



COINVEST

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Project no. FP7-217512

Project acronym COINVEST

Project title: Competitiveness, Innovation and Intangible Investments in Europe

7th FRAMEWORK PROGRAMME

Specific Programme ‘Socio-economic Sciences and Humanities theme’

SSH-CT-2008-217512

Deliverable D7: A paper quantifying figures on time-series estimates dating back to

1980 for Portugal

Due date of deliverable: May 2009

Actual submission date: October 2009

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Start date of project: 01.04.2008 Duration: 24 months

Organisation name of lead contractor for this deliverable: Instituto Superior Técnico

Project funded by the European Commission within the Seventh Framework Programme (2007-2013)

Dissemination level

| | | |
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Invest in Intangible Assets by Portuguese Firms

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ACKNOWLEDGEMENT: FINANCIAL SUPPORT HAS BEEN PROVIDED BY THE COINVEST PROJECT, WWW.COINVEST.ORG.UK, FUNDED BY THE EUROPEAN COMMISSION SEVENTH FRAMEWORK PROGRAMME, THEME 9, SOCIO-ECONOMIC SCIENCE AND HUMANITIES, GRANT NUMBER 217512.

Introduction

ECONOMIC MODELS DESCRIBING ECONOMIC LONG-RUN GROWTH CONSIDER TECHNOLOGICAL CHANGE AS THE MAIN DRIVER OF GROWTH, WHICH CAN BE CONSIDERED ENDOGENOUSLY OR EXOGENOUSLY DRIVEN. THE KEY DIFFERENCE BETWEEN THE ENDOGENOUS AND EXOGENOUS MODEL IS THE ASSUMPTION MADE ON THE EVOLUTION OF PRODUCTION FUNCTION AND THE INTERPRETATION OF THE ROLE OF NON RIVAL AND EXCLUDABLE INTANGIBLE GOODS. THE EXOGENOUS MODEL, BY CONSIDERING KNOWLEDGE AS AN EXTERNAL VARIABLE (A PUBLIC GOOD THAT CANNOT BE INTERNALIZED IN THE MODEL), ASSUMES DIMINISHING RETURNS OF THE PRODUCTION FUNCTION. COUNTRIES HAVE THEIR GROWTH LIMITED BY THE TANGIBLE GOODS, CAPITAL AND LABOUR. AS KNOWLEDGE DOES NOT DEPEND ON THE FIRMS' BEHAVIOR, IT IS CONSIDER AS A VARIABLE THAT DOES NOT ALLOW THE DISTINCTION BETWEEN DIFFERENT ACTORS. AS A CONSEQUENCE, INITIAL CONDITIONS AND CURRENT DISTURBANCES OF ACTORS' SETTING HAVE NO LONG-RUN EFFECT ON THE LEVEL OF OUTPUT AND CONSUMPTION. THE RATE OF RETURN ON INVESTMENT AND THE RATE OF GROWTH OF CAPITAL OUTPUT ARE DECREASING FUNCTIONS OF THE LEVEL OF PER CAPITA CAPITAL STOCK.

AS THE NAME POINTS OUT, THE ENDOGENOUS GROWTH MODEL REGARDS KNOWLEDGE AS AN INTERNAL VARIABLE – MOST TECHNOLOGICAL CHANGES TAKE PLACE BECAUSE OF INTENTIONAL ACTIONS TAKEN BY PROFIT MAXIMIZING ACTORS IN RESPONSE TO MARKET STIMULUS. WITH THIS ASSUMPTION, INTANGIBLE GOODS PRODUCERS BENEFIT FROM THEIR ACTIVITIES AND, CONSIDERING THAT THIS TYPE OF GOODS CAN GROW WITHOUT BOUNDS, THE PRODUCTION OF OUTPUT, AS A FUNCTION OF STOCK OF KNOWLEDGE AND OTHER INPUTS, HAS INCREASING RETURNS.

ROMER (1990) PROPOSED THIS ENDOGENOUS MODEL, WHICH CONSIDERS THE DEPARTURE FROM THE USUAL ASSUMPTION OF DIMINISHING RETURNS, BASED ON THREE PREMISES: THE MAIN DRIVER OF GROWTH IS TECHNOLOGICAL CHANGE, TECHNOLOGY CONFERS BENEFITS TO THE ACTORS THAT DEVELOPED THE NEW IDEA, AND INTANGIBLE GOODS ARE NON RIVAL GOODS.

THE LAST TWO PREMISES BRING US TO THE DISCUSSION OF TWO FUNDAMENTAL CONCEPTS: RIVALRY AND EXCLUDABILITY. AN ACTOR THAT PRODUCES KNOWLEDGE, AS REFERRED BEFORE, IS ABLE TO TAKE BENEFITS FROM HIS ACTION (PARTIAL EXCLUDABILITY) BUT CANNOT PREVENT THE INTANGIBLE CAPITAL GOOD DISSEMINATION (NON-RIVALRY) – THE USE OF A NEW DESIGN BY AN INDIVIDUAL DOES NOT EXCLUDE THE USE BY ANOTHER ACTOR AND EXTERNALITIES ARE PRODUCED.

THIS PARTIAL EXCLUDABILITY OF KNOWLEDGE ASSUMES A DECISIVE PART IN MAKING TECHNOLOGICAL CHANGE ENDOGENOUS. IF A FIRM OBTAINS PROFITS FROM A PARTIAL MARKET MONOPOLY OF A NEW CONCEPT, ACHIEVED BY PATENTING OR KEEPING SECRET, IT WILL HAVE MOTIVATION TO IMPLEMENT R&D ACTIVITIES BECAUSE THE INVESTMENT MADE WILL HAVE RETURN BEFORE THE TRANSFORMATION OF THE CONCEPT IN A COMPLETE PUBLIC GOOD.

THE MOST IMPORTANT CONSEQUENCE OF THIS INCOMPLETE APPROPRIABILITY AND NON-RIVALRY OF KNOWLEDGE ASSOCIATED WITH UNBOUNDED GROWTH, IS THE CONSUMPTION GOODS PRODUCTION'S CONVEXITY AS A FUNCTION OF STOCK OF KNOWLEDGE WHEN ALL OTHER INPUTS ARE HELD CONSTANT – MULTIPLYING THE INVEST IN NON RIVAL GOODS IN A CERTAIN RATE BRINGS AN INCREASE IN OUTPUT SUPERIOR TO THE ORIGINAL RATE (NON RIVAL GOODS ARE PATH DEPENDENT).

THE NON-RIVALRY OF INTANGIBLE CAPITAL GOODS LEADS TO INCREASING RETURNS OF SCALE BECAUSE THE EFFECTS PRODUCED BY THIS KIND OF GOODS TRANSCEND THE INITIAL INVESTMENT – ACTORS NON-PRODUCERS OF KNOWLEDGE COULD TAKE FREELY BENEFITS OF KNOWLEDGE AND THE WELFARE CREATED IS MULTIPLIED (THE INVENTION OF CONSUMER PRODUCT LIKE TELEPHONE OR COMPUTERS, HAVE PRODUCED EXTERNALITIES MUCH SUPERIOR TO THE INVESTMENT ON INPUT).

IN CONCLUSION, THE ENDOGENOUS MODEL PROVIDES AN EXPLANATION FOR THE DIFFERENCES BETWEEN THE LEVELS OF GROWTH OF DEVELOPING AND DEVELOPED NATIONS, BY ASSUMING INCREASING RETURNS TO PER CAPITA CAPITAL IN THE PRODUCTION OF PER CAPITA OUTPUT.

WITHIN THIS CONTEXT, INVESTMENT IN INTANGIBLES ASSETS AND, IN PARTICULAR, INVESTMENT IN KNOWLEDGE CREATION IS BELIEVED TO BE AN ESSENTIAL CONDITION FOR ECONOMIC GROWTH. NEVERTHELESS, THE EFFECT OF INTANGIBLES ON THE MACROECONOMIC PRODUCTIVITY GROWTH IS NOT IMMEDIATE AND MAY BE DIFFICULT TO MEASURE. CORRADO, HULTEN AND SICHEL (2005, 2006) DEFINE INTANGIBLE INVESTMENT AS EXPENDITURES BY BUSINESSES INTENDED TO BOOST OUTPUT IN THE FUTURE BUT THAT ARE NOT TRADITIONAL, TANGIBLE PHYSICAL CAPITAL. THEREFORE, THERE ARE CONCERNS ABOUT THE ACCURATENESS OF THE OFFICIAL DATA MEASURES OF THE FACTORS THAT AFFECT ECONOMIC GROWTH (CORRADO, HULTEN AND SICHEL 2006). RECENTLY, SEVERAL AUTHORS DEFEND THIS POINT OF VIEW ARGUING THAT ONE POSSIBLE EXPLANATION FOR THE DIFFERENCES BETWEEN REALITY AND MEASURES IS DUE TO THE UNDER-CONSIDERATION OF THE INVESTMENT IN INTANGIBLES (SEE CORRADO, HULTEN AND SICHEL 2005, 2006; MARRANO AND HASKEL 2006; MARRANO, HASKEL AND WALLACE 2007; HAO AND MANOLE 2008).

AS IN MOST COUNTRIES, THE PORTUGUESE NATIONAL ACCOUNTS TREAT INTANGIBLES AS AN INTERMEDIATE GOOD AND NOT AS AN INVESTMENT. IN THIS CONTEXT AND CONSIDERING THAT THE IMPACT OF INTANGIBLES ON THE PORTUGUESE ECONOMY WAS NEVER ANALYZED IN DETAIL, THIS PAPER AIMS AT APPLYING THE THEORETICAL FRAMEWORK AND METHODOLOGY DEVELOPED BY CORRADO, HULTEN AND SICHEL (2006) AND MARRANO AND HASKEL (2006) TO ESTIMATE EXPENDITURES AND INVESTMENT IN INTANGIBLES FOR THE PORTUGUESE ECONOMY.

Methods and Databases

FOLLOWING THE METHODOLOGY OF CORRADO, HULTEN AND SICHEL (2006) AND MARRANO AND HASKEL (2006) AND IN ORDER TO ALLOW INTERNATIONAL COMPARISONS, THIS PAPER WILL MEASURE INTANGIBLE INVESTMENT IN THE BUSINESS SECTOR. THE GOVERNMENT SECTOR WILL NOT BE CONSIDERED IN THIS ANALYSIS.

THREE DIFFERENT BROAD CATEGORIES OF INTANGIBLES ASSETS ARE CONSIDERED: COMPUTERIZED INFORMATION (SOFTWARE, COMPUTERIZED DATABASES);

INNOVATIVE PROPERTY (SCIENTIFIC R&D, MINERAL EXPLORATIONS, COPYRIGHT AND LICENSE COST, PRODUCT DEVELOPMENT IN FINANCIAL INDUSTRIES, DESIGN, R&D IN SOCIAL SCIENCES AND HUMANITIES); AND ECONOMIC COMPETENCIES (BRAND EQUITY, VOCATIONAL TRAINING AND ORGANIZATIONAL CAPITAL). THE PROCEDURES FOR THE DIFFERENT VARIABLES WILL BE DESCRIBED BELOW. VARIOUS METHODS AND SURVEYS ARE USED TO ESTIMATE THE SPENDING ON THE DIFFERENT INTANGIBLES CATEGORIES, BUT THE QUADROS DE PESSOAL DATABASE IS THE MAIN DATA SOURCE AT THIS STAGE OF THE PROJECT. THEREFORE, THE END OF THIS SECTION WILL PROVIDE A DESCRIPTION OF THIS DATABASE.

Computerised information

COMPUTER SOFTWARE

THE EU-KLEMS DATABASE PROVIDES INFORMATION ON COMPUTER SOFTWARE FOR ALL EUROPEAN COUNTRIES. THUS, WE FOLLOWED MARRANO AND HASKEL (2006) AND CONSIDERED THE DATA FROM THIS DATABASE. THE EU-KLEMS (2008) DATABASE IS THE MAIN OUTPUT OF A RESEARCH PROJECT THAT AIMED AT STUDYING PRODUCTIVITY TRENDS IN THE EUROPEAN UNION. THE DATABASE INCLUDES INFORMATION ON OUTPUT GROWTH, EMPLOYMENT, SKILL CREATION, CAPITAL FORMATION AND TOTAL FACTOR PRODUCTIVITY AT THE INDUSTRY LEVEL. THE INCLUSION OF DATA FROM NATIONAL ACCOUNTS IN ORDER TO MAKE THE DISTINCTION BETWEEN OWN ACCOUNT AND PURCHASED COMPUTER SOFTWARE WILL BE CONSIDERED IN A FUTURE ANALYSIS.

COMPUTERIZED DATABASES

THE QUADROS DE PESSOAL DATABASE (FIRM DATABASE) PROVIDES INFORMATION ON THE SALES OF THE COMPUTERIZED DATABASE ACTIVITIES INDUSTRY. THIS DATA COMPLEMENTS THE DATA PROVIDED BY EU-KLEMS FOR COMPUTER SOFTWARE, DESPITE NOT CONSIDERING OWN ACCOUNT INVESTMENTS BY FIRMS.

Innovative property

SCIENTIFIC R&D

FOLLOWING THE UK PROCEDURE, EXPENDITURE ON R&D AS PUBLISHED IN BERD IS COLLECTED FROM THE OECD - MAIN SCIENCE AND TECHNOLOGY INDICATORS 2008-2 (1982-2007). THIS INDICATOR MAY DOUBLE COUNT THE SOFTWARE

INDUSTRY R&D INVESTMENT; AN ISSUE THAT WILL BE CONSIDERED IN FUTURE ANALYSES.

MINERAL EXPLORATION

FOR THE UK, THE MINERAL EXPLORATION INVESTMENTS WERE TAKEN FROM THE NATIONAL ACCOUNTS. FOR PORTUGAL THE NATIONAL ACCOUNTS WILL ALSO BE USED FOR MEASURING THESE ASSETS. NEVERTHELESS, THE DATA PRESENTED IN THIS PAPER IS COLLECTED FROM AN ALTERNATIVE SOURCE, THE QUADROS DE PESSOAL DATABASE. THIS DATABASE PROVIDES INFORMATION ON SALES FROM THE MINERAL EXPLORATION INDUSTRY EXCLUDING THE SERVICES ASSOCIATED TO OIL AND GAS EXTRACTION NOT RELATED TO PROSPECTION INDUSTRY AND THE SALT REFINEMENT INDUSTRY.

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THE NATIONAL ACCOUNTS ARE ALSO THE DATA SOURCE FOR COPYRIGHT AND LICENSE COSTS FOR THE UK STUDY. FOR PORTUGAL, THE DATA COLLECTION FOR COPYRIGHT AND LICENSE COSTS WAS ALSO SIMILAR TO THE ONE ADOPTED FOR MINERAL EXPLORATION. THE INFORMATION WAS COLLECTED FROM THE QUADROS DE PESSOAL DATABASE THAT PROVIDES INFORMATION ON SALES FROM THE BOOKS, NEWSPAPERS, MAGAZINES, AND SOUND PUBLISHING INDUSTRY, REPRODUCTION OF RECORDED SOUNDS OR VIDEOS INDUSTRY, RADIO AND TV ACTIVITIES, AND OTHER ARTISTIC AND LITERARY ACTIVITIES INDUSTRY. THE NATIONAL ACCOUNTS WILL BE USED IN A SECOND STEP OF THE WORK.

NEW PRODUCT DEVELOPMENT COSTS IN THE FINANCIAL INDUSTRY

IN THE UK, THE NEW PRODUCT DEVELOPMENT COSTS IN THE FINANCIAL INDUSTRY WERE MEASURED AS 20% OF INTERMEDIATE CONSUMPTION BY THE FINANCIAL SERVICES INDUSTRY. THE QUADROS DE PESSOAL DATABASE PROVIDES DATA ON THE SALES FROM THE FINANCIAL INDUSTRY. THIS VALUE IS MULTIPLIED BY THE SHARE OF INNOVATION EXPENDITURES OF THE FINANCIAL INDUSTRY OBTAINED FROM THE THIRD COMMUNITY INNOVATION SURVEY (4%). THE DATA FROM NATIONAL ACCOUNTS AND FROM DIFFERENT WAVES OF THE COMMUNITY INNOVATION SURVEY WILL BE USED TO VALIDATE THIS DATA.

NEW ARCHITECTURAL AND ENGINEERING DESIGNS

TO ACCOUNT FOR THE NEW ARCHITECTURAL AND ENGINEERING DESIGNS THE UK METHODOLOGY IS FOLLOWED FOR THE PORTUGUESE CONTEXT. IT IS CONSIDER THAT 50% OF SALES FROM THE ARCHITECTURAL AND ENGINEERING INDUSTRY AND THE EARNINGS FROM DESIGNERS OF OTHER INDUSTRIES ACCOUNT FOR THE INVESTMENT IN THIS KIND OF INTANGIBLE. THE QUADROS DE PESSOAL DATABASE PROVIDES DATA ON THESE ITENS.

R&D IN SOCIAL SCIENCE AND HUMANITIES

THE EXPENDITURES IN R&D IN SOCIAL SCIENCE AND HUMANITIES ARE INCLUDED IN THE SCIENTIFIC R&D.

Economic competencies

BRAND EQUITY - ADVERTISING EXPENDITURE AND MARKET RESEARCH

IN THE UK, DATA FROM THE ADVERTISING ASSOCIATION WAS USED TO ACCOUNT FOR THE ADVERTISING EXPENDITURE. FOR PORTUGAL, NATIONAL ACCOUNTS WILL ALSO BE USED FOR MEASURING THIS INTANGIBLE EXPENDITURE. NEVERTHELESS, THE DATA PRESENTED IN THIS PAPER WAS COLLECTED FROM AN ALTERNATIVE SOURCE, THE QUADROS DE PESSOAL DATABASE. THIS DATABASE PROVIDES INFORMATION ON SALES FROM THE ADVERTISING INDUSTRY AND THE MARKET RESEARCH INDUSTRY.

FIRM-SPECIFIC HUMAN CAPITAL

IN LINE WITH THE UK METHODOLOGY, THE FIRM SPECIFIC HUMAN CAPITAL FOR PORTUGAL WAS MEASURED BY THE COMPENSATION OF EMPLOYEES (EU KLEMS) MULTIPLIED BY THE PERCENTAGE OF TRAINING COSTS OBTAINED FROM THE EUROSTAT VOCATIONAL TRAINING SURVEY (1999 VALUE).

PURCHASED ORGANIZATIONAL STRUCTURE

DATA FROM MANAGEMENT CONSULTANCY ASSOCIATION ON THE TURNOVER OF MANAGEMENT CONSULTANTS ALLOWED THE ESTIMATION OF PURCHASED ORGANIZATIONAL STRUCTURE EXPENDITURES FOR THE UK. FOR PORTUGAL, THE SALES OF THE MANAGEMENT CONSULTING INDUSTRY TAKEN FROM THE QUADROS

DE PESSOAL DATABASE ARE USED TO ACCOUNT FOR THE PURCHASED ORGANIZATIONAL STRUCTURE. AS IN PREVIOUS ITEMS, THESE VALUES WILL BE COMPLEMENTED WITH NATIONAL ACCOUNTS DATA.

OWN ACCOUNT ORGANIZATIONAL STRUCTURE

IN LINE WITH THE UK STUDY, OWN ACCOUNT SPENDING ON ORGANISATIONAL STRUCTURE WAS ESTIMATE AS ONE FIFTH OF MANAGERS' EARNINGS. THE QUADRO DE PESSOAL DATABASE CONTAINS INFORMATION ON THE EARNINGS OF MANAGERS IN EVERY PRIVATE PORTUGUESE FIRMS.

THE PORTUGUESE PERSONNEL REGISTER DATASET CALLED "QUADROS DE PESSOAL" IS AN ANNUAL MANDATORY EMPLOYMENT SURVEY COLLECTED BY THE PORTUGUESE MINISTRY OF EMPLOYMENT SINCE 1982. THE DATABASE COVERS ALMOST ALL FIRMS (AND ESTABLISHMENTS) WITH WAGE EARNERS. IT EXCLUDES PUBLIC ADMINISTRATION, ENTITIES THAT EMPLOY RURAL NON-PERMANENT WORKERS AND HOUSEKEEPERS.

THE DEGREE OF COVERAGE AND RELIABILITY OF THE DATA IS CONSIDERED EXTREMELY HIGH, SINCE EACH YEAR EVERY ESTABLISHMENT WITH WAGE EARNERS IS LEGALLY OBLIGED TO FILL IN A STANDARDIZED QUESTIONNAIRE. ACCORDING TO THE PORTUGUESE LAW, THE QUESTIONNAIRE IS MADE AVAILABLE TO EVERY IN A PUBLIC SPACE OF THE FIRM. THIS REQUIREMENT FACILITATES THE MINISTRY OF EMPLOYMENT TO MONITOR COMPLIANCE OF FIRMS WITH THE LAW, IN WHAT REFERS, FOR INSTANCE TO THE EXISTENCE OF ILLEGAL WORK.

REPORTED DATA COVER THREE MAIN UNITS OF ANALYSIS: THE ESTABLISHMENT ITSELF (LOCATION, ECONOMIC ACTIVITY AND EMPLOYMENT), THE FIRM (LOCATION, ECONOMIC ACTIVITY, EMPLOYMENT, SALES AND LEGAL FRAMEWORK) AND EACH OF ITS WORKERS (GENDER, AGE, EDUCATION, SKILL, OCCUPATION, TENURE, EARNINGS AND DURATION OF WORK). THE INFORMATION ON EARNINGS IS VERY COMPLETE. IT INCLUDES THE BASE WAGE (GROSS PAY FOR NORMAL HOURS OF WORK), SENIORITY PAYMENTS, REGULAR BENEFITS, IRREGULAR BENEFITS AND OVERTIME PAY, AS WELL AS THE MECHANISM OF WAGE BARGAINING.

Results and discussion

TABLES 1 AND 2 PRESENT THE VALUES OF SPENDING ON INTANGIBLES IN PORTUGAL FOR THE PERIOD 1995-2005. TWO MAJOR FACTS CAN BE DRAWN FROM A FIRST ANALYSIS: INTANGIBLES HAVE A RELEVANT WEIGHT ON THE PORTUGUESE ECONOMY (IN 2005 WAS 8.35% OF THE GDP) AND THIS WEIGHT HAS INCREASED IN RECENT YEARS (FROM 6.19% IN 1995 TO 8.35% IN 2005). IN ADDITION, ALMOST EVERY TYPE OF INTANGIBLE INVESTMENT HAS FOLLOWED THIS INCREASING TREND, A FACT THAT CAN BE EXPLAINED BY THE INCREASING EFFECT OF KNOWLEDGE ON GROWTH. SINCE THE RESULTS ARE STILL PRELIMINARY (AS REFERRED IN THE PREVIOUS SECTION), WE WILL NOT COMPARE THE WEIGHT OF THE DIFFERENT KINDS OF INTANGIBLE INVESTMENTS. THE PRELIMINARY RESULTS ALLOW A FIRST ASSESSMENT OF THE IMPORTANCE OF INTANGIBLE ASSETS IN THE PORTUGUESE ECONOMY BUT WE WILL ONLY DRAW MORE INSIGHTFUL CONCLUSIONS AFTER OBTAINING RESULTS WITH COMPLEMENTARY DATA SOURCES.

TABLE 1 – SPENDING ON INTANGIBLE ASSETS IN THE PORTUGUESE MARKET SECTOR 1995-1999 (MEUROS AND % GDP)

| TYPE OF INTANGIBLE INVESTMENT (MILLION EUROS AND PERCENTAGE OF GDP) | 1995 | | 1996 | | 1997 | | 1998 | | 1999 | |
|---|---------|-------|---------|-------|---------|-------|---------|-------|---------|-------|
| | VALUE | % GDP | VALUE | % GDP | VALUE | % GDP | VALUE | % GDP | VALUE | % GDP |
| 1. COMPUTERIZED INFORMATION | | | | | | | | | | |
| A) SOFTWARE | 211.09 | 0.25 | 236.79 | 0.26 | 295.18 | 0.30 | 317.75 | 0.30 | 404.26 | 0.35 |
| B) DATABASES | 2.76 | 0.00 | 3.05 | 0.00 | 2.59 | 0.00 | 1.78 | 0.00 | 3.38 | 0.00 |
| 2. INNOVATIVE PROPERTY | | | | | | | | | | |
| A) R&D, INCLUDING SOCIAL SCIENCES AND HUMANITIES | 710.10 | 0.83 | 786.20 | 0.87 | 859.00 | 0.88 | 1004.30 | 0.94 | 1169.40 | 1.02 |
| B) MINERAL EXPLORATION AND EVALUATION | 712.98 | 0.84 | 750.34 | 0.83 | 680.34 | 0.69 | 704.45 | 0.66 | 638.14 | 0.56 |
| C) COPYRIGHT AND LICENSE COSTS | 933.39 | 1.10 | 1027.74 | 1.14 | 1224.01 | 1.25 | 1148.40 | 1.08 | 1325.48 | 1.16 |
| D) DEVELOPMENT COSTS IN FINANCIAL INDUSTRY | 716.21 | 0.84 | 745.73 | 0.82 | 812.30 | 0.83 | 881.10 | 0.83 | 1040.67 | 0.91 |
| E) NEW ARCHITECTURAL AND ENGINEERING DESIGNS | 323.06 | 0.38 | 284.21 | 0.31 | 388.30 | 0.40 | 377.19 | 0.35 | 380.86 | 0.33 |
| 3. ECONOMIC COMPETENCIES | | | | | | | | | | |
| A) BRAND EQUITY | | | | | | | | | | |
| ADVERTISING EXPENDITURE | 918.58 | 1.08 | 957.32 | 1.06 | 1157.70 | 1.18 | 902.76 | 0.85 | 1098.17 | 0.96 |
| MARKET RESEARCH | 32.01 | 0.04 | 43.17 | 0.05 | 31.06 | 0.03 | 48.87 | 0.05 | 55.27 | 0.05 |
| B) FIRM-SPECIFIC HUMAN CAPITAL | | | | | | | | | | |
| CONTINUING VOCATIONAL TRAINING | 494.54 | 0.58 | 530.41 | 0.59 | 572.77 | 0.59 | 621.30 | 0.58 | 673.17 | 0.59 |
| APPRENTICE TRAINING | | | | | | | | | | |
| C) ORGANIZATIONAL STRUCTURE | | | | | | | | | | |
| PURCHASED | 202.43 | 0.24 | 268.95 | 0.30 | 268.56 | 0.27 | 346.40 | 0.33 | 472.32 | 0.41 |
| OWN ACCOUNT | 14.09 | 0.02 | 15.59 | 0.02 | 16.93 | 0.02 | 18.46 | 0.02 | 20.38 | 0.02 |
| TOTAL | 5271.24 | 6.19 | 5649.48 | 6.24 | 6308.74 | 6.44 | 6372.76 | 5.98 | 7281.50 | 6.38 |

TABLE 2 – SPENDING ON INTANGIBLE ASSETS IN THE PORTUGUESE MARKET SECTOR 2000-2005 (MEUROS AND % GDP)

| TYPE OF INTANGIBLE INVESTMENT (MILLION EUROS AND PERCENTAGE OF GDP) | 2000 | | 2001 | | 2002 | | 2003 | | 2004 | | 2005 | |
|---|-------------|-------|-------------|-------|-------------|-------|-------------|-------|-------------|-------|-------------|-------|
| | VALUE | % GDP | VALUE | % GDP | VALUE | % GDP | VALUE | % GDP | VALUE | % GDP | VALUE | % GDP |
| 1. COMPUTERIZED INFORMATION | | | | | | | | | | | | |
| A) SOFTWARE | 829.76 | 0.68 | 939.47 | 0.73 | 1155.3 6 | 0.85 | 1169.9 5 | 0.84 | 1179.0 7 | 0.82 | 1232.6 1 | 0.83 |
| B) DATABASES | 5.29 | 0.00 | 7.43 | 0.01 | 9.70 | 0.01 | 6.19 | 0.00 | 11.73 | 0.01 | 11.03 | 0.01 |
| 2. INNOVATIVE PROPERTY | | | | | | | | | | | | |
| A) R&D, INCLUDING SOCIAL SCIENCES AND HUMANITIES | 1322.6 0 | 1.08 | 1472.2 0 | 1.14 | 1453.2 0 | 1.07 | 1445.1 0 | 1.04 | 1552.7 0 | 1.08 | 1697.9 0 | 1.14 |
| B) MINERAL EXPLORATION AND EVALUATION | 717.80 | 0.59 | 752.06 | 0.58 | 733.45 | 0.54 | 699.96 | 0.51 | 570.69 | 0.40 | 344.88 | 0.23 |
| C) COPYRIGHT AND LICENSE COSTS | 1334.0 9 | 1.09 | 1665.7 8 | 1.29 | 1753.2 1 | 1.29 | 2124.0 0 | 1.53 | 1928.0 6 | 1.34 | 1970.3 3 | 1.32 |
| D) DEVELOPMENT COSTS IN FINANCIAL INDUSTRY | 999.54 | 0.82 | 1126.6 8 | 0.87 | 1128.2 4 | 0.83 | 1430.5 6 | 1.03 | 1446.0 9 | 1.00 | 1332.2 4 | 0.89 |
| E) NEW ARCHITECTURAL AND ENGINEERING DESIGNS | 658.65 | 0.54 | 538.11 | 0.42 | 863.42 | 0.64 | 764.99 | 0.55 | 753.53 | 0.52 | 748.86 | 0.50 |
| 3. ECONOMIC COMPETENCIES | | | | | | | | | | | | |
| A) BRAND EQUITY | | | | | | | | | | | | |
| ADVERTISING EXPENDITURE | 1166.5 9 | 0.95 | 1461.7 2 | 1.13 | 1408.2 4 | 1.04 | 1363.8 3 | 0.98 | 1521.1 8 | 1.06 | 1658.8 3 | 1.11 |
| MARKET RESEARCH | 75.03 | 0.06 | 95.30 | 0.07 | 131.59 | 0.10 | 117.67 | 0.08 | 142.51 | 0.10 | 154.21 | 0.10 |
| B) FIRM-SPECIFIC HUMAN CAPITAL | | | | | | | | | | | | |
| CONTINUING VOCATIONAL TRAINING APPRENTICE TRAINING | 732.51 | 0.60 | 772.55 | 0.60 | 812.21 | 0.60 | 833.41 | 0.60 | 861.74 | 0.60 | 887.77 | 0.60 |
| C) ORGANIZATIONAL STRUCTURE | | | | | | | | | | | | |
| PURCHASED | 745.65 | 0.61 | 895.87 | 0.69 | 1231.0 1 | 0.91 | 884.68 | 0.64 | 1229.6 7 | 0.85 | 2372.1 4 | 1.59 |

| | | | | | | | | | | | | |
|-------------|---------|------|---------|------|----------|------|----------|------|----------|------|----------|------|
| OWN ACCOUNT | 20.77 | 0.02 | - | - | 26.43 | 0.02 | 31.19 | 0.02 | 34.18 | 0.02 | 39.14 | 0.03 |
| TOTAL | 8608.27 | 7.04 | 9727.16 | 7.52 | 10706.06 | 7.91 | 10871.52 | 7.84 | 11231.16 | 7.79 | 12449.94 | 8.35 |

TABLE 3 COMPARES THE PORTUGUESE RESULTS WITH THE RESULTS FROM OTHER COUNTRIES. INVESTMENT IN INTANGIBLES HAS A SIMILAR INFLUENCE IN THE PORTUGUESE ECONOMY AS IN THE ECONOMIES OF THE DEVELOPED COUNTRIES INCLUDED IN THE TABLE. PORTUGAL, A COUNTRY WITH LOWER DEVELOPING LEVELS AND WITH AN INDUSTRIAL STRUCTURE LESS KNOWLEDGE INTENSIVE, ALSO DEPENDS HEAVILY ON THE INVESTMENTS IN INTANGIBLE ASSETS.

TABLE 3 - SPENDING ON INTANGIBLE ASSETS IN THE MARKET SECTOR (% GDP)

| TYPE OF INTANGIBLE INVESTMENT (PERCENTAGE OF GDP) | GERMANY | FRANCE | ITALY | SPAIN | UK | PORTUGAL | US |
|--|-------------|-------------|-------------|-------------|--------------|-------------|--------------|
| | 2004 | 2004 | 2004 | 2004 | 2004 | 2004 | 98-00 |
| 1. COMPUTERIZED INFORMATION | 0.71 | 1.31 | 0.66 | 0.74 | 1.70 | 0.83 | 1.65 |
| A) SOFTWARE | 0.69 | 1.27 | 0.66 | 0.72 | | 0.82 | |
| B) DATABASES | 0.02 | 0.04 | 0.01 | 0.03 | | 0.01 | |
| 2. INNOVATIVE PROPERTY | 3.47 | 3.12 | 2.26 | 2.51 | 3.23 | 4.34 | 4.57 |
| A) R&D, INCLUDING SOCIAL SCIENCES AND HUMANITIES | 1.69 | 1.32 | 0.52 | 0.55 | 1.09 | 1.08 | 2.06 |
| B) MINERAL EXPLORATION AND EVALUATION | 0.00 | 0.02 | 0.04 | 0.04 | 0.04 | 0.40 | 0.19 |
| C) COPYRIGHT AND LICENSE COSTS | 0.20 | 0.32 | 0.10 | 0.19 | 0.21 | 1.34 | 0.81 |
| D) DEVELOPMENT COSTS IN FINANCIAL INDUSTRY | 0.70 | 0.58 | 0.79 | 0.35 | 0.69 | 1.00 | 0.79 |
| E) NEW ARCHITECTURAL AND ENGINEERING DESIGNS | 0.87 | 0.88 | 0.80 | 1.38 | 1.2 | 0.52 | 0.73 |
| 3. ECONOMIC COMPETENCIES | 3.27 | 5.22 | 2.67 | 2.19 | 5.95 | 2.63 | 6.91 |
| A) BRAND EQUITY | 0.84 | 1.51 | 1.19 | 0.58 | 1.59 | 1.16 | 2.53 |
| ADVERTISING EXPENDITURE | 0.69 | 1.24 | 0.91 | 0.33 | 1.2 | 1.06 | 2.33 |
| MARKET RESEARCH | 0.15 | 0.27 | 0.28 | 0.25 | 0.39 | 0.10 | 0.2 |
| B) FIRM-SPECIFIC HUMAN CAPITAL | 1.34 | 1.51 | 1.00 | 0.83 | 2.45 | 0.60 | 1.25 |
| CONTINUING VOCATIONAL TRAINING | 0.67 | 1.25 | 0.69 | 0.73 | | 0.60 | |
| APPRENTICE TRAINING | 0.67 | 0.26 | 0.31 | 0.11 | | - | |
| C) ORGANIZATIONAL STRUCTURE | 1.09 | 2.21 | 0.48 | 0.78 | 1.92 | 0.87 | 3.13 |
| PURCHASED | 0.50 | 0.31 | 0.11 | 0.25 | 0.6 | 0.85 | 0.87 |
| OWN ACCOUNT | 0.59 | 1.90 | 0.37 | 0.53 | 1.31 | 0.02 | 2.26 |
| TOTAL SPENDING | 7.45 | 9.65 | 5.58 | 5.44 | 10.88 | 7.85 | 13.13 |

SOURCES: THE SOURCE OF THE US IS CHS (2005). THE SOURCE OF THE UK IS MH(2006). FOR GERMANY, FRANCE, ITALY AND SPAIN, WE USE A WIDE RANGE OF DATA SOURCES INCLUDING

NATIONAL ACCOUNTS, SURVEYS OF STATISTICAL OFFICES, SURVEYS OF TRADE ASSOCIATIONS AND CORPORATE FINANCIAL REPORTS.

IN CONCLUSION, THIS PAPER PRESENTS PRELIMINARY RESULTS AND ADDS EMPIRICAL EVIDENCE OF THE ROLE OF INTANGIBLE INVESTMENTS ON ECONOMIC GROWTH. IN LINE WITH THE EVIDENCE FROM OTHER COUNTRIES, THE RESULTS FOR PORTUGAL STRESS THE IMPORTANCE OF CONSIDERING THIS KIND OF INVESTMENTS IN GROWTH ACCOUNTING EXERCISES.

References

CORRADO, CAROL, HULTEN, CHARLES AND SICHEL, DANIEL (2005), 'MEASURING CAPITAL AND TECHNOLOGY: AN EXPANDED FRAMEWORK', IN: CORRADO, CAROL, HALTIWANGER, JOHN AND SICHEL, DANIEL (EDS), MEASURING CAPITAL IN THE NEW ECONOMY, NATIONAL BUREAU OF ECONOMIC RESEARCH STUDIES IN INCOME AND WEALTH, VOL. 65, PP. 11–45, THE UNIVERSITY OF CHICAGO PRESS, CHICAGO AND LONDON.

CORRADO, CAROL, HULTEN, CHARLES AND SICHEL, DANIEL (2006), "THE CONTRIBUTION OF INTANGIBLE INVESTMENTS TO US ECONOMIC GROWTH: A SOURCES-OF-GROWTH ANALYSIS", NBER WORKING PAPER. NO. 11948.

EU KLEMS (2008), EU KLEMS DATABASE, MARCH 2008, WWW.EUKLEMS.NET

HAO, JANET X. AND MANOLE, VLAD (2008), "INTANGIBLE CAPITAL AND GROWTH – AN INTERNATIONAL COMPARISON", THE CONFERENCE BOARD, AUGUST.

MARRANO, GIORGIO MAURO AND HASKEL, JONATHAN (2006), "HOW MUCH DOES THE UK INVEST IN INTANGIBLE ASSETS?", WORKING PAPER, NO. 578, QUEEN MARY UNIVERSITY, LONDON.

MARRANO, GIORGIO MAURO, HASKEL, JONATHAN AND WALLIS, GAVIN (2007), "WHAT HAPPENED TO THE KNOWLEDGE ECONOMY? ICT, INTANGIBLE INVESTMENT AND BRITAIN'S PRODUCTIVITY RECORD REVISITED", WORKING PAPER, NO. 603, QUEEN MARY UNIVERSITY, LONDON.

ROMER, P. 1990. ENDOGENOUS TECHNOLOGICAL CHANGE. *Journal of Political Economy*, 98, S71-S102.