989	1.729.686,5	1.990.142,3	1.130.000,0
Greece Sterea	5	1990	1.774.034,1	2.039.781,2	1.180.000,0
Greece Sterea	5	1991	1.891.048,1	2.192.820,5	1.310.000,0
Greece Sterea	5	1992	2.007.584,4	2.357.212,0	1.190.000,0
Greece Sterea	5	1993	2.102.533,9	2.507.388,7	1.160.000,0
Greece Sterea	5	1994	2.113.369,7	2.530.219,8	1.160.000,0
Greece Sterea	5	1995	2.149.215,1	2.603.171,0	1.620.000,0
Greece Sterea	5	1996	2.216.036,4	2.724.148,4	1.770.000,0
Greece Sterea	5	1997	2.254.868,8	2.782.486,7	1.720.000,0
Greece Sterea	5	1998	2.313.051,5	2.844.374,5	2.290.000,0
Greece Sterea	5	1999	2.370.999,2	2.920.056,8	2.680.000,0
Greece Sterea	5	2000	2.497.574,3	3.016.981,3	2.770.000,0
Greece Sterea	5	2001	2.609.736,2	3.101.069,2	3.010.000,0

Region	unit	time	REAL Infrastructure Capital	REAL Infrastructure Capital	GFCF (000)
			Plain (2010=100)	with "Dianomarxiaka" (2010=100)	(2005=100)
Greece Sterea	5	2002	2.633.686,2	3.096.820,1	2.670.000,0
Greece Sterea	5	2003	2.605.085,7	3.061.481,9	3.330.000,0
Greece Sterea	5	2004	2.651.143,5	3.108.644,2	3.350.000,0
Greece Sterea	5	2005	2.775.757,4	3.274.961,9	2.760.000,0
Greece Sterea	5	2006	2.963.178,9	3.474.104,4	3.730.000,0
Greece Sterea	5	2007	3.334.920,6	3.870.259,0	3.740.000,0
Greece Sterea	5	2008	3.758.616,4	4.313.365,1	3.090.000,0
Greece Sterea	5	2009	4.272.392,5	4.872.835,2	2.270.000,0
Greece Western	6	1981	1.789.275,6	1.982.576,0	805.520,0
Greece Western	6	1982	1.830.264,2	2.031.643,9	820.600,0
Greece Western	6	1983	1.899.495,8	2.106.416,0	796.660,0
Greece Western	6	1984	1.964.105,2	2.182.927,4	719.820,0
Greece Western	6	1985	2.084.820,7	2.303.160,7	775.950,0
Greece Western	6	1986	2.130.614,2	2.350.586,0	817.260,0
Greece Western	6	1987	2.131.107,4	2.352.566,8	692.130,0
Greece Western	6	1988	2.142.444,0	2.369.012,6	802.530,0
Greece Western	6	1989	2.181.310,5	2.427.456,4	839.790,0
Greece Western	6	1990	2.180.671,7	2.445.000,5	872.990,0
Greece Western	6	1991	2.159.793,5	2.427.925,6	976.010,0
Greece Western	6	1992	2.188.652,1	2.458.690,6	943.830,0

Region	unit	time	REAL Infrastructure Capital	REAL Infrastructure Capital	GFCF (000)
			Plain (2010=100)	with "Dianomarxiaka" (2010=100)	(2005=100)
Greece Western	6	1993	2.298.163,9	2.572.951,4	918.020,0
Greece Western	6	1994	2.435.642,3	2.705.012,5	930.330,0
Greece Western	6	1995	2.595.718,5	2.868.637,4	940.400,0
Greece Western	6	1996	2.693.138,5	2.978.096,3	1.000.000,0
Greece Western	6	1997	2.828.209,4	3.117.180,0	1.070.000,0
Greece Western	6	1998	2.905.285,4	3.189.732,0	1.370.000,0
Greece Western	6	1999	3.074.841,0	3.361.498,8	1.470.000,0
Greece Western	6	2000	3.246.325,4	3.549.166,5	1.610.000,0
Greece Western	6	2001	3.382.925,1	3.696.818,9	1.780.000,0
Greece Western	6	2002	3.470.996,3	3.783.376,1	1.810.000,0
Greece Western	6	2003	3.263.015,8	3.893.318,0	2.000.000,0
Greece Western	6	2004	3.359.473,7	3.969.387,0	2.260.000,0
Greece Western	6	2005	3.389.441,9	4.005.412,1	2.040.000,0
Greece Western	6	2006	3.444.186,1	4.099.463,2	2.470.000,0
Greece Western	6	2007	3.451.521,4	4.139.015,2	2.580.000,0
Greece Western	6	2008	3.538.205,7	4.243.567,7	2.780.000,0
Greece Western	6	2009	3.583.520,0	4.350.714,5	3.060.000,0
Ionio	7	1981	333.591,6	333.591,5	424.040,0
Ionio	7	1982	356.887,3	356.887,2	416.890,0
Ionio	7	1983	404.493,4	404.493,3	402.600,0

Region	unit	time	REAL Infrastructure Capital	REAL Infrastructure Capital	GFCF (000)
			Plain (2010=100)	with "Dianomarxiaka" (2010=100)	(2005=100)
Ionio	7	1984	458.612,7	458.612,7	363.920,0
Ionio	7	1985	526.330,9	526.330,8	388.670,0
Ionio	7	1986	577.988,9	577.988,8	401.430,0
Ionio	7	1987	599.050,7	599.050,7	347.960,0
Ionio	7	1988	619.591,9	620.009,0	401.340,0
Ionio	7	1989	637.454,2	638.283,0	395.410,0
Ionio	7	1990	642.607,9	643.469,9	404.970,0
Ionio	7	1991	668.428,8	671.187,6	434.480,0
Ionio	7	1992	726.256,5	734.745,1	415.980,0
Ionio	7	1993	785.004,6	800.087,9	400.130,0
Ionio	7	1994	849.320,2	872.584,4	394.220,0
Ionio	7	1995	875.035,4	900.939,7	386.320,0
Ionio	7	1996	880.057,7	909.841,6	408.530,0
Ionio	7	1997	888.230,6	921.404,1	428.330,0
Ionio	7	1998	887.742,4	928.009,6	504.370,0
Ionio	7	1999	894.006,8	939.941,1	542.020,0
Ionio	7	2000	960.928,8	1.006.066,4	613.980,0
Ionio	7	2001	996.584,9	1.043.176,7	720.260,0
Ionio	7	2002	1.013.199,4	1.061.239,3	729.240,0
Ionio	7	2003	1.028.812,8	1.082.754,9	794.890,0

Region	unit	time	REAL Infrastructure Capital	REAL Infrastructure Capital	GFCF (000)
			Plain (2010=100)	with "Dianomarxiaka" (2010=100)	(2005=100)
Ionio	7	2004	1.072.990,8	1.135.771,3	924.690,0
Ionio	7	2005	1.111.936,3	1.186.309,1	685.000,0
Ionio	7	2006	1.151.618,4	1.241.680,2	905.440,0
Ionio	7	2007	1.186.164,8	1.309.223,9	1.120.000,0
Ionio	7	2008	1.234.628,2	1.374.622,9	988.740,0
Ionio	7	2009	1.265.432,3	1.439.897,5	660.890,0
Ipeiros	8	1981	642.841,9	722.017,9	608.480,0
Ipeiros	8	1982	701.589,0	788.719,3	575.730,0
Ipeiros	8	1983	756.223,7	891.480,9	571.140,0
Ipeiros	8	1984	845.407,2	1.013.706,3	500.420,0
Ipeiros	8	1985	957.621,5	1.136.607,9	537.760,0
Ipeiros	8	1986	1.072.701,6	1.240.004,2	611.060,0
Ipeiros	8	1987	1.173.710,3	1.320.517,9	489.930,0
Ipeiros	8	1988	1.251.132,4	1.389.120,6	541.610,0
Ipeiros	8	1989	1.317.892,4	1.455.825,0	538.330,0
Ipeiros	8	1990	1.383.688,7	1.497.529,5	530.070,0
Ipeiros	8	1991	1.427.494,3	1.568.281,2	582.230,0
Ipeiros	8	1992	1.495.659,8	1.667.004,8	555.840,0
Ipeiros	8	1993	1.588.901,6	1.762.113,6	527.800,0
Ipeiros	8	1994	1.677.276,4	1.782.192,4	519.650,0

Region	unit	time	REAL Infrastructure Capital	REAL Infrastructure Capital	GFCF (000)
			Plain (2010=100)	with "Dianomarxiaka" (2010=100)	(2005=100)
Ipeiros	8	1995	1.698.685,0	1.859.119,3	529.850,0
Ipeiros	8	1996	1.726.351,0	1.917.286,7	555.740,0
Ipeiros	8	1997	1.750.738,5	1.964.431,9	590.970,0
Ipeiros	8	1998	1.790.082,9	1.991.061,8	775.540,0
Ipeiros	8	1999	1.817.780,6	2.058.507,9	845.770,0
Ipeiros	8	2000	1.881.966,6	2.129.503,1	849.960,0
Ipeiros	8	2001	1.955.657,1	2.180.118,8	884.710,0
Ipeiros	8	2002	2.007.456,3	2.201.502,2	961.240,0
Ipeiros	8	2003	2.029.108,4	2.233.907,5	1.060.000,0
Ipeiros	8	2004	2.057.011,4	2.326.602,6	1.240.000,0
Ipeiros	8	2005	2.141.468,6	2.362.398,4	1.180.000,0
Ipeiros	8	2006	2.160.744,5	2.477.627,0	1.300.000,0
Ipeiros	8	2007	2.248.409,1	2.583.643,9	1.470.000,0
Ipeiros	8	2008	2.332.675,8	2.751.183,4	1.600.000,0
Ipeiros	8	2009	2.469.408,6	2.757.689,2	1.310.000,0
Macedonia Central	9	1981	2.180.022,4	2.434.483,4	4.730.000,0
Macedonia Central	9	1982	2.354.114,5	2.633.698,9	4.470.000,0
Macedonia Central	9	1983	2.612.874,6	2.914.022,8	4.200.000,0
Macedonia Central	9	1984	2.891.459,0	3.197.707,3	4.030.000,0
Macedonia Central	9	1985	3.154.691,3	3.470.749,8	4.550.000,0

Region	unit	time	REAL Infrastructure Capital	REAL Infrastructure Capital	GFCF (000)
			Plain (2010=100)	with "Dianomarxiaka" (2010=100)	(2005=100)
Macedonia Central	9	1986	3.364.980,9	3.678.761,9	4.660.000,0
Macedonia Central	9	1987	3.423.661,0	3.729.206,9	3.920.000,0
Macedonia Central	9	1988	3.516.487,7	3.812.872,4	4.490.000,0
Macedonia Central	9	1989	3.583.094,1	3.872.031,6	4.670.000,0
Macedonia Central	9	1990	3.597.768,4	3.880.822,0	4.720.000,0
Macedonia Central	9	1991	3.648.057,5	3.938.602,2	5.140.000,0
Macedonia Central	9	1992	3.782.989,4	4.093.595,1	4.850.000,0
Macedonia Central	9	1993	3.891.644,1	4.225.483,1	4.610.000,0
Macedonia Central	9	1994	3.929.830,3	4.278.361,0	4.590.000,0
Macedonia Central	9	1995	4.127.217,7	4.511.516,9	4.540.000,0
Macedonia Central	9	1996	4.214.358,6	4.706.928,4	5.000.000,0
Macedonia Central	9	1997	4.515.621,7	5.206.754,9	5.200.000,0
Macedonia Central	9	1998	4.677.576,4	5.540.786,5	5.990.000,0
Macedonia Central	9	1999	4.921.935,0	6.069.580,0	6.490.000,0
Macedonia Central	9	2000	5.110.858,5	6.242.110,9	6.720.000,0
Macedonia Central	9	2001	5.203.381,6	6.272.660,9	6.830.000,0
Macedonia Central	9	2002	5.399.070,3	6.419.592,2	6.700.000,0
Macedonia Central	9	2003	5.666.853,0	6.694.618,0	7.840.000,0
Macedonia Central	9	2004	6.047.455,2	7.078.303,5	8.670.000,0
Macedonia Central	9	2005	6.316.711,6	7.377.864,7	7.120.000,0

Region	unit	time	REAL Infrastructure Capital Plain (2010=100)	REAL Infrastructure Capital with "Dianomarxiaka" (2010=100)	GFCF (000) (2005=100)
Macedonia Central	9	2006	6.790.498,8	7.885.723,3	8.450.000,0
Macedonia Central	9	2007	7.227.167,3	8.415.880,8	10.430.000,0
Macedonia Central	9	2008	7.482.270,3	8.728.772,9	7.460.000,0
Macedonia Central	9	2009	7.520.717,8	8.890.688,7	6.010.000,0
Macedonia Eastern_Thrace	10	1981	1.114.296,6	1.241.796,7	1.230.000,0
Macedonia Eastern_Thrace	10	1982	1.199.230,2	1.351.024,2	1.250.000,0
Macedonia Eastern_Thrace	10	1983	1.366.676,9	1.543.211,2	1.200.000,0
Macedonia Eastern_Thrace	10	1984	1.559.419,4	1.742.183,2	1.230.000,0
Macedonia Eastern_Thrace	10	1985	1.729.371,9	1.917.339,1	1.400.000,0
Macedonia Eastern_Thrace	10	1986	1.836.091,6	2.020.715,2	1.260.000,0
Macedonia Eastern_Thrace	10	1987	1.867.076,8	2.046.605,5	1.050.000,0
Macedonia Eastern_Thrace	10	1988	1.902.468,5	2.075.005,9	1.150.000,0
Macedonia Eastern_Thrace	10	1989	1.942.543,1	2.108.475,4	1.220.000,0
Macedonia Eastern_Thrace	10	1990	1.965.048,1	2.125.145,3	1.240.000,0
Macedonia Eastern_Thrace	10	1991	2.117.904,7	2.279.601,1	1.360.000,0
Macedonia Eastern_Thrace	10	1992	2.281.734,1	2.447.710,5	1.260.000,0
Macedonia Eastern_Thrace	10	1993	2.351.587,9	2.522.977,8	1.180.000,0
Macedonia Eastern_Thrace	10	1994	2.408.800,9	2.585.882,4	1.180.000,0
Macedonia Eastern_Thrace	10	1995	2.455.429,8	2.649.696,2	1.140.000,0
Macedonia Eastern_Thrace	10	1996	2.497.252,0	2.733.180,6	1.250.000,0

Region	unit	time	REAL Infrastructure Capital Plain (2010=100)	REAL Infrastructure Capital with "Dianomarxiaka" (2010=100)	GFCF (000) (2005=100)
Macedonia Eastern_Thrace	10	1997	2.575.374,6	2.873.218,9	1.280.000,0
Macedonia Eastern_Thrace	10	1998	2.691.009,0	3.040.290,5	1.530.000,0
Macedonia Eastern_Thrace	10	1999	2.839.853,3	3.270.131,3	1.580.000,0
Macedonia Eastern_Thrace	10	2000	2.911.145,5	3.483.891,0	1.700.000,0
Macedonia Eastern_Thrace	10	2001	2.958.127,4	3.510.526,4	1.770.000,0
Macedonia Eastern_Thrace	10	2002	2.889.796,7	3.432.214,9	1.640.000,0
Macedonia Eastern_Thrace	10	2003	2.888.902,1	3.440.019,9	1.840.000,0
Macedonia Eastern_Thrace	10	2004	2.945.573,3	3.518.974,7	2.100.000,0
Macedonia Eastern_Thrace	10	2005	2.958.989,5	3.577.820,2	1.880.000,0
Macedonia Eastern_Thrace	10	2006	3.054.545,3	3.703.462,0	2.150.000,0
Macedonia Eastern_Thrace	10	2007	3.223.049,0	3.909.427,8	2.660.000,0
Macedonia Eastern_Thrace	10	2008	3.436.395,7	4.159.839,4	2.540.000,0
Macedonia Eastern_Thrace	10	2009	3.422.016,8	4.190.234,6	1.660.000,0
Macedonia Western	11	1981	539.249,3	684.645,3	811.000,0
Macedonia Western	11	1982	575.734,1	735.486,2	817.140,0
Macedonia Western	11	1983	634.691,9	806.766,8	737.860,0
Macedonia Western	11	1984	701.236,4	876.225,8	665.390,0
Macedonia Western	11	1985	771.935,7	952.531,6	789.530,0
Macedonia Western	11	1986	837.269,1	1.016.564,1	863.670,0
Macedonia Western	11	1987	850.031,9	1.024.622,0	830.140,0

Region	unit	time	REAL Infrastructure Capital	REAL Infrastructure Capital	GFCF (000)
			Plain (2010=100)	with "Dianomarxiaka" (2010=100)	(2005=100)
Macedonia Western	11	1988	868.540,5	1.037.896,1	917.780,0
Macedonia Western	11	1989	901.583,8	1.066.684,4	958.360,0
Macedonia Western	11	1990	903.005,8	1.064.744,5	981.530,0
Macedonia Western	11	1991	931.913,3	1.097.933,1	1.050.000,0
Macedonia Western	11	1992	991.838,4	1.169.322,1	933.180,0
Macedonia Western	11	1993	1.041.202,9	1.231.963,1	859.720,0
Macedonia Western	11	1994	1.059.854,2	1.259.010,0	848.690,0
Macedonia Western	11	1995	1.107.041,1	1.326.636,5	915.920,0
Macedonia Western	11	1996	1.133.076,9	1.414.541,4	1.040.000,0
Macedonia Western	11	1997	1.153.310,3	1.548.240,1	1.100.000,0
Macedonia Western	11	1998	1.186.883,2	1.680.142,3	1.250.000,0
Macedonia Western	11	1999	1.241.383,6	1.897.177,2	1.190.000,0
Macedonia Western	11	2000	1.307.498,4	1.929.400,6	1.090.000,0
Macedonia Western	11	2001	1.327.103,7	1.910.928,6	1.200.000,0
Macedonia Western	11	2002	1.373.013,9	1.943.964,1	1.020.000,0
Macedonia Western	11	2003	1.467.602,3	2.040.255,4	1.170.000,0
Macedonia Western	11	2004	1.520.973,9	2.107.413,3	1.280.000,0
Macedonia Western	11	2005	1.706.520,3	2.308.192,0	1.430.000,0
Macedonia Western	11	2006	1.926.698,4	2.545.897,2	1.540.000,0
Macedonia Western	11	2007	2.094.348,8	2.726.131,8	1.700.000,0

Region	unit	time	REAL Infrastructure Capital Plain (2010=100)	REAL Infrastructure Capital with "Dianomarxiaka" (2010=100)	GFCF (000) (2005=100)
Macedonia Western	11	2008	2.195.573,6	2.849.403,3	2.080.000,0
Macedonia Western	11	2009	2.210.604,0	2.889.551,7	2.480.000,0
Peloponnese	12	1981	707.071,1	1.036.227,1	2.300.000,0
Peloponnese	12	1982	767.471,7	1.122.812,7	2.160.000,0
Peloponnese	12	1983	879.691,6	1.252.579,5	2.030.000,0
Peloponnese	12	1984	1.003.296,4	1.411.766,2	1.770.000,0
Peloponnese	12	1985	1.135.685,5	1.547.595,4	1.910.000,0
Peloponnese	12	1986	1.285.907,3	1.701.400,6	1.990.000,0
Peloponnese	12	1987	1.378.777,7	1.796.019,9	1.610.000,0
Peloponnese	12	1988	1.479.976,3	1.908.421,3	1.760.000,0
Peloponnese	12	1989	1.565.198,6	2.039.006,6	1.700.000,0
Peloponnese	12	1990	1.597.932,2	2.115.345,3	1.730.000,0
Peloponnese	12	1991	1.623.088,1	2.132.734,0	1.840.000,0
Peloponnese	12	1992	1.673.946,2	2.165.116,6	1.700.000,0
Peloponnese	12	1993	1.708.554,8	2.184.622,1	1.570.000,0
Peloponnese	12	1994	1.723.714,4	2.180.833,7	1.530.000,0
Peloponnese	12	1995	1.739.893,9	2.187.883,7	1.450.000,0
Peloponnese	12	1996	1.735.108,5	2.186.630,5	1.590.000,0
Peloponnese	12	1997	1.735.316,9	2.187.595,2	1.540.000,0
Peloponnese	12	1998	1.750.858,6	2.190.418,1	1.900.000,0

Region	unit	time	REAL Infrastructure Capital	REAL Infrastructure Capital	GFCF (000)
			Plain (2010=100)	with "Dianomarxiaka" (2010=100)	(2005=100)
Peloponnese	12	1999	1.804.683,8	2.241.317,0	2.170.000,0
Peloponnese	12	2000	1.892.656,2	2.332.212,9	2.050.000,0
Peloponnese	12	2001	1.989.465,1	2.434.595,9	2.060.000,0
Peloponnese	12	2002	1.994.951,5	2.423.870,2	2.120.000,0
Peloponnese	12	2003	1.988.410,4	2.418.638,5	2.500.000,0
Peloponnese	12	2004	2.069.670,5	2.530.590,3	2.720.000,0
Peloponnese	12	2005	2.155.063,2	2.705.883,4	2.400.000,0
Peloponnese	12	2006	2.254.636,6	2.852.685,0	2.750.000,0
Peloponnese	12	2007	2.318.965,3	3.004.273,9	2.860.000,0
Peloponnese	12	2008	2.414.914,8	3.151.611,1	2.730.000,0
Peloponnese	12	2009	2.468.162,6	3.300.356,8	2.060.000,0
Thessaly	13	1981	616.938,0	884.363,3	1.880.000,0
Thessaly	13	1982	710.699,5	973.972,5	1.740.000,0
Thessaly	13	1983	842.685,3	1.096.692,7	1.680.000,0
Thessaly	13	1984	992.486,1	1.238.741,8	1.540.000,0
Thessaly	13	1985	1.142.906,4	1.401.405,9	1.710.000,0
Thessaly	13	1986	1.265.672,6	1.511.789,0	1.800.000,0
Thessaly	13	1987	1.339.748,5	1.571.120,8	1.480.000,0
Thessaly	13	1988	1.420.695,3	1.640.616,1	1.680.000,0
Thessaly	13	1989	1.505.898,0	1.715.854,6	1.770.000,0

Region	unit	time	REAL Infrastructure Capital	REAL Infrastructure Capital	GFCF (000)
			Plain (2010=100)	with "Dianomarxiaka" (2010=100)	(2005=100)
Thessaly	13	1990	1.566.226,4	1.764.469,1	1.740.000,0
Thessaly	13	1991	1.642.275,3	1.840.477,6	1.920.000,0
Thessaly	13	1992	1.745.675,0	1.946.418,3	1.740.000,0
Thessaly	13	1993	1.789.625,0	1.988.742,6	1.630.000,0
Thessaly	13	1994	1.834.880,0	2.033.012,5	1.620.000,0
Thessaly	13	1995	1.914.160,2	2.118.224,2	1.610.000,0
Thessaly	13	1996	1.952.287,2	2.187.558,1	1.800.000,0
Thessaly	13	1997	2.026.417,6	2.279.803,5	1.900.000,0
Thessaly	13	1998	2.044.367,6	2.314.023,3	2.530.000,0
Thessaly	13	1999	2.061.468,7	2.357.948,0	2.530.000,0
Thessaly	13	2000	2.110.305,7	2.495.204,3	2.470.000,0
Thessaly	13	2001	2.181.336,5	2.624.822,1	2.300.000,0
Thessaly	13	2002	2.243.771,9	2.735.279,5	2.260.000,0
Thessaly	13	2003	2.368.814,1	2.907.863,6	2.750.000,0
Thessaly	13	2004	2.513.292,1	3.119.519,9	2.890.000,0
Thessaly	13	2005	2.597.749,5	3.274.205,3	2.430.000,0
Thessaly	13	2006	2.666.332,7	3.397.898,4	2.870.000,0
Thessaly	13	2007	2.743.012,6	3.551.825,3	3.300.000,0
Thessaly	13	2008	2.881.549,8	3.737.997,4	2.960.000,0
Thessaly	13	2009	2.876.838,9	3.816.365,9	2.730.000,0

ITALY

Table 3 of Appendix: Italy- GDP, Employment and Education

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
PIEMONTE	1	1970	48.120.684,0	1.907,1	
PIEMONTE	1	1971	48.076.599,4	1.890,8	
PIEMONTE	1	1972	49.706.748,8	1.863,7	
PIEMONTE	1	1973	53.404.660,3	1.899,3	
PIEMONTE	1	1974	56.003.277,2	1.953,0	
PIEMONTE	1	1975	52.575.271,8	1.936,9	
PIEMONTE	1	1976	57.087.871,2	1.950,7	
PIEMONTE	1	1977	57.547.296,4	1.969,5	
PIEMONTE	1	1978	59.283.822,6	1.967,6	
PIEMONTE	1	1979	62.105.378,9	1.973,5	
PIEMONTE	1	1980	64.486.700,0	1.978,8	
PIEMONTE	1	1981	64.138.200,0	1.949,2	
PIEMONTE	1	1982	63.136.900,0	1.931,9	
PIEMONTE	1	1983	64.239.000,0	1.938,5	
PIEMONTE	1	1984	65.411.800,0	1.889,2	
PIEMONTE	1	1985	67.738.200,0	1.866,3	
PIEMONTE	1	1986	69.996.700,0	1.875,8	
PIEMONTE	1	1987	71.303.800,0	1.882,5	
PIEMONTE	1	1988	74.570.000,0	1.921,0	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
PIEMONTE	1	1989	76.107.200,0	1.928,4	
PIEMONTE	1	1990	76.914.200,0	1.926,1	
PIEMONTE	1	1991	76.756.400,0	1.936,0	
PIEMONTE	1	1992	77.325.600,0	1.897,8	
PIEMONTE	1	1993	75.880.700,0	1.825,9	
PIEMONTE	1	1994	78.261.600,0	1.828,6	
PIEMONTE	1	1995	81.112.758,0	1.855,6	
PIEMONTE	1	1996	80.830.824,2	1.863,4	
PIEMONTE	1	1997	82.764.232,3	1.858,3	28,946
PIEMONTE	1	1998	83.503.643,6	1.858,8	27,387
PIEMONTE	1	1999	85.080.593,1	1.885,9	26,610
PIEMONTE	1	2000	87.427.528,2	1.928,5	26,013
PIEMONTE	1	2001	88.090.710,5	1.934,4	26,996
PIEMONTE	1	2002	87.683.126,0	1.944,8	26,647
PIEMONTE	1	2003	87.227.392,7	1.957,7	27,260
PIEMONTE	1	2004	88.207.208,6	1.977,0	26,417
VALLE D'AOSTA	2	1970	1.708.992,4	52,5	
VALLE D'AOSTA	2	1971	1.718.921,6	51,5	
VALLE D'AOSTA	2	1972	1.818.667,5	51,3	
VALLE D'AOSTA	2	1973	1.949.963,7	52,4	
VALLE D'AOSTA	2	1974	2.012.309,1	54,9	
VALLE D'AOSTA	2	1975	1.841.724,7	55,0	
VALLE D'AOSTA	2	1976	1.910.639,9	54,7	
VALLE D'AOSTA	2	1977	1.928.204,3	55,2	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
VALLE D'AOSTA	2	1978	1.950.731,1	53,3	
VALLE D'AOSTA	2	1979	1.976.616,0	52,8	
VALLE D'AOSTA	2	1980	2.175.800,0	57,4	
VALLE D'AOSTA	2	1981	2.213.900,0	57,9	
VALLE D'AOSTA	2	1982	2.229.100,0	58,5	
VALLE D'AOSTA	2	1983	2.256.500,0	59,3	
VALLE D'AOSTA	2	1984	2.354.900,0	60,3	
VALLE D'AOSTA	2	1985	2.448.400,0	59,9	
VALLE D'AOSTA	2	1986	2.519.800,0	62,7	
VALLE D'AOSTA	2	1987	2.531.800,0	59,9	
VALLE D'AOSTA	2	1988	2.580.300,0	60,6	
VALLE D'AOSTA	2	1989	2.635.000,0	60,0	
VALLE D'AOSTA	2	1990	2.672.900,0	61,9	
VALLE D'AOSTA	2	1991	2.716.700,0	62,2	
VALLE D'AOSTA	2	1992	2.742.400,0	62,2	
VALLE D'AOSTA	2	1993	2.706.200,0	60,5	
VALLE D'AOSTA	2	1994	2.702.700,0	58,8	
VALLE D'AOSTA	2	1995	2.714.652,4	56,8	
VALLE D'AOSTA	2	1996	2.713.722,8	56,8	
VALLE D'AOSTA	2	1997	2.687.435,1	57,5	0,782
VALLE D'AOSTA	2	1998	2.811.746,3	57,3	0,755
VALLE D'AOSTA	2	1999	2.815.361,5	57,1	0,678
VALLE D'AOSTA	2	2000	2.781.223,7	59,2	0,645
VALLE D'AOSTA	2	2001	2.880.021,9	60,3	0,610

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
VALLE D'AOSTA	2	2002	2.858.661,0	60,7	0,630
VALLE D'AOSTA	2	2003	2.902.894,8	60,6	0,644
VALLE D'AOSTA	2	2004	2.941.234,1	60,9	0,662
Lombardia	3	1970	98.538.182,7	3.598,1	
Lombardia	3	1971	99.885.661,7	3.598,6	
Lombardia	3	1972	103.145.000,3	3.552,0	
Lombardia	3	1973	109.235.705,8	3.634,5	
Lombardia	3	1974	114.695.771,5	3.680,9	
Lombardia	3	1975	111.286.732,7	3.682,7	
Lombardia	3	1976	119.783.846,4	3.721,6	
Lombardia	3	1977	123.388.755,0	3.766,8	
Lombardia	3	1978	127.010.710,8	3.780,6	
Lombardia	3	1979	132.936.620,0	3.790,9	
Lombardia	3	1980	134.005.000,0	3.880,0	
Lombardia	3	1981	136.118.900,0	3.884,2	
Lombardia	3	1982	136.711.100,0	3.877,2	
Lombardia	3	1983	138.679.400,0	3.869,7	
Lombardia	3	1984	141.971.700,0	3.869,5	
Lombardia	3	1985	148.437.300,0	3.922,7	
Lombardia	3	1986	154.325.400,0	4.018,8	
Lombardia	3	1987	159.351.300,0	4.065,4	
Lombardia	3	1988	167.838.300,0	4.135,0	
Lombardia	3	1989	174.716.100,0	4.187,7	
Lombardia	3	1990	178.898.900,0	4.274,2	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Lombardia	3	1991	181.230.900,0	4.314,0	
Lombardia	3	1992	180.548.500,0	4.242,7	
Lombardia	3	1993	178.001.300,0	4.116,4	
Lombardia	3	1994	184.234.400,0	4.098,2	
Lombardia	3	1995	189.934.306,7	4.114,9	
Lombardia	3	1996	192.574.486,0	4.143,5	63,575
Lombardia	3	1997	196.009.750,7	4.165,5	61,878
Lombardia	3	1998	199.448.527,3	4.216,7	58,685
Lombardia	3	1999	201.044.069,3	4.241,3	56,996
Lombardia	3	2000	206.101.111,9	4.279,9	58,483
Lombardia	3	2001	210.025.564,6	4.353,8	57,748
Lombardia	3	2002	210.528.459,7	4.417,1	59,078
Lombardia	3	2003	209.296.166,5	4.443,5	56,445
Lombardia	3	2004	212.070.752,0	4.508,7	
Trentino Alto Adige	4	1970	9.143.952,0	345,6	
Trentino Alto Adige	4	1971	9.236.027,0	349,8	
Trentino Alto Adige	4	1972	9.542.030,3	351,2	
Trentino Alto Adige	4	1973	10.535.491,4	362,9	
Trentino Alto Adige	4	1974	10.962.620,0	370,4	
Trentino Alto Adige	4	1975	10.724.623,6	370,5	
Trentino Alto Adige	4	1976	11.493.749,1	375,7	
Trentino Alto Adige	4	1977	11.853.293,0	387,3	
Trentino Alto Adige	4	1978	12.405.199,5	392,3	
Trentino Alto Adige	4	1979	13.535.054,9	406,3	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Trentino Alto Adige	4	1980	14.883.300,0	422,9	
Trentino Alto Adige	4	1981	14.686.600,0	437,0	
Trentino Alto Adige	4	1982	14.991.700,0	435,0	
Trentino Alto Adige	4	1983	14.963.500,0	441,8	
Trentino Alto Adige	4	1984	15.793.200,0	445,2	
Trentino Alto Adige	4	1985	15.846.200,0	444,4	
Trentino Alto Adige	4	1986	16.023.600,0	449,7	
Trentino Alto Adige	4	1987	16.512.700,0	455,5	
Trentino Alto Adige	4	1988	17.483.100,0	462,6	
Trentino Alto Adige	4	1989	17.786.800,0	468,3	
Trentino Alto Adige	4	1990	18.444.900,0	479,1	
Trentino Alto Adige	4	1991	18.760.600,0	475,4	
Trentino Alto Adige	4	1992	19.040.700,0	475,7	
Trentino Alto Adige	4	1993	18.935.700,0	473,2	
Trentino Alto Adige	4	1994	19.406.500,0	465,7	
Trentino Alto Adige	4	1995	19.552.954,9	457,1	
Trentino Alto Adige	4	1996	20.127.461,6	467,9	
Trentino Alto Adige	4	1997	20.027.114,0	467,4	6,174
Trentino Alto Adige	4	1998	20.828.087,0	478,6	6,359
Trentino Alto Adige	4	1999	20.845.388,3	479,7	5,965
Trentino Alto Adige	4	2000	21.949.418,2	490,5	6,012
Trentino Alto Adige	4	2001	22.050.282,2	493,9	6,208
Trentino Alto Adige	4	2002	22.137.949,3	497,4	6,161
Trentino Alto Adige	4	2003	22.321.861,3	496,7	6,303

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Trentino Alto Adige	4	2004	22.723.180,8	504,6	6,018
Veneto	5	1970	37.730.400,6	1.547,9	
Veneto	5	1971	38.367.872,3	1.559,8	
Veneto	5	1972	39.633.432,0	1.569,9	
Veneto	5	1973	42.838.495,9	1.617,9	
Veneto	5	1974	45.684.781,7	1.651,3	
Veneto	5	1975	44.915.155,4	1.650,2	
Veneto	5	1976	48.474.965,4	1.696,7	
Veneto	5	1977	49.266.453,6	1.719,9	
Veneto	5	1978	50.828.682,2	1.734,6	
Veneto	5	1979	54.687.609,8	1.788,6	
Veneto	5	1980	57.538.700,0	1.838,6	
Veneto	5	1981	58.846.500,0	1.864,5	
Veneto	5	1982	60.031.700,0	1.887,4	
Veneto	5	1983	59.866.500,0	1.877,7	
Veneto	5	1984	62.322.500,0	1.888,0	
Veneto	5	1985	63.850.800,0	1.889,8	
Veneto	5	1986	64.756.700,0	1.944,9	
Veneto	5	1987	67.254.900,0	1.988,2	
Veneto	5	1988	70.342.800,0	2.047,8	
Veneto	5	1989	72.942.800,0	2.046,7	
Veneto	5	1990	74.788.200,0	2.060,6	
Veneto	5	1991	75.790.800,0	2.079,3	
Veneto	5	1992	77.005.800,0	2.082,3	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Veneto	5	1993	77.560.700,0	2.030,0	
Veneto	5	1994	79.849.000,0	2.029,1	
Veneto	5	1995	83.952.547,9	2.041,3	
Veneto	5	1996	85.307.937,4	2.063,4	
Veneto	5	1997	88.418.660,6	2.088,4	34,081
Veneto	5	1998	89.316.262,7	2.098,2	32,234
Veneto	5	1999	90.872.605,6	2.110,9	30,932
Veneto	5	2000	94.152.726,6	2.167,5	31,385
Veneto	5	2001	94.742.933,6	2.185,7	31,026
Veneto	5	2002	94.067.318,6	2.199,2	30,081
Veneto	5	2003	94.429.009,3	2.197,7	30,774
Veneto	5	2004	95.787.128,9	2.212,4	31,108
Friuli Venezia Giulia	6	1970	10.918.491,1	496,4	
Friuli Venezia Giulia	6	1971	10.968.765,7	484,9	
Friuli Venezia Giulia	6	1972	11.409.013,3	481,4	
Friuli Venezia Giulia	6	1973	12.307.216,1	495,2	
Friuli Venezia Giulia	6	1974	13.090.841,5	504,4	
Friuli Venezia Giulia	6	1975	12.783.112,9	503,6	
Friuli Venezia Giulia	6	1976	13.583.894,5	507,1	
Friuli Venezia Giulia	6	1977	13.882.957,2	514,6	
Friuli Venezia Giulia	6	1978	14.524.191,2	521,2	
Friuli Venezia Giulia	6	1979	15.711.841,5	536,9	
Friuli Venezia Giulia	6	1980	15.685.500,0	538,7	
Friuli Venezia Giulia	6	1981	15.601.500,0	537,9	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Friuli Venezia Giulia	6	1982	15.748.700,0	536,0	
Friuli Venezia Giulia	6	1983	15.450.400,0	535,2	
Friuli Venezia Giulia	6	1984	15.881.600,0	536,2	
Friuli Venezia Giulia	6	1985	16.238.400,0	530,6	
Friuli Venezia Giulia	6	1986	16.632.200,0	526,4	
Friuli Venezia Giulia	6	1987	17.272.700,0	529,4	
Friuli Venezia Giulia	6	1988	18.032.900,0	535,9	
Friuli Venezia Giulia	6	1989	19.157.300,0	545,3	
Friuli Venezia Giulia	6	1990	19.601.500,0	538,1	
Friuli Venezia Giulia	6	1991	19.779.200,0	539,8	
Friuli Venezia Giulia	6	1992	19.850.800,0	533,2	
Friuli Venezia Giulia	6	1993	19.865.100,0	508,2	
Friuli Venezia Giulia	6	1994	20.742.700,0	506,9	
Friuli Venezia Giulia	6	1995	22.215.961,6	520,6	
Friuli Venezia Giulia	6	1996	22.381.382,8	523,0	
Friuli Venezia Giulia	6	1997	22.218.543,9	522,7	9,445
Friuli Venezia Giulia	6	1998	22.448.573,8	527,4	8,178
Friuli Venezia Giulia	6	1999	22.909.201,7	530,3	7,833
Friuli Venezia Giulia	6	2000	23.751.026,5	540,1	8,084
Friuli Venezia Giulia	6	2001	24.185.211,8	548,0	7,753
Friuli Venezia Giulia	6	2002	24.485.933,1	548,8	7,777
Friuli Venezia Giulia	6	2003	24.783.963,8	553,6	7,956
Friuli Venezia Giulia	6	2004	24.822.487,0	548,5	7,653
Liguria	7	1970	17.557.224,8	697,4	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Liguria	7	1971	17.556.158,3	686,5	
Liguria	7	1972	18.180.964,4	686,5	
Liguria	7	1973	19.120.639,7	696,0	
Liguria	7	1974	20.308.583,9	707,8	
Liguria	7	1975	19.108.121,6	707,5	
Liguria	7	1976	20.304.166,4	715,1	
Liguria	7	1977	20.355.997,5	718,7	
Liguria	7	1978	21.061.571,6	715,6	
Liguria	7	1979	22.116.549,3	719,1	
Liguria	7	1980	24.891.700,0	725,7	
Liguria	7	1981	24.704.200,0	715,0	
Liguria	7	1982	24.300.300,0	692,3	
Liguria	7	1983	24.264.000,0	684,7	
Liguria	7	1984	25.228.100,0	700,7	
Liguria	7	1985	26.134.400,0	724,6	
Liguria	7	1986	26.044.000,0	718,5	
Liguria	7	1987	26.019.800,0	714,5	
Liguria	7	1988	26.464.400,0	714,8	
Liguria	7	1989	27.455.100,0	717,9	
Liguria	7	1990	28.020.400,0	710,2	
Liguria	7	1991	28.405.700,0	703,3	
Liguria	7	1992	27.868.400,0	693,5	
Liguria	7	1993	27.140.600,0	672,5	
Liguria	7	1994	27.430.900,0	647,5	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Liguria	7	1995	27.998.936,1	645,0	
Liguria	7	1996	28.264.033,4	644,1	
Liguria	7	1997	28.806.778,0	648,8	10,549
Liguria	7	1998	29.045.277,8	655,1	9,986
Liguria	7	1999	29.568.500,3	651,9	9,276
Liguria	7	2000	30.700.522,1	663,4	9,233
Liguria	7	2001	31.586.658,9	676,3	8,963
Liguria	7	2002	31.267.810,0	675,5	8,913
Liguria	7	2003	31.656.640,3	681,4	9,118
Liguria	7	2004	31.575.123,5	681,2	8,760
Emilia Romagna	8	1970	38.477.468,3	1.562,3	
Emilia Romagna	8	1971	38.733.319,0	1.560,9	
Emilia Romagna	8	1972	40.510.501,5	1.571,5	
Emilia Romagna	8	1973	44.622.709,2	1.624,3	
Emilia Romagna	8	1974	47.827.610,6	1.672,7	
Emilia Romagna	8	1975	46.878.489,9	1.689,6	
Emilia Romagna	8	1976	50.607.610,0	1.730,2	
Emilia Romagna	8	1977	52.076.788,0	1.756,4	
Emilia Romagna	8	1978	54.547.731,8	1.766,3	
Emilia Romagna	8	1979	57.790.166,7	1.794,4	
Emilia Romagna	8	1980	60.771.300,0	1.838,3	
Emilia Romagna	8	1981	61.355.000,0	1.838,9	
Emilia Romagna	8	1982	60.712.400,0	1.829,5	
Emilia Romagna	8	1983	59.712.200,0	1.829,2	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Emilia Romagna	8	1984	61.283.800,0	1.849,6	
Emilia Romagna	8	1985	62.231.000,0	1.857,8	
Emilia Romagna	8	1986	62.962.300,0	1.869,8	
Emilia Romagna	8	1987	66.002.000,0	1.889,3	
Emilia Romagna	8	1988	69.420.300,0	1.924,8	
Emilia Romagna	8	1989	70.985.300,0	1.922,4	
Emilia Romagna	8	1990	72.210.000,0	1.942,6	
Emilia Romagna	8	1991	72.969.700,0	1.948,0	
Emilia Romagna	8	1992	74.088.200,0	1.935,8	
Emilia Romagna	8	1993	74.246.800,0	1.899,8	
Emilia Romagna	8	1994	76.673.700,0	1.892,5	
Emilia Romagna	8	1995	80.829.171,6	1.908,9	
Emilia Romagna	8	1996	81.640.008,9	1.921,6	
Emilia Romagna	8	1997	82.923.714,2	1.933,7	28,192
Emilia Romagna	8	1998	84.289.484,4	1.940,2	27,192
Emilia Romagna	8	1999	85.786.744,6	1.960,9	25,363
Emilia Romagna	8	2000	89.550.424,3	2.003,0	24,588
Emilia Romagna	8	2001	90.727.171,3	2.024,2	25,006
Emilia Romagna	8	2002	91.350.099,7	2.047,7	24,654
Emilia Romagna	8	2003	91.340.936,3	2.060,5	25,222
Emilia Romagna	8	2004	91.562.925,6	2.044,9	24,345
Toscana	9	1970	34.569.406,0	1.349,9	
Toscana	9	1971	35.553.770,9	1.336,0	
Toscana	9	1972	36.815.524,1	1.327,9	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Toscana	9	1973	38.819.506,0	1.360,1	
Toscana	9	1974	41.033.034,8	1.394,2	
Toscana	9	1975	40.081.082,6	1.398,8	
Toscana	9	1976	42.802.130,4	1.418,8	
Toscana	9	1977	42.979.560,4	1.422,3	
Toscana	9	1978	45.330.186,9	1.435,3	
Toscana	9	1979	47.828.714,0	1.471,9	
Toscana	9	1980	47.683.500,0	1.512,9	
Toscana	9	1981	49.192.800,0	1.554,3	
Toscana	9	1982	49.912.300,0	1.570,8	
Toscana	9	1983	49.128.900,0	1.541,4	
Toscana	9	1984	49.657.300,0	1.550,2	
Toscana	9	1985	51.816.000,0	1.577,8	
Toscana	9	1986	52.553.200,0	1.566,6	
Toscana	9	1987	53.350.700,0	1.556,0	
Toscana	9	1988	54.619.800,0	1.565,9	
Toscana	9	1989	56.058.600,0	1.571,0	
Toscana	9	1990	56.892.700,0	1.569,9	
Toscana	9	1991	58.079.300,0	1.601,4	
Toscana	9	1992	58.440.200,0	1.600,9	
Toscana	9	1993	58.642.200,0	1.565,5	
Toscana	9	1994	59.623.000,0	1.546,5	
Toscana	9	1995	62.061.695,9	1.552,1	
Toscana	9	1996	63.002.525,5	1.551,3	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Toscana	9	1997	63.949.087,7	1.553,7	27,335
Toscana	9	1998	65.048.211,3	1.566,4	26,559
Toscana	9	1999	66.788.051,3	1.585,1	24,198
Toscana	9	2000	68.943.535,8	1.617,0	23,465
Toscana	9	2001	70.101.948,6	1.641,7	23,686
Toscana	9	2002	69.976.679,3	1.650,2	23,125
Toscana	9	2003	69.997.256,7	1.664,8	23,657
Toscana	9	2004	70.560.111,3	1.672,1	22,509
Umbria	10	1970	6.049.378,7	275,3	
Umbria	10	1971	6.187.878,5	280,6	
Umbria	10	1972	6.468.595,8	279,0	
Umbria	10	1973	7.008.611,1	292,8	
Umbria	10	1974	7.350.923,9	301,7	
Umbria	10	1975	7.324.227,6	302,9	
Umbria	10	1976	7.943.352,8	309,3	
Umbria	10	1977	8.152.365,0	315,3	
Umbria	10	1978	8.359.694,0	307,6	
Umbria	10	1979	8.871.509,2	317,3	
Umbria	10	1980	9.997.100,0	330,4	
Umbria	10	1981	9.754.000,0	327,4	
Umbria	10	1982	10.124.400,0	337,0	
Umbria	10	1983	10.135.900,0	344,1	
Umbria	10	1984	10.092.800,0	339,5	
Umbria	10	1985	10.317.700,0	335,9	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Umbria	10	1986	10.529.700,0	341,5	
Umbria	10	1987	10.666.100,0	343,6	
Umbria	10	1988	11.204.600,0	346,5	
Umbria	10	1989	11.654.100,0	343,0	
Umbria	10	1990	11.865.000,0	345,6	
Umbria	10	1991	12.019.000,0	345,2	
Umbria	10	1992	12.372.200,0	347,5	
Umbria	10	1993	12.320.300,0	342,9	
Umbria	10	1994	12.626.900,0	334,1	
Umbria	10	1995	12.980.524,4	328,5	
Umbria	10	1996	12.889.266,5	328,7	
Umbria	10	1997	13.303.568,2	329,9	7,214
Umbria	10	1998	13.485.412,7	336,1	7,159
Umbria	10	1999	13.906.738,2	346,4	6,750
Umbria	10	2000	14.405.274,1	356,0	6,670
Umbria	10	2001	14.607.053,8	361,2	6,756
Umbria	10	2002	14.540.242,4	359,9	6,889
Umbria	10	2003	14.568.644,8	360,4	7,048
Umbria	10	2004	14.972.041,9	370,2	6,445
Marche	11	1970	11.540.568,0	530,6	
Marche	11	1971	11.751.528,2	538,8	
Marche	11	1972	12.224.878,4	535,4	
Marche	11	1973	13.500.978,6	561,7	
Marche	11	1974	14.404.188,7	582,2	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Marche	11	1975	14.487.497,0	584,4	
Marche	11	1976	15.588.464,7	595,6	
Marche	11	1977	16.090.381,0	604,5	
Marche	11	1978	16.840.258,9	601,1	
Marche	11	1979	17.764.508,3	619,8	
Marche	11	1980	17.360.200,0	635,6	
Marche	11	1981	17.340.800,0	645,4	
Marche	11	1982	17.297.400,0	635,3	
Marche	11	1983	17.507.600,0	633,0	
Marche	11	1984	17.579.400,0	632,7	
Marche	11	1985	18.069.200,0	635,7	
Marche	11	1986	18.604.100,0	640,0	
Marche	11	1987	19.185.100,0	646,3	
Marche	11	1988	19.515.400,0	648,2	
Marche	11	1989	20.187.600,0	649,0	
Marche	11	1990	20.654.900,0	648,5	
Marche	11	1991	20.912.300,0	644,6	
Marche	11	1992	21.422.100,0	638,5	
Marche	11	1993	21.278.300,0	614,8	
Marche	11	1994	22.248.800,0	615,3	
Marche	11	1995	23.410.887,9	625,2	
Marche	11	1996	23.798.127,3	629,6	
Marche	11	1997	24.731.726,5	628,3	12,940
Marche	11	1998	24.859.704,5	633,1	13,145

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Marche	11	1999	25.675.964,6	641,0	12,186
Marche	11	2000	26.335.789,9	646,9	11,674
Marche	11	2001	26.791.459,9	658,4	11,900
Marche	11	2002	26.712.147,2	667,0	11,812
Marche	11	2003	26.928.270,3	672,4	12,084
Marche	11	2004	27.392.825,2	683,0	12,014
Lazio	12	1970	47.749.253,0	1.679,3	
Lazio	12	1971	48.348.304,7	1.688,6	
Lazio	12	1972	50.148.784,1	1.681,8	
Lazio	12	1973	52.093.532,1	1.718,1	
Lazio	12	1974	54.289.836,8	1.744,7	
Lazio	12	1975	53.996.305,1	1.755,0	
Lazio	12	1976	57.364.994,9	1.781,0	
Lazio	12	1977	58.665.718,4	1.799,6	
Lazio	12	1978	60.381.651,8	1.811,1	
Lazio	12	1979	63.212.746,8	1.829,1	
Lazio	12	1980	65.620.700,0	1.844,0	
Lazio	12	1981	66.376.700,0	1.856,1	
Lazio	12	1982	67.345.100,0	1.929,7	
Lazio	12	1983	70.563.800,0	1.996,7	
Lazio	12	1984	73.277.900,0	2.045,8	
Lazio	12	1985	75.378.100,0	2.106,1	
Lazio	12	1986	78.933.800,0	2.129,8	
Lazio	12	1987	81.887.000,0	2.139,2	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Lazio	12	1988	83.216.200,0	2.162,9	
Lazio	12	1989	84.453.800,0	2.114,2	
Lazio	12	1990	87.348.600,0	2.161,8	
Lazio	12	1991	89.107.200,0	2.182,7	
Lazio	12	1992	91.255.500,0	2.192,7	
Lazio	12	1993	90.231.500,0	2.132,6	
Lazio	12	1994	90.733.900,0	2.088,7	
Lazio	12	1995	92.639.353,0	2.097,7	
Lazio	12	1996	93.413.470,2	2.101,9	
Lazio	12	1997	93.896.099,2	2.106,8	49,269
Lazio	12	1998	97.057.538,5	2.137,9	48,441
Lazio	12	1999	97.510.987,6	2.156,6	45,999
Lazio	12	2000	100.021.484,6	2.194,7	45,108
Lazio	12	2001	102.470.471,6	2.238,7	46,710
Lazio	12	2002	104.025.880,1	2.304,7	46,739
Lazio	12	2003	104.970.019,3	2.335,5	47,815
Lazio	12	2004	108.938.464,5	2.434,7	46,684
Abruzzo	13	1970	7.977.941,9	401,0	
Abruzzo	13	1971	8.585.023,6	401,2	
Abruzzo	13	1972	8.979.412,5	392,6	
Abruzzo	13	1973	9.484.030,3	403,3	
Abruzzo	13	1974	9.861.634,8	421,7	
Abruzzo	13	1975	9.724.883,1	429,1	
Abruzzo	13	1976	10.390.869,2	417,6	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Abruzzo	13	1977	10.788.912,5	423,9	
Abruzzo	13	1978	11.386.929,9	441,5	
Abruzzo	13	1979	12.218.341,4	458,3	
Abruzzo	13	1980	12.922.500,0	452,8	
Abruzzo	13	1981	13.010.200,0	449,7	
Abruzzo	13	1982	13.325.300,0	459,8	
Abruzzo	13	1983	13.581.000,0	467,9	
Abruzzo	13	1984	14.029.600,0	462,4	
Abruzzo	13	1985	14.343.100,0	466,1	
Abruzzo	13	1986	14.840.700,0	474,8	
Abruzzo	13	1987	15.267.800,0	478,1	
Abruzzo	13	1988	15.899.500,0	484,0	
Abruzzo	13	1989	16.584.900,0	486,3	
Abruzzo	13	1990	16.885.200,0	497,4	
Abruzzo	13	1991	17.269.300,0	494,3	
Abruzzo	13	1992	17.550.600,0	485,3	
Abruzzo	13	1993	16.976.700,0	468,7	
Abruzzo	13	1994	17.227.500,0	470,4	
Abruzzo	13	1995	17.673.981,4	473,6	
Abruzzo	13	1996	17.916.148,1	479,2	
Abruzzo	13	1997	18.330.708,0	475,4	12,304
Abruzzo	13	1998	18.395.729,9	474,8	12,109
Abruzzo	13	1999	18.608.458,5	467,0	11,640
Abruzzo	13	2000	19.561.011,6	481,0	11,750

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Abruzzo	13	2001	19.908.638,8	500,3	11,967
Abruzzo	13	2002	19.930.492,8	504,1	11,802
Abruzzo	13	2003	19.913.720,6	504,4	12,074
Abruzzo	13	2004	19.745.241,7	491,0	12,754
Molise	14	1970	1.922.264,5	116,3	
Molise	14	1971	1.936.865,3	115,4	
Molise	14	1972	2.010.363,2	115,7	
Molise	14	1973	2.085.139,7	115,1	
Molise	14	1974	2.234.011,1	116,0	
Molise	14	1975	2.295.607,3	115,7	
Molise	14	1976	2.464.946,2	120,6	
Molise	14	1977	2.502.709,5	121,8	
Molise	14	1978	2.663.792,3	117,3	
Molise	14	1979	2.847.814,6	121,6	
Molise	14	1980	3.247.000,0	124,6	
Molise	14	1981	3.171.800,0	120,8	
Molise	14	1982	3.109.800,0	115,6	
Molise	14	1983	3.141.800,0	111,9	
Molise	14	1984	3.250.700,0	116,4	
Molise	14	1985	3.373.600,0	118,1	
Molise	14	1986	3.472.500,0	117,5	
Molise	14	1987	3.535.500,0	121,4	
Molise	14	1988	3.785.300,0	121,6	
Molise	14	1989	3.871.400,0	116,5	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Molise	14	1990	3.908.000,0	118,8	
Molise	14	1991	4.005.400,0	115,9	
Molise	14	1992	4.077.700,0	118,1	
Molise	14	1993	3.987.400,0	112,9	
Molise	14	1994	4.117.800,0	110,8	
Molise	14	1995	4.136.561,5	110,0	
Molise	14	1996	4.168.426,9	110,9	
Molise	14	1997	4.343.041,0	112,3	3,143
Molise	14	1998	4.369.690,2	112,4	2,991
Molise	14	1999	4.324.861,7	111,2	3,005
Molise	14	2000	4.488.888,4	114,4	3,146
Molise	14	2001	4.583.761,6	116,4	3,165
Molise	14	2002	4.693.098,8	116,4	3,043
Molise	14	2003	4.659.501,0	115,9	3,113
Molise	14	2004	4.733.064,5	116,9	2,954
Campania	15	1970	32.675.959,8	1.464,3	
Campania	15	1971	33.772.861,8	1.473,3	
Campania	15	1972	33.961.345,5	1.480,7	
Campania	15	1973	36.143.501,1	1.521,8	
Campania	15	1974	37.834.978,9	1.553,8	
Campania	15	1975	37.542.001,5	1.558,4	
Campania	15	1976	39.570.125,0	1.605,3	
Campania	15	1977	41.104.629,0	1.638,9	
Campania	15	1978	42.626.947,3	1.644,0	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Campania	15	1979	45.574.619,0	1.705,5	
Campania	15	1980	46.715.000,0	1.764,0	
Campania	15	1981	46.779.500,0	1.743,7	
Campania	15	1982	48.966.000,0	1.786,2	
Campania	15	1983	49.283.500,0	1.803,2	
Campania	15	1984	50.806.300,0	1.802,8	
Campania	15	1985	52.847.700,0	1.817,7	
Campania	15	1986	52.542.700,0	1.774,8	
Campania	15	1987	53.473.400,0	1.738,8	
Campania	15	1988	55.852.200,0	1.730,1	
Campania	15	1989	57.271.400,0	1.743,0	
Campania	15	1990	57.892.700,0	1.771,5	
Campania	15	1991	57.743.700,0	1.777,0	
Campania	15	1992	58.358.900,0	1.763,1	
Campania	15	1993	57.631.700,0	1.702,3	
Campania	15	1994	58.134.900,0	1.710,0	
Campania	15	1995	58.508.575,8	1.668,6	
Campania	15	1996	58.247.145,3	1.658,3	
Campania	15	1997	60.512.790,1	1.679,5	57,221
Campania	15	1998	62.176.659,2	1.717,0	59,891
Campania	15	1999	63.167.481,8	1.706,6	56,717
Campania	15	2000	65.084.466,5	1.720,0	54,389
Campania	15	2001	66.849.509,6	1.762,8	56,686
Campania	15	2002	68.024.487,0	1.811,7	53,460

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Campania	15	2003	68.523.994,4	1.812,8	54,691
Campania	15	2004	68.855.629,2	1.801,3	59,604
Puglia	16	1970	22.574.971,6	1.217,2	
Puglia	16	1971	23.805.036,4	1.212,0	
Puglia	16	1972	24.437.691,2	1.190,8	
Puglia	16	1973	25.582.979,9	1.195,0	
Puglia	16	1974	27.075.075,3	1.222,6	
Puglia	16	1975	27.147.711,3	1.229,3	
Puglia	16	1976	28.617.114,8	1.264,5	
Puglia	16	1977	29.276.807,6	1.259,7	
Puglia	16	1978	30.576.677,3	1.251,4	
Puglia	16	1979	32.150.412,4	1.265,7	
Puglia	16	1980	33.239.500,0	1.300,3	
Puglia	16	1981	32.565.600,0	1.249,0	
Puglia	16	1982	32.544.900,0	1.263,4	
Puglia	16	1983	33.762.100,0	1.303,0	
Puglia	16	1984	34.620.300,0	1.304,7	
Puglia	16	1985	35.273.800,0	1.317,0	
Puglia	16	1986	36.947.100,0	1.331,8	
Puglia	16	1987	38.133.900,0	1.315,8	
Puglia	16	1988	40.204.200,0	1.322,0	
Puglia	16	1989	40.756.300,0	1.338,4	
Puglia	16	1990	41.258.800,0	1.349,8	
Puglia	16	1991	42.303.200,0	1.377,4	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Puglia	16	1992	42.789.900,0	1.404,0	
Puglia	16	1993	41.614.100,0	1.334,3	
Puglia	16	1994	42.842.200,0	1.301,8	
Puglia	16	1995	42.821.662,3	1.279,1	
Puglia	16	1996	43.223.052,6	1.272,4	
Puglia	16	1997	43.758.360,1	1.259,3	41,760
Puglia	16	1998	44.973.686,5	1.271,2	42,043
Puglia	16	1999	47.093.019,1	1.285,8	38,659
Puglia	16	2000	48.113.434,6	1.313,9	37,958
Puglia	16	2001	48.737.985,9	1.335,5	38,512
Puglia	16	2002	49.037.372,1	1.360,2	37,125
Puglia	16	2003	48.629.553,8	1.343,1	37,980
Puglia	16	2004	48.784.570,7	1.332,7	37,277
Basilicata	17	1970	3.933.578,2	201,9	
Basilicata	17	1971	4.060.121,0	201,8	
Basilicata	17	1972	4.263.775,1	201,0	
Basilicata	17	1973	4.704.454,5	207,3	
Basilicata	17	1974	4.753.632,8	212,8	
Basilicata	17	1975	4.730.112,5	213,6	
Basilicata	17	1976	4.716.101,8	212,8	
Basilicata	17	1977	4.926.617,3	215,1	
Basilicata	17	1978	4.965.379,2	206,8	
Basilicata	17	1979	5.176.992,2	212,9	
Basilicata	17	1980	5.082.000,0	211,9	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Basilicata	17	1981	4.884.600,0	203,0	
Basilicata	17	1982	4.861.600,0	199,8	
Basilicata	17	1983	5.086.800,0	208,8	
Basilicata	17	1984	5.575.700,0	217,6	
Basilicata	17	1985	5.402.800,0	209,7	
Basilicata	17	1986	5.323.200,0	199,8	
Basilicata	17	1987	5.462.300,0	207,0	
Basilicata	17	1988	5.651.900,0	205,5	
Basilicata	17	1989	5.775.200,0	202,8	
Basilicata	17	1990	5.963.700,0	203,0	
Basilicata	17	1991	5.984.300,0	189,9	
Basilicata	17	1992	6.196.100,0	192,9	
Basilicata	17	1993	6.236.300,0	188,1	
Basilicata	17	1994	6.437.600,0	186,9	
Basilicata	17	1995	6.667.716,8	184,7	
Basilicata	17	1996	6.774.158,6	184,9	
Basilicata	17	1997	7.150.500,7	185,8	6,377
Basilicata	17	1998	7.423.706,4	188,8	6,626
Basilicata	17	1999	7.742.463,6	192,1	6,381
Basilicata	17	2000	7.778.667,2	197,9	6,449
Basilicata	17	2001	7.674.188,0	193,7	6,525
Basilicata	17	2002	7.801.823,5	195,5	6,074
Basilicata	17	2003	7.683.162,4	194,0	6,214
Basilicata	17	2004	7.740.294,0	191,6	6,281

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Calabria	18	1970	12.244.695,5	622,3	
Calabria	18	1971	12.606.741,2	634,5	
Calabria	18	1972	12.543.808,8	621,6	
Calabria	18	1973	13.669.407,1	627,5	
Calabria	18	1974	13.988.367,6	625,4	
Calabria	18	1975	13.901.541,9	617,0	
Calabria	18	1976	13.786.578,2	622,8	
Calabria	18	1977	14.775.125,6	619,3	
Calabria	18	1978	14.788.329,3	623,4	
Calabria	18	1979	15.442.589,4	623,5	
Calabria	18	1980	14.936.500,0	599,2	
Calabria	18	1981	15.545.200,0	637,4	
Calabria	18	1982	15.201.400,0	634,3	
Calabria	18	1983	15.998.500,0	641,9	
Calabria	18	1984	15.845.600,0	627,8	
Calabria	18	1985	16.989.400,0	664,8	
Calabria	18	1986	17.107.300,0	662,9	
Calabria	18	1987	17.596.800,0	654,9	
Calabria	18	1988	17.729.900,0	652,8	
Calabria	18	1989	19.271.200,0	664,5	
Calabria	18	1990	18.656.500,0	639,0	
Calabria	18	1991	19.329.300,0	648,1	
Calabria	18	1992	19.265.600,0	649,0	
Calabria	18	1993	19.741.900,0	648,1	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Calabria	18	1994	19.578.700,0	628,0	
Calabria	18	1995	20.196.976,7	630,8	
Calabria	18	1996	20.503.752,1	611,7	
Calabria	18	1997	20.809.288,0	614,2	22,728
Calabria	18	1998	21.132.590,0	613,7	22,956
Calabria	18	1999	21.860.122,8	605,2	22,152
Calabria	18	2000	22.288.007,4	615,6	21,308
Calabria	18	2001	22.890.815,8	632,8	22,112
Calabria	18	2002	23.147.553,4	648,0	20,930
Calabria	18	2003	23.478.842,2	653,7	21,411
Calabria	18	2004	24.123.838,4	662,4	21,016
Sicilia	19	1970	30.600.995,0	1.402,4	
Sicilia	19	1971	31.712.526,9	1.390,2	
Sicilia	19	1972	32.823.399,0	1.393,7	
Sicilia	19	1973	34.442.575,1	1.382,6	
Sicilia	19	1974	36.264.168,0	1.401,8	
Sicilia	19	1975	36.572.718,9	1.398,7	
Sicilia	19	1976	37.437.944,9	1.401,5	
Sicilia	19	1977	37.851.021,9	1.404,2	
Sicilia	19	1978	39.942.034,2	1.450,9	
Sicilia	19	1979	42.268.123,2	1.459,5	
Sicilia	19	1980	45.225.800,0	1.489,6	
Sicilia	19	1981	45.752.200,0	1.469,2	
Sicilia	19	1982	45.707.300,0	1.478,6	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Sicilia	19	1983	46.926.900,0	1.495,8	
Sicilia	19	1984	48.529.600,0	1.517,7	
Sicilia	19	1985	48.574.000,0	1.524,0	
Sicilia	19	1986	49.793.900,0	1.527,4	
Sicilia	19	1987	51.802.700,0	1.536,3	
Sicilia	19	1988	52.850.600,0	1.510,2	
Sicilia	19	1989	53.204.000,0	1.505,1	
Sicilia	19	1990	54.457.900,0	1.529,6	
Sicilia	19	1991	55.467.400,0	1.559,6	
Sicilia	19	1992	54.843.000,0	1.536,4	
Sicilia	19	1993	54.144.500,0	1.481,6	
Sicilia	19	1994	53.571.800,0	1.441,0	
Sicilia	19	1995	53.326.085,7	1.423,7	
Sicilia	19	1996	54.794.579,3	1.429,6	
Sicilia	19	1997	55.925.413,3	1.436,8	47,736
Sicilia	19	1998	56.725.353,4	1.458,2	49,005
Sicilia	19	1999	57.387.089,6	1.457,9	46,677
Sicilia	19	2000	59.086.542,7	1.479,5	44,784
Sicilia	19	2001	60.955.548,6	1.516,0	46,878
Sicilia	19	2002	61.395.802,1	1.524,6	45,421
Sicilia	19	2003	62.771.842,6	1.531,5	46,467
Sicilia	19	2004	62.972.279,0	1.535,4	50,304
Sardegna	20	1970	11.815.866,7	481,4	
Sardegna	20	1971	12.382.979,2	472,4	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Sardegna	20	1972	12.244.531,7	468,4	
Sardegna	20	1973	12.775.000,8	475,0	
Sardegna	20	1974	13.371.843,3	473,4	
Sardegna	20	1975	13.385.012,7	470,0	
Sardegna	20	1976	14.017.317,7	487,5	
Sardegna	20	1977	14.638.545,2	488,4	
Sardegna	20	1978	14.922.575,0	493,7	
Sardegna	20	1979	15.271.414,1	493,2	
Sardegna	20	1980	15.959.500,0	509,9	
Sardegna	20	1981	15.806.700,0	512,8	
Sardegna	20	1982	15.978.700,0	517,8	
Sardegna	20	1983	16.400.000,0	529,9	
Sardegna	20	1984	17.043.600,0	537,9	
Sardegna	20	1985	17.011.300,0	520,1	
Sardegna	20	1986	17.426.900,0	544,0	
Sardegna	20	1987	17.677.700,0	566,4	
Sardegna	20	1988	18.312.500,0	571,5	
Sardegna	20	1989	18.528.000,0	584,0	
Sardegna	20	1990	18.861.200,0	590,3	
Sardegna	20	1991	19.586.500,0	606,5	
Sardegna	20	1992	19.745.700,0	597,3	
Sardegna	20	1993	19.901.300,0	563,2	
Sardegna	20	1994	20.011.000,0	560,4	
Sardegna	20	1995	19.951.762,9	546,3	

REGION	unit	YEAR	GDP (1995=100) (000)	EMPLOYMENT (000)	Secondary Graduates (000)
Sardegna	20	1996	19.960.077,9	550,2	
Sardegna	20	1997	20.805.931,0	558,1	15,378
Sardegna	20	1998	21.117.251,2	566,0	15,323
Sardegna	20	1999	21.416.021,5	564,4	14,359
Sardegna	20	2000	21.669.343,6	566,4	14,710
Sardegna	20	2001	22.350.705,2	586,3	14,853
Sardegna	20	2002	22.610.019,9	592,2	14,811
Sardegna	20	2003	22.779.691,2	587,5	15,152
Sardegna	20	2004	23.052.555,9	589,7	13,478

Table 4 of Appendix: Italy- Education, Public Capital and GFCF

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
PIEMONTE	1	1970		34.035,5	
PIEMONTE	1	1971		35.379,9	
PIEMONTE	1	1972		42.306,1	
PIEMONTE	1	1973		42.467,2	
PIEMONTE	1	1974		58.303,3	
PIEMONTE	1	1975		57.531,7	
PIEMONTE	1	1976		55.502,1	
PIEMONTE	1	1977		61.141,3	
PIEMONTE	1	1978		61.511,6	
PIEMONTE	1	1979		71.559,8	
PIEMONTE	1	1980		218.878,0	16.120.000,0
PIEMONTE	1	1981		307.393,6	15.860.000,0
PIEMONTE	1	1982		291.444,4	15.160.000,0
PIEMONTE	1	1983		286.819,0	14.930.000,0
PIEMONTE	1	1984		340.514,5	15.490.000,0
PIEMONTE	1	1985		469.826,5	15.950.000,0
PIEMONTE	1	1986		588.812,5	16.580.000,0
PIEMONTE	1	1987		457.278,7	17.370.000,0
PIEMONTE	1	1988		544.525,8	19.020.000,0
PIEMONTE	1	1989		550.812,6	19.800.000,0

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
PIEMONTE	1	1990		618.402,9	20.600.000,0
PIEMONTE	1	1991		488.723,2	20.450.000,0
PIEMONTE	1	1992		664.784,9	20.160.000,0
PIEMONTE	1	1993		627.127,9	17.670.000,0
PIEMONTE	1	1994		485.653,3	18.210.000,0
PIEMONTE	1	1995		639.564,7	19.900.000,0
PIEMONTE	1	1996		638.245,7	20.290.000,0
PIEMONTE	1	1997	8,021	653.911,2	21.580.000,0
PIEMONTE	1	1998	8,845	669.609,9	22.420.000,0
PIEMONTE	1	1999	9,869	687.641,3	23.530.000,0
PIEMONTE	1	2000	10,339	707.211,5	24.990.000,0
PIEMONTE	1	2001	11,766	726.190,0	24.370.000,0
PIEMONTE	1	2002	11,623	745.128,4	25.800.000,0
PIEMONTE	1	2003	13,340	763.535,5	24.830.000,0
PIEMONTE	1	2004	15,257		25.630.000,0
VALLE D'AOSTA	2	1970		2.406,2	
VALLE D'AOSTA	2	1971		3.447,3	
VALLE D'AOSTA	2	1972		2.276,0	
VALLE D'AOSTA	2	1973		2.624,6	
VALLE D'AOSTA	2	1974		2.270,9	
VALLE D'AOSTA	2	1975		2.698,5	
VALLE D'AOSTA	2	1976		3.927,1	
VALLE D'AOSTA	2	1977		4.021,1	
VALLE D'AOSTA	2	1978		5.681,0	

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
VALLE D'AOSTA	2	1979		6.547,6	
VALLE D'AOSTA	2	1980		15.041,8	592.340,0
VALLE D'AOSTA	2	1981		20.166,1	591.760,0
VALLE D'AOSTA	2	1982		30.230,3	580.710,0
VALLE D'AOSTA	2	1983		62.814,1	568.290,0
VALLE D'AOSTA	2	1984		40.866,2	599.510,0
VALLE D'AOSTA	2	1985		81.998,9	620.860,0
VALLE D'AOSTA	2	1986		84.826,5	640.110,0
VALLE D'AOSTA	2	1987		123.647,0	674.850,0
VALLE D'AOSTA	2	1988		98.142,8	725.650,0
VALLE D'AOSTA	2	1989		98.919,6	778.490,0
VALLE D'AOSTA	2	1990		85.134,8	807.300,0
VALLE D'AOSTA	2	1991		127.258,1	822.300,0
VALLE D'AOSTA	2	1992		121.981,4	836.900,0
VALLE D'AOSTA	2	1993		92.644,6	747.110,0
VALLE D'AOSTA	2	1994		90.594,3	760.050,0
VALLE D'AOSTA	2	1995		125.068,8	805.440,0
VALLE D'AOSTA	2	1996		111.870,2	830.190,0
VALLE D'AOSTA	2	1997		112.488,0	856.840,0
VALLE D'AOSTA	2	1998		113.158,2	921.340,0
VALLE D'AOSTA	2	1999		113.729,6	982.610,0
VALLE D'AOSTA	2	2000		114.368,7	1.070.000,0
VALLE D'AOSTA	2	2001		115.096,5	1.140.000,0
VALLE D'AOSTA	2	2002		115.841,0	1.180.000,0

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
VALLE D'AOSTA	2	2003		116.566,4	1.180.000,0
VALLE D'AOSTA	2	2004	0,030		1.170.000,0
Lombardia	3	1970		65.603,5	
Lombardia	3	1971		60.750,3	
Lombardia	3	1972		72.926,3	
Lombardia	3	1973		79.926,4	
Lombardia	3	1974		75.075,8	
Lombardia	3	1975		70.598,6	
Lombardia	3	1976		84.704,1	
Lombardia	3	1977		77.823,3	
Lombardia	3	1978		85.935,8	
Lombardia	3	1979		118.345,1	
Lombardia	3	1980		588.299,2	33.410.000,0
Lombardia	3	1981		656.539,6	33.340.000,0
Lombardia	3	1982		707.313,5	33.290.000,0
Lombardia	3	1983		687.436,7	31.670.000,0
Lombardia	3	1984		696.153,4	32.890.000,0
Lombardia	3	1985		895.120,0	34.120.000,0
Lombardia	3	1986		880.596,7	35.670.000,0
Lombardia	3	1987		773.761,4	37.410.000,0
Lombardia	3	1988		757.147,0	40.720.000,0
Lombardia	3	1989		978.446,7	43.050.000,0
Lombardia	3	1990		951.450,0	44.880.000,0
Lombardia	3	1991		854.166,0	45.050.000,0

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Lombardia	3	1992		1.206.872,0	44.140.000,0
Lombardia	3	1993		1.067.754,5	39.320.000,0
Lombardia	3	1994		741.607,3	40.030.000,0
Lombardia	3	1995		1.022.658,5	43.360.000,0
Lombardia	3	1996	23,522	1.102.929,9	44.340.000,0
Lombardia	3	1997	24,865	1.136.853,8	47.480.000,0
Lombardia	3	1998	26,610	1.172.926,0	49.550.000,0
Lombardia	3	1999	26,091	1.209.495,6	51.170.000,0
Lombardia	3	2000	26,493	1.250.322,2	54.580.000,0
Lombardia	3	2001	26,686	1.292.199,0	56.960.000,0
Lombardia	3	2002	33,742	1.334.864,4	59.170.000,0
Lombardia	3	2003	44,067	1.376.581,0	55.860.000,0
Lombardia	3	2004			58.510.000,0
Trentino Alto Adige	4	1970		20.478,5	
Trentino Alto Adige	4	1971		20.383,0	
Trentino Alto Adige	4	1972		17.294,1	
Trentino Alto Adige	4	1973		24.091,2	
Trentino Alto Adige	4	1974		16.030,3	
Trentino Alto Adige	4	1975		22.056,3	
Trentino Alto Adige	4	1976		18.851,2	
Trentino Alto Adige	4	1977		52.327,4	
Trentino Alto Adige	4	1978		67.880,5	
Trentino Alto Adige	4	1979		33.639,4	
Trentino Alto Adige	4	1980		165.591,1	4.090.000,0

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Trentino Alto Adige	4	1981		162.000,7	4.180.000,0
Trentino Alto Adige	4	1982		243.446,9	4.030.000,0
Trentino Alto Adige	4	1983		197.672,8	3.990.000,0
Trentino Alto Adige	4	1984		219.047,4	4.210.000,0
Trentino Alto Adige	4	1985		224.183,1	4.250.000,0
Trentino Alto Adige	4	1986		260.738,4	4.410.000,0
Trentino Alto Adige	4	1987		239.651,0	4.690.000,0
Trentino Alto Adige	4	1988		254.726,4	5.040.000,0
Trentino Alto Adige	4	1989		322.414,7	5.390.000,0
Trentino Alto Adige	4	1990		317.963,9	5.730.000,0
Trentino Alto Adige	4	1991		313.057,6	5.830.000,0
Trentino Alto Adige	4	1992		400.175,6	5.980.000,0
Trentino Alto Adige	4	1993		499.079,7	5.630.000,0
Trentino Alto Adige	4	1994		476.303,9	5.740.000,0
Trentino Alto Adige	4	1995		420.297,8	6.240.000,0
Trentino Alto Adige	4	1996		451.692,2	6.550.000,0
Trentino Alto Adige	4	1997	1,115	456.942,3	7.590.000,0
Trentino Alto Adige	4	1998	1,329	462.784,6	7.370.000,0
Trentino Alto Adige	4	1999	1,596	468.822,8	7.380.000,0
Trentino Alto Adige	4	2000	1,617	475.416,2	8.030.000,0
Trentino Alto Adige	4	2001	1,848	481.883,5	8.520.000,0
Trentino Alto Adige	4	2002	2,185	488.348,0	9.060.000,0
Trentino Alto Adige	4	2003	2,092	494.783,6	8.780.000,0
Trentino Alto Adige	4	2004	2,344		9.320.000,0

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Veneto	5	1970		52.033,5	
Veneto	5	1971		53.632,5	
Veneto	5	1972		49.481,7	
Veneto	5	1973		41.231,3	
Veneto	5	1974		40.948,8	
Veneto	5	1975		45.819,5	
Veneto	5	1976		43.100,9	
Veneto	5	1977		54.800,7	
Veneto	5	1978		65.073,6	
Veneto	5	1979		81.645,1	
Veneto	5	1980		145.234,9	14.480.000,0
Veneto	5	1981		198.184,1	14.480.000,0
Veneto	5	1982		197.267,9	14.160.000,0
Veneto	5	1983		198.278,6	13.700.000,0
Veneto	5	1984		586.146,6	14.400.000,0
Veneto	5	1985		477.024,9	14.540.000,0
Veneto	5	1986		543.410,8	15.290.000,0
Veneto	5	1987		539.377,8	16.490.000,0
Veneto	5	1988		524.889,1	18.070.000,0
Veneto	5	1989		569.633,9	18.970.000,0
Veneto	5	1990		477.493,3	19.830.000,0
Veneto	5	1991		507.917,3	20.130.000,0
Veneto	5	1992		694.638,1	20.330.000,0
Veneto	5	1993		620.474,4	18.290.000,0

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Veneto	5	1994		539.077,2	18.740.000,0
Veneto	5	1995		621.517,7	20.490.000,0
Veneto	5	1996		704.121,8	21.120.000,0
Veneto	5	1997	9,956	721.304,3	21.710.000,0
Veneto	5	1998	10,748	739.194,9	22.510.000,0
Veneto	5	1999	11,419	758.213,6	23.500.000,0
Veneto	5	2000	11,499	778.353,3	25.360.000,0
Veneto	5	2001	12,851	799.091,2	27.020.000,0
Veneto	5	2002	15,640	820.841,4	29.590.000,0
Veneto	5	2003	17,007	842.262,5	28.540.000,0
Veneto	5	2004	19,401		29.740.000,0
Friuli Venezia Giulia	6	1970		14.827,5	
Friuli Venezia Giulia	6	1971		14.947,8	
Friuli Venezia Giulia	6	1972		13.732,6	
Friuli Venezia Giulia	6	1973		12.837,1	
Friuli Venezia Giulia	6	1974		14.184,0	
Friuli Venezia Giulia	6	1975		20.599,9	
Friuli Venezia Giulia	6	1976		21.718,0	
Friuli Venezia Giulia	6	1977		25.052,3	
Friuli Venezia Giulia	6	1978		28.001,8	
Friuli Venezia Giulia	6	1979		32.408,7	
Friuli Venezia Giulia	6	1980		186.156,9	4.010.000,0
Friuli Venezia Giulia	6	1981		223.614,0	3.950.000,0
Friuli Venezia Giulia	6	1982		242.292,7	3.810.000,0

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Friuli Venezia Giulia	6	1983		255.966,9	3.720.000,0
Friuli Venezia Giulia	6	1984		249.628,4	3.940.000,0
Friuli Venezia Giulia	6	1985		280.956,2	3.970.000,0
Friuli Venezia Giulia	6	1986		328.629,8	4.040.000,0
Friuli Venezia Giulia	6	1987		301.481,2	4.290.000,0
Friuli Venezia Giulia	6	1988		276.387,6	4.660.000,0
Friuli Venezia Giulia	6	1989		286.564,9	4.970.000,0
Friuli Venezia Giulia	6	1990		274.243,8	5.140.000,0
Friuli Venezia Giulia	6	1991		246.854,5	5.220.000,0
Friuli Venezia Giulia	6	1992		244.297,0	5.160.000,0
Friuli Venezia Giulia	6	1993		285.536,1	4.500.000,0
Friuli Venezia Giulia	6	1994		255.761,3	4.570.000,0
Friuli Venezia Giulia	6	1995		232.693,3	5.030.000,0
Friuli Venezia Giulia	6	1996		143.864,8	5.210.000,0
Friuli Venezia Giulia	6	1997	2,639	148.154,6	5.340.000,0
Friuli Venezia Giulia	6	1998	2,694	152.295,3	5.520.000,0
Friuli Venezia Giulia	6	1999	3,165	156.795,2	5.870.000,0
Friuli Venezia Giulia	6	2000	4,143	161.734,2	6.330.000,0
Friuli Venezia Giulia	6	2001	4,372	167.141,6	7.170.000,0
Friuli Venezia Giulia	6	2002	4,481	172.237,0	6.970.000,0
Friuli Venezia Giulia	6	2003	5,623	177.301,2	6.990.000,0
Friuli Venezia Giulia	6	2004	7,032		6.930.000,0
Liguria	7	1970		34.287,6	
Liguria	7	1971		31.467,7	

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Liguria	7	1972		26.499,4	
Liguria	7	1973		25.840,4	
Liguria	7	1974		38.516,8	
Liguria	7	1975		44.511,9	
Liguria	7	1976		35.917,0	
Liguria	7	1977		36.414,3	
Liguria	7	1978		32.491,9	
Liguria	7	1979		61.414,5	
Liguria	7	1980		82.844,3	7.710.000,0
Liguria	7	1981		132.302,8	7.370.000,0
Liguria	7	1982		160.181,7	7.060.000,0
Liguria	7	1983		145.903,7	6.690.000,0
Liguria	7	1984		125.762,4	7.070.000,0
Liguria	7	1985		241.847,5	7.080.000,0
Liguria	7	1986		156.399,2	7.080.000,0
Liguria	7	1987		171.829,3	7.190.000,0
Liguria	7	1988		172.650,0	7.600.000,0
Liguria	7	1989		269.763,5	7.920.000,0
Liguria	7	1990		318.239,2	8.230.000,0
Liguria	7	1991		262.093,6	8.370.000,0
Liguria	7	1992		342.136,2	8.110.000,0
Liguria	7	1993		274.594,5	7.120.000,0
Liguria	7	1994		253.671,2	7.130.000,0
Liguria	7	1995		261.657,2	7.570.000,0

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Liguria	7	1996		249.115,1	7.630.000,0
Liguria	7	1997	3,801	253.762,0	7.120.000,0
Liguria	7	1998	3,857	258.151,2	7.380.000,0
Liguria	7	1999	4,166	262.938,3	7.650.000,0
Liguria	7	2000	4,350	267.957,9	8.170.000,0
Liguria	7	2001	4,359	272.916,7	8.080.000,0
Liguria	7	2002	4,074	277.966,0	8.190.000,0
Liguria	7	2003	4,784	282.995,6	8.750.000,0
Liguria	7	2004	5,304		7.490.000,0
Emilia Romagna	8	1970		59.496,4	
Emilia Romagna	8	1971		58.784,2	
Emilia Romagna	8	1972		54.771,3	
Emilia Romagna	8	1973		59.991,6	
Emilia Romagna	8	1974		52.284,0	
Emilia Romagna	8	1975		55.399,3	
Emilia Romagna	8	1976		60.237,0	
Emilia Romagna	8	1977		69.984,0	
Emilia Romagna	8	1978		89.204,5	
Emilia Romagna	8	1979		100.580,0	
Emilia Romagna	8	1980		231.076,2	16.170.000,0
Emilia Romagna	8	1981		384.420,6	16.030.000,0
Emilia Romagna	8	1982		349.069,1	15.390.000,0
Emilia Romagna	8	1983		425.778,4	14.890.000,0
Emilia Romagna	8	1984		318.385,9	15.730.000,0

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Emilia Romagna	8	1985		496.532,0	15.940.000,0
Emilia Romagna	8	1986		562.478,4	16.330.000,0
Emilia Romagna	8	1987		482.814,9	17.260.000,0
Emilia Romagna	8	1988		487.013,2	18.670.000,0
Emilia Romagna	8	1989		525.778,4	19.510.000,0
Emilia Romagna	8	1990		568.861,3	20.580.000,0
Emilia Romagna	8	1991		574.863,5	20.870.000,0
Emilia Romagna	8	1992		665.958,8	20.860.000,0
Emilia Romagna	8	1993		618.559,4	18.890.000,0
Emilia Romagna	8	1994		437.804,1	19.250.000,0
Emilia Romagna	8	1995		530.706,5	20.980.000,0
Emilia Romagna	8	1996		589.230,8	21.520.000,0
Emilia Romagna	8	1997	13,880	604.903,7	21.970.000,0
Emilia Romagna	8	1998	14,717	621.256,0	22.830.000,0
Emilia Romagna	8	1999	15,768	639.551,5	23.790.000,0
Emilia Romagna	8	2000	17,139	658.322,8	25.550.000,0
Emilia Romagna	8	2001	18,527	676.771,3	26.080.000,0
Emilia Romagna	8	2002	19,019	696.841,2	29.830.000,0
Emilia Romagna	8	2003	22,222	716.537,6	29.490.000,0
Emilia Romagna	8	2004	25,978		29.920.000,0
Toscana	9	1970		46.393,8	
Toscana	9	1971		53.907,8	
Toscana	9	1972		49.530,3	
Toscana	9	1973		41.280,4	

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Toscana	9	1974		31.722,3	
Toscana	9	1975		27.477,1	
Toscana	9	1976		29.225,3	
Toscana	9	1977		56.947,1	
Toscana	9	1978		82.207,0	
Toscana	9	1979		84.608,6	
Toscana	9	1980		302.990,8	10.730.000,0
Toscana	9	1981		306.863,7	11.100.000,0
Toscana	9	1982		322.369,3	10.970.000,0
Toscana	9	1983		426.966,8	10.660.000,0
Toscana	9	1984		356.465,3	11.150.000,0
Toscana	9	1985		428.076,1	11.610.000,0
Toscana	9	1986		485.326,9	12.000.000,0
Toscana	9	1987		481.340,9	12.440.000,0
Toscana	9	1988		511.323,8	13.280.000,0
Toscana	9	1989		442.526,6	13.930.000,0
Toscana	9	1990		396.360,0	14.580.000,0
Toscana	9	1991		338.167,7	14.900.000,0
Toscana	9	1992		511.959,1	14.780.000,0
Toscana	9	1993		414.067,3	13.270.000,0
Toscana	9	1994		368.804,5	13.340.000,0
Toscana	9	1995		340.260,9	14.390.000,0
Toscana	9	1996		415.018,6	14.760.000,0
Toscana	9	1997	10,003	426.649,4	14.720.000,0

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Toscana	9	1998	10,295	438.605,8	15.420.000,0
Toscana	9	1999	11,833	450.674,8	16.270.000,0
Toscana	9	2000	12,178	463.133,9	17.380.000,0
Toscana	9	2001	12,387	476.528,0	17.510.000,0
Toscana	9	2002	14,671	489.918,1	18.490.000,0
Toscana	9	2003	15,589	502.958,9	20.100.000,0
Toscana	9	2004	17,621		20.160.000,0
Umbria	10	1970		14.058,5	
Umbria	10	1971		21.576,5	
Umbria	10	1972		24.155,2	
Umbria	10	1973		18.474,7	
Umbria	10	1974		13.298,2	
Umbria	10	1975		9.280,2	
Umbria	10	1976		13.632,4	
Umbria	10	1977		12.605,7	
Umbria	10	1978		13.581,3	
Umbria	10	1979		23.175,0	
Umbria	10	1980		109.390,2	4.080.000,0
Umbria	10	1981		97.469,9	3.880.000,0
Umbria	10	1982		137.512,8	3.760.000,0
Umbria	10	1983		38.513,2	3.630.000,0
Umbria	10	1984		47.911,2	3.620.000,0
Umbria	10	1985		84.488,7	3.620.000,0
Umbria	10	1986		77.024,9	3.630.000,0

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Umbria	10	1987		97.575,2	3.700.000,0
Umbria	10	1988		94.313,8	3.960.000,0
Umbria	10	1989		84.091,6	4.100.000,0
Umbria	10	1990		84.540,9	4.240.000,0
Umbria	10	1991		96.856,8	4.290.000,0
Umbria	10	1992		144.381,2	4.230.000,0
Umbria	10	1993		97.429,1	3.690.000,0
Umbria	10	1994		81.144,7	3.680.000,0
Umbria	10	1995		104.601,1	3.900.000,0
Umbria	10	1996		99.047,1	3.920.000,0
Umbria	10	1997	2,353	101.700,8	3.900.000,0
Umbria	10	1998	2,530	104.519,9	3.990.000,0
Umbria	10	1999	2,640	107.389,2	4.210.000,0
Umbria	10	2000	2,837	110.481,9	4.460.000,0
Umbria	10	2001	3,409	113.335,0	4.190.000,0
Umbria	10	2002	3,389	116.566,9	4.920.000,0
Umbria	10	2003	3,976	119.722,2	4.400.000,0
Umbria	10	2004	4,828		4.030.000,0
Marche	11	1970		31.274,6	
Marche	11	1971		33.646,1	
Marche	11	1972		23.309,2	
Marche	11	1973		26.092,4	
Marche	11	1974		22.228,8	
Marche	11	1975		22.555,7	

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Marche	11	1976		32.595,7	
Marche	11	1977		30.114,1	
Marche	11	1978		54.178,4	
Marche	11	1979		38.897,0	
Marche	11	1980		96.797,5	6.610.000,0
Marche	11	1981		110.316,2	6.430.000,0
Marche	11	1982		92.026,4	6.080.000,0
Marche	11	1983		169.036,3	5.870.000,0
Marche	11	1984		60.135,2	5.880.000,0
Marche	11	1985		134.245,2	5.930.000,0
Marche	11	1986		150.070,5	6.090.000,0
Marche	11	1987		177.483,5	6.340.000,0
Marche	11	1988		154.890,6	6.590.000,0
Marche	11	1989		167.766,4	6.850.000,0
Marche	11	1990		154.316,3	7.080.000,0
Marche	11	1991		283.535,4	7.030.000,0
Marche	11	1992		230.677,0	6.970.000,0
Marche	11	1993		182.524,6	6.120.000,0
Marche	11	1994		155.603,8	6.100.000,0
Marche	11	1995		164.333,5	6.500.000,0
Marche	11	1996		201.066,0	6.670.000,0
Marche	11	1997	4,102	205.443,9	6.390.000,0
Marche	11	1998	4,914	210.076,0	6.470.000,0
Marche	11	1999	4,355	215.380,1	6.850.000,0

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Marche	11	2000	5,336	220.792,8	7.250.000,0
Marche	11	2001	6,040	226.660,3	8.140.000,0
Marche	11	2002	6,053	232.307,7	7.750.000,0
Marche	11	2003	6,882	237.985,2	7.880.000,0
Marche	11	2004	7,559		8.230.000,0
Lazio	12	1970		57.040,6	
Lazio	12	1971		67.463,7	
Lazio	12	1972		66.288,3	
Lazio	12	1973		79.122,2	
Lazio	12	1974		69.756,3	
Lazio	12	1975		58.986,1	
Lazio	12	1976		55.832,1	
Lazio	12	1977		58.663,3	
Lazio	12	1978		93.439,4	
Lazio	12	1979		114.876,0	
Lazio	12	1980		416.951,1	14.580.000,0
Lazio	12	1981		456.910,5	14.730.000,0
Lazio	12	1982		371.781,3	14.710.000,0
Lazio	12	1983		547.565,2	15.200.000,0
Lazio	12	1984		487.406,7	16.350.000,0
Lazio	12	1985		553.180,1	16.750.000,0
Lazio	12	1986		595.481,0	17.900.000,0
Lazio	12	1987		653.213,7	19.130.000,0
Lazio	12	1988		518.912,1	20.520.000,0

REGION	**unit**	**YEAR**	**University Graduates (000)**	**REAL Public Capital (1990=100) (000)**	**GFCF (2005=100) (000)**
Lazio	12	1989		534.444,1	21.530.000,0
Lazio	12	1990		838.576,2	23.260.000,0
Lazio	12	1991		561.314,8	24.070.000,0
Lazio	12	1992		747.968,0	24.250.000,0
Lazio	12	1993		963.424,0	21.720.000,0
Lazio	12	1994		777.650,8	21.580.000,0
Lazio	12	1995		779.923,8	22.960.000,0
Lazio	12	1996		884.165,4	23.750.000,0
Lazio	12	1997	16,783	900.571,9	23.310.000,0
Lazio	12	1998	17,024	917.315,4	24.900.000,0
Lazio	12	1999	19,408	935.595,5	25.770.000,0
Lazio	12	2000	21,035	954.355,4	27.500.000,0
Lazio	12	2001	21,885	973.642,8	27.490.000,0
Lazio	12	2002	25,629	992.728,1	28.340.000,0
Lazio	12	2003	33,992	1.011.284,9	29.660.000,0
Lazio	12	2004	31,715		29.130.000,0
Abruzzo	13	1970		26.091,9	
Abruzzo	13	1971		25.299,2	
Abruzzo	13	1972		27.930,0	
Abruzzo	13	1973		40.696,3	
Abruzzo	13	1974		40.284,2	
Abruzzo	13	1975		37.349,6	
Abruzzo	13	1976		37.385,3	
Abruzzo	13	1977		42.646,4	

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Abruzzo	13	1978		37.427,1	
Abruzzo	13	1979		46.233,2	
Abruzzo	13	1980		119.253,5	3.160.000,0
Abruzzo	13	1981		138.627,9	3.130.000,0
Abruzzo	13	1982		134.277,2	3.090.000,0
Abruzzo	13	1983		221.128,3	3.090.000,0
Abruzzo	13	1984		177.245,9	3.320.000,0
Abruzzo	13	1985		130.419,8	3.400.000,0
Abruzzo	13	1986		153.351,5	3.540.000,0
Abruzzo	13	1987		200.403,9	3.750.000,0
Abruzzo	13	1988		159.801,6	4.030.000,0
Abruzzo	13	1989		145.891,8	4.310.000,0
Abruzzo	13	1990		172.622,1	4.610.000,0
Abruzzo	13	1991		190.903,1	4.790.000,0
Abruzzo	13	1992		224.359,7	4.850.000,0
Abruzzo	13	1993		206.044,6	4.290.000,0
Abruzzo	13	1994		155.320,8	4.390.000,0
Abruzzo	13	1995		143.966,5	4.770.000,0
Abruzzo	13	1996		171.964,1	4.920.000,0
Abruzzo	13	1997	3,091	175.707,7	4.730.000,0
Abruzzo	13	1998	3,057	179.709,5	4.910.000,0
Abruzzo	13	1999	3,582	183.802,8	5.220.000,0
Abruzzo	13	2000	3,589	187.993,7	5.780.000,0
Abruzzo	13	2001	3,953	192.080,1	6.480.000,0

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Abruzzo	13	2002	5,262	196.303,8	6.350.000,0
Abruzzo	13	2003	6,825	200.529,2	6.530.000,0
Abruzzo	13	2004	8,151		6.450.000,0
Molise	14	1970		10.599,2	
Molise	14	1971		6.757,8	
Molise	14	1972		14.080,2	
Molise	14	1973		6.316,8	
Molise	14	1974		18.415,3	
Molise	14	1975		11.994,7	
Molise	14	1976		12.635,1	
Molise	14	1977		25.237,7	
Molise	14	1978		17.526,5	
Molise	14	1979		19.108,9	
Molise	14	1980		39.920,1	1.110.000,0
Molise	14	1981		40.608,5	1.090.000,0
Molise	14	1982		44.251,6	1.020.000,0
Molise	14	1983		98.287,4	1.030.000,0
Molise	14	1984		61.894,3	1.120.000,0
Molise	14	1985		47.850,8	1.150.000,0
Molise	14	1986		50.812,1	1.190.000,0
Molise	14	1987		66.274,3	1.250.000,0
Molise	14	1988		61.263,2	1.380.000,0
Molise	14	1989		35.537,4	1.430.000,0
Molise	14	1990		41.609,9	1.480.000,0

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Molise	14	1991		45.983,3	1.520.000,0
Molise	14	1992		70.495,3	1.510.000,0
Molise	14	1993		61.798,2	1.310.000,0
Molise	14	1994		90.823,1	1.340.000,0
Molise	14	1995		75.962,0	1.430.000,0
Molise	14	1996		77.654,5	1.480.000,0
Molise	14	1997	0,264	4.345.037,0	1.520.000,0
Molise	14	1998	0,300	8.714.727,2	1.520.000,0
Molise	14	1999	0,384	13.039.588,9	1.580.000,0
Molise	14	2000	0,419	17.528.477,3	1.680.000,0
Molise	14	2001	0,572	22.112.238,9	1.730.000,0
Molise	14	2002	0,635	26.805.337,7	1.410.000,0
Molise	14	2003	0,870	31.464.838,7	1.500.000,0
Molise	14	2004	1,118		1.730.000,0
Campania	15	1970		46.985,7	
Campania	15	1971		57.595,3	
Campania	15	1972		56.067,6	
Campania	15	1973		51.576,0	
Campania	15	1974		59.387,4	
Campania	15	1975		61.674,8	
Campania	15	1976		82.627,4	
Campania	15	1977		79.092,3	
Campania	15	1978		95.029,1	
Campania	15	1979		116.426,4	

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Campania	15	1980		278.726,6	22.970.000,0
Campania	15	1981		365.960,3	22.070.000,0
Campania	15	1982		470.676,1	21.580.000,0
Campania	15	1983		553.095,4	20.880.000,0
Campania	15	1984		630.462,7	21.250.000,0
Campania	15	1985		596.957,6	20.840.000,0
Campania	15	1986		552.017,5	20.270.000,0
Campania	15	1987		592.514,0	20.820.000,0
Campania	15	1988		557.014,3	22.020.000,0
Campania	15	1989		642.036,5	22.710.000,0
Campania	15	1990		571.232,8	23.230.000,0
Campania	15	1991		643.605,5	22.740.000,0
Campania	15	1992		516.227,1	21.690.000,0
Campania	15	1993		377.072,9	18.780.000,0
Campania	15	1994		328.612,2	18.480.000,0
Campania	15	1995		356.362,5	18.980.000,0
Campania	15	1996		446.827,7	18.960.000,0
Campania	15	1997	12,426	458.821,7	18.250.000,0
Campania	15	1998	13,180	471.272,5	18.850.000,0
Campania	15	1999	14,159	483.581,0	19.430.000,0
Campania	15	2000	14,246	496.462,8	20.320.000,0
Campania	15	2001	16,822	509.946,4	21.250.000,0
Campania	15	2002	16,664	523.618,2	21.020.000,0
Campania	15	2003	17,748	537.137,0	22.520.000,0

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Campania	15	2004	21,968		22.470.000,0
Puglia	16	1970		44.087,3	
Puglia	16	1971		39.936,6	
Puglia	16	1972		52.394,6	
Puglia	16	1973		54.326,1	
Puglia	16	1974		52.869,2	
Puglia	16	1975		43.823,4	
Puglia	16	1976		72.562,2	
Puglia	16	1977		112.418,2	
Puglia	16	1978		105.929,4	
Puglia	16	1979		88.868,3	
Puglia	16	1980		257.743,0	11.370.000,0
Puglia	16	1981		285.331,1	10.600.000,0
Puglia	16	1982		292.594,5	9.890.000,0
Puglia	16	1983		428.484,1	10.110.000,0
Puglia	16	1984		350.443,4	10.420.000,0
Puglia	16	1985		335.431,5	10.240.000,0
Puglia	16	1986		320.992,9	10.560.000,0
Puglia	16	1987		388.185,5	11.020.000,0
Puglia	16	1988		320.291,6	11.930.000,0
Puglia	16	1989		442.318,0	12.250.000,0
Puglia	16	1990		343.042,0	12.510.000,0
Puglia	16	1991		326.750,4	12.880.000,0
Puglia	16	1992		474.913,1	12.510.000,0

REGION	**unit**	**YEAR**	**University Graduates (000)**	**REAL Public Capital (1990=100) (000)**	**GFCF (2005=100) (000)**
Puglia	16	1993		414.381,3	10.830.000,0
Puglia	16	1994		366.029,5	11.100.000,0
Puglia	16	1995		388.192,2	11.540.000,0
Puglia	16	1996		312.367,6	11.770.000,0
Puglia	16	1997	6,064	320.182,7	10.620.000,0
Puglia	16	1998	7,092	328.553,9	11.110.000,0
Puglia	16	1999	7,205	337.795,9	11.890.000,0
Puglia	16	2000	8,186	347.484,2	12.590.000,0
Puglia	16	2001	8,945	357.110,4	12.840.000,0
Puglia	16	2002	9,438	366.928,8	12.740.000,0
Puglia	16	2003	9,579	376.563,1	12.660.000,0
Puglia	16	2004	11,979		13.190.000,0
Basilicata	17	1970		25.427,2	
Basilicata	17	1971		35.297,2	
Basilicata	17	1972		30.259,7	
Basilicata	17	1973		23.131,6	
Basilicata	17	1974		25.611,6	
Basilicata	17	1975		44.772,7	
Basilicata	17	1976		45.577,3	
Basilicata	17	1977		54.861,2	
Basilicata	17	1978		59.899,2	
Basilicata	17	1979		54.928,3	
Basilicata	17	1980		91.155,7	1.450.000,0
Basilicata	17	1981		108.024,7	1.350.000,0

REGION	**unit**	**YEAR**	**University Graduates (000)**	**REAL Public Capital (1990=100) (000)**	**GFCF (2005=100) (000)**
Basilicata	17	1982		104.237,0	1.260.000,0
Basilicata	17	1983		170.567,1	1.300.000,0
Basilicata	17	1984		194.484,2	1.480.000,0
Basilicata	17	1985		119.415,7	1.410.000,0
Basilicata	17	1986		125.062,1	1.410.000,0
Basilicata	17	1987		166.328,0	1.500.000,0
Basilicata	17	1988		159.883,7	1.620.000,0
Basilicata	17	1989		182.238,5	1.680.000,0
Basilicata	17	1990		200.288,2	1.780.000,0
Basilicata	17	1991		156.381,6	1.820.000,0
Basilicata	17	1992		281.344,0	1.840.000,0
Basilicata	17	1993		225.692,7	1.690.000,0
Basilicata	17	1994		172.947,0	1.740.000,0
Basilicata	17	1995		159.717,4	1.900.000,0
Basilicata	17	1996		136.461,3	1.990.000,0
Basilicata	17	1997	0,202	138.188,3	2.060.000,0
Basilicata	17	1998	0,224	139.860,2	2.190.000,0
Basilicata	17	1999	0,266	141.634,8	2.390.000,0
Basilicata	17	2000	0,300	143.501,7	2.510.000,0
Basilicata	17	2001	0,485	145.229,4	2.550.000,0
Basilicata	17	2002	0,425	147.026,9	2.330.000,0
Basilicata	17	2003	0,541	148.800,0	2.510.000,0
Basilicata	17	2004	0,734		2.540.000,0
Calabria	18	1970		61.168,6	

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Calabria	18	1971		55.292,9	
Calabria	18	1972		46.867,4	
Calabria	18	1973		54.110,2	
Calabria	18	1974		58.336,9	
Calabria	18	1975		55.558,4	
Calabria	18	1976		44.650,3	
Calabria	18	1977		45.557,2	
Calabria	18	1978		43.360,7	
Calabria	18	1979		107.775,3	
Calabria	18	1980		184.360,7	4.250.000,0
Calabria	18	1981		255.016,1	4.480.000,0
Calabria	18	1982		190.512,2	4.190.000,0
Calabria	18	1983		292.377,1	4.380.000,0
Calabria	18	1984		294.312,3	4.370.000,0
Calabria	18	1985		281.175,7	4.710.000,0
Calabria	18	1986		284.336,4	4.650.000,0
Calabria	18	1987		367.374,9	4.960.000,0
Calabria	18	1988		367.749,3	5.110.000,0
Calabria	18	1989		306.850,3	5.600.000,0
Calabria	18	1990		269.924,1	5.480.000,0
Calabria	18	1991		336.986,1	5.850.000,0
Calabria	18	1992		397.376,4	5.650.000,0
Calabria	18	1993		279.557,6	5.180.000,0
Calabria	18	1994		266.608,0	5.060.000,0

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Calabria	18	1995		308.821,1	5.480.000,0
Calabria	18	1996		272.049,9	5.520.000,0
Calabria	18	1997	2,088	276.921,9	5.660.000,0
Calabria	18	1998	1,976	281.840,7	5.860.000,0
Calabria	18	1999	2,195	286.970,5	6.260.000,0
Calabria	18	2000	2,586	291.802,0	6.610.000,0
Calabria	18	2001	2,989	297.387,6	7.250.000,0
Calabria	18	2002	3,620	303.055,0	7.370.000,0
Calabria	18	2003	4,671	308.700,3	7.150.000,0
Calabria	18	2004	6,019		7.370.000,0
Sicilia	19	1970		101.063,4	
Sicilia	19	1971		114.342,0	
Sicilia	19	1972		113.360,2	
Sicilia	19	1973		98.932,5	
Sicilia	19	1974		108.076,9	
Sicilia	19	1975		106.109,2	
Sicilia	19	1976		123.211,6	
Sicilia	19	1977		107.862,0	
Sicilia	19	1978		111.611,5	
Sicilia	19	1979		141.507,1	
Sicilia	19	1980		307.581,6	16.280.000,0
Sicilia	19	1981		383.026,6	15.760.000,0
Sicilia	19	1982		377.492,8	15.010.000,0
Sicilia	19	1983		583.268,3	15.030.000,0

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Sicilia	19	1984		560.560,3	15.250.000,0
Sicilia	19	1985		469.760,4	14.720.000,0
Sicilia	19	1986		531.086,1	14.980.000,0
Sicilia	19	1987		787.393,8	15.630.000,0
Sicilia	19	1988		621.401,5	15.910.000,0
Sicilia	19	1989		634.307,7	15.900.000,0
Sicilia	19	1990		766.745,3	16.690.000,0
Sicilia	19	1991		774.840,8	17.010.000,0
Sicilia	19	1992		780.567,8	16.360.000,0
Sicilia	19	1993		656.529,3	14.360.000,0
Sicilia	19	1994		395.775,4	13.900.000,0
Sicilia	19	1995		447.042,0	14.410.000,0
Sicilia	19	1996		557.165,1	14.370.000,0
Sicilia	19	1997	9,106	567.941,2	14.650.000,0
Sicilia	19	1998	9,659	579.168,3	14.980.000,0
Sicilia	19	1999	10,345	589.866,1	15.420.000,0
Sicilia	19	2000	10,008	602.619,9	16.320.000,0
Sicilia	19	2001	11,267	615.540,8	16.280.000,0
Sicilia	19	2002	11,729	627.533,5	16.250.000,0
Sicilia	19	2003	13,086	639.522,6	16.570.000,0
Sicilia	19	2004	16,004		17.290.000,0
Sardegna	20	1970		27.727,5	
Sardegna	20	1971		26.923,4	
Sardegna	20	1972		27.721,3	

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Sardegna	20	1973		23.362,4	
Sardegna	20	1974		23.981,7	
Sardegna	20	1975		32.019,3	
Sardegna	20	1976		41.786,5	
Sardegna	20	1977		50.453,2	
Sardegna	20	1978		68.049,9	
Sardegna	20	1979		64.157,9	
Sardegna	20	1980		251.513,0	7.080.000,0
Sardegna	20	1981		258.329,7	6.700.000,0
Sardegna	20	1982		306.602,4	6.440.000,0
Sardegna	20	1983		394.983,7	6.390.000,0
Sardegna	20	1984		299.179,9	6.650.000,0
Sardegna	20	1985		306.085,9	6.380.000,0
Sardegna	20	1986		278.373,9	6.440.000,0
Sardegna	20	1987		269.529,0	6.580.000,0
Sardegna	20	1988		202.239,4	6.870.000,0
Sardegna	20	1989		216.834,4	6.970.000,0
Sardegna	20	1990		275.407,9	7.220.000,0
Sardegna	20	1991		429.397,2	7.520.000,0
Sardegna	20	1992		556.708,5	7.360.000,0
Sardegna	20	1993		360.351,1	6.410.000,0
Sardegna	20	1994		280.418,5	6.220.000,0
Sardegna	20	1995		319.478,2	6.310.000,0
Sardegna	20	1996		242.839,6	6.210.000,0

REGION	unit	YEAR	University Graduates (000)	REAL Public Capital (1990=100) (000)	GFCF (2005=100) (000)
Sardegna	20	1997	2,511	247.760,6	6.610.000,0
Sardegna	20	1998	2,822	253.231,8	6.930.000,0
Sardegna	20	1999	3,276	258.272,5	6.970.000,0
Sardegna	20	2000	3,900	263.833,1	7.040.000,0
Sardegna	20	2001	4,740	269.367,9	7.170.000,0
Sardegna	20	2002	4,859	274.833,3	7.880.000,0
Sardegna	20	2003	5,542	280.117,7	7.800.000,0
Sardegna	20	2004	6,245		8.750.000,0

SPAIN

Table 5 of Appendix: Spain- GDP, Employment and Education

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Andalucva	1	1980	61.000.000,0	1.800			
Andalucva	1	1981	60.370.000,0	1.740			
Andalucva	1	1982	61.360.000,0	1.740			
Andalucva	1	1983	62.930.000,0	1.740			
Andalucva	1	1984	63.260.000,0	1.660			
Andalucva	1	1985	65.050.000,0	1.650			
Andalucva	1	1986	67.320.000,0	1.690			
Andalucva	1	1987	71.950.000,0	1.780			
Andalucva	1	1988	75.100.000,0	1.870			
Andalucva	1	1989	77.640.000,0	1.950			
Andalucva	1	1990	83.230.000,0	2.040			
Andalucva	1	1991	85.650.000,0	2.060			
Andalucva	1	1992	85.320.000,0	2.010			
Andalucva	1	1993	83.880.000,0	1.940			
Andalucva	1	1994	85.940.000,0	1.940			
Andalucva	1	1995	87.270.000,0	1.980			
Andalucva	1	1996	89.500.000,0	2.030			
Andalucva	1	1997	92.730.000,0	2.130			
Andalucva	1	1998	95.680.000,0	2.200	588,764	446,965	286,551

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Andalucva	1	1999	99.220.000,0	2.300	578,664	243,867	293,467
Andalucva	1	2000	105.310.000,0	2.420	568,576	216,772	303,126
Andalucva	1	2001	109.580.000,0	2.510	559,732	227,094	301,560
Andalucva	1	2002	113.560.000,0	2.570	551,509	222,146	303,277
Andalucva	1	2003	118.910.000,0	2.690	541,745	217,281	300,998
Andalucva	1	2004	123.730.000,0	2.800	609,732	210,049	296,935
Andalucva	1	2005	129.080.000,0	2.950	600,251	217,064	291,848
Andalucva	1	2006	133.850.000,0	3.100	596,704	216,108	288,931
Andalucva	1	2007	138.450.000,0	3.220	597,218	218,737	288,318
Andalucva	1	2008	138.740.000,0	3.200	580,694	214,373	288,896
Andalucva	1	2009	133.100.000,0	2.990	578,208	206,222	288,334
Andalucva	1	2010	132.720.000,0	2.930	572,111	221,389	306,495
Andalucva	1	2011	131.380.000,0	2.840	574,397	247,933	329,668
Andalucva	1	2012	126.770.000,0	2.700	579,519	255,697	340,373
Aragon	2	1980	14.520.000,0	434,07			
Aragon	2	1981	14.410.000,0	419,80			
Aragon	2	1982	14.670.000,0	420,54			
Aragon	2	1983	15.450.000,0	417,91			
Aragon	2	1984	15.930.000,0	402,04			
Aragon	2	1985	16.030.000,0	396,66			
Aragon	2	1986	16.420.000,0	410,58			
Aragon	2	1987	17.210.000,0	434,62			
Aragon	2	1988	18.670.000,0	444,15			

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Aragon	2	1989	19.490.000,0	458,62			
Aragon	2	1990	19.900.000,0	475,82			
Aragon	2	1991	20.460.000,0	487,79			
Aragon	2	1992	20.410.000,0	475,72			
Aragon	2	1993	20.190.000,0	460,94			
Aragon	2	1994	20.640.000,0	456,22			
Aragon	2	1995	21.070.000,0	454,19			
Aragon	2	1996	21.670.000,0	464,34			
Aragon	2	1997	22.460.000,0	484,25			
Aragon	2	1998	22.880.000,0	499,77	65,552	67,719	49,537
Aragon	2	1999	23.340.000,0	513,02	64,536	41,988	50,315
Aragon	2	2000	24.450.000,0	541,02	63,604	38,051	52,968
Aragon	2	2001	25.270.000,0	553,81	63,002	35,455	50,285
Aragon	2	2002	26.350.000,0	570,30	62,946	34,291	48,287
Aragon	2	2003	27.170.000,0	581,56	63,919	30,491	47,567
Aragon	2	2004	27.930.000,0	599,79	66,267	30,089	45,957
Aragon	2	2005	28.930.000,0	620,11	66,761	30,098	45,328
Aragon	2	2006	30.230.000,0	638,34	67,738	30,052	44,272
Aragon	2	2007	31.880.000,0	656,83	69,691	29,822	42,617
Aragon	2	2008	32.480.000,0	663,74	72,311	29,865	42,656
Aragon	2	2009	31.060.000,0	621,23	74,208	29,749	42,604
Aragon	2	2010	31.250.000,0	609,14	74,465	31,594	43,548
Aragon	2	2011	30.800.000,0	590,70	75,384	31,911	51,184

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Aragon	2	2012	29.520.000,0	570,50	76,534	32,869	51,340
Principado de Asturias	3	1980	13.750.000,0	401,93			
Principado de Asturias	3	1981	13.960.000,0	388,88			
Principado de Asturias	3	1982	14.450.000,0	372,18			
Principado de Asturias	3	1983	13.940.000,0	372,94			
Principado de Asturias	3	1984	13.960.000,0	363,13			
Principado de Asturias	3	1985	13.880.000,0	359,10			
Principado de Asturias	3	1986	13.870.000,0	355,15			
Principado de Asturias	3	1987	13.810.000,0	365,26			
Principado de Asturias	3	1988	14.700.000,0	360,96			
Principado de Asturias	3	1989	15.040.000,0	366,32			
Principado de Asturias	3	1990	15.030.000,0	377,23			
Principado de Asturias	3	1991	15.200.000,0	382,03			
Principado de Asturias	3	1992	15.290.000,0	378,60			
Principado de Asturias	3	1993	15.140.000,0	364,12			
Principado de Asturias	3	1994	15.220.000,0	349,55			
Principado de Asturias	3	1995	15.640.000,0	346,16			
Principado de Asturias	3	1996	15.700.000,0	339,95			
Principado de Asturias	3	1997	15.800.000,0	350,94			
Principado de Asturias	3	1998	16.430.000,0	355,68	53,590	68,687	49,161
Principado de Asturias	3	1999	16.450.000,0	359,57	50,885	40,053	48,147
Principado de Asturias	3	2000	17.400.000,0	370,62	48,541	37,582	49,389
Principado de Asturias	3	2001	18.040.000,0	382,52	46,644	35,879	48,520

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Principado de Asturias	3	2002	18.360.000,0	387,40	45,204	32,835	46,175
Principado de Asturias	3	2003	18.700.000,0	400,29	44,318	28,695	45,214
Principado de Asturias	3	2004	19.160.000,0	408,40	44,079	26,610	43,232
Principado de Asturias	3	2005	19.970.000,0	425,52	43,096	29,618	41,371
Principado de Asturias	3	2006	20.890.000,0	440,74	43,030	27,975	39,035
Principado de Asturias	3	2007	21.650.000,0	454,42	43,447	26,137	36,732
Principado de Asturias	3	2008	21.880.000,0	459,54	44,482	24,437	35,305
Principado de Asturias	3	2009	20.670.000,0	428,23	45,097	22,551	34,050
Principado de Asturias	3	2010	20.770.000,0	415,73	45,811	24,384	34,336
Principado de Asturias	3	2011	20.400.000,0	411,98	46,797	24,353	38,647
Principado de Asturias	3	2012	19.440.000,0	394,77	47,674	24,374	38,123
Illes Balears	4	1980	9.140.000,0	232,55			
Illes Balears	4	1981	9.640.000,0	229,49			
Illes Balears	4	1982	10.180.000,0	231,94			
Illes Balears	4	1983	10.770.000,0	233,78			
Illes Balears	4	1984	11.450.000,0	235,21			
Illes Balears	4	1985	10.810.000,0	241,21			
Illes Balears	4	1986	10.880.000,0	242,71			
Illes Balears	4	1987	11.530.000,0	241,19			
Illes Balears	4	1988	12.040.000,0	264,46			
Illes Balears	4	1989	12.390.000,0	274,35			
Illes Balears	4	1990	13.120.000,0	285,26			
Illes Balears	4	1991	13.660.000,0	286,99			

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Illes Balears	4	1992	13.960.000,0	279,80			
Illes Balears	4	1993	13.960.000,0	273,07			
Illes Balears	4	1994	14.490.000,0	277,66			
Illes Balears	4	1995	14.830.000,0	283,72			
Illes Balears	4	1996	15.370.000,0	294,06			
Illes Balears	4	1997	16.500.000,0	306,13			
Illes Balears	4	1998	17.440.000,0	318,45	55,653	41,570	19,130
Illes Balears	4	1999	18.770.000,0	372,52	55,920	21,864	17,004
Illes Balears	4	2000	20.120.000,0	406,64	56,054	19,766	17,232
Illes Balears	4	2001	20.850.000,0	421,94	56,151	20,409	16,660
Illes Balears	4	2002	21.140.000,0	431,63	56,831	20,305	16,175
Illes Balears	4	2003	21.330.000,0	444,19	57,286	19,022	16,707
Illes Balears	4	2004	21.870.000,0	460,72	58,270	19,667	16,898
Illes Balears	4	2005	22.620.000,0	493,05	58,063	19,838	17,200
Illes Balears	4	2006	23.510.000,0	513,37	58,651	20,112	17,251
Illes Balears	4	2007	24.350.000,0	536,06	60,747	20,321	19,553
Illes Balears	4	2008	24.800.000,0	538,57	62,677	20,618	17,648
Illes Balears	4	2009	23.790.000,0	507,37	64,593	21,006	18,644
Illes Balears	4	2010	23.790.000,0	494,38	65,330	22,917	19,681
Illes Balears	4	2011	23.640.000,0	480,73	66,556	25,460	24,466
Illes Balears	4	2012	23.270.000,0	468,03	67,085	25,517	24,199
Canarias	5	1980	13.860.000,0	434,78			
Canarias	5	1981	14.040.000,0	424,05			

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Canarias	5	1982	14.660.000,0	426,52			
Canarias	5	1983	15.170.000,0	431,12			
Canarias	5	1984	15.730.000,0	416,60			
Canarias	5	1985	17.090.000,0	398,32			
Canarias	5	1986	18.510.000,0	418,47			
Canarias	5	1987	19.730.000,0	443,42			
Canarias	5	1988	21.120.000,0	465,20			
Canarias	5	1989	21.570.000,0	477,78			
Canarias	5	1990	21.940.000,0	501,14			
Canarias	5	1991	22.320.000,0	499,11			
Canarias	5	1992	23.160.000,0	499,90			
Canarias	5	1993	23.400.000,0	498,43			
Canarias	5	1994	24.150.000,0	510,95			
Canarias	5	1995	24.650.000,0	533,29			
Canarias	5	1996	25.300.000,0	552,97			
Canarias	5	1997	26.430.000,0	582,12			
Canarias	5	1998	28.080.000,0	618,47	129,421	108,822	56,890
Canarias	5	1999	30.370.000,0	645,16	126,779	66,624	58,914
Canarias	5	2000	31.670.000,0	663,39	125,354	59,587	59,820
Canarias	5	2001	33.140.000,0	697,10	123,144	60,246	59,695
Canarias	5	2002	34.040.000,0	719,98	121,773	57,499	60,168
Canarias	5	2003	35.130.000,0	745,93	121,369	55,184	61,538
Canarias	5	2004	35.750.000,0	781,99	125,830	55,900	62,004

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Canarias	5	2005	36.790.000,0	814,22	125,774	60,895	62,050
Canarias	5	2006	37.780.000,0	852,87	126,620	63,034	60,361
Canarias	5	2007	38.800.000,0	888,64	128,326	59,970	59,452
Canarias	5	2008	38.830.000,0	873,55	131,279	61,267	59,703
Canarias	5	2009	37.020.000,0	806,44	131,858	59,986	60,228
Canarias	5	2010	37.460.000,0	792,94	132,179	66,144	60,874
Canarias	5	2011	37.280.000,0	768,32	132,484	68,622	63,440
Canarias	5	2012	36.110.000,0	741,52	132,806	65,760	69,044
Cantabria	6	1980	6.400.000,0	189,20			
Cantabria	6	1981	6.560.000,0	186,42			
Cantabria	6	1982	6.460.000,0	175,68			
Cantabria	6	1983	6.550.000,0	174,73			
Cantabria	6	1984	6.640.000,0	170,25			
Cantabria	6	1985	6.460.000,0	165,65			
Cantabria	6	1986	6.190.000,0	163,72			
Cantabria	6	1987	6.500.000,0	166,47			
Cantabria	6	1988	7.120.000,0	167,24			
Cantabria	6	1989	7.580.000,0	176,88			
Cantabria	6	1990	7.620.000,0	180,15			
Cantabria	6	1991	7.670.000,0	177,82			
Cantabria	6	1992	7.850.000,0	176,04			
Cantabria	6	1993	7.620.000,0	173,58			
Cantabria	6	1994	7.830.000,0	169,44			

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Cantabria	6	1995	8.020.000,0	167,75			
Cantabria	6	1996	8.130.000,0	171,96			
Cantabria	6	1997	8.350.000,0	177,24			
Cantabria	6	1998	8.760.000,0	186,07	30,520	34,559	18,534
Cantabria	6	1999	9.160.000,0	195,25	29,438	20,545	18,322
Cantabria	6	2000	9.690.000,0	206,52	28,443	18,007	18,538
Cantabria	6	2001	10.080.000,0	215,32	27,410	17,774	18,040
Cantabria	6	2002	10.350.000,0	222,52	26,885	16,947	17,509
Cantabria	6	2003	10.510.000,0	226,20	26,421	15,304	17,218
Cantabria	6	2004	10.780.000,0	232,91	26,639	15,027	16,736
Cantabria	6	2005	11.180.000,0	242,72	26,215	15,887	16,160
Cantabria	6	2006	11.530.000,0	248,93	26,337	16,195	15,461
Cantabria	6	2007	11.970.000,0	256,93	27,225	15,486	15,121
Cantabria	6	2008	12.110.000,0	258,93	28,023	14,501	15,182
Cantabria	6	2009	11.650.000,0	244,13	28,848	14,943	14,941
Cantabria	6	2010	11.650.000,0	234,43	29,751	15,637	15,411
Cantabria	6	2011	11.440.000,0	228,55	30,961	16,230	18,616
Cantabria	6	2012	11.030.000,0	218,85	31,652	16,551	19,203
Castilla y Leσn	7	1980	29.810.000,0	917,78			
Castilla y Leσn	7	1981	29.200.000,0	907,26			
Castilla y Leσn	7	1982	29.950.000,0	898,56			
Castilla y Leσn	7	1983	30.970.000,0	891,67			
Castilla y Leσn	7	1984	31.710.000,0	852,94			

					Education		
Regio	unit	Year	GDP (2005=100) (000s euros)	Employment (000)	Primary (000)	Secondary (000)	Tertiary (000)
Castilla y Leσn	7	1985	31.390.000,0	833,50			
Castilla y Leσn	7	1986	31.640.000,0	842,00			
Castilla y Leσn	7	1987	33.300.000,0	894,54			
Castilla y Leσn	7	1988	34.540.000,0	912,99			
Castilla y Leσn	7	1989	35.310.000,0	927,64			
Castilla y Leσn	7	1990	35.590.000,0	942,89			
Castilla y Leσn	7	1991	36.360.000,0	945,22			
Castilla y Leσn	7	1992	36.520.000,0	925,77			
Castilla y Leσn	7	1993	37.370.000,0	895,29			
Castilla y Leσn	7	1994	37.690.000,0	885,02			
Castilla y Leσn	7	1995	39.420.000,0	881,18			
Castilla y Leσn	7	1996	39.800.000,0	870,18			
Castilla y Leσn	7	1997	40.140.000,0	886,43			
Castilla y Leσn	7	1998	40.870.000,0	915,77	141,024	159,441	118,100
Castilla y Leσn	7	1999	42.140.000,0	927,44	136,306	96,657	120,041
Castilla y Leσn	7	2000	43.480.000,0	954,97	132,025	89,183	122,078
Castilla y Leσn	7	2001	44.500.000,0	972,85	127,820	86,596	119,385
Castilla y Leσn	7	2002	45.460.000,0	986,22	124,493	82,085	118,246
Castilla y Leσn	7	2003	46.540.000,0	1.010,00	122,261	72,195	113,895
Castilla y Leσn	7	2004	47.640.000,0	1.030,00	126,943	70,077	110,765
Castilla y Leσn	7	2005	48.900.000,0	1.070,00	122,553	71,760	109,679
Castilla y Leσn	7	2006	50.190.000,0	1.090,00	122,409	69,530	105,863
Castilla y Leσn	7	2007	52.000.000,0	1.120,00	123,781	69,044	104,015

					Education		
Regio	unit	Year	GDP (2005=100) (000s euros)	Employment (000)	Primary (000)	Secondary (000)	Tertiary (000)
Castilla y Leσn	7	2008	52.060.000,0	1.110,00	125,420	71,816	103,529
Castilla y Leσn	7	2009	50.450.000,0	1.050,00	127,246	68,660	100,071
Castilla y Leσn	7	2010	50.460.000,0	1.030,00	127,029	72,785	100,761
Castilla y Leσn	7	2011	50.020.000,0	1.010,00	128,597	74,491	112,373
Castilla y Leσn	7	2012	48.500.000,0	973,27	129,424	71,456	114,770
Castilla-La Mancha	8	1980	16.090.000,0	512,74			
Castilla-La Mancha	8	1981	15.720.000,0	503,63			
Castilla-La Mancha	8	1982	15.860.000,0	508,38			
Castilla-La Mancha	8	1983	15.800.000,0	504,10			
Castilla-La Mancha	8	1984	15.790.000,0	485,85			
Castilla-La Mancha	8	1985	16.550.000,0	492,64			
Castilla-La Mancha	8	1986	16.760.000,0	502,42			
Castilla-La Mancha	8	1987	18.200.000,0	513,83			
Castilla-La Mancha	8	1988	19.650.000,0	526,71			
Castilla-La Mancha	8	1989	20.900.000,0	531,75			
Castilla-La Mancha	8	1990	21.610.000,0	552,10			
Castilla-La Mancha	8	1991	22.010.000,0	555,16			
Castilla-La Mancha	8	1992	22.200.000,0	557,30			
Castilla-La Mancha	8	1993	21.820.000,0	538,52			
Castilla-La Mancha	8	1994	22.240.000,0	525,37			
Castilla-La Mancha	8	1995	22.650.000,0	530,14			
Castilla-La Mancha	8	1996	23.330.000,0	551,57			
Castilla-La Mancha	8	1997	23.900.000,0	573,99			

					Education		
Regio	unit	Year	GDP (2005=100) (000s euros)	Employment (000)	Primary (000)	Secondary (000)	Tertiary (000)
Castilla-La Mancha	8	1998	24.920.000,0	610,69	126,986	98,820	36,925
Castilla-La Mancha	8	1999	25.450.000,0	617,68	126,198	55,346	39,072
Castilla-La Mancha	8	2000	26.490.000,0	643,18	124,710	51,978	43,722
Castilla-La Mancha	8	2001	27.640.000,0	663,47	123,066	51,491	41,773
Castilla-La Mancha	8	2002	28.610.000,0	684,86	121,713	50,432	41,693
Castilla-La Mancha	8	2003	29.920.000,0	702,61	121,146	44,072	40,695
Castilla-La Mancha	8	2004	30.900.000,0	730,95	120,698	44,166	40,512
Castilla-La Mancha	8	2005	32.510.000,0	761,99	126,405	48,324	40,754
Castilla-La Mancha	8	2006	34.100.000,0	792,92	127,431	48,779	40,912
Castilla-La Mancha	8	2007	36.050.000,0	827,51	130,476	51,880	40,715
Castilla-La Mancha	8	2008	36.830.000,0	831,22	133,078	50,507	41,223
Castilla-La Mancha	8	2009	35.670.000,0	770,21	135,259	52,516	40,443
Castilla-La Mancha	8	2010	35.630.000,0	754,92	135,184	55,781	44,399
Castilla-La Mancha	8	2011	35.220.000,0	726,09	134,185	57,493	53,840
Castilla-La Mancha	8	2012	34.030.000,0	692,78	134,253	59,272	55,495
Catalupa	9	1980	81.570.000,0	2.150,00			
Catalupa	9	1981	79.460.000,0	2.090,00			
Catalupa	9	1982	80.480.000,0	2.000,00			
Catalupa	9	1983	81.870.000,0	1.990,00			
Catalupa	9	1984	83.330.000,0	1.960,00			
Catalupa	9	1985	84.660.000,0	1.920,00			
Catalupa	9	1986	88.290.000,0	1.980,00			
Catalupa	9	1987	94.190.000,0	2.100,00			

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Cataluρa	9	1988	100.120.000,0	2.190,00			
Cataluρa	9	1989	106.920.000,0	2.300,00			
Cataluρa	9	1990	110.490.000,0	2.400,00			
Cataluρa	9	1991	113.460.000,0	2.450,00			
Cataluρa	9	1992	115.130.000,0	2.430,00			
Cataluρa	9	1993	113.280.000,0	2.360,00			
Cataluρa	9	1994	117.090.000,0	2.370,00			
Cataluρa	9	1995	121.510.000,0	2.450,00			
Cataluρa	9	1996	126.330.000,0	2.530,00			
Cataluρa	9	1997	130.650.000,0	2.610,00			
Cataluρa	9	1998	135.000.000,0	2.730,00	362,748	300,954	224,322
Cataluρa	9	1999	141.920.000,0	2.880,00	352,750	180,417	236,650
Cataluρa	9	2000	148.890.000,0	3.040,00	351,281	146,343	249,713
Cataluρa	9	2001	155.070.000,0	3.110,00	350,291	151,389	248,635
Cataluρa	9	2002	159.210.000,0	3.170,00	352,406	147,715	239,844
Cataluρa	9	2003	164.280.000,0	3.270,00	358,537	141,769	241,469
Cataluρa	9	2004	169.580.000,0	3.400,00	366,923	140,435	241,400
Cataluρa	9	2005	175.160.000,0	3.540,00	380,816	148,749	241,562
Cataluρa	9	2006	182.730.000,0	3.700,00	401,171	144,189	238,801
Cataluρa	9	2007	189.450.000,0	3.810,00	414,465	151,899	233,536
Cataluρa	9	2008	190.590.000,0	3.820,00	450,149	155,812	237,536
Cataluρa	9	2009	183.780.000,0	3.590,00	460,919	159,274	250,930
Cataluρa	9	2010	184.670.000,0	3.540,00	448,329	164,701	263,180

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Cataluρa	9	2011	181.810.000,0	3.440,00	471,165	168,460	333,070
Cataluρa	9	2012	177.130.000,0	3.290,00	483,885	179,054	328,756
Comunitat Valenciana	10	1980	43.270.000,0	1.200,00			
Comunitat Valenciana	10	1981	43.670.000,0	1.180,00			
Comunitat Valenciana	10	1982	42.800.000,0	1.150,00			
Comunitat Valenciana	10	1983	44.010.000,0	1.150,00			
Comunitat Valenciana	10	1984	45.490.000,0	1.160,00			
Comunitat Valenciana	10	1985	48.170.000,0	1.150,00			
Comunitat Valenciana	10	1986	48.550.000,0	1.190,00			
Comunitat Valenciana	10	1987	51.090.000,0	1.280,00			
Comunitat Valenciana	10	1988	52.930.000,0	1.320,00			
Comunitat Valenciana	10	1989	55.680.000,0	1.370,00			
Comunitat Valenciana	10	1990	58.230.000,0	1.430,00			
Comunitat Valenciana	10	1991	59.720.000,0	1.450,00			
Comunitat Valenciana	10	1992	60.140.000,0	1.430,00			
Comunitat Valenciana	10	1993	58.980.000,0	1.370,00			
Comunitat Valenciana	10	1994	60.120.000,0	1.370,00			
Comunitat Valenciana	10	1995	60.970.000,0	1.430,00			
Comunitat Valenciana	10	1996	62.610.000,0	1.440,00			
Comunitat Valenciana	10	1997	65.700.000,0	1.490,00			
Comunitat Valenciana	10	1998	69.090.000,0	1.550,00	266,340	222,570	150,789
Comunitat Valenciana	10	1999	72.180.000,0	1.620,00	261,529	145,851	159,808
Comunitat Valenciana	10	2000	76.280.000,0	1.700,00	256,521	112,611	164,074

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Comunitat Valenciana	10	2001	80.080.000,0	1.750,00	252,763	106,115	158,949
Comunitat Valenciana	10	2002	82.440.000,0	1.820,00	255,514	106,104	168,305
Comunitat Valenciana	10	2003	84.740.000,0	1.880,00	257,593	101,394	175,074
Comunitat Valenciana	10	2004	87.440.000,0	1.960,00	269,061	102,909	176,387
Comunitat Valenciana	10	2005	90.600.000,0	2.040,00	269,561	108,306	175,537
Comunitat Valenciana	10	2006	94.690.000,0	2.130,00	272,997	106,692	175,066
Comunitat Valenciana	10	2007	97.980.000,0	2.200,00	281,752	106,860	175,055
Comunitat Valenciana	10	2008	98.950.000,0	2.180,00	290,879	107,506	180,380
Comunitat Valenciana	10	2009	93.500.000,0	1.980,00	300,120	108,652	184,632
Comunitat Valenciana	10	2010	92.490.000,0	1.920,00	301,781	116,885	198,351
Comunitat Valenciana	10	2011	91.430.000,0	1.860,00	307,886	121,909	224,126
Comunitat Valenciana	10	2012	87.500.000,0	1.780,00	313,204	126,977	222,094
Extremadura	11	1980	7.200.000,0	305,08			
Extremadura	11	1981	7.320.000,0	297,46			
Extremadura	11	1982	7.390.000,0	290,79			
Extremadura	11	1983	7.230.000,0	291,03			
Extremadura	11	1984	8.300.000,0	277,92			
Extremadura	11	1985	8.480.000,0	279,00			
Extremadura	11	1986	8.370.000,0	280,93			
Extremadura	11	1987	9.000.000,0	305,40			
Extremadura	11	1988	9.880.000,0	308,29			
Extremadura	11	1989	10.040.000,0	317,34			
Extremadura	11	1990	10.380.000,0	326,53			

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Extremadura	11	1991	10.810.000,0	320,07			
Extremadura	11	1992	11.010.000,0	315,65			
Extremadura	11	1993	10.930.000,0	307,73			
Extremadura	11	1994	11.260.000,0	303,55			
Extremadura	11	1995	11.100.000,0	304,85			
Extremadura	11	1996	11.330.000,0	304,96			
Extremadura	11	1997	11.540.000,0	303,42			
Extremadura	11	1998	11.940.000,0	318,04	83,206	64,307	27,711
Extremadura	11	1999	12.490.000,0	332,30	81,649	37,035	29,528
Extremadura	11	2000	13.110.000,0	340,60	79,748	35,024	27,622
Extremadura	11	2001	13.460.000,0	343,99	77,512	34,109	32,369
Extremadura	11	2002	13.770.000,0	350,28	75,576	32,450	32,182
Extremadura	11	2003	14.180.000,0	358,86	73,579	30,013	31,727
Extremadura	11	2004	14.580.000,0	368,68	75,161	29,248	31,394
Extremadura	11	2005	15.230.000,0	381,39	72,385	32,421	30,849
Extremadura	11	2006	15.620.000,0	388,81	71,209	31,883	29,988
Extremadura	11	2007	16.280.000,0	398,90	70,626	32,796	31,607
Extremadura	11	2008	16.560.000,0	400,91	70,209	31,706	29,253
Extremadura	11	2009	16.170.000,0	375,60	68,129	32,280	29,532
Extremadura	11	2010	16.370.000,0	371,51	67,542	32,945	30,403
Extremadura	11	2011	15.950.000,0	358,54	67,092	33,051	35,415
Extremadura	11	2012	15.310.000,0	343,34	66,695	33,559	36,114
Galicia	12	1980	28.970.000,0	1.100,00			

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Galicia	12	1981	29.290.000,0	1.070,00			
Galicia	12	1982	29.870.000,0	1.080,00			
Galicia	12	1983	30.010.000,0	1.080,00			
Galicia	12	1984	30.620.000,0	1.080,00			
Galicia	12	1985	28.270.000,0	1.040,00			
Galicia	12	1986	28.990.000,0	1.010,00			
Galicia	12	1987	29.860.000,0	1.040,00			
Galicia	12	1988	31.720.000,0	1.080,00			
Galicia	12	1989	32.980.000,0	1.090,00			
Galicia	12	1990	33.340.000,0	1.100,00			
Galicia	12	1991	34.050.000,0	1.090,00			
Galicia	12	1992	34.420.000,0	1.050,00			
Galicia	12	1993	34.230.000,0	1.020,00			
Galicia	12	1994	34.750.000,0	1.010,00			
Galicia	12	1995	36.130.000,0	999,82			
Galicia	12	1996	36.530.000,0	967,02			
Galicia	12	1997	37.350.000,0	947,27			
Galicia	12	1998	38.340.000,0	948,38	156,869	158,218	106,826
Galicia	12	1999	39.550.000,0	944,40	150,854	110,283	111,668
Galicia	12	2000	40.730.000,0	967,77	145,914	78,123	114,084
Galicia	12	2001	42.160.000,0	1.000,00	141,223	77,861	115,067
Galicia	12	2002	43.280.000,0	1.030,00	136,044	69,977	112,535
Galicia	12	2003	44.650.000,0	1.060,00	132,334	68,697	111,991

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Galicia	12	2004	46.220.000,0	1.090,00	129,769	74,186	111,672
Galicia	12	2005	48.160.000,0	1.130,00	126,505	80,039	106,425
Galicia	12	2006	50.210.000,0	1.170,00	124,476	77,511	101,827
Galicia	12	2007	52.380.000,0	1.220,00	124,716	73,313	97,123
Galicia	12	2008	53.420.000,0	1.220,00	126,539	70,542	93,339
Galicia	12	2009	51.620.000,0	1.150,00	128,007	69,169	94,375
Galicia	12	2010	51.790.000,0	1.130,00	129,843	71,903	94,529
Galicia	12	2011	50.700.000,0	1.100,00	132,007	73,301	105,227
Galicia	12	2012	49.020.000,0	1.050,00	133,825	71,742	102,683
Comunidad de Madrid	13	1980	67.340.000,0	1.562.663			
Comunidad de Madrid	13	1981	67.880.000,0	1.533.164			
Comunidad de Madrid	13	1982	68.840.000,0	1.577.274			
Comunidad de Madrid	13	1983	69.820.000,0	1.575.259			
Comunidad de Madrid	13	1984	71.080.000,0	1.531.105			
Comunidad de Madrid	13	1985	74.670.000,0	1.550.542			
Comunidad de Madrid	13	1986	79.100.000,0	1.645.563			
Comunidad de Madrid	13	1987	84.200.000,0	1.709.693			
Comunidad de Madrid	13	1988	88.030.000,0	1.765.928			
Comunidad de Madrid	13	1989	92.960.000,0	1.839.979			
Comunidad de Madrid	13	1990	97.820.000,0	1.943.454			
Comunidad de Madrid	13	1991	100.770.000,0	1.998.835			
Comunidad de Madrid	13	1992	102.450.000,0	2.006.713			
Comunidad de Madrid	13	1993	102.040.000,0	1.977.335			

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Comunidad de Madrid	13	1994	104.450.000,0	1.949.340			
Comunidad de Madrid	13	1995	108.210.000,0	2.005.559			
Comunidad de Madrid	13	1996	111.480.000,0	2.034.961			
Comunidad de Madrid	13	1997	116.600.000,0	2.153.262			
Comunidad de Madrid	13	1998	124.430.000,0	2.282.151	320,198	315,359	290,047
Comunidad de Madrid	13	1999	131.090.000,0	2.441.065	316,227	198,217	291,611
Comunidad de Madrid	13	2000	139.310.000,0	2.603.243	313,980	162,797	291,226
Comunidad de Madrid	13	2001	145.800.000,0	2.717.630	314,077	156,206	295,562
Comunidad de Madrid	13	2002	150.330.000,0	2.809.777	317,929	150,985	294,589
Comunidad de Madrid	13	2003	155.090.000,0	2.899.069	323,407	140,236	296,836
Comunidad de Madrid	13	2004	160.300.000,0	3.026.753	338,198	137,989	294,765
Comunidad de Madrid	13	2005	166.260.000,0	3.165.901	335,864	140,856	291,622
Comunidad de Madrid	13	2006	174.510.000,0	3.321.273	340,209	142,137	287,025
Comunidad de Madrid	13	2007	181.190.000,0	3.408.279	348,497	139,080	290,410
Comunidad de Madrid	13	2008	184.240.000,0	3.466.472	361,737	139,112	291,603
Comunidad de Madrid	13	2009	181.510.000,0	3.318.276	375,420	139,971	296,259
Comunidad de Madrid	13	2010	179.780.000,0	3.266.412	385,853	152,059	304,583
Comunidad de Madrid	13	2011	180.680.000,0	3.218.472	395,997	158,080	371,827
Comunidad de Madrid	13	2012	177.530.000,0	3.098.444	403,346	161,073	370,443
Regiσn de Murcia	14	1980	9.860.000,0	300,31			
Regiσn de Murcia	14	1981	9.780.000,0	293,76			
Regiσn de Murcia	14	1982	9.860.000,0	291,04			
Regiσn de Murcia	14	1983	10.600.000,0	286,81			

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Regiσn de Murcia	14	1984	10.370.000,0	295,59			
Regiσn de Murcia	14	1985	10.850.000,0	294,09			
Regiσn de Murcia	14	1986	12.060.000,0	299,81			
Regiσn de Murcia	14	1987	12.570.000,0	317,95			
Regiσn de Murcia	14	1988	12.840.000,0	338,67			
Regiσn de Murcia	14	1989	13.540.000,0	353,96			
Regiσn de Murcia	14	1990	14.520.000,0	368,01			
Regiσn de Murcia	14	1991	14.700.000,0	367,23			
Regiσn de Murcia	14	1992	14.750.000,0	363,25			
Regiσn de Murcia	14	1993	14.360.000,0	350,70			
Regiσn de Murcia	14	1994	14.790.000,0	353,72			
Regiσn de Murcia	14	1995	14.900.000,0	355,45			
Regiσn de Murcia	14	1996	15.350.000,0	357,62			
Regiσn de Murcia	14	1997	16.260.000,0	383,02			
Regiσn de Murcia	14	1998	17.090.000,0	406,42	88,901	71,570	46,250
Regiσn de Murcia	14	1999	17.810.000,0	424,11	88,748	42,111	46,125
Regiσn de Murcia	14	2000	19.120.000,0	439,76	88,327	36,704	42,629
Regiσn de Murcia	14	2001	20.030.000,0	465,66	87,768	37,105	47,182
Regiσn de Murcia	14	2002	20.930.000,0	493,56	87,771	35,442	48,499
Regiσn de Murcia	14	2003	21.920.000,0	519,13	88,752	33,377	48,202
Regiσn de Murcia	14	2004	22.680.000,0	550,26	95,659	34,344	48,370
Regiσn de Murcia	14	2005	23.890.000,0	575,09	94,799	35,729	47,337
Regiσn de Murcia	14	2006	24.960.000,0	604,62	95,113	35,462	47,325

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Regiσn de Murcia	14	2007	26.070.000,0	636,32	96,567	36,167	46,931
Regiσn de Murcia	14	2008	26.570.000,0	368,13	100,255	36,044	47,032
Regiσn de Murcia	14	2009	25.290.000,0	594,42	101,075	36,842	48,188
Regiσn de Murcia	14	2010	25.420.000,0	592,73	102,578	39,969	52,054
Regiσn de Murcia	14	2011	24.740.000,0	569,99	103,576	41,432	59,604
Regiσn de Murcia	14	2012	24.090.000,0	547,58	104,526	43,059	63,049
Comunidad Foral de Navarra	15	1980	7.850.000,0	196,11			
Comunidad Foral de Navarra	15	1981	8.030.000,0	191,67			
Comunidad Foral de Navarra	15	1982	7.750.000,0	189,55			
Comunidad Foral de Navarra	15	1983	7.880.000,0	186,18			
Comunidad Foral de Navarra	15	1984	8.010.000,0	182,90			
Comunidad Foral de Navarra	15	1985	8.310.000,0	181,34			
Comunidad Foral de Navarra	15	1986	8.370.000,0	187,24			
Comunidad Foral de Navarra	15	1987	9.310.000,0	194,67			
Comunidad Foral de	15	1988	9.430.000,0	200,16			

Navarra							
					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Comunidad Foral de Navarra	15	1989	10.270.000,0	210,89			
Comunidad Foral de Navarra	15	1990	10.230.000,0	216,18			
Comunidad Foral de Navarra	15	1991	10.510.000,0	221,30			
Comunidad Foral de Navarra	15	1992	10.560.000,0	214,38			
Comunidad Foral de Navarra	15	1993	10.270.000,0	208,80			
Comunidad Foral de Navarra	15	1994	10.550.000,0	209,02			
Comunidad Foral de Navarra	15	1995	10.930.000,0	214,85			
Comunidad Foral de Navarra	15	1996	11.340.000,0	221,58			
Comunidad Foral de Navarra	15	1997	11.880.000,0	234,65			
Comunidad Foral de Navarra	15	1998	12.320.000,0	253,48	29,750	26,977	24,972
Comunidad Foral de	15	1999	12.820.000,0	265,89	29,302	15,325	24,485

Navarra							
					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Comunidad Foral de Navarra	15	2000	13.610.000,0	282,67	29,283	14,901	23,866
Comunidad Foral de Navarra	15	2001	13.960.000,0	287,26	29,368	15,013	22,680
Comunidad Foral de Navarra	15	2002	14.340.000,0	292,95	29,918	14,619	22,663
Comunidad Foral de Navarra	15	2003	14.720.000,0	298,73	31,028	14,023	22,433
Comunidad Foral de Navarra	15	2004	15.130.000,0	303,85	32,558	14,108	21,871
Comunidad Foral de Navarra	15	2005	15.650.000,0	314,26	33,326	14,843	21,760
Comunidad Foral de Navarra	15	2006	16.190.000,0	319,77	34,315	15,028	21,056
Comunidad Foral de Navarra	15	2007	16.730.000,0	329,46	35,611	14,697	21,972
Comunidad Foral de Navarra	15	2008	17.090.000,0	329,87	37,090	14,826	21,496
Comunidad Foral de Navarra	15	2009	16.560.000,0	307,17	38,138	16,119	20,757
Comunidad Foral de Navarra	15	2010	16.580.000,0	304,87	39,115	16,383	20,715

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Comunidad Foral de Navarra	15	2011	16.550.000,0	298,50	39,667	15,618	24,702
Comunidad Foral de Navarra	15	2012	15.950.000,0	285,50	40,169	17,680	24,214
Pavs Vasco	16	1980	32.770.000,0	781,81			
Pavs Vasco	16	1981	33.230.000,0	760,28			
Pavs Vasco	16	1982	33.720.000,0	762,25			
Pavs Vasco	16	1983	33.020.000,0	747,79			
Pavs Vasco	16	1984	32.480.000,0	734,24			
Pavs Vasco	16	1985	34.060.000,0	710,79			
Pavs Vasco	16	1986	35.020.000,0	719,46			
Pavs Vasco	16	1987	35.400.000,0	722,87			
Pavs Vasco	16	1988	36.260.000,0	736,20			
Pavs Vasco	16	1989	38.280.000,0	763,81			
Pavs Vasco	16	1990	39.130.000,0	789,59			
Pavs Vasco	16	1991	39.800.000,0	812,41			
Pavs Vasco	16	1992	39.580.000,0	791,92			
Pavs Vasco	16	1993	38.990.000,0	771,57			
Pavs Vasco	16	1994	39.700.000,0	761,94			
Pavs Vasco	16	1995	40.630.000,0	763,29			
Pavs Vasco	16	1996	41.310.000,0	774,42			
Pavs Vasco	16	1997	42.910.000,0	808,86			
Pavs Vasco	16	1998	45.170.000,0	850,68	106,534	123,556	93,102

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Pavs Vasco	16	1999	47.480.000,0	892,84	102,851	71,038	94,734
Pavs Vasco	16	2000	49.660.000,0	932,35	100,435	66,081	96,620
Pavs Vasco	16	2001	51.090.000,0	962,74	98,297	63,123	95,919
Pavs Vasco	16	2002	51.960.000,0	984,42	97,357	59,348	92,802
Pavs Vasco	16	2003	52.940.000,0	1.010,00	97,652	56,960	90,989
Pavs Vasco	16	2004	54.330.000,0	1.030,00	106,826	55,823	88,211
Pavs Vasco	16	2005	56.250.000,0	1.060,00	108,640	57,629	86,359
Pavs Vasco	16	2006	58.650.000,0	1.090,00	111,188	55,900	82,237
Pavs Vasco	16	2007	60.630.000,0	1.120,00	115,191	54,568	78,729
Pavs Vasco	16	2008	61.730.000,0	1.130,00	119,640	51,950	77,082
Pavs Vasco	16	2009	59.070.000,0	1.070,00	123,205	51,988	73,544
Pavs Vasco	16	2010	59.650.000,0	1.060,00	126,688	54,692	76,974
Pavs Vasco	16	2011	59.190.000,0	1.030,00	130,591	55,239	83,708
Pavs Vasco	16	2012	57.910.000,0	999,29	132,354	56,851	83,104
La Rioja	17	1980	3.680.000,0	98,81			
La Rioja	17	1981	3.900.000,0	94,50			
La Rioja	17	1982	3.780.000,0	98,01			
La Rioja	17	1983	3.960.000,0	93,33			
La Rioja	17	1984	4.070.000,0	90,45			
La Rioja	17	1985	3.980.000,0	94,49			
La Rioja	17	1986	4.020.000,0	99,75			
La Rioja	17	1987	4.000.000,0	100,64			
La Rioja	17	1988	4.200.000,0	104,40			

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
La Rioja	17	1989	4.390.000,0	109,91			
La Rioja	17	1990	4.550.000,0	108,06			
La Rioja	17	1991	4.700.000,0	111,21			
La Rioja	17	1992	4.760.000,0	108,13			
La Rioja	17	1993	4.680.000,0	104,60			
La Rioja	17	1994	4.830.000,0	105,09			
La Rioja	17	1995	4.900.000,0	104,92			
La Rioja	17	1996	5.010.000,0	106,36			
La Rioja	17	1997	5.220.000,0	110,49			
La Rioja	17	1998	5.430.000,0	115,43	15,381	14,707	7,761
La Rioja	17	1999	5.640.000,0	120,54	15,096	8,744	8,298
La Rioja	17	2000	5.970.000,0	126,48	14,889	8,259	8,613
La Rioja	17	2001	6.120.000,0	129,37	14,829	8,136	8,879
La Rioja	17	2002	6.250.000,0	132,37	14,763	7,776	8,458
La Rioja	17	2003	6.490.000,0	135,06	14,898	7,222	8,989
La Rioja	17	2004	6.630.000,0	140,17	15,634	7,126	8,928
La Rioja	17	2005	6.860.000,0	141,27	15,985	7,618	8,984
La Rioja	17	2006	7.140.000,0	146,28	16,568	7,853	8,829
La Rioja	17	2007	7.420.000,0	148,57	16,728	7,854	8,764
La Rioja	17	2008	7.550.000,0	148,08	17,462	7,787	8,534
La Rioja	17	2009	7.230.000,0	138,57	17,861	7,707	8,406
La Rioja	17	2010	7.280.000,0	137,68	18,314	8,247	8,469
La Rioja	17	2011	7.190.000,0	134,89	18,814	8,686	15,522

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
La Rioja	17	2012	6.950.000,0	129,79	19,290	8,586	17,650
Ceuta	18	1980	497.000,0	11,12			
Ceuta	18	1981	501.000,0	11,09			
Ceuta	18	1982	512.000,0	11,43			
Ceuta	18	1983	526.000,0	11,65			
Ceuta	18	1984	523.000,0	11,49			
Ceuta	18	1985	741.000,0	15,11			
Ceuta	18	1986	733.000,0	15,35			
Ceuta	18	1987	763.000,0	16,54			
Ceuta	18	1988	801.000,0	19,08			
Ceuta	18	1989	817.000,0	19,66			
Ceuta	18	1990	842.000,0	19,64			
Ceuta	18	1991	884.000,0	19,02			
Ceuta	18	1992	881.000,0	19,27			
Ceuta	18	1993	901.000,0	19,40			
Ceuta	18	1994	913.000,0	19,85			
Ceuta	18	1995	1.010.000,0	20,27			
Ceuta	18	1996	1.010.000,0	20,46			
Ceuta	18	1997	1.050.000,0	21,44			
Ceuta	18	1998	1.120.000,0	22,67			
Ceuta	18	1999	1.180.000,0	22,82			
Ceuta	18	2000	1.240.000,0	25,22			
Ceuta	18	2001	1.230.000,0	25,61			

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Ceuta	18	2002	1.250.000,0	25,51			
Ceuta	18	2003	1.290.000,0	26,51	6,073	2,363	1,398
Ceuta	18	2004	1.310.000,0	27,31	6,441	2,253	1,493
Ceuta	18	2005	1.330.000,0	28,11	6,410	2,634	1,479
Ceuta	18	2006	1.370.000,0	28,41	6,396	2,630	1,653
Ceuta	18	2007	1.420.000,0	28,61	6,496	2,540	1,662
Ceuta	18	2008	1.440.000,0	29,62	6,331	2,406	1,725
Ceuta	18	2009	1.420.000,0	29,12	6,442	2,288	1,832
Ceuta	18	2010	1.440.000,0	29,32	6,546	2,592	2,065
Ceuta	18	2011	1.440.000,0	29,02	6,781	3,064	2,720
Ceuta	18	2012	1.390.000,0	28,52	6,927	3,235	2,692
Melilla	19	1980	458.000,0	11,06			
Melilla	19	1981	462.000,0	11,03			
Melilla	19	1982	472.000,0	11,37			
Melilla	19	1983	485.000,0	11,59			
Melilla	19	1984	482.000,0	11,43			
Melilla	19	1985	683.000,0	15,04			
Melilla	19	1986	676.000,0	15,27			
Melilla	19	1987	703.000,0	16,45			
Melilla	19	1988	738.000,0	18,98			
Melilla	19	1989	753.000,0	19,56			
Melilla	19	1990	776.000,0	19,54			
Melilla	19	1991	814.000,0	18,93			

					Education		
Regio	**unit**	**Year**	**GDP (2005=100) (000s euros)**	**Employment (000)**	**Primary (000)**	**Secondary (000)**	**Tertiary (000)**
Melilla	19	1992	812.000,0	19,17			
Melilla	19	1993	830.000,0	19,30			
Melilla	19	1994	841.000,0	19,75			
Melilla	19	1995	930.000,0	20,17			
Melilla	19	1996	929.000,0	20,15			
Melilla	19	1997	962.000,0	21,94			
Melilla	19	1998	1.020.000,0	22,67			
Melilla	19	1999	1.080.000,0	22,92			
Melilla	19	2000	1.130.000,0	25,41			
Melilla	19	2001	1.120.000,0	25,41			
Melilla	19	2002	1.120.000,0	24,21			
Melilla	19	2003	1.150.000,0	25,51	6,001	2,523	1,216
Melilla	19	2004	1.180.000,0	26,11	6,434	2,413	1,245
Melilla	19	2005	1.210.000,0	26,31	6,466	2,725	1,218
Melilla	19	2006	1.250.000,0	26,51	6,361	2,708	1,266
Melilla	19	2007	1.270.000,0	27,11	6,499	2,835	1,283
Melilla	19	2008	1.290.000,0	27,71	6,714	2,488	1,283
Melilla	19	2009	1.280.000,0	26,91	6,624	2,432	1,355
Melilla	19	2010	1.290.000,0	27,32	6,776	2,664	1,563
Melilla	19	2011	1.290.000,0	27,02	6,846	3,009	2,327
Melilla	19	2012	1.250.000,0	26,62	6,964	3,090	2,483

Table 6 of Appendix: Net Public Capital and GFCF

Regio	**unit**	**Year**	**Stock of Net Public Capital (2005=100), (000)**	**GFCF (2005=100) (000)**
Andalucva	1	1980	27.587.113,3	12.260.000,0
Andalucva	1	1981	28.520.718,8	12.100.000,0
Andalucva	1	1982	29.916.078,6	12.360.000,0
Andalucva	1	1983	31.363.719,9	12.260.000,0
Andalucva	1	1984	32.546.549,6	11.540.000,0
Andalucva	1	1985	34.461.479,7	11.480.000,0
Andalucva	1	1986	36.574.357,5	12.660.000,0
Andalucva	1	1987	38.821.557,2	14.560.000,0
Andalucva	1	1988	41.971.431,4	16.620.000,0
Andalucva	1	1989	46.254.502,5	18.720.000,0
Andalucva	1	1990	52.173.707,5	20.200.000,0
Andalucva	1	1991	57.499.548,4	20.520.000,0
Andalucva	1	1992	61.062.778,9	19.480.000,0
Andalucva	1	1993	64.345.744,1	17.370.000,0
Andalucva	1	1994	66.990.911,4	17.980.000,0
Andalucva	1	1995	69.737.532,4	19.380.000,0
Andalucva	1	1996	71.748.346,3	20.090.000,0
Andalucva	1	1997	73.529.990,9	20.890.000,0
Andalucva	1	1998	76.282.973,0	22.740.000,0
Andalucva	1	1999	78.705.524,9	25.080.000,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
Andalucva	1	2000	80.822.855,3	26.910.000,0
Andalucva	1	2001	83.274.124,0	28.990.000,0
Andalucva	1	2002	86.091.934,7	31.100.000,0
Andalucva	1	2003	89.083.077,4	33.730.000,0
Andalucva	1	2004	92.696.182,6	37.240.000,0
Andalucva	1	2005	96.218.649,8	40.900.000,0
Andalucva	1	2006	100.019.761,8	44.480.000,0
Andalucva	1	2007	104.824.866,5	47.250.000,0
Andalucva	1	2008	110.317.898,5	45.160.000,0
Andalucva	1	2009	115.850.691,3	37.510.000,0
Andalucva	1	2010	120.795.382,7	35.690.000,0
Andalucva	1	2011	123.287.199,0	33.360.000,0
Andalucva	1	2012	123.464.848,8	30.430.000,0
Aragon	2	1980	10.603.729,3	3.210.000,0
Aragon	2	1981	10.848.120,4	3.140.000,0
Aragon	2	1982	11.136.419,1	3.200.000,0
Aragon	2	1983	11.439.966,3	3.230.000,0
Aragon	2	1984	11.638.358,7	3.030.000,0
Aragon	2	1985	12.047.406,9	3.360.000,0
Aragon	2	1986	12.504.311,0	3.700.000,0
Aragon	2	1987	12.953.817,5	4.200.000,0
Aragon	2	1988	13.441.077,2	4.810.000,0
Aragon	2	1989	14.022.514,4	5.290.000,0
Aragon	2	1990	14.718.144,3	5.660.000,0

Regio	**unit**	**Year**	**Stock of Net Public Capital (2005=100), (000)**	**GFCF (2005=100) (000)**
Aragon	2	1991	15.477.676,3	5.720.000,0
Aragon	2	1992	16.037.082,3	5.360.000,0
Aragon	2	1993	16.454.570,9	5.010.000,0
Aragon	2	1994	16.993.173,1	5.090.000,0
Aragon	2	1995	17.439.077,4	5.360.000,0
Aragon	2	1996	17.966.675,1	5.500.000,0
Aragon	2	1997	18.493.337,0	5.810.000,0
Aragon	2	1998	19.268.576,3	6.390.000,0
Aragon	2	1999	20.251.219,4	6.980.000,0
Aragon	2	2000	21.591.762,0	7.460.000,0
Aragon	2	2001	22.950.804,0	7.710.000,0
Aragon	2	2002	24.431.349,6	7.950.000,0
Aragon	2	2003	25.417.796,3	8.350.000,0
Aragon	2	2004	26.351.659,0	8.360.000,0
Aragon	2	2005	27.196.875,4	8.540.000,0
Aragon	2	2006	28.076.122,0	9.220.000,0
Aragon	2	2007	29.176.601,7	9.590.000,0
Aragon	2	2008	30.344.638,1	9.250.000,0
Aragon	2	2009	31.394.724,0	7.590.000,0
Aragon	2	2010	32.112.249,7	7.230.000,0
Aragon	2	2011	32.363.208,9	6.680.000,0
Aragon	2	2012	32.189.246,8	6.010.000,0
Principado de Asturias	3	1980	5.916.352,8	2.920.000,0
Principado de Asturias	3	1981	6.160.859,0	2.920.000,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
Principado de Asturias	3	1982	6.557.162,2	2.930.000,0
Principado de Asturias	3	1983	7.028.933,8	2.860.000,0
Principado de Asturias	3	1984	7.266.198,0	2.650.000,0
Principado de Asturias	3	1985	7.516.042,8	2.850.000,0
Principado de Asturias	3	1986	7.837.302,9	3.020.000,0
Principado de Asturias	3	1987	8.261.293,9	3.220.000,0
Principado de Asturias	3	1988	8.680.988,8	3.580.000,0
Principado de Asturias	3	1989	9.132.944,8	3.970.000,0
Principado de Asturias	3	1990	9.858.893,5	4.160.000,0
Principado de Asturias	3	1991	10.573.277,7	4.210.000,0
Principado de Asturias	3	1992	11.214.137,2	4.080.000,0
Principado de Asturias	3	1993	11.897.568,7	3.590.000,0
Principado de Asturias	3	1994	12.649.184,9	3.520.000,0
Principado de Asturias	3	1995	13.275.933,9	3.690.000,0
Principado de Asturias	3	1996	13.711.262,4	3.630.000,0
Principado de Asturias	3	1997	14.253.084,5	3.880.000,0
Principado de Asturias	3	1998	14.896.749,9	4.230.000,0
Principado de Asturias	3	1999	15.655.320,7	4.490.000,0
Principado de Asturias	3	2000	16.316.797,6	4.730.000,0
Principado de Asturias	3	2001	17.244.448,9	5.010.000,0
Principado de Asturias	3	2002	18.190.417,8	5.280.000,0
Principado de Asturias	3	2003	19.053.786,9	5.470.000,0
Principado de Asturias	3	2004	19.842.157,7	5.600.000,0
Principado de Asturias	3	2005	20.469.544,8	5.680.000,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
Principado de Asturias	3	2006	21.271.024,6	6.310.000,0
Principado de Asturias	3	2007	22.337.274,4	6.240.000,0
Principado de Asturias	3	2008	23.262.669,0	5.970.000,0
Principado de Asturias	3	2009	24.248.526,2	4.840.000,0
Principado de Asturias	3	2010	25.040.453,7	4.600.000,0
Principado de Asturias	3	2011	25.325.853,9	4.230.000,0
Principado de Asturias	3	2012	25.227.239,5	3.770.000,0
Illes Balears	4	1980	2.743.453,2	1.710.000,0
Illes Balears	4	1981	2.831.483,4	1.770.000,0
Illes Balears	4	1982	2.948.267,8	1.830.000,0
Illes Balears	4	1983	3.057.541,1	1.820.000,0
Illes Balears	4	1984	3.258.505,4	1.790.000,0
Illes Balears	4	1985	3.491.384,2	2.270.000,0
Illes Balears	4	1986	3.776.400,7	2.420.000,0
Illes Balears	4	1987	4.096.686,4	2.680.000,0
Illes Balears	4	1988	4.371.714,4	3.100.000,0
Illes Balears	4	1989	4.684.702,8	3.510.000,0
Illes Balears	4	1990	5.102.051,2	3.660.000,0
Illes Balears	4	1991	5.488.988,1	3.670.000,0
Illes Balears	4	1992	5.767.065,1	3.440.000,0
Illes Balears	4	1993	5.998.669,6	3.060.000,0
Illes Balears	4	1994	6.274.837,3	3.200.000,0
Illes Balears	4	1995	6.656.453,2	3.570.000,0
Illes Balears	4	1996	6.989.645,9	3.740.000,0

Regio	**unit**	**Year**	**Stock of Net Public Capital (2005=100), (000)**	**GFCF (2005=100) (000)**
Illes Balears	4	1997	7.266.431,5	4.050.000,0
Illes Balears	4	1998	7.550.509,0	4.520.000,0
Illes Balears	4	1999	7.959.098,5	5.040.000,0
Illes Balears	4	2000	8.289.427,1	5.600.000,0
Illes Balears	4	2001	8.691.203,5	5.980.000,0
Illes Balears	4	2002	9.231.437,2	6.190.000,0
Illes Balears	4	2003	9.979.343,3	6.330.000,0
Illes Balears	4	2004	10.716.645,3	6.880.000,0
Illes Balears	4	2005	11.593.251,5	7.510.000,0
Illes Balears	4	2006	12.390.679,9	8.010.000,0
Illes Balears	4	2007	13.256.855,3	8.120.000,0
Illes Balears	4	2008	13.893.677,1	7.900.000,0
Illes Balears	4	2009	14.633.276,6	6.580.000,0
Illes Balears	4	2010	15.289.778,5	6.290.000,0
Illes Balears	4	2011	15.580.593,7	5.910.000,0
Illes Balears	4	2012	15.618.730,0	5.510.000,0
Canarias	5	1980	7.198.529,0	3.540.000,0
Canarias	5	1981	7.500.395,9	3.450.000,0
Canarias	5	1982	7.904.350,7	3.540.000,0
Canarias	5	1983	8.143.497,3	3.650.000,0
Canarias	5	1984	8.449.889,6	3.500.000,0
Canarias	5	1985	8.951.048,9	3.850.000,0
Canarias	5	1986	9.440.749,5	4.350.000,0
Canarias	5	1987	10.005.357,8	5.100.000,0

Regio	**unit**	**Year**	**Stock of Net Public Capital (2005=100), (000)**	**GFCF (2005=100) (000)**
Canarias	5	1988	10.712.219,3	5.090.000,0
Canarias	5	1989	11.601.773,6	6.450.000,0
Canarias	5	1990	12.706.263,1	6.890.000,0
Canarias	5	1991	13.695.904,9	6.900.000,0
Canarias	5	1992	14.497.787,0	6.750.000,0
Canarias	5	1993	15.134.022,0	6.050.000,0
Canarias	5	1994	15.857.983,8	6.170.000,0
Canarias	5	1995	16.662.313,1	6.950.000,0
Canarias	5	1996	17.249.922,3	7.180.000,0
Canarias	5	1997	17.910.545,0	7.510.000,0
Canarias	5	1998	18.881.484,6	8.410.000,0
Canarias	5	1999	19.972.047,6	9.640.000,0
Canarias	5	2000	20.915.345,3	10.190.000,0
Canarias	5	2001	22.097.934,9	10.810.000,0
Canarias	5	2002	23.265.613,6	11.310.000,0
Canarias	5	2003	24.463.174,7	12.080.000,0
Canarias	5	2004	25.488.306,4	12.250.000,0
Canarias	5	2005	26.626.966,9	13.020.000,0
Canarias	5	2006	27.535.690,3	13.670.000,0
Canarias	5	2007	28.677.529,1	13.950.000,0
Canarias	5	2008	29.743.326,7	13.230.000,0
Canarias	5	2009	30.665.656,3	10.850.000,0
Canarias	5	2010	31.623.226,8	10.410.000,0
Canarias	5	2011	32.146.295,6	9.710.000,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
Canarias	5	2012	32.047.173,6	8.830.000,0
Cantabria	6	1980	2.505.236,5	1.290.000,0
Cantabria	6	1981	2.638.744,4	1.300.000,0
Cantabria	6	1982	2.823.625,6	1.270.000,0
Cantabria	6	1983	2.996.124,1	1.260.000,0
Cantabria	6	1984	3.099.350,2	1.200.000,0
Cantabria	6	1985	3.264.902,7	1.200.000,0
Cantabria	6	1986	3.416.239,8	1.280.000,0
Cantabria	6	1987	3.675.993,5	1.410.000,0
Cantabria	6	1988	3.987.016,7	1.600.000,0
Cantabria	6	1989	4.360.223,3	1.790.000,0
Cantabria	6	1990	4.817.514,3	1.860.000,0
Cantabria	6	1991	5.145.437,4	1.900.000,0
Cantabria	6	1992	5.286.089,1	1.890.000,0
Cantabria	6	1993	5.674.359,4	1.690.000,0
Cantabria	6	1994	5.990.098,7	1.710.000,0
Cantabria	6	1995	6.261.330,7	1.810.000,0
Cantabria	6	1996	6.428.641,9	1.810.000,0
Cantabria	6	1997	6.698.715,0	1.900.000,0
Cantabria	6	1998	7.010.082,6	2.130.000,0
Cantabria	6	1999	7.429.294,6	2.360.000,0
Cantabria	6	2000	7.837.101,1	2.500.000,0
Cantabria	6	2001	8.334.936,0	2.590.000,0
Cantabria	6	2002	8.740.884,2	2.820.000,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
Cantabria	6	2003	9.233.658,8	3.100.000,0
Cantabria	6	2004	9.686.996,6	3.170.000,0
Cantabria	6	2005	10.293.185,7	3.240.000,0
Cantabria	6	2006	10.782.879,7	3.380.000,0
Cantabria	6	2007	11.232.899,1	3.610.000,0
Cantabria	6	2008	11.585.246,6	3.470.000,0
Cantabria	6	2009	12.005.064,0	2.880.000,0
Cantabria	6	2010	12.248.716,0	2.730.000,0
Cantabria	6	2011	12.349.907,5	2.520.000,0
Cantabria	6	2012	12.325.893,9	2.290.000,0
Castilla y Leσn	7	1980	17.899.254,2	5.710.000,0
Castilla y Leσn	7	1981	18.441.325,5	5.740.000,0
Castilla y Leσn	7	1982	19.145.052,3	5.880.000,0
Castilla y Leσn	7	1983	19.885.906,5	5.710.000,0
Castilla y Leσn	7	1984	20.380.731,6	5.460.000,0
Castilla y Leσn	7	1985	21.163.184,2	6.000.000,0
Castilla y Leσn	7	1986	22.015.191,3	6.590.000,0
Castilla y Leσn	7	1987	22.758.865,4	7.210.000,0
Castilla y Leσn	7	1988	23.673.691,5	8.190.000,0
Castilla y Leσn	7	1989	25.032.225,7	9.050.000,0
Castilla y Leσn	7	1990	26.485.355,7	9.410.000,0
Castilla y Leσn	7	1991	27.941.900,1	9.600.000,0
Castilla y Leσn	7	1992	29.225.798,2	9.430.000,0
Castilla y Leσn	7	1993	30.490.119,5	8.560.000,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
Castilla y Leσn	7	1994	31.505.052,5	8.660.000,0
Castilla y Leσn	7	1995	32.553.148,8	9.080.000,0
Castilla y Leσn	7	1996	33.498.530,1	9.210.000,0
Castilla y Leσn	7	1997	34.625.061,5	9.730.000,0
Castilla y Leσn	7	1998	36.166.190,1	10.580.000,0
Castilla y Leσn	7	1999	38.037.544,1	11.220.000,0
Castilla y Leσn	7	2000	39.424.137,7	11.820.000,0
Castilla y Leσn	7	2001	41.266.937,9	12.200.000,0
Castilla y Leσn	7	2002	43.264.775,8	12.640.000,0
Castilla y Leσn	7	2003	45.347.117,5	13.530.000,0
Castilla y Leσn	7	2004	47.168.923,4	14.130.000,0
Castilla y Leσn	7	2005	49.152.275,8	15.510.000,0
Castilla y Leσn	7	2006	51.725.640,7	17.680.000,0
Castilla y Leσn	7	2007	54.331.199,2	18.660.000,0
Castilla y Leσn	7	2008	57.009.257,5	17.870.000,0
Castilla y Leσn	7	2009	59.849.770,6	15.050.000,0
Castilla y Leσn	7	2010	62.125.350,4	14.430.000,0
Castilla y Leσn	7	2011	63.240.643,6	13.550.000,0
Castilla y Leσn	7	2012	63.378.545,6	12.460.000,0
Castilla-La Mancha	8	1980	9.760.336,2	3.440.000,0
Castilla-La Mancha	8	1981	10.073.421,6	3.420.000,0
Castilla-La Mancha	8	1982	10.469.117,2	3.420.000,0
Castilla-La Mancha	8	1983	10.823.252,9	3.380.000,0
Castilla-La Mancha	8	1984	11.142.264,0	3.230.000,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
Castilla-La Mancha	8	1985	11.643.514,6	3.290.000,0
Castilla-La Mancha	8	1986	12.294.628,2	3.580.000,0
Castilla-La Mancha	8	1987	13.087.392,8	3.970.000,0
Castilla-La Mancha	8	1988	14.122.390,2	4.560.000,0
Castilla-La Mancha	8	1989	15.414.013,6	5.130.000,0
Castilla-La Mancha	8	1990	16.647.518,5	5.450.000,0
Castilla-La Mancha	8	1991	18.184.546,7	5.660.000,0
Castilla-La Mancha	8	1992	19.373.478,1	5.360.000,0
Castilla-La Mancha	8	1993	20.377.625,5	5.010.000,0
Castilla-La Mancha	8	1994	21.147.271,6	5.200.000,0
Castilla-La Mancha	8	1995	21.994.137,9	5.540.000,0
Castilla-La Mancha	8	1996	22.689.220,2	5.640.000,0
Castilla-La Mancha	8	1997	23.289.524,7	5.940.000,0
Castilla-La Mancha	8	1998	23.991.210,0	6.610.000,0
Castilla-La Mancha	8	1999	24.687.475,6	6.990.000,0
Castilla-La Mancha	8	2000	25.365.005,9	7.380.000,0
Castilla-La Mancha	8	2001	26.344.752,5	7.640.000,0
Castilla-La Mancha	8	2002	27.571.278,4	8.460.000,0
Castilla-La Mancha	8	2003	28.697.687,7	8.990.000,0
Castilla-La Mancha	8	2004	29.645.663,5	10.200.000,0
Castilla-La Mancha	8	2005	31.603.180,2	12.490.000,0
Castilla-La Mancha	8	2006	32.907.904,0	14.520.000,0
Castilla-La Mancha	8	2007	34.199.445,5	16.600.000,0
Castilla-La Mancha	8	2008	35.934.456,9	16.310.000,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
Castilla-La Mancha	8	2009	38.287.765,4	13.800.000,0
Castilla-La Mancha	8	2010	40.204.293,2	13.280.000,0
Castilla-La Mancha	8	2011	40.913.725,6	12.500.000,0
Castilla-La Mancha	8	2012	40.974.177,9	11.520.000,0
Cataluρa	9	1980	26.911.505,9	16.900.000,0
Cataluρa	9	1981	27.366.499,7	16.130.000,0
Cataluρa	9	1982	28.729.650,1	16.120.000,0
Cataluρa	9	1983	30.065.147,5	15.900.000,0
Cataluρa	9	1984	31.020.731,9	15.080.000,0
Cataluρa	9	1985	32.308.107,6	16.140.000,0
Cataluρa	9	1986	33.584.606,7	18.130.000,0
Cataluρa	9	1987	35.059.051,7	20.690.000,0
Cataluρa	9	1988	36.955.296,5	23.600.000,0
Cataluρa	9	1989	39.215.012,7	26.550.000,0
Cataluρa	9	1990	42.225.635,9	28.320.000,0
Cataluρa	9	1991	45.547.450,9	28.840.000,0
Cataluρa	9	1992	48.671.283,3	27.620.000,0
Cataluρa	9	1993	51.516.801,1	24.990.000,0
Cataluρa	9	1994	54.946.232,6	25.250.000,0
Cataluρa	9	1995	56.997.519,8	27.560.000,0
Cataluρa	9	1996	58.802.735,1	28.700.000,0
Cataluρa	9	1997	60.604.311,9	29.750.000,0
Cataluρa	9	1998	62.822.076,0	32.900.000,0
Cataluρa	9	1999	65.104.346,6	36.300.000,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
Cataluρa	9	2000	66.857.845,6	39.200.000,0
Cataluρa	9	2001	69.350.093,6	40.160.000,0
Cataluρa	9	2002	72.573.291,0	41.570.000,0
Cataluρa	9	2003	76.042.458,2	44.310.000,0
Cataluρa	9	2004	78.768.021,0	45.390.000,0
Cataluρa	9	2005	82.832.712,5	47.330.000,0
Cataluρa	9	2006	86.798.056,9	49.830.000,0
Cataluρa	9	2007	91.987.332,7	52.520.000,0
Cataluρa	9	2008	99.136.696,7	49.940.000,0
Cataluρa	9	2009	108.198.609,2	41.340.000,0
Cataluρa	9	2010	114.045.292,6	39.310.000,0
Cataluρa	9	2011	117.861.761,7	36.200.000,0
Cataluρa	9	2012	119.173.977,8	33.070.000,0
Comunitat Valenciana	10	1980	15.814.371,0	8.140.000,0
Comunitat Valenciana	10	1981	16.247.795,7	7.950.000,0
Comunitat Valenciana	10	1982	17.018.196,7	7.720.000,0
Comunitat Valenciana	10	1983	18.111.744,4	7.750.000,0
Comunitat Valenciana	10	1984	19.045.643,8	7.520.000,0
Comunitat Valenciana	10	1985	20.046.018,7	7.690.000,0
Comunitat Valenciana	10	1986	20.916.970,2	8.510.000,0
Comunitat Valenciana	10	1987	21.995.856,3	9.630.000,0
Comunitat Valenciana	10	1988	23.415.080,7	10.750.000,0
Comunitat Valenciana	10	1989	25.080.208,7	12.200.000,0
Comunitat Valenciana	10	1990	27.166.964,2	13.240.000,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
Comunitat Valenciana	10	1991	28.984.006,8	13.310.000,0
Comunitat Valenciana	10	1992	30.738.577,3	12.720.000,0
Comunitat Valenciana	10	1993	32.837.546,4	11.650.000,0
Comunitat Valenciana	10	1994	34.671.318,2	12.150.000,0
Comunitat Valenciana	10	1995	36.496.424,9	13.350.000,0
Comunitat Valenciana	10	1996	37.959.286,8	13.840.000,0
Comunitat Valenciana	10	1997	39.615.836,6	14.740.000,0
Comunitat Valenciana	10	1998	41.438.806,1	16.390.000,0
Comunitat Valenciana	10	1999	43.463.430,3	17.920.000,0
Comunitat Valenciana	10	2000	45.247.969,9	19.350.000,0
Comunitat Valenciana	10	2001	46.952.040,8	21.100.000,0
Comunitat Valenciana	10	2002	49.341.270,4	22.610.000,0
Comunitat Valenciana	10	2003	51.478.691,3	24.870.000,0
Comunitat Valenciana	10	2004	53.386.125,6	26.140.000,0
Comunitat Valenciana	10	2005	55.247.593,6	27.640.000,0
Comunitat Valenciana	10	2006	57.213.894,3	30.320.000,0
Comunitat Valenciana	10	2007	59.470.174,7	31.770.000,0
Comunitat Valenciana	10	2008	61.723.376,0	30.620.000,0
Comunitat Valenciana	10	2009	64.697.080,8	25.070.000,0
Comunitat Valenciana	10	2010	67.180.772,3	23.800.000,0
Comunitat Valenciana	10	2011	68.509.704,9	22.110.000,0
Comunitat Valenciana	10	2012	68.451.079,3	20.020.000,0
Extremadura	11	1980	5.512.434,9	1.730.000,0
Extremadura	11	1981	5.685.775,3	1.710.000,0

Regio	**unit**	**Year**	**Stock of Net Public Capital (2005=100), (000)**	**GFCF (2005=100) (000)**
Extremadura	11	1982	5.937.811,2	1.710.000,0
Extremadura	11	1983	6.190.565,9	1.720.000,0
Extremadura	11	1984	6.451.891,3	1.630.000,0
Extremadura	11	1985	6.824.538,5	1.720.000,0
Extremadura	11	1986	7.375.882,6	1.880.000,0
Extremadura	11	1987	7.879.376,4	2.170.000,0
Extremadura	11	1988	8.373.087,9	2.520.000,0
Extremadura	11	1989	8.910.042,8	2.860.000,0
Extremadura	11	1990	9.652.853,8	3.080.000,0
Extremadura	11	1991	10.701.491,3	3.180.000,0
Extremadura	11	1992	11.621.717,8	3.140.000,0
Extremadura	11	1993	12.441.213,4	2.830.000,0
Extremadura	11	1994	13.031.311,3	2.820.000,0
Extremadura	11	1995	13.675.559,7	3.000.000,0
Extremadura	11	1996	14.079.226,4	3.000.000,0
Extremadura	11	1997	14.465.213,5	3.110.000,0
Extremadura	11	1998	15.039.875,6	3.430.000,0
Extremadura	11	1999	15.549.171,6	3.750.000,0
Extremadura	11	2000	15.992.052,9	3.990.000,0
Extremadura	11	2001	16.512.918,9	4.020.000,0
Extremadura	11	2002	17.124.219,8	4.290.000,0
Extremadura	11	2003	17.825.915,3	4.640.000,0
Extremadura	11	2004	18.431.269,8	4.850.000,0
Extremadura	11	2005	19.153.781,9	5.050.000,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
Extremadura	11	2006	20.009.719,1	5.430.000,0
Extremadura	11	2007	20.913.110,0	5.540.000,0
Extremadura	11	2008	21.770.627,3	5.330.000,0
Extremadura	11	2009	22.833.034,5	4.480.000,0
Extremadura	11	2010	23.575.964,4	4.300.000,0
Extremadura	11	2011	24.227.676,5	3.930.000,0
Extremadura	11	2012	24.279.576,9	3.540.000,0
Galicia	12	1980	11.145.856,9	5.220.000,0
Galicia	12	1981	11.658.576,9	5.130.000,0
Galicia	12	1982	12.233.922,5	5.170.000,0
Galicia	12	1983	12.806.881,9	5.060.000,0
Galicia	12	1984	13.306.556,5	4.830.000,0
Galicia	12	1985	14.223.208,9	4.660.000,0
Galicia	12	1986	15.087.519,6	5.010.000,0
Galicia	12	1987	15.875.976,7	5.650.000,0
Galicia	12	1988	16.830.303,3	6.470.000,0
Galicia	12	1989	18.131.789,9	7.300.000,0
Galicia	12	1990	19.565.012,5	7.690.000,0
Galicia	12	1991	21.096.463,0	7.890.000,0
Galicia	12	1992	22.488.167,5	7.490.000,0
Galicia	12	1993	23.887.402,5	6.850.000,0
Galicia	12	1994	25.333.304,9	7.050.000,0
Galicia	12	1995	27.110.440,3	7.670.000,0
Galicia	12	1996	28.106.145,2	7.850.000,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
Galicia	12	1997	29.601.337,7	8.320.000,0
Galicia	12	1998	30.980.660,9	9.180.000,0
Galicia	12	1999	32.652.430,1	9.930.000,0
Galicia	12	2000	33.805.872,1	10.640.000,0
Galicia	12	2001	35.163.644,5	11.180.000,0
Galicia	12	2002	36.496.082,2	11.510.000,0
Galicia	12	2003	38.256.631,6	12.300.000,0
Galicia	12	2004	40.008.152,1	13.400.000,0
Galicia	12	2005	41.611.667,3	14.480.000,0
Galicia	12	2006	43.268.557,0	15.940.000,0
Galicia	12	2007	45.563.360,1	16.700.000,0
Galicia	12	2008	48.469.379,7	16.270.000,0
Galicia	12	2009	51.563.720,5	13.610.000,0
Galicia	12	2010	53.855.319,2	13.060.000,0
Galicia	12	2011	55.501.388,6	12.080.000,0
Galicia	12	2012	56.361.195,8	11.050.000,0
Comunidad de Madrid	13	1980	20.439.284,5	14.350.000,0
Comunidad de Madrid	13	1981	21.224.285,6	14.280.000,0
Comunidad de Madrid	13	1982	22.267.885,0	14.610.000,0
Comunidad de Madrid	13	1983	22.919.353,4	14.440.000,0
Comunidad de Madrid	13	1984	23.551.095,9	13.720.000,0
Comunidad de Madrid	13	1985	24.761.606,7	15.550.000,0
Comunidad de Madrid	13	1986	26.140.819,4	17.510.000,0
Comunidad de Madrid	13	1987	27.522.818,3	19.450.000,0

Regio	**unit**	**Year**	**Stock of Net Public Capital (2005=100), (000)**	**GFCF (2005=100) (000)**
Comunidad de Madrid	13	1988	29.348.020,2	21.990.000,0
Comunidad de Madrid	13	1989	31.124.834,8	24.580.000,0
Comunidad de Madrid	13	1990	33.363.762,3	26.450.000,0
Comunidad de Madrid	13	1991	36.053.860,5	26.670.000,0
Comunidad de Madrid	13	1992	38.043.391,6	25.780.000,0
Comunidad de Madrid	13	1993	39.914.391,7	23.850.000,0
Comunidad de Madrid	13	1994	41.494.162,5	23.710.000,0
Comunidad de Madrid	13	1995	43.130.412,3	25.220.000,0
Comunidad de Madrid	13	1996	44.485.245,2	25.370.000,0
Comunidad de Madrid	13	1997	46.319.587,4	26.940.000,0
Comunidad de Madrid	13	1998	49.283.400,5	30.260.000,0
Comunidad de Madrid	13	1999	51.919.378,0	33.870.000,0
Comunidad de Madrid	13	2000	54.620.889,3	36.820.000,0
Comunidad de Madrid	13	2001	58.543.598,0	38.280.000,0
Comunidad de Madrid	13	2002	63.702.426,9	39.500.000,0
Comunidad de Madrid	13	2003	69.960.956,8	42.160.000,0
Comunidad de Madrid	13	2004	76.189.688,2	43.490.000,0
Comunidad de Madrid	13	2005	80.348.941,7	47.590.000,0
Comunidad de Madrid	13	2006	85.300.190,7	48.250.000,0
Comunidad de Madrid	13	2007	90.805.348,0	48.470.000,0
Comunidad de Madrid	13	2008	95.270.706,6	46.500.000,0
Comunidad de Madrid	13	2009	98.835.407,9	39.220.000,0
Comunidad de Madrid	13	2010	103.364.237,2	36.670.000,0
Comunidad de Madrid	13	2011	105.935.327,7	34.410.000,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
Comunidad de Madrid	13	2012	105.930.240,1	31.610.000,0
Regiσn de Murcia	14	1980	3.446.816,0	1.870.000,0
Regiσn de Murcia	14	1981	3.631.887,2	1.840.000,0
Regiσn de Murcia	14	1982	3.897.510,4	1.840.000,0
Regiσn de Murcia	14	1983	4.134.396,8	1.810.000,0
Regiσn de Murcia	14	1984	4.313.183,5	1.760.000,0
Regiσn de Murcia	14	1985	4.663.521,8	1.900.000,0
Regiσn de Murcia	14	1986	5.081.398,3	2.090.000,0
Regiσn de Murcia	14	1987	5.505.018,4	2.350.000,0
Regiσn de Murcia	14	1988	5.889.054,0	2.720.000,0
Regiσn de Murcia	14	1989	6.411.920,1	3.140.000,0
Regiσn de Murcia	14	1990	7.002.155,7	3.350.000,0
Regiσn de Murcia	14	1991	7.595.811,6	3.410.000,0
Regiσn de Murcia	14	1992	8.084.120,7	3.300.000,0
Regiσn de Murcia	14	1993	8.627.570,8	3.000.000,0
Regiσn de Murcia	14	1994	9.042.304,0	3.140.000,0
Regiσn de Murcia	14	1995	9.550.283,7	3.300.000,0
Regiσn de Murcia	14	1996	9.893.680,6	3.380.000,0
Regiσn de Murcia	14	1997	10.290.157,7	3.690.000,0
Regiσn de Murcia	14	1998	10.728.731,7	4.140.000,0
Regiσn de Murcia	14	1999	11.227.288,2	4.580.000,0
Regiσn de Murcia	14	2000	11.683.932,9	4.940.000,0
Regiσn de Murcia	14	2001	12.224.298,7	5.360.000,0
Regiσn de Murcia	14	2002	12.693.435,0	5.480.000,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
Regiσn de Murcia	14	2003	13.250.375,0	6.260.000,0
Regiσn de Murcia	14	2004	13.896.472,6	7.220.000,0
Regiσn de Murcia	14	2005	14.743.212,2	8.530.000,0
Regiσn de Murcia	14	2006	15.703.407,7	9.910.000,0
Regiσn de Murcia	14	2007	16.649.445,9	10.220.000,0
Regiσn de Murcia	14	2008	17.474.330,3	10.010.000,0
Regiσn de Murcia	14	2009	18.303.537,6	8.310.000,0
Regiσn de Murcia	14	2010	19.022.461,3	8.030.000,0
Regiσn de Murcia	14	2011	19.330.886,6	7.430.000,0
Regiσn de Murcia	14	2012	19.306.363,2	6.890.000,0
Comunidad Foral de Navarra	15	1980	4.076.701,8	1.730.000,0
Comunidad Foral de Navarra	15	1981	4.076.633,3	1.720.000,0
Comunidad Foral de Navarra	15	1982	4.145.625,6	1.710.000,0
Comunidad Foral de Navarra	15	1983	4.228.041,2	1.640.000,0
Comunidad Foral de Navarra	15	1984	4.289.861,2	1.600.000,0
Comunidad Foral de Navarra	15	1985	4.505.388,1	1.750.000,0
Comunidad Foral de Navarra	15	1986	4.807.967,2	1.890.000,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
Comunidad Foral de Navarra	15	1987	5.072.497,6	2.100.000,0
Comunidad Foral de Navarra	15	1988	5.328.678,0	2.370.000,0
Comunidad Foral de Navarra	15	1989	5.638.393,7	2.690.000,0
Comunidad Foral de Navarra	15	1990	6.035.732,0	2.750.000,0
Comunidad Foral de Navarra	15	1991	6.492.672,6	2.880.000,0
Comunidad Foral de Navarra	15	1992	6.940.430,2	2.760.000,0
Comunidad Foral de Navarra	15	1993	7.298.795,7	2.500.000,0
Comunidad Foral de Navarra	15	1994	7.676.909,4	2.600.000,0
Comunidad Foral de Navarra	15	1995	8.017.591,7	2.790.000,0
Comunidad Foral de Navarra	15	1996	8.333.565,7	2.880.000,0
Comunidad Foral de Navarra	15	1997	8.622.572,8	3.100.000,0
Comunidad Foral de Navarra	15	1998	8.962.348,1	3.510.000,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
Comunidad Foral de Navarra	15	1999	9.294.004,5	3.810.000,0
Comunidad Foral de Navarra	15	2000	9.611.233,1	4.160.000,0
Comunidad Foral de Navarra	15	2001	10.073.186,4	4.390.000,0
Comunidad Foral de Navarra	15	2002	10.351.360,8	4.440.000,0
Comunidad Foral de Navarra	15	2003	10.627.040,5	4.600.000,0
Comunidad Foral de Navarra	15	2004	10.863.391,7	4.720.000,0
Comunidad Foral de Navarra	15	2005	11.098.613,1	4.700.000,0
Comunidad Foral de Navarra	15	2006	11.350.286,9	5.100.000,0
Comunidad Foral de Navarra	15	2007	11.863.103,7	5.450.000,0
Comunidad Foral de Navarra	15	2008	12.259.545,4	5.280.000,0
Comunidad Foral de Navarra	15	2009	12.686.615,7	4.400.000,0
Comunidad Foral de Navarra	15	2010	12.957.853,5	4.190.000,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
Comunidad Foral de Navarra	15	2011	13.033.917,7	3.930.000,0
Comunidad Foral de Navarra	15	2012	12.887.015,9	3.560.000,0
Pavs Vasco	16	1980	11.604.348,5	6.310.000,0
Pavs Vasco	16	1981	12.055.632,7	6.250.000,0
Pavs Vasco	16	1982	12.895.591,7	6.390.000,0
Pavs Vasco	16	1983	13.583.967,4	6.110.000,0
Pavs Vasco	16	1984	14.246.636,8	5.820.000,0
Pavs Vasco	16	1985	15.192.228,7	6.250.000,0
Pavs Vasco	16	1986	16.237.551,1	6.750.000,0
Pavs Vasco	16	1987	17.105.184,9	7.110.000,0
Pavs Vasco	16	1988	17.862.103,0	7.840.000,0
Pavs Vasco	16	1989	19.182.579,3	8.590.000,0
Pavs Vasco	16	1990	20.516.356,5	8.840.000,0
Pavs Vasco	16	1991	22.041.647,0	9.130.000,0
Pavs Vasco	16	1992	23.496.524,6	8.600.000,0
Pavs Vasco	16	1993	25.058.044,8	8.060.000,0
Pavs Vasco	16	1994	26.393.194,9	8.250.000,0
Pavs Vasco	16	1995	27.674.675,4	8.860.000,0
Pavs Vasco	16	1996	28.648.296,7	8.990.000,0
Pavs Vasco	16	1997	29.405.873,7	9.400.000,0
Pavs Vasco	16	1998	30.070.308,4	10.390.000,0
Pavs Vasco	16	1999	31.073.405,8	11.430.000,0

Regio	**unit**	**Year**	**Stock of Net Public Capital (2005=100), (000)**	**GFCF (2005=100) (000)**
Pavs Vasco	16	2000	31.850.776,6	12.040.000,0
Pavs Vasco	16	2001	32.960.008,3	12.480.000,0
Pavs Vasco	16	2002	34.476.002,3	12.770.000,0
Pavs Vasco	16	2003	35.553.671,4	13.080.000,0
Pavs Vasco	16	2004	36.512.817,6	13.430.000,0
Pavs Vasco	16	2005	37.315.453,4	13.240.000,0
Pavs Vasco	16	2006	37.846.831,0	13.570.000,0
Pavs Vasco	16	2007	38.826.829,6	13.760.000,0
Pavs Vasco	16	2008	39.858.236,5	13.190.000,0
Pavs Vasco	16	2009	41.613.028,8	10.770.000,0
Pavs Vasco	16	2010	42.993.283,3	10.250.000,0
Pavs Vasco	16	2011	43.938.944,5	9.470.000,0
Pavs Vasco	16	2012	44.030.314,7	8.660.000,0
La Rioja	17	1980	2.784.540,2	718.280,0
La Rioja	17	1981	2.830.671,2	702.340,0
La Rioja	17	1982	2.916.215,9	724.180,0
La Rioja	17	1983	2.980.630,0	716.140,0
La Rioja	17	1984	3.025.496,7	680.660,0
La Rioja	17	1985	3.102.366,8	706.760,0
La Rioja	17	1986	3.170.903,5	777.480,0
La Rioja	17	1987	3.251.005,2	879.590,0
La Rioja	17	1988	3.345.781,1	999.810,0
La Rioja	17	1989	3.510.093,6	1.140.000,0
La Rioja	17	1990	3.673.552,0	1.160.000,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
La Rioja	17	1991	3.807.143,8	1.200.000,0
La Rioja	17	1992	3.893.842,9	1.110.000,0
La Rioja	17	1993	3.979.934,5	1.040.000,0
La Rioja	17	1994	4.052.077,5	1.110.000,0
La Rioja	17	1995	4.148.219,0	1.130.000,0
La Rioja	17	1996	4.186.944,4	1.130.000,0
La Rioja	17	1997	4.236.065,5	1.220.000,0
La Rioja	17	1998	4.313.984,2	1.340.000,0
La Rioja	17	1999	4.438.870,8	1.470.000,0
La Rioja	17	2000	4.565.706,0	1.560.000,0
La Rioja	17	2001	4.710.755,1	1.610.000,0
La Rioja	17	2002	5.001.738,1	1.740.000,0
La Rioja	17	2003	5.212.251,0	1.860.000,0
La Rioja	17	2004	5.323.915,0	1.840.000,0
La Rioja	17	2005	5.499.554,7	2.100.000,0
La Rioja	17	2006	5.784.051,1	2.390.000,0
La Rioja	17	2007	6.117.980,3	2.590.000,0
La Rioja	17	2008	6.278.508,8	2.520.000,0
La Rioja	17	2009	6.455.669,0	2.090.000,0
La Rioja	17	2010	6.575.384,1	2.020.000,0
La Rioja	17	2011	6.653.294,0	1.880.000,0
La Rioja	17	2012	6.576.760,0	1.730.000,0
Ceuta	18	1980	395.856,4	60.290,0
Ceuta	18	1981	404.027,0	60.430,0

Regio	**unit**	**Year**	**Stock of Net Public Capital (2005=100), (000)**	**GFCF (2005=100) (000)**
Ceuta	18	1982	411.548,3	62.560,0
Ceuta	18	1983	416.023,7	64.590,0
Ceuta	18	1984	423.756,3	61.630,0
Ceuta	18	1985	439.006,1	107.390,0
Ceuta	18	1986	459.176,9	110.150,0
Ceuta	18	1987	472.217,4	124.330,0
Ceuta	18	1988	495.122,9	143.430,0
Ceuta	18	1989	538.564,7	144.930,0
Ceuta	18	1990	557.382,7	160.510,0
Ceuta	18	1991	571.212,7	166.420,0
Ceuta	18	1992	590.292,6	151.490,0
Ceuta	18	1993	616.406,2	136.340,0
Ceuta	18	1994	644.444,2	145.080,0
Ceuta	18	1995	672.675,0	150.120,0
Ceuta	18	1996	712.680,3	146.530,0
Ceuta	18	1997	720.832,3	155.880,0
Ceuta	18	1998	725.502,1	179.840,0
Ceuta	18	1999	755.568,1	190.990,0
Ceuta	18	2000	798.095,4	211.380,0
Ceuta	18	2001	832.209,5	250.000,0
Ceuta	18	2002	861.373,4	245.260,0
Ceuta	18	2003	902.135,1	269.740,0
Ceuta	18	2004	939.361,8	244.930,0
Ceuta	18	2005	990.904,5	292.190,0

Regio	**unit**	**Year**	**Stock of Net Public Capital (2005=100), (000)**	**GFCF (2005=100) (000)**
Ceuta	18	2006	1.026.312,1	308.920,0
Ceuta	18	2007	1.066.944,7	321.050,0
Ceuta	18	2008	1.125.590,4	311.150,0
Ceuta	18	2009	1.171.306,8	268.220,0
Ceuta	18	2010	1.228.825,3	260.410,0
Ceuta	18	2011	1.250.086,0	246.160,0
Ceuta	18	2012	1.246.486,1	225.900,0
Melilla	19	1980	331.717,6	56.880,0
Melilla	19	1981	336.094,8	57.010,0
Melilla	19	1982	345.998,8	59.020,0
Melilla	19	1983	350.892,5	60.940,0
Melilla	19	1984	353.415,0	58.140,0
Melilla	19	1985	366.910,3	101.310,0
Melilla	19	1986	393.402,2	103.920,0
Melilla	19	1987	405.260,7	117.290,0
Melilla	19	1988	418.582,9	135.320,0
Melilla	19	1989	458.038,9	136.730,0
Melilla	19	1990	476.072,4	151.430,0
Melilla	19	1991	501.238,1	157.000,0
Melilla	19	1992	516.615,3	142.920,0
Melilla	19	1993	566.441,4	128.630,0
Melilla	19	1994	612.435,7	136.870,0
Melilla	19	1995	638.863,0	141.620,0
Melilla	19	1996	654.314,7	138.630,0

Regio	unit	Year	Stock of Net Public Capital (2005=100), (000)	GFCF (2005=100) (000)
Melilla	19	1997	670.904,9	147.720,0
Melilla	19	1998	708.221,9	170.380,0
Melilla	19	1999	793.007,6	181.230,0
Melilla	19	2000	835.069,3	201.070,0
Melilla	19	2001	885.817,2	210.200,0
Melilla	19	2002	930.403,6	207.990,0
Melilla	19	2003	970.593,4	245.430,0
Melilla	19	2004	1.006.569,5	235.040,0
Melilla	19	2005	1.084.508,0	298.450,0
Melilla	19	2006	1.151.847,8	293.030,0
Melilla	19	2007	1.272.633,5	306.590,0
Melilla	19	2008	1.379.607,1	298.340,0
Melilla	19	2009	1.483.541,6	258.090,0
Melilla	19	2010	1.605.383,0	250.080,0
Melilla	19	2011	1.665.550,6	237.640,0
Melilla	19	2012	1.680.940,7	218.090,0

BIBLIOGRAPHY

AARON Henry J. (1990). «Discussion of Why is Infrastructure Important?», in A. Munnell ed. «*Is There a Shortfall in Public Capital Investment?»,* Federal Reserve Bank, Boston, pp. 51-63.

ACCONCIA Antonio and DEL MONTE Alfredo. (2000). «Regional Development and Public Spending: The Case of Italy». *Mimeo, University of Naples, Department of Theory and History of Public Economics*.

AFONSO Antonio and St. AUBYN Miguel. (2009). "Macroeconomic Rates of Return of Public and Private Investment: Crowding-in and Crowding-out Effects", *The Manchester School*, Vol. 77, Is. s1, pp. 21-39.

AIELLO Francesco and SCOPPA Vincenzo. (2000). "Uneven Regional Development in Italy: Explaining Differences in Productivity Levels», *Giornale degli Economisti e Annali di Economia,* Nuova Serie, Vol. 60 (Anno 113), No. 2, p.p. 270-298.

AIELLO Francesco and SCOPPA Vincenzo. (2008). "Convergence and Regional Productivity Divide in Italy: Evidence from Panel Data," *MPRA Paper 17343*, University Library of Munich, Germany.

ALBALA-BERTRAND J.M. (2010). «A contribution to estimate a benchmark capital stock. An optimal consistency method», *International Review of Applied Economics,* Vol. 24, Is. 6, pp. 715 -729.

ALDER Simon. (2019). "Chinese Roads in India: The Effect of Transport Infrastructure on Economic Development," Working Paper, University of North Carolina at Chapel Hill.

ALLISON, Paul D. (2009). «*Fixed Effects Regression Models, Quantitative Applications in the Social Sciences*», California, SAGE Publications Inc.

ALONSO-CARRERA Jaime, FREIRE-SERÉN and MANZANO Baltasar. (2009). «Macroeconomic effects from the regional allocation of public capital formation», *Regional Science and Urban Economics*, Vol. 39, Is. 5, pp. 563-574.

ASCHAUER, David A. (1988). "Government spending and the "falling rate of profit", *Federal Reserve Bank of Chicago – Economic Perspectives*, vol.12, pp.11 – 17.

ASCHAUER, David A. (1989a**).** "Does public capital crowd out private capital?", *Federal Reserve Bank of Chicago, Journal of Monetary Economics 24,* pp.171 – 188, North Holland.

ASCHAUER, David A. (1989b). "Is public expenditure productive?", *Journal of Monetary Economics 23*, pp. 177 – 200.

ASCHAUER, David A. (1989c). **"**Public investment and productivity growth in the Group of Seven", *Federal Reserve Bank of Chicago, Economic Perspectives*, vol. 13, No 5, pp. 17 – 25.

ASCHAUER, David A. (1990). "Why Is Infrastructure Important?", pp.21 – 50, in Alicia H. Munnell, *Conference Series No 34*, FRB of Boston, Boston.

ASCHAUER, David A. (2000). "Do States Optimise? Public Capital and Economic Growth", *The Annals of Regional Science*, Vol. 34, No 5, pp. 343-363.

ASTURIAS Jose, GARCIA-SANTANA Manuel and RAMOS Roberto. (2018) "Competition and Welfare Gains from Transport Infrastructure: Evidence from the Golden Quadrilateral of India", *Documentos de Trabajo, N.º 1816, Banco de Espana*, *Eurosistema*.

BAJO-RUBIO Oscar and SOSVILLA-RIVERO Simón. (1993). "Does public capital affect private sector performance? An analysis of the Spanish case, 1964-88", *Economic Modelling*, Vol.10, Is. 3, pp. 179-185.

BALTAGI Badi, H. (2005). **«***Econometric Analysis of Panel Data*», Third Edition, John Wiley & Sons, Ltd, West Sussex, England.

BARRO Robert J. (1991) «Economic Growth in a Cross Section of Countries», *Quarterly Journal of Economics*, Vol. 106, Is. 2, pp. 407–443.

BBVA Foundation and Ivie (Valencian Institute of Economic Research). (2015). «Series históricas de capital público en España y su distribución territorial (1900-2012)», Database available at: http://www.fbbva.es/TLFU/tlfu/esp/areas/econosoc/bbdd/Capital_Publico.jsp

BECKER Sascha O., EGGER Peter and von EHRILICH Maximilian. (2013). "Absorptive Capacity and the Growth and Investment Effects of Regional Transfers: A Regression Discontinuity Design with Heterogeneous Treatment Effects", *American Economic Journal: Economic Policy*, Vol. 5, Is. 4, pp. 29-77.

BERLEMANN Michael and WESSELHÖFT Jan-Erik. (2014). «Estimating Aggregate Capital Stocks Using the Perpetual Inventory Method. A Survey of

Previous Implementations and New Empirical Evidence for 103 Countries», *Review of Economics*, Volume 65, Issue 1, Pages 1–34.

BERNDT Ernst H. and HANSSON Bengt. (1991). "Measuring the Contribution of Public Infrastructure Capital in Sweden." *National Bureau of Economic Research (NBER)*, Working Paper No 3842.

BIEHL D. (1991). "The Role of Infrastructure in Regional Development", (pp. 9-35, in Vickerman R.W. (ed.) *"Infrastructure and Regional Development, European Research in Regional Science"*, Pion Limited, London.

BOARNET Marlon G. (1997). "Infrastructure Services and the Productivity of Public Capital: The Case of Streets and Highways." *National Tax Journal*, vol. 50, no. 1, pp. 39-57.

BOM Pedro R.B. and Ligthart Jenny E. (2014). "What have we learned from three decades of research on the productivity of public capital?" *Journal of Economic Surveys*, Vol. 28, Is. 5, pp. 889-916.

BRONZINI Raffaello and PISELLI Paolo. (2006). «Determinants of long-run regional productivity: The role of R&D, human capital and public infrastructure», *Banca d'Italia, Temi di discussione del Sevizio Studi,* No 597.

BUHR Walter, 2003, «What is Infrastructure?», *Volkswirtschaftliche Diskussionsbeitraege/ Discussion Paper No 107-03*, University of Siegen, Germany.

BUITER Willem H. (1977). «Crowding out and the effectiveness of fiscal policy», *Journal of Public Economics*, Vol. 7, Is. 3, pp. 309-328.

CAMBRIDGE ECONOMETRICS Database, European Regional Database, available at: https://www.camecon.com/european-regional-data/

CANNING David and PEDRONI Peter. (2004). «The Effect of Infrastructure on Long Run Economic Growth», Mimeo, the Manchester School, N. 76 November.

CHAKRABORTY Shankha and DABLA-NORRIS Era. (2011). "The Quality of Public Investment", *The B.E. Journal of Macroeconomics*, Vol. 11, Is. 1, pp. 1-29.

CHARLOT Sylvie and SCHMITT Bertrand. (1999). "Public Infrastructure and Economic Growth in France's Regions", *39th Congress of the European Regional Science Association (ERSA)*, paper (#129), 23-27 August, Dublin, Ireland.

COBB Charles W. and DOUGLAS Paul H. (1928), «A theory of production», *The American Economic Review*, Vol. 18, No 1, pp. 139-165.

CRENOS (Centre for North South Economic Research/ Centro Ricerche Economiche Nord Sud) Database, available at: https://crenos.unica.it/crenos/databases/database-regio-it-1960-1996

CRIHFIELD John B. and PANGGABEAN Martin P.H. (1995). "Is Public Infrastructure Productive? A Metropolitan Perspective using New Capital Stock Estimates." *Regional Science and Urban Economics,* Vol. 25, pp.607-630.

CULLISON William E. (1993). "Public Investment and Economic Growth." *Federal Reserve Bank of Richmond Economic Quarterly*, Vol. 79/4.

DALAMAGAS Basil. (1995). «A reconsideration of the public sector's contribution to growth», *Empirical Economics*, Vol. 20, pp. 385-414.

DALL'ERBA, Sandy. (2003). "European Regional Development Policies", *European Union Center, University of Illinois at Urbana – Champaign,* Illinois.

DANIELE Vittorio. (2009). Development Policy, Public Spending and Regional Convergence in Italy (1996-2007), *Regional and Sectoral Economic Studies*, Vol. 9, Is. 2, pp. 17-34.

DELGADO Maria Jesus and ALVAREZ Inmaculada. (2000). "Public Productive Infrastructure and Economic Growth." *40th Congress of the European Regional Science Association*.

DEMETRIADES Panicos O. and MAMUNEAS Theofanis P. (2000). "Intertemporal output and employment effects of Public Infrastructure Capital: Evidence from 12 OECD economies". *Economic Journal*, Vol. 110, Is. 465, pp. 687–712.

DERBYSHIRE, James, GARDINER Ben and WAIGHTS Sevrin. (2013). «Estimating the capital stock for the NUTS2 regions of the EU27», *Applied Economics*, Vol. 45, Is. 9, pp. 1133-1149.

DESTEFANIS Sergio and SENA Vania. (2005). "Public Capital and Total Factor Productivity: New Evidence from the Italian Regions, 1970-1998", *Regional Studies,* Vol. 39, Is. 5, pp. 603-617.

DUGGAL Vijaya G., SALTZMAN Cynthia and KLEIN Lawrence. R. (1999). **"**Infrastructure and productivity: a nonlinear approach". *Journal of Econometrics*, Vol. 92, Is. 1, pp. 47-74.

EISNER Robert. (1991). "Infrastructure and Regional Economic Performance", *New England Economic Review,* Federal Reserve Bank of Boston, September/October pp. 47 – 58.

ENDERS, Walter. (2004). «Applied Econometric Time Series», Second Edition, *Wiley Series in Probability and Statistics.*

ERENBURG Sharon J. (1993). «The real effects of public investment on private investment», *Applied Economics*, Vol. 25, Is. 6, pp. 831-837.

ESFAHANI Hadi, and RAMIRES Maria Teresa. (2003), "Institutions, infrastructure and economic growth", *Journal of Development Economics,* Vol. 70, Is. 2, pp. 443-477.

EUROPEAN CENTRAL BANK (ECB). (2016). «*Economic Bulletin*», Is.2, p.p. 75-88.

EUROPEAN COMMISSION. (2017). «Government Investment in the EU: The Role of Institutional Factors», *Report on Public Finances in EMU 2017*, pp. 133-186.

EUROPEAN COMMISSION / Knowledge for Policy / Territorial / Urban Data Platform, Urban and Territorial Dashboard, available at:

https://urban.jrc.ec.europa.eu/rel2018/#/en/my-place

EUROSTAT DATABASE, Data concerning Education for Spanish regions at all levels, (according to ISCED 1997), available at:

https://ec.europa.eu/eurostat/data/database?node_code=educ_renrlrg1

EVANS Paul and KARRAS Georgios. (1994). "Is Government Capital Productive? Evidence from a Panel of Seven Countries". *Journal of Macroeconomics*, Vol. 16, No. 2, pp.271-279.

EZCURRA Roberto, GIL Carlos, PASCUAL Pedro, RAPUN Manuel. (2005). "Public Capital, Regional Productivity and Spatial Spillovers." *The Annals of Regional Science*, 39, pp. 471-494.

FEENSTRA, Robert C., INKLAAR Robert and TIMMER Marcel P. (2015). "The Next Generation of the Penn World Table", *American Economic Review*, Vol 105, Is.10, pp. 3150-3182, available for download at www.ggdc.net/pwt

FELICE Emanuele. (2009). «Estimating regional GDP in Italy (1871-2001): sources, methodology and results», *Universidad Carlos III de Madrid*, Departamnento de Historia Economica e Instituciones, *Working paper in Economic History, 09-07*, pp. 1-25.

FELICE Emanuele and VECCHI Giovanni. (2015). «Italy's Modern Economic Growth, 1861–2011», *Enterprise & Society*, Vol. 16, Is. 2, pp. 225-248.

FERNALD John, G. (1999). "Roads to Prosperity? Assessing the Link between Public Capital and Productivity." *American Economic Review,* Vol. 89, No 3, pp. 619-638.

FORD Robert and PORET Pierre. (1991). “Infrastructure and Private – Sector Productivity”. *Economic Studies,* No 17, pp.63-89.

GARCIA-MILÁ Teresa and McGUIRE Therese J. (1992). “The Contribution of Publicly Provided Inputs to States’ economies.” *Regional Science and Urban Economics,* Vol. 22, pp. 229-241.

GARCIA-MILÁ Teresa, McGUIRE Therese J and PORTER R. H. (1996). “The effects of public capital in state-level production functions reconsidered.” *Review of Economics and Statistics,* 78, (1), pp. 177-180.

GĖRARDIN B. (1991) “Investment in Transport Infrastructure and Regional Development”, pp.51-60, in “Vickerman R.W. (ed.) “*Infrastructure and Regional Development”,* European Research in Regional Science, Pion Limited, London.

GHOSH Buddhadeb and DE Prabir. (2005). “Investigating the Linkage Between Infrastructure and Regional Development in India: Era of Planning to Globalization.” *Journal of Asian Economics,* 15, pp.1023-1050.

GRAMLICH, Edward M. (1994). “Infrastructure Investment: A Review Essay”, *Journal of Economic Literature*, Vol. 32, pp.1176 – 1196.

GRILICHES Zvi. (1980). «R&D and the Productivity Slowdown», *NBER Working Paper Series,* No 434, Cambridge/Massachusetts.

GUPTA Sanjeev, KANGUR Alvar, PAPAGEORGIOU Chris and WANE Abdoul. (2014). "Efficiency-Adjusted Public Capital and Growth," *World Development,* Elsevier, vol. 57(C), pp. 164-178.

INFRASTRUCURE CANADA. (2007). “*Infrastructure and Productivity: A Literature Review», Research and Analysis Division – Part of the Transport, Infrastructure and Communities Portfolio*”, Commissioned from Pricewaterhouse Coopers.

HANUSHEK Eric A. and KIMKO Dennis D. (2000). «Schooling, Labor-Force Quality, and the Growth of Nations», *The American Economic Review,* Vol. 90, No 5, pp. 1184-1208.

HARBERGER, Arnold C. (1978). «Perspectives on Capital and Technology in Less Developed Countries», in: *M. J. Artis and A. R. Nobay (Eds.): Contemporary Economic Analysis,* London, pp. 42–72.

HEINEMANN Friedrich. (2006). "Factor mobility, government debt and the decline in public investment", *International Economics and Economic Policy*, Vol. 3, Is. 1, pp. 11-26.

HILL Carter R., GRIFFITHS William E. and LIM Guay C. (2008). «*Principle of Econometrics – third edition*», Danvers MA, *Wiley.*

HOLTZ-EAKIN Douglas. (1992). "Public-Sector Capital and the Productivity Puzzle", *NBER Working Paper Series*, No.4122, National Bureau of Economic Research, Massachusetts.

HOLTZ-EAKIN Douglas. (1993). "New Federal spending for infrastructure: Should we let this genie out of the bottle?", in *Public Infrastructure Investment: A Bridge to Productivity Growth?*, The Jeromy Levy Economics Institute, Bard College, NY.

HOLTZ-EAKIN Douglas, LOVELY Mary E. (1996). "Scale economies, returns to variety, and the productivity of public infrastructure", *Regional Science and Urban Economics*, Vol. 26, pp. 105-123.

HULTEN, Charles R. and SCHWAB, Robert M. (1984). "Regional Productivity Growth in U.S. Manufacturing 1951 – 1978, *The American Economic Review*, Vol. 74, No 1, pp. 152 – 162.

IUZZOLINO Giovanni, PELLEGRINI Guido and VIESTI Gianfranco. (2011). «*Quaderni di Storia Economica – Economic History Working Papers, Convergence among Italian Regions 1861-2011*», Banca d' Italia, No 22.

JOCHIMSEN Reimut. (1966). «Theorie der Infrastruktur, Grundlagen der marktwirtschaftlichen Entwicklung», *J C B Mohr (Paul Siebeck)*, Tübingen.

KALYVITIS Sarantis and VELLA Eugenia. (2014). «On the Productivity Effects of Public Capital Maintenance: Evidence from U.S. States», *Max Weber Programme (MWP 2014/04) EUI Working Papers*.

KAMPS Christophe. (2006). **«**New Estimates of Government Net Capital Stocks for 22 OECD Countries 1960-2001», *IMF Staff Paper*, Vol 53, No 1, pp. 120–150.

KAPPELER Andreas and VÄLILÄ Timo. (2008). "Fiscal federalism and the composition of public investment in Europe*", European Journal of Political Economy*, Vol. 24, Is. 3, pp. 562-570.

KAVANAGH Catherine. (1997). "Public capital and private sector productivity in Ireland, 1958-1990", *Journal of Economic Studies*, Vol. 24, Is. 1/2, pp. 72-94.

KOUTSOYIANNIS Anna. (1977). «*Theory of Econometrics – An Introductory Exposition of Econometric Methods*», Second Edition, *MacMillan Press Ltd* London.

LAMBRINIDIS Matthew, PSYCHARIS Yiannis and ROVOLIS Antonis. (2005). "Regional Allocation of Public Infrastructure Investment: The Case of Greece", *Regional Studies*, Vol. 39, Is. 9, pp. 1231-1244.

LAMBRINIDIS Matthew, PSYCHARIS Yiannis and KAZAZIS Evaggelos. (2001). «Public Infrastructure and Regional Development», *ΤΟΠΟΣ*, (in Greek), V.16, pp. 45-64.

LIBERTO Di Adriana. (2008). "Education and Italian regional development", *Economics of Education Review*, Volume 27, Is. 1, pp. 94 – 107.

MAMATZAKIS Emmanuel C. (1999a). **«**Testing for long run relationship between infrastructure and private capital productivity: a time series analysis for the Greek industry», *Applied Economics Letters*, Vol. 6, Is. 4, pp. 243-246.

MAMATZAKIS Emmanuel C. (1999b). "*Public Infrastructure, Private Input Demand, and Economic Performance of the Greek Industry*", Queen Mary and Westfield College Working Paper No 406.

MAMATZAKIS Emmanuel C. (2007). «EU Infrastructure Investment and Productivity in Greek Manufacturing», *Journal of Policy Modelling*, Vol. 29, Is. 2, pp. 335-344.

MARROCU Emanuela & PACI Raffaele. (2010). «The effects of public capital on the productivity of the Italian regions», *Applied Economics*, Vol. 42, Is. 8, pp.: 989-1002.

MAS Matilde, MAUDOS Joaquin, PEREZ Francisco and URIEL Ezequiel. (1996). "Infrastructures and Productivity in the Spanish Regions", *Regional Studies*, Vol. 30, Num. 7, pp. 641-649.

MASTROMARCO Camilla and WOITEK Ulrich. (2006). «Public Infrastructure Investment and Efficiency in Italian Regions», *Journal of Productivity Analysis*, Vol. 26, Is. 1-2, p.p. 57-65.

MEHROTA Aaron and VÄLILÄ Timo. (2006). "Public Investment in Europe: Evolution and Determinants in Perspective», *Fiscal Studies*, Vol. 27, Is. 4, pp. 443-471.

MELACHROINOS Konstantinos, and SPENCE Nigel. (2000) «Constructing Manufacturing Fixed Capital Stock Series for the Regions of Greece», *European Planning Studies,* Vol. 8, No 1, pp. 43-67.

MORRISON-PAUL Catherine and SCHWARTZ Amy Ellen. (1996). «State Infrastructure and Productive Performance», *American Economic Review,* Vol. 86, No 5, pp. 1095-1111.

MUNNELL, Alicia H. (1990a). "Why Has Productivity Growth Declined? Productivity and Public Investment", *New England Economic Review*, January/ February pp.3 – 22.

MUNNELL, Alicia H. with the assistance of Leah M. Cook. (1990b). "How Does Public Infrastructure Affect Regional Economic Performance?", *New England Economic Review,* September/October, pp. 11-32.

MUNNELL, Alicia H. (1990c). "*Is There a Shortfall in Public Capital Investment? An Overview",* Conference Series No 34, Boston, FRB of Boston.

NADIRI Ishaq M. and MAMUNEAS Theofanis P. (1994). "The Effects of Public Infrastructure and R&D Capital on the Cost Structure and Performance of U.S. Manufacturing Industries." *The Review of Economics and Statistics,* vol. 76, no. 1, pp. 22-37.

NEHRU Vikram and DHARESHWAR Ashok. (1993). «A new database on Physical Capital Stock: Sources, Methodology and Results», *Revista de Analisis Economico/Economic Analysis Review*, Vol. 8, Is.1, pp. 37–59.

NIJKAMP Peter. (2000). «Infrastructure and Suprastructure in Regional Competition: A Deus Ex Machina?» *In: Batey Peter W. J., Friedrich Peter (eds.) Regional Competition/ Advances in Spatial Science,* Springer-Verlag, Berlin, Heidelberg, New York, pp. 87-107.

NÚÑEZ-SERRANO Juan Andrés and VELÁZQUEZ Fransisco J. (2017). "Is Public Capital Productive? Evidence from a Meta-analysis", *Applied Economic Perspectives and Policy*, Vol. 39, Is. 2, pp. 313-345.

OULTON Nicholas and WALLIS Gavin. (2016). «Capital stocks and capital services: Integrated and consistent estimates for the United Kingdom, 1950–2013». *Economic Modelling*, Vol. 54. pp. 117-125.

PACI Raffaele and SADDI Silvia. (2002). «Capitale pubblico e produttività nelle regioni italiane», *Scienze Regionali,* No 3, pp. 5-26.

PALEI Tatyana. (2015). «Assessing the Impact of Infrastructure on Economic Growth and Global Competitiveness», *Procedia Economics and Finance,* 23, pp.168-175.

PERCOCO Marco. (2004). «Infrastructure and Economic Efficiency in Italian Regions», *Networks and Spatial Economics,* Vol 4, pp 361-378.

PEREIRA Alfredo Marvão and PEREIRA Rui Marvão. (2017). "Identifying Priorities in Infrastructure Investment in Portugal", *Journal of Economics and Public Finance,* Vol. 3, No. 3, pp. 367-392.

PEREIRA Alfredo M. and Andraz Jorge M. (2013). "On The Economic Effects Of Public Infrastructure Investment: A Survey Of The International Evidence," *Journal of Economic Development, Chung-Ang Unviersity, Department of Economics,* vol. 38(4), pp. 1-37.

PEREIRA Alfredo Marvão and ROCA-SAGALES Oriol. (2007). «Public Infrastructure and regional Asymmetries in Spain», *Revue d'Economie Régionale and Urbaine*, Octobre, Vol. 3, pp. 503-519.

PETRAGLIA Carmelo. (2002). «Total Factor Productivity and Public Capital: The Case of Italy», *Studi Economici*, Vol 78, pp. 65-92.

PHILLIPS Peter C. B. (1998). «Impulse Response and Forecast Error Variance Asymptotics in Nonstationary VARs», *Journal of Econometrics,* Vol. 83, Is.1, pp. 21-56.

PICCI Lucio. (1999). "Productivity and Infrastructure in the Italian Regions", *Giornale degli Economisti e Annali di Economia,* Vol. 58, No. 3-4, pp. 329-353.

PLASKOVITIS Ilias. (2008). «Change in Regional Policy Priorities, Objectives and Instruments in Greece», in: Coccossis Harry, Psycharis Yiannis, (eds) *Regional Analysis and Policy*. *Contributions to Economics*. Physica-Verlag HD, - A Springer Company, Heidelberg.

PRITCHETT Lant. (1996). "Mind your P's and Q's. The Cost of Public Investment is not the Value of Public Capital". *World Bank Policy Research Paper,* No. 1660.

PSYCHARIS Yiannis. (2008). «Public Spending Patterns: The regional Distribution of Public Investment in Greece» in: Coccossis Harry, Psycharis Yiannis, (eds) *Regional Analysis and Policy*. *Contributions to Economics*. Physica-Verlag HD, - A Springer Company, Heidelberg.

PUIG-JUNOY Jaume. (2001). «Technical Inefficiency and Public Capital in US States: A Stochastic Frontier Approach», *Journal of Regional Science,* Vol. 41, Is. 1, pp. 75-96.

PUIG-JUNOY Jaume and PINILLA Jaime. (2008). «Why are Some Spanish Regions So Much More Efficient than others?» *Environment and Planning C: Government and Policy,* Vol. 26, Is. 6, pp. 1129–1142.

RATNER Jonathan, B. (1983). «Government Capital and the Production Function for the US Private Output», *Economics Letters*, Vol. 13, Is. 2-3, pp. 213-217.

REICH Robert. (1991), «The Real Economy» *The Atlantic Monthly*, pp. 32 – 52.

ROMP Ward and DE HAAN Jakob. (2007). «Public capital and economic growth: a critical survey», *Perspektiven der Wirtschaftspolitik*, Vol. 8, Special Issue, April, p.p. 6-52.

ROSIK Piotr. (2006). "Public capital and regional economic growth." *Economics and Business Review EBR*, Vol. 6. No 1, pp. 69-93.

ROVOLIS Antonis and SPENCE Nigel. (2002). "Duality theory and cost function analysis in a regional context: the impact of public infrastructure capital in the Greek regions", *The Annals of Regional Science,* Springer – Verlag, 36: pp. 55 – 78.

ROVOLIS Antonis. (1999). "The Effects of Public Infrastructure Capital on the Economic Development and Productivity of the Metropolitan and Peripheral Regions of Greece: 1976-1992" (*Doctorate Dissertation (Ph.D), London School of Economics and Political Science, London, UK*), «Retrieved from LSE Theses Online» Platform.

SALINAS – Jimenez, M. del M. (2004). "Public Infrastructure and private productivity in the Spanish regions", *Journal of Policy Modeling,* vol.26, pp. 47 – 64.

SCHREYER Paul, DUPONT Julien, KOH Seung-Hee Koh and WEBB Colin – OECD. (2011). *Capital Stock Data at the OECD – Status and Outlook,* OECD.

SEGOURA Io and CHRISTODOULAKIS Nikolaos. (1997). Public Infrastructure and Private Productivity – An Empirical Investigation for the Greek Economy 1963-1990, in Provopoulos G. and Rapanos V (eds). *"Functions of Public Sector. Problems-Perspectives",* Foundation for Economic and Industrial Research (FEIR), Athens (in Greek).

SEITZ Helmut (1994). Public Capital and the Demand for Private Inputs. *Journal of Public Economics*, No 54, pp. 287-307.

SIMS Cristopher A., STOCK James H. and WATSON Mark M. (1990). Inference in Linear Time Series Models with Some Unit Roots, *Econometrica*, Vol. 58, No. 1, pp. 113-144.

STATISTICS CANADA, (2001). *Investment Flows and Capital Stocks. Methodology.*

STEVENS Barrie and MICHALSKI Wolfgang. (1993). “Infrastructure in the 1990s: An Overview of Trends and Policy Issues” Chapter 1, pp.7-19, in *Infrastructure Policies for the 1990s,* OECD, Paris.

STURM Jan-Egbert. (1998). *Public Capital Expenditure in OECD Countries. The Causes and Impact of the Decline in Public Capital Spending,* Edward Elgar.

STURM Jan-Egbert and HAAN Jakob de. (1995). Is public Expenditure really productive? New Evidence for the USA and the Netherlands. *Economic Modelling*, Vol.12, Is. 1, pp.60-72.

TATOM John, A. (1991). Public Capital and Private Sector Performance, *Federal Reserve Bank of St. Louis*, Vol. 73, pp. 3-15.

TATOM John A. (1993). The Spurious Effect of Public Capital Formation on Private Sector Productivity, *Policy Studies Journal*, Vol. 21, No. 2, pp. 391-395.

TINBERGEN Jan. (1962). *Shaping the World Economy, Suggestions for an International Economic Policy*, The Twentieth Century Fund, New York.

TURRINI, Alessandro. (2004). Public investment and the EU fiscal framework, *European Commission, European Economy, Economic Papers*, No 202, May 2004, available at:

https://ec.europa.eu/economy_finance/publications/pages/publication734_en.pdf

U.S. DEPARTMENT OF COMMERCE, Bureau of Economic Analysis. (2003). *Fixed Assets and Consumer Durable Goods in the United States, 1925–99.* Washington, DC: U.S. Government Printing Office.

VOSS Graham M. (2002). Public and Private Investment in the United States and Canada, *Economic Modelling*, Vol. 19, Is. 4, pp. 641-664.

WOOLDRIDGE Jeffrey M. (2009). On Estimating firm-level production functions using proxy variables to control for unobservables”, *Economics Letters*, Vol. 104, Is. 3, pp. 112-114.

WOOLDRIDGE Jeffrey M. (2013). *«Introductory Econometrics – A Modern Approach»*, South-Western Cengage Learning, 5th edition.

WORLD BANK. (1994a). *Development Report, Infrastructure for Development, Executive Summary*, available at: http://documents.worldbank.org/curated/en/687361468340136928/pdf/13483.pdf

WORLD BANK (1994b). *Annual Report, World Bank*, available at: http://documents.worldbank.org/curated/en/567941468322429653/pdf/multi0page.pdf

WORLD BANK. (various years). *Private Participation in Infrastructure (PPI) Database Global Report*

WORLD BANK. (various years). *The World Bank Database, GDP Deflator-Greece*, available at: https://data.worldbank.org/indicator/NY.GDP.DEFL.ZS?locations=GR