# Multiple Market Imperfections, Firm Profitability and Investment*

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**Abstract**

This paper investigates the impact of the interaction between product, labor and financial market imperfections on firms' investment by using a panel data of European firms over the period 1994-2008. It studies the impact of product and labor market regulations on firm investment and how it changes with the degree of financial market imperfections. Findings show that product and labor market regulations negatively affect firm investment by lowering firm profitability. The presence of more efficient financial markets increases firm investment and lowers the negative effects of market regulations.

Keywords: Investment, Regulation Impact, EPL, Financial Market Development.
JEL Classification: D21, D43, E22, E60.

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## Non-technical Summary

In an environment where product, labor and capital markets are imperfect, companies should revise their investment decisions as these market imperfections may affect the cost of external funds as well as the availability of their internal sources of finance.

Market imperfections affect investment through different channels: product and labor market regulations affect firm's investment indirectly through the level of firm profitability. Capital market imperfections, instead, affect firm investment both directly, by increasing firm access to credit (and at a lower cost), and indirectly, through their impact on firm profitability. In this paper we test both these direct and indirect impact by using a rich dataset that combines information on almost 120.000 firms with country level information from eight euro area countries. We consider several indicators of market imperfections. Labor market imperfection is measured by means of the Employment Protection Legislation (EPL) index, according to which higher EPL values mean more rigid labor markets. The degree of product regulation is controlled for by the OECD Regulation Impact indicator (RII) and higher values of this indicator means that a firm faces higher production costs because another sector that provides its products as inputs is heavily regulated. We introduce three alternative measures of financial development: one encompassing indicator of the overall size of capital markets and two more specific indicators of financial efficiency and development, which, respectively, measure the development of the credit market and the activity of financial intermediaries in channelling savings to investors.

Empirically, our strategy is twofold. First, we investigate the role of market imperfections on firm profitability. We expect that labor and product market imperfections have a negative impact on firm profitability, and then on investment. As for capital market imperfections, a positive role played by firms' capacity to generate internal funds is expected, while the degree of financial market development might generate two opposite effects on profitability. On one hand, a more developed financial market may lead to more competitive markets, and thus to lower profitability in financially dependent sectors. On the other, more efficient financial markets are expected to foster firm profitability and

investment by decreasing costs of credit access. The final impact of financial development and efficiency depends on which of these two opposite effects prevails. Second, a dynamic investment model is estimated by means of GMM techniques. It is assumed that product, labor market and financial market imperfections affect firms' profitability, and through it investment, while financial market imperfections also influence investment directly.

Our findings show that market regulations hamper profitability and, in turn, investment. As for capital market imperfections, estimates show that the overall effect on investment of an improved access to external funds and higher levels of internal liquidity is positive. Finally, interactions between labor, product and financial markets show that in the presence of more efficient financial markets, the (indirect) negative impact of market regulations on firm investment is lower.

# 1 Introduction

This paper addresses the role of the interaction between product, labor and financial market imperfections on firms' investment by using a panel dataset containing balance sheet information on European firms and other country-level information on financial-, labor- and product-market regulations from 1994 to 2008.

Economic literature on the role of market imperfections on investment is large, but fragmented. Traditionally, investment models take each type of market imperfection in isolation with respect to the other imperfections. Therefore, for instance, there is substantial theoretical and empirical literature analyzing the role of financial constraints or financial development on firms' investment (for instance, Fazzari *et al.*, 1988; Kaplan and Zingales, 1997; Levine, 2005). Still limited is instead the number of papers that consider how investment is affected by the contemporaneous presence of market imperfections. Recently, some authors started analyzing investment decisions in the contemporaneous presence of labor and financial market imperfections (Calcagnini *et al.*, 2009; Cingano *et al.*, 2010; Calcagnini *et al.*, 2013).[1]

This paper improves on existing literature by analyzing the simultaneous presence of product, financial and labor market imperfections on firms' investment by using a large panel dataset that combines firm data with country level information. To our knowledge, this paper is the first that attempts to capture the effects of the simultaneous presence of multiple market imperfections on firm profitability and investment.

Balance sheet data come from Amadeus, produced by Bureau van Dijk, while market imperfection information comes form several sources.

Labor market imperfection is measured by means of the Employment Protection Legislation (EPL) index (Venn, 2009) according to which higher EPL values mean more rigid labor markets.

The degree of product regulation is controlled for by the OECD Regulation Impact indicator (RII). It measures the "knock-on" effects of non-manufacturing regulation

[1] Example of papers that study the effects of the contemporaneous presence of markets imperfections are Nickell and Nicolitsas, 1999; Belke and Fehn, 2000; Arnold, 2002; Blanchard and Giavazzi, 2003; Spector, 2004; Rendon, 2004; Wasmer and Weil, 2004; Povel and Raith, 2004; Amable and Ekkehard, 2005; Fiori *et al.*, 2007; Griffith *et al.*, 2007. However, they are not concerned with investment decisions.

on the cost structures faced by firms that use the output of non-manufacturing sectors as intermediate inputs in the production process: higher values of the RII mean a higher production costs (Conway and Nicoletti, 2006). RII is used for at least three reasons. First, non-manufacturing sectors cover around two thirds of economic activity and, in terms of productivity growth and employment, are the most dynamic part of the economy in many OECD countries. Second, most of economic regulations regards non-manufacturing sectors. Moreover, because import penetration is much more limited in these sectors than in manufacturing sectors, final and intermediate consumers of non-manufacturing products have little alternative than to purchase these products on the domestic market. Therefore, domestic regulations are most relevant for economic activity and the consumers' welfare. Finally, empirical evidence on how the regulation in non-manufacturing sectors that produce intermediate inputs affect firm profitability and investment is scanty. [2]

Capital market imperfections, caused by asymmetric information, incentive problems and transaction costs, make external funds more expensive than internal funds, and give rise to the existence of financing constraints. Following the pioneeristic work of Fazzari *et al.* (1988), capital market imperfections are conventionally controlled for by firm-level liquidity indicators (cash-flow, etc.) that are added as explanatory variables in empirical investment models.[3] Capital market imperfections can be thought of as the sum of firm- (idiosyncratic) and country-level components. In a cross-country analysis of firm investment decisions, keeping the two components separated would provide a more correct way to specify empirical models and a better description of the role of this type of market imperfection on investment. Therefore, empirical profitability and investment models in this paper include among the regressors both idiosyncratic liquidity variables

[2] Research on the role of product market regulation has mainly focused on its direct effects on economic performance, i.e: the allocation of resources between sectors and between firms; the productivity of existing firms; the pace of productivity growth (Schiantarelli, 2005). Regulatory reforms that imply a reduction in entry barriers, in the markup of prices over costs and in adjustment costs tend to increase investment (Alesina *et al.*, 2005). Recently, Barone and Cingano (2011) find that lower service regulation has non-negligible positive effects on the value added, productivity and export growth rates of service-intensive users. For a survey of the literature on regulation and economic performance see Rincon-Aznar *et al.* (2010) and Arnold *et al.* (2011).

[3] Some authors are critical towards this popular approach. See Erickson and Whited (2000); Bond *et al.* (2004); Whited (2010); Moyen (2004).

and country-level financial variables, such as the size of capital markets, or measures of financial efficiency and financial development (ECB, 2013).[4]

To study the effects of multiple market imperfections on investment, this paper follows a two-step strategy as in Griffith *et al.* (2007).

In the first step, the role of market imperfections on firm profitability is studied. Based on previous considerations, it is expected that labor and product market imperfections have a negative impact on firm profitability, and then on investment. As for capital market imperfections, a positive role played by firms' capacity to generate internal funds is expected, while the degree of financial market development might generate two opposite effects on profitability. On one hand, a more developed financial market may lead to more competitive markets, and thus to lower profitability in financially dependent sectors, even when it reduces the number of firms and increases standard market concentration indexes (Dellas and Fernandes, 2007). On the other, more efficient financial markets are expected to foster firm profitability and investment by decreasing costs of credit access (Rajan and Zingales, 1998). The final impact of financial development and efficiency depends on which of these two opposite effects prevails.

In the second step a dynamic investment model is estimated by means of GMM techniques. The extent of product and labor market regulations on firm's investment are captured by the level of firm profitability. Capital market imperfections, instead, affect firm investment both directly, by increasing firm access to credit (and at a lower cost), and indirectly, through its impact on firm profitability.

Empirical findings show that labor and product market regulations reduce firm profitability, and consequently investment. As for capital market imperfections, estimates show that the overall effect on investment of an improved access to external funds and higher levels of internal liquidity is positive. Finally, interactions between labor, product and financial markets show that in the presence of more efficient financial markets, the (indirect) negative impact of market regulations on firm investment is lower.

[4]It is expected that the influence of idiosyncratic variates, such as the cash-flow, on investment also depends on the degree of countries' financial development (Love, 2003; Becker and Sivadasan, 2010). Indeed, the correlation coefficient between firm liquidity (i.e., total cash-in-hand available to the firm) and an index of financial development (i.e., financial efficiency), as shown in Tables 2 and 3, is -0.77 and statistically significant at the 1% probability level.

These results have important policy implications for the ongoing debate surrounding market deregulations. While product market regulation hampers competition and makes the cost of inaction low, inflexible employment protection legislation reduces both firms' incentives to experiment with uncertain growth opportunities and the reallocation of labor to more productive uses (Biosca, 2010). Thus, the debate on Employment Protection needs to consider not only its impact on employment flows, but also its role on investment. As for financial market imperfections, estimates show that improvements in credit markets should stimulate firm investment by reducing the cost of external funds and by lowering the negative impact of market regulations on investment.

The paper is organized as follows. Section 2 describes the data used, while Section 3 the empirical models and strategy. Session 4 discusses the findings, and Session 5 concludes.

## 2 Data Sources and Descriptive Statistics

The dataset contains observations on multiple phenomena observed over the 1994-2008 period for eight European countries (Belgium, Germany, Spain, Finland, France, Italy, Netherlands, and Portugal) and a variable number of firms. It includes accounting information at firm level and country-level indicators of market regulations that vary over time across countries or industries.

**Firm Data**

We use the entire universe of the Bureau van Dijk (hereinafter BvD) Amadeus database for the accounting data (both balance sheets and income statements). Amadeus is a comprehensive, pan-European database containing accounting information. BvD collects accounting information directly from a variety of sources, such as official registers, regulatory bodies, annual reports, private correspondence, company websites and news reports, and indirectly from BvD associated information providers. It further harmonizes the financial accounts to allow cross-country comparisons. There are several studies that have analyzed the limitations, but also the benefits of the Amadeus database[5]. For

[5]See for instance Ferrando *et al.* (2013).

instance, although Amadeus includes companies regardless of their size, limited coverage may still occur because the degree of company accounts filing and publication requirements differ between countries. This would imply a sample selection bias towards countries with more demanding accounting standards. However, one advantage of Amadeus is that it includes firms that are mostly private, increasing its country representativeness in comparison with datasets based only on listed companies. The dataset includes also many SMEs which represent the backbone of the European economy and which are particularly targeted from market imperfections in their daily activity. Another well-known bias of the database is related to the practice of BvD to restrict the release of the financial statements to at most the preceding ten accounting years of each firm. Further, BvD removes a firm after at least five years of no reporting data. To eliminate this potential survivorship bias, we compile our database by collecting accounting information from each annual release retrospectively so that we can have the complete history of data for all firms across the entire sample period. The original dataset contains end-of-year accounting information for the period 1993–2008. For our analysis we drop the first one year because of poor coverage, and draw a 15 % random sample for computational reasons. We eliminate observations when there are inputting mistakes (e.g., negative total assets) and focus our analysis on eight non-financial sectors: 1) manufacturing, 2) construction, 3) post and telecommunication, 4) computers and related activities, 5) R&D, 6) other business activities, 7) wholesale and retail trade and 8) transport and storage. We keep firms with at least three years of observations, so as to have enough information to analyze the investment behavior. We winsorize all variables at the top and bottom 1 % of their distribution within each country and sector. After performing our data filtering, we end up with an unbalanced panel of 117,072 firms and 569,980 firm-year observations over the 1994–2008 period. The final sample contains eight euro area countries (Belgium, Finland, France, Germany, Italy, Netherlands, Portugal, and Spain). Table 1 shows the sample coverage. One third of the total sample is made up of Spanish firms and together with French and Italian firms represent 85 % of the entire sample. Firm size varies substantially across countries. The mean values of real total

assets (Size) in our sample are € 3,168 thousands (hereinafter th) with the lowest mean value for Portuguese firms (€1,180 th) and the highest for Dutch firms (€98,659 th). On average firms are 15 years old, with Dutch firms being on average 34 years old and Spanish firms around 12 years old.

Table 1: **Sample characteristics**
The sample includes all non-financial corporations with accounting information for at least three years over 1994-2008

| **Country** | **No obs** | **No firms** | **Size (€th)** | **Age** | **Freq** |
|---|---|---|---|---|---|
| BE | 10,946 | 1,565 | 19,902 | 25 | 1.9 |
| DE | 7,609 | 2,283 | 20,548 | 31 | 1.3 |
| ES | 196,011 | 33,926 | 1,180 | 12 | 34.4 |
| FI | 13,494 | 2,733 | 2,061 | 16 | 2.4 |
| FR | 140,643 | 23,525 | 1,283 | 16 | 24.7 |
| IT | 144,195 | 34,500 | 3,212 | 16 | 25.3 |
| NL | 3,230 | 574 | 98,659 | 34 | 0.6 |
| PT | 53,852 | 17,966 | 771 | 16 | 9.4 |
| Total | 569,980 | 117,072 | 3,168 | 15 | 100 |

*Source:* Amadeus Bureau van Dijk.

Table 2 shows descriptive statistics of all variables of interest for this paper. Profitability (PROF) is defined as the ratio between operating profit/loss and fixed assets.[6] The median euro area firms' operating profits is 26 % of their fixed assets, where Finnish and French firms show the highest level of profitability, while Portuguese and Spanish the lowest. These figures are in line with those documented by Ferrando *et al.* (2013) for the same countries. Profitability and investment rates (I/K) are positively correlated, ranking countries in the same order with the exception of Finland, for which the median investment rate is relatively low with respect to previous studies. Looking at the cash holding-to-total-assets ratio (LIQ), French and Finnish firms are characterized by the highest median values, while Dutch firms the lowest (almost one fifth compared to Finnish firms).[7] Overall, Spain and Portuguese show the lowest levels of capital expenditures.

[6]Most of the firms in the BvD Amadeus database are not listed; thus the construction of firm marginal or average $q$ is not feasible. It is assumed that PROF is a proxy for $q$.

[7]Cash flow might not efficiently measure the extent to which investment depends on internally generated funds. Indeed, investment may depend on the availability of other, less volatile, liquid assets. See Coluzzi *et al.*, 2012.

Table 2: **Summary statistics**

This table reports summary statistics at country level of the variables included both in the profitability and investment models: firm profitability (PROF), investment rate (I/K), and cash-to-total-assets (LIQ). All variables are winsorized at the 1st and 99th percentiles of their distribution within each country. Please refer to Appendix 1 for all variables definitions.

| **Country** | **Statistics** | **PROF** | **I/K** | **LIQ** |
|---|---|---|---|---|
| BE | obs | 10,946 | 9,442 | 10,303 |
| | mean | .715 | .261 | .180 |
| | median | .277 | .199 | .127 |
| | sd | 1.465 | .232 | .164 |
| DE | obs | 7,609 | 6,221 | 7,290 |
| | mean | .732 | .296 | .258 |
| | median | .296 | .211 | .203 |
| | sd | 1.345 | .273 | .199 |
| ES | obs | 196,011 | 153,176 | 178,678 |
| | mean | .501 | .187 | .133 |
| | median | .195 | .112 | .079 |
| | sd | 1.031 | .225 | .148 |
| FI | obs | 13,494 | 10,414 | 12,926 |
| | mean | 1.090 | .208 | .289 |
| | median | .426 | .125 | .227 |
| | sd | 1.869 | .251 | .225 |
| FR | obs | 140,643 | 122,028 | 130,889 |
| | mean | .855 | .280 | .271 |
| | median | .341 | .243 | .221 |
| | sd | 1.558 | .230 | .196 |
| IT | obs | 144,195 | 117,732 | 132,352 |
| | mean | .766 | .284 | .281 |
| | median | .312 | .198 | .194 |
| | sd | 1.311 | .279 | .242 |
| NL | obs | 3,230 | 2,139 | 2,775 |
| | mean | .690 | .247 | .098 |
| | median | .296 | .183 | .042 |
| | sd | 1.412 | .214 | .131 |
| PT | obs | 53,852 | 40,362 | 49,372 |
| | mean | .553 | .164 | .173 |
| | median | .190 | .067 | .089 |
| | sd | 1.360 | .246 | .201 |
| Total | obs | 569,980 | 461,514 | 524,585 |
| | mean | .682 | .238 | .215 |
| | median | .256 | .168 | .143 |
| | sd | 1.326 | .249 | .207 |

*Source:* Amadeus Bureau van Dijk.

**Regulation of the labor market**

Different measures of Employment Protection are available to scholars. This paper uses the OECD EPL index (Venn, 2009), Version 1, that accounts for regular and temporary workers.[8] EPL for regular workers is largely determined by employer costs for firing workers with regular contracts; it is measured according to the strictness in the regulations for regular procedural inconvenience, notice and severance pay for no-fault individual dismissals, and difficulty of dismissals. The strictness of EPL for temporary workers mainly refers to hiring practices, such as the type of contracts considered acceptable or the number of successive contracts or renewals. The index is measured both for the fixed-term contracts and for temporary agency workers. The overall EPL index theoretically ranges from 0 to 6.

The first column of Table 3 shows summary statistics of the EPL index. For the eight countries, the index ranges from an average value of 2.03 in Finland to 3.43 in Portugal, and over time showed low variability across countries, with the exception of Italy where it declined from 3.57 to 1.82. Overall, as documented in Figure 1, EPL declined steadily from the 90s, but the deregulation process has been uneven across countries.

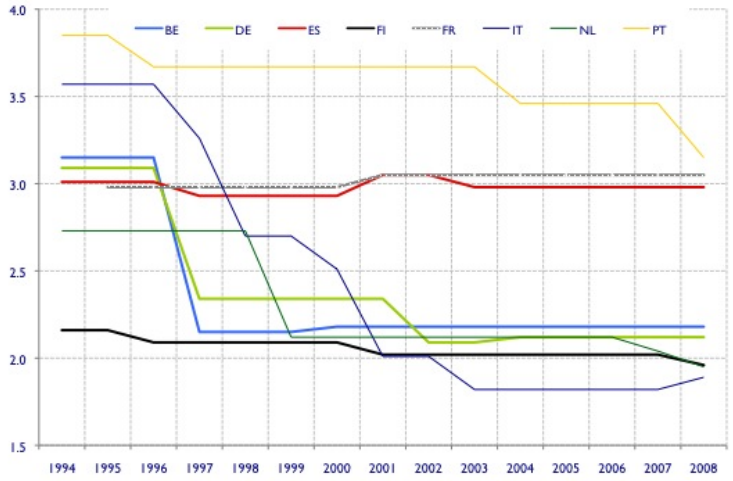
**Regulation of the product market**

Imperfections on the product market are proxied by the OECD Regulation Impact Indicators (RII) (OECD, 2011). These indicators measure the "knock-on" effects of non-manufacturing regulation on the cost structures faced by firms that use the output of non-manufacturing sectors as intermediate inputs in the production process. In any given country the magnitude of these "knock-on" effects of non-manufacturing regulation on the economy depends on two factors:

- the extent of anti-competitive regulation in non-manufacturing sectors, and
- the importance of these sectors as suppliers of intermediate inputs.

[8] Version 2 was excluded from this study, even though it also accounts for collective dismissal, because the series starts in 1998.

Figure 1: Employment Protection Legislation Index by Country: 1994-2008




*Source:* OECD.

Using total input-output coefficients, the sectoral RII indicators in each country are calculated as follows :

$$RII_{k,t} = \sum_{j} NMR_{j,t} * w_{k,j}$$

where the variable $NMR_{j,t}$ is an indicator of anti-competitive regulation in non-manufacturing sector j at time t, and the weight $w_{j,k}$ is the total input requirement of sector k for intermediate inputs from non-manufacturing sector j.

Higher values of the RII means that a firm faces higher production costs because another sector that provides its products as inputs is heavily regulated. Furthermore, higher regulation in the intermediate sectors may affect the costs of entry for new firms that use these inputs, how firms outsource these inputs, the work organization within the firm, the resource allocation between firms and, finally, the scope for the associated productivity improvements.[9]

The second column in Table 3 shows RII values. Differences in the RII across countries are more contained but more persistent than in the EPL case. Netherlands and Germany are the two countries with the lowest mean RII, France and Belgium with the highest. During the 1994-2008 period, RII decreased in all countries, but Portugal (see Figure 2).

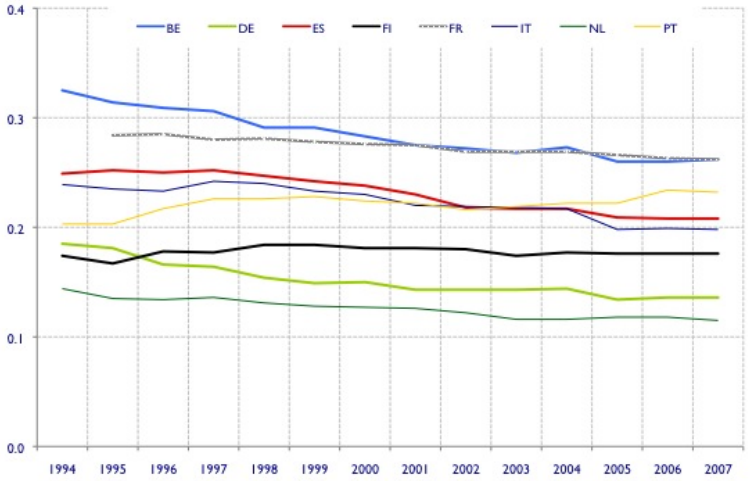
**Indicators of financial development**

Following previous studies, this paper uses three different measures of financial development: the size of capital markets, financial efficiency, and financial development.

Levine and Zervos (1998) shows that the size of capital markets is a useful summary statistic of a country's degree of financial development. Additionally, Levine (2002) shows that both the size of domestic securities markets and the amount of bank lending to the non-bank private sector positively affect growth. Hence Capital Market Size (CAP MK) is calculated as the amount of outstanding stocks, bonds and bank loans over GDP (ECB, 2013). Column 5 in Table 3 shows the CAP MK values across countries. The Netherlands has the largest capital market among the eight European countries, while Spain, Finland and Portugal are the three countries that experienced strongest growth in

[9]See http://www.oecd.org/eco/reform/45654705.pdf for a description of the RII indicator.

Figure 2: Regulation Impact Indicator by Country: 1994-2008




*Source:* OECD.

their capital markets as proxied by the difference between the maximum and minimum CAP MK values.[10]

The other two measures of financial development come from the World Bank financial structure dataset (Beck *et al.*, 2009).

Financial Development (FIN DEV) is a measure of the relative importance of deposit money banks relative to central banks and it is calculated as the ratio between deposit money and Central Bank assets. This indicator of financial development could be seen as a specific part of the encompassing indicator on the size of capital markets - the part related to the development of the credit market- and has been used as a measure of financial development by, among others, Levine *et al.* (2000). Specifically, countries where deposit money banks have a larger role in financial intermediation than central banks can be considered as having higher levels of financial development, and the relationship between Deposit Money vs. Central Bank Assets and economic growth is positive (Levine and Zervos, 1998). FIN DEV shows the lowest cross-country variability among the three financial development indicators: Portugal shows the highest value, Italy the lowest (see Table 3, column 6)

Financial Efficiency (FIN EFF) is a measure of the activity of financial intermediaries and is calculated as the ratio of private credit by deposit money banks and other financial institutions to GDP. This indicator measures the activity of financial intermediaries in channeling savings to investors (Levine and Zervos, 1998; Levine *et al.*, 2000). Countries with higher levels of private credit to GDP have been shown to grow faster and experience faster rates of poverty reduction (Beck *et al.*, 2007). FIN EFF shows a cross-country variability similar to CAP MK and countries with larger capital market size also show, on average, more developed financial intermediaries (see Table 3, column 7).

# 3 Empirical Models

There at least two ways to study the effects of market imperfections on investment. On one hand, one might start from a "standard" investment model and add to it variates that

[10]However, Finland experienced a smaller contraction of its capital market than the other countries, given that it already witnessed a story of a credit-led boom-bust cycle during the 90s and a strong financial crisis at the end of the 90s.

Table 3: **Summary statistics of the market imperfection variables**
This table reports summary statistics of the indicators of employment protection index (EPL), regulation impact index (RII), capital market size (as the sum of outstanding stocks, bonds and bank loans, CAP MK), financial development index ( as deposit money banks relative to central bank assets, FIN DEV) and financial efficiency (private credit by deposit money banks and other financial institutions divided by GDP, FIN EFF).

| Country | Statistics | EPL | RII | CAP MK | FIN DEV | FIN EFF |
|---|---|---|---|---|---|---|
| BE | min | 2.15 | .099 | 1.16 | .991 | .714 |
| | max | 3.15 | .563 | 1.88 | .998 | .937 |
| | mean | 2.34 | .283 | 1.51 | .995 | .767 |
| DE | min | 2.09 | .029 | 1.26 | .994 | .962 |
| | max | 3.09 | .454 | 1.89 | .999 | 1.17 |
| | mean | 2.18 | .141 | 1.67 | .998 | 1.1 |
| ES | min | 2.93 | .043 | 1.04 | .96 | .704 |
| | max | 3.05 | .556 | 3.27 | .995 | 1.88 |
| | mean | 2.98 | .222 | 2.2 | .984 | 1.2 |
| FI | min | 1.96 | .043 | 1.03 | .985 | .501 |
| | max | 2.16 | .339 | 3.25 | 1 | .805 |
| | mean | 2.03 | .178 | 2.07 | .998 | .648 |
| FR | min | 2.98 | .049 | 1.3 | .991 | .81 |
| | max | 3.05 | .495 | 2.32 | .998 | 1.07 |
| | mean | 3.03 | .271 | 1.88 | .995 | .908 |
| IT | min | 1.82 | .052 | .78 | .878 | .538 |
| | max | 3.57 | .551 | 1.63 | .975 | 1.03 |
| | mean | 2.04 | .212 | 1.37 | .951 | .841 |
| NL | min | 1.95 | .03 | 1.59 | .994 | .923 |
| | max | 2.73 | .37 | 3.38 | 1 | 1.93 |
| | mean | 2.25 | .124 | 2.71 | .998 | 1.47 |
| PT | min | 3.15 | .049 | .682 | .976 | .613 |
| | max | 3.85 | .586 | 2.7 | .999 | 1.72 |
| | mean | 3.43 | .229 | 2.31 | .999 | 1.5 |
| Total | min | 1.82 | .029 | .682 | .878 | .501 |
| | max | 3.85 | .586 | 3.38 | 1 | 1.93 |
| | mean | 2.75 | .23 | 1.9 | .981 | 1.05 |

*Source:* OECD, ECB, World Bank Financial Structure Dataset.

measure market imperfections. On the other, one still assumes that some measures of market imperfections directly influence investment, while all or some of them indirectly affect capital accumulation through another variable already present in the "standard" model. This paper follows this second road and assume that product, labor market and financial market imperfections directly affect firms' profitability, and through it investment. Further, it also assumes that financial market imperfections directly influence investment.

This approach is implemented by estimating two separate models: one concerning firm profitability, and the other an investment equation. Given the dynamic nature of the latter, the investment equation is estimated by means of GMM techniques.

### 3.1 Market regulations and firm profitability

The first model assumes that firm profitability (PROF) is a function of labor, product and financial market imperfections, and other firm characteristics, as follows:

$$PROF_{i,s,j,t} = \beta_0 + \beta_1 RII_{s,j,t} + \beta_2 EPL_{j,t} + \beta_3 FMD_{j,t} + \beta_4 LIQ_{i,s,j,t} + X'_{i,j,s,t}\beta_5 + u_{i,t} + \varepsilon_{i,t} \quad (1)$$

where $i$ refers to the firm, $j$ to the country, $s$ to the industry and $t$ to the time period. RII, EPL and LIQ are variates that, as described above, controls for regulations in the product and labor markets, and firms' financial conditions. FMD captures countries' financial market development and, alternatively, is defined as Capital Market Size (CAP MK), Financial Efficiency (FIN EFF), or Financial Development (FIN DEV). Regulation indexes and FMD variates are beginning of period, to control for the fact that regulations take some time to produce economic effects and the potential endogeneity of LIQ. X is a vector of control variables. We control for firm characteristics such as firm size (ASSET, the natural log of a firm total assets) and age ( AGE, number of years since incorporation), and the sector of activity. Finally, $u_{i,t}$ and $\varepsilon_{i,t}$ are, respectively, between-firm and within-firm error terms of the random effects model.[11]

[11]Profitability is modeled as characterized by random effects because the firm sample used to estimate model (1) was randomly drawn from a larger firm population. The presence of random effects is tested by the Breusch and Pagan Lagrangian Multiplier (BP LM) test that fails to reject the null of no need of random effects ($Var(u) = 0$), as shown at the bottom of Table 4.

The estimated coefficients of RII and EPL are expected to be negative ($\beta_1 < 0$, and $\beta_2 < 0$). As long as RII increases, the effects of the anti-competitive regulations in the non-manufacturing sectors are higher, and intermediate input costs increase, thus firm profitability decreases. Higher EPL levels are also expected to lower firm profitability due to higher labor costs.

The coefficient of LIQ is expected to be positive ($\beta_4 > 0$): more liquidity means that a firm is able to react to sudden changes in its environment and, thus, reduces exposure to the risk of being unable to meet short-term financial commitments (Goddard *et al.*, 2006).

The estimated coefficient of FMD may be either negative ($\beta_3 < 0$), if a more developed financial market lead to more competitive markets (Dellas and Fernandes, 2007), or positive ($\beta_3 > 0$), if efficient financial markets decrease the costs of credit access (Rajan and Zingales, 1998). If both effects co-exist, the final impact of FDM on firm profitability depends on which of these two opposite effects prevails.

The estimated coefficient of ASSET is expected to be positive if firms gain advantages from scale or scope economies as they expand in size. Alternatively, if growth tends to lead to diseconomies of scale, the size-profit relationship could be negative (Goddard *et al.*, 2006). A negative sign is expected for the coefficient of AGE: in their early years, firms obtain significant increases in profitability, while mature firms seldom experience low profitability levels (Warusawitharana, 2012).

Finally, model (1) includes country- and sector- specific year effects. Year-country and year-industry interactions are interpreted as national and industry-specific business cycles and are considered as indicators for the relevance of macroeconomic environment in explaining profitability variation (Schiefer and Hartmann, 2013).

### 3.2 Market regulations and firm investment

The second model (the "second step") aims at capturing the effects of market imperfections on firm investment. As described at the beginning of this Section, it is assumed that product, labor market and financial market imperfections affect firms' profitability, and through it investment, while financial market imperfections also influence investment

directly.

The empirical investment specification is as follow:

$$\begin{aligned} I/K_{i,s,j,t} &= \gamma_0 + \gamma_1 I/K_{i,s,j,t-1} + \gamma_2 I/K_{i,s,j,t-2} + \gamma_3 PROF_{i,s,j,t} + \gamma_4 FMD_{j,t} \\ &+ \gamma_5 PROF_{i,s,j,t} * FMD_{j,t} + \gamma_6 LIQ_{i,s,j,t} + \gamma_7 PROF_{i,s,j,t} * LIQ_{i,s,j,t} \\ &+ C'_{i,j,s,t}\gamma_8 + \varepsilon^u_{i,t}. \end{aligned} \tag{2}$$

where, as above for equation (1), $i$ refers to the firm, $j$ to the country, $s$ to the industry, and $t$ to the time period.

Equation (2) states that investment is a function of firm profitability, two measures of the degree of financial market imperfections, and their interaction with profitability. These two interaction variables (PROF*FMD, PROF*LIQ) aim at describing how the contemporaneous presence of product, labor and financial market imperfections affect firm investment because, as shown in equation (1), profitability is also a function of product and labor market imperfections.

Equation (2) also controls for the presence of the autoregressive process in observed investment by adding the dependent variable lagged twice.

Finally, vector C includes control variables. Specifically, it is assumed that changes in the user cost of capital among firms can be controlled for by country- and sector- specific year effects. More generally, these variables control for the heterogeneous environment in which firms operate.

Technically, given its dynamic structure, the endogeneity of PROF and the likely presence of unobserved firm-specific effects, equation (2) is estimated by means of the system GMM estimator.[12] One advantage of the GMM method is that it allows to directly instrument endogenous variables (i.e., PROF) by defining appropriate instru-

[12]See Blundell *et al.* (2000), and Blundell and Bond (1998). This method uses equations in first-differences for which endogenous variables lagged two or more periods will be valid instruments, provided there is no serial correlation in the time varying component of the error term. This assumption is tested by performing tests for serial correlation in the first differences residuals. The equations in differences are combined with the equations in levels, for which lagged differences of the variables are used as instruments. AR(1) and AR(2) are the empirical realizations of the test statistics of first and second order residual autocorrelation. Significance means that the null hypothesis of no autocorrelation is rejected. The absence of AR(2) is the necessary condition for unbiased and efficient estimates.

ments. In the case of equation (2), appropriate instruments are all explanatory variables of equation (1) and standard errors of the estimated coefficients are unbiased. Thus, by combining estimated coefficients of equation (2) with those of equation (1), the overall effects on investment of the three types of market imperfections can be calculated and statistical test run.

# 4 Results

## 4.1 Market imperfections and firm profitability

Table 4 shows the estimated coefficients of model (1). Columns (1) to (3) control for the capital market imperfections by using the three alternative measures of country level FMD i.e.: Capital Market Size, Financial Development and Financial Efficiency, respectively. Columns (4) to (6) also control for the firm capability to generate internal funds by means of the variable LIQ.

Overall, the estimates show that, as expected, EPL and RII reduce firm profitability as higher EPL and RII levels imply higher firm costs. As for FMD, indifferently from the type of variable used, it also decreases firm profitability. This finding suggests that more developed financial markets increase competition among firms, thus reducing firm rents and profits. This effect more than counterbalances the potential positive effect on firm profitability that should be driven by lower financing costs in the presence of more developed financial markets.

LIQ positively affects firm profitability. By reducing firm exposure to the risk of being unable to meet short-term financial commitments, liquidity produces a beneficial effect on profitability, i.e. liquid firms adapt more easily to changing circumstances in an increasingly volatile competitive environment.

Among control variables, both AGE and ASSETS negatively affect firm profitability. While the first finding is in line with the firm growth cycle according to which mature firms face slow declines in profitability, the second one reveals that, on average, larger firms experiment diseconomies of scale and X - Inefficiency that, in turn, lower firm profitability.

Table 4: **The impact of imperfect markets on firm profitability.**
Estimation by XTREG using STATA 10 SE package.

| VARIABLES | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| EPL | -0.045*** | -0.060*** | -0.032*** | -0.017*** | -0.060*** | -0.006 |
| | (0.006) | (0.006) | (0.006) | (0.006) | (0.006) | (0.006) |
| RII | -0.893*** | -0.912*** | -1.153*** | -1.017*** | -0.912*** | -1.219*** |
| | (0.059) | (0.060) | (0.059) | (0.061) | (0.060) | (0.061) |
| CAP MK | -0.188*** | | | -0.146*** | | |
| | (0.007) | | | (0.008) | | |
| FIN DEV | | -1.441*** | | | -1.441*** | |
| | | (0.157) | | | (0.157) | |
| FIN EFF | | | -0.504*** | | | -0.391*** |
| | | | (0.012) | | | (0.013) |
| LIQ | | | | 1.107*** | 1.123*** | 1.067*** |
| | | | | (0.019) | (0.019) | (0.019) |
| AGE | -0.002*** | -0.002*** | -0.002*** | -0.002*** | -0.002*** | -0.002*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| ASSETS | -0.027*** | -0.013*** | -0.028*** | -0.013*** | -0.013*** | -0.014*** |
| | (0.002) | (0.003) | (0.002) | (0.002) | (0.003) | (0.002) |
| Constant | 1.218*** | 2.289*** | 1.320*** | 0.905*** | 2.289*** | 0.989*** |
| | (0.040) | (0.165) | (0.040) | (0.043) | (0.165) | (0.043) |
| *Country-specific year effects* | yes | yes | yes | yes | yes | yes |
| *Industry-specific year effects* | yes | yes | yes | yes | yes | yes |
| BP LM test (*p-value*) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Observations | 569,980 | 524,521 | 569,980 | 524,521 | 524,521 | 524,521 |
| Number of firms | 117,072 | 116,041 | 117,072 | 116,041 | 116,041 | 116,041 |

Standard errors are reported in brackets below coefficients.
*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$ significance levels respectively.

### 4.2 Market imperfections and firm investment

Estimation results for five different specifications of the investment equation (2) are shown in Table 5.[13]

A key issue in estimating equation (2) is the potential endogeneity of the profitability variable that, if not controlled for, may lead to biased and inconsistent results.

For comparative purposes, column (1) shows the base model in which firm profitability is assumed to be as exogenous. All estimated coefficients, with the exception of those of the investment rate dated t-2 and Capital Market Size ($\gamma_2$ and $\gamma_4$, respectively) are statistically significant at conventional probability levels. However, these findings also indicate that model (2) is misspecified: the Sargan test of overidentifying restrictions rejects the hypothesis that the error term in the first-differenced equations is orthogonal to these instruments, and suggests that PROF is endogenous. Indeed, even if (1) does not includes investment as explanatory variable, PROF is weakly endogenous because the disturbances are correlated between equations (1) and (2). For example, investment and firm profitability might be contemporaneously affected by a positive demand shock.

Column (2) shows results when PROF is instrumented with all variables from model (1). The validity of these moment conditions is confirmed by the Sargan statistic, as shown at the bottom of column (2), which suggests that the over identified restrictions that the market regulation variables can be excluded from this regression cannot be rejected.[14]

As expected, investment shows a persistent autoregressive dynamics. Moreover, the profitability coefficient is positive and statistically significant, as well as the estimated coefficient of the variable Capital Market Size.

Furthermore, the liquidity index coefficient is positive and statistically significant. The latter result supports the hypothesis that, on average, firms in our dataset show excess sensitivity to the availability of internal liquidity sources or, equivalently, that

[13]Table 5 presents estimates for a a specification of equation (2) in which the interaction term PROF*FMD is left out of the model because its estimated coefficient is not statistically significant. Estimates are available upon request from the authors.

[14]The two models (1) and (2) generate a triangular system and one does not need to include all exogenous variables of equation (2) as instruments for the profitability (Baltagi, 2002).

financial market imperfections do likely exist.

The interaction term PROF*LIQ captures how the (indirect) impact of multiple market imperfections varies with firm liquidity, measured at the beginning of each year to mitigate potential problems of endogeneity. The estimated coefficient of this variable ($\hat{\gamma}_7$) is negative and statistically significant, and leads to a twofold interpretation.

On one hand, the overall impact of liquidity on investment reveals that investment decisions of more profitable firms are less sensitive to the availability of internal sources of funds. Indeed, by recalling equations 1 and 2, the overall impact of LIQ on I/K (computed as $\frac{\partial(I/K)}{\partial LIQ}$) depends on: its direct impact ($\hat{\gamma}_6$), on its role in determining profitability ($\hat{\gamma}_3 * \hat{\beta}_4$), on its interaction with the profitability itself ($\hat{\gamma}_7 * \hat{\beta}_4 * \overline{LIQ} + \hat{\gamma}_7 * \overline{PROF}$), where $\overline{LIQ}$ and $\overline{PROF}$ are the sample mean values of LIQ and PROF, respectively. As expected, the following F test result rejects the null in favor of a positive impact of LIQ on investment, meaning that the interaction effect does not outweigh the linear effect:

$$\frac{\partial(I/K)}{\partial LIQ} : \underbrace{\hat{\gamma}_6}_{positive} + \underbrace{\hat{\gamma}_3 * \hat{\beta}_4}_{positive} + \underbrace{\hat{\gamma}_7 * (\hat{\beta}_4 * \overline{LIQ} + \overline{PROF})}_{negative} = 0$$

On the other, more efficient financial markets, mitigate the (indirect) negative impact of market regulations on investment. To analyze the overall impact of RII, EPL, and FMD on investment, the following F tests are run:

$$\frac{\partial(I/K)}{\partial RII} : \underbrace{\hat{\gamma}_3 * \hat{\beta}_1}_{negative} + \underbrace{\hat{\gamma}_7 * \hat{\beta}_1 * \overline{LIQ}}_{positive} = 0 \quad (3)$$

$$\frac{\partial(I/K)}{\partial EPL} : \underbrace{\hat{\gamma}_3 * \hat{\beta}_2}_{negative} + \underbrace{\hat{\gamma}_7 * \hat{\beta}_2 * \overline{LIQ}}_{positive} = 0 \quad (4)$$

$$\frac{\partial(I/K)}{\partial FMD} : \underbrace{\hat{\gamma}_3 * \hat{\beta}_3}_{negative} + \underbrace{\hat{\gamma}_7 * \hat{\beta}_3 * \overline{LIQ}}_{positive} + \underbrace{\hat{\gamma}_4}_{positive} = 0 \quad (5)$$

The first terms of each of tests (3), (4) and (5) show that RII, EPL, and FMD negatively affect firm investment by lowering firm profitability. However, the second terms, which capture the role of the interaction between firm profitability and liquidity, suggest that investment of more liquid firms suffers less from multiple market imperfections.

Table 5, bottom of column (2), shows the *p-values* of the above F tests. Results for (3) and (4) reject the null in favor of a negative impact of RII and EPL on investment. Thus, stringent regulations hamper firm profitability by increasing firm costs, and, in turn, lower investment. Diversely, the F test for (5) does not reject the null: overall, the size of capital markets does not affect firm investment decisions. This finding suggests that the impact of capital market imperfections on firm investment is better controlled for by the liquidity index (LIQ) than by the Capital Market Size.

Estimates shown in column (3) and (4) of Table 5 use two alternative indexes of FMD, i.e. Financial Development and Financial Efficiency, respectively. Overall, estimates confirm previous findings. However, this time the F test for (5) rejects the null in favor of a positive impact of these FMD variables on investment. In other words, investment are more responsive to financial efficiency and development than to the capital market size.

Finally, controlling for the potential endogeneity of the interaction term LIQ *PROF does not significantly changes previous findings as shown in column (5) of Table 5.

# 5 Conclusions and Policy Implications

The Lisbon agenda called for EU to become by the end of the current decade "the most competitive and dynamic knowledge-based economy in the world" through reforms to product, labor and capital markets (Griffith *et al.*, 2007).

This paper contributes to the ongoing debate on market regulations by empirically analyzing the impact of product and labor market regulations and credit market imperfections on firm profitability and investment. The findings show that market regulations hamper profitability and, in turn, investment, while the role of financial market development is twofold. On the one side, financial market development generates an increasing competition effect that reduces firm profitability. On the other side, when financial markets are more developed, firms have a better access to credit markets and might finance their investment projects at a lower costs. Thus, financial market development fosters investment. The paper also provide evidence that the size of the labor and product

Table 5: **Fixed Investment Models.**

Estimation by GMM-SYSTEM using STATA 10 SE package two-step results; "Sargan test " is test of the overidentified restrictions (p-value reported); AR(k) is the test statistic for the presence of k-th order serial correlation in the first-differenced residuals, (p-value reported)

| VARIABLES | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| $I/K_{i,t-1}$ | 0.332*** | 0.422*** | 0.427*** | 0.378*** | 0.438*** |
| | (0.020) | (0.051) | (0.053) | (0.044) | (0.049) |
| $I/K_{i,t-2}$ | -0.003 | 0.011 | 0.014 | -0.003 | 0.019 |
| | (0.010) | (0.018) | (0.018) | (0.016) | (0.018) |
| PROF | 0.015*** | 0.383*** | 0.349*** | 0.330*** | 0.320*** |
| | (0.002) | (0.068) | (0.066) | (0.080) | (0.093) |
| LIQ | 0.173*** | 0.663*** | 0.598*** | 0.536*** | 0.477** |
| | (0.052) | (0.113) | (0.105) | (0.126) | (0.218) |
| LIQ *PROF | -0.023*** | -0.756*** | -0.688*** | -0.650*** | -0.537** |
| | (0.006) | (0.132) | (0.127) | (0.155) | (0.263) |
| CAP MK | 0.053 | 0.123* | | | 0.141** |
| | (0.036) | (0.065) | | | (0.064) |
| FIN DEV | | | 2.179** | | |
| | | | (0.876) | | |
| FIN EFF | | | | 0.397*** | |
| | | | | (0.116) | |
| Constant | 0.104** | -0.348 | -2.161** | -0.750*** | -0.395 |
| | (0.050) | (0.451) | (0.907) | (0.256) | (0.426) |
| *Country-specific year effects* | yes | yes | yes | yes | yes |
| *Industry-specific year effects* | yes | yes | yes | yes | yes |
| Arellano-Bond test AR1 (*p-value*) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Arellano-Bond test AR2 (*p-value*) | 0.20 | 0.17 | 0.94 | 0.97 | 0.21 |
| Sargan test (*p-value*) | 0.00 | 0.33 | 0.50 | 0.58 | 0.15 |
| RII F test (*p-value*) | - | 0.000 | 0.000 | 0.000 | 0.000 |
| EPL F test (*p value*) | - | 0.000 | 0.000 | 0.000 | 0.000 |
| FMD F test (*p value*) | - | 0.212 | 0.030 | 0.011 | 0.112 |
| Observations | 246,373 | 244,733 | 244,733 | 244,733 | 244,733 |
| Number of firms | 66,610 | 66,105 | 66,105 | 66,105 | 66,105 |

Robust standard errors are reported in brackets below coefficients.

*** p<0.01, ** p<0.05, * p<0.1

market regulation effects on firm investment varies with the degree of financial market development, as investment of more liquid firms suffers less from multiple market imperfections.

These findings have important policy implications. First, the effect of product market regulations that restrict competition in non-manufacturing sectors is by no means confined to these sectors. These "knock-on" effects of non-manufacturing regulation are likely to have become particularly salient over recent years given the large and increasingly important role of the non-manufacturing sector as a supplier of intermediate inputs in OECD countries (Arnold *et al.*, 2011). Second, the estimates confirm previous findings according to which EPL affect not only labor market variables but also the capital accumulation. Furthermore, the effects of labor and product market regulations vary with the degree of financial market imperfections: they are smaller in the presence of more efficient financial markets, of which firm liquidity might be considered a substitute.

To operate efficiently, many components need to be in place (Haltiwanger 2011). Labor markets need to be sufficiently flexible not only to allow job reallocation from less productive to more productive sectors, but also to reduce firm production costs and allow higher investment rates. Intermediate product markets need to be sufficiently competitive, and this also means lower regulations that, by reducing costs should lead to higher investment and firm growth. This means that regulation has to be designed to provide an appropriate oversight without imposing onerous time and resource costs on firms.

Finally, financial markets need to be efficient and sufficiently developed to provide access to funding to firms that aim at expanding their businesses and to start up firms.

The results of the paper support the effort put forward by the European Institutions to reform markets in recent years.

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## Annex 1. Variable definitions

- AGE is the number of years since incorporation;
- ASSETS is the natural log of total assets (in € mil), expressed in real value. It is used as a measure of firm size;
- I/K is the ratio of capital expenditure at time t to tangible total assets at time t-1. Capital expenditure is computed as the annual change in tangible fixed assets plus depreciation;
- LIQ is the ratio of cash and cash equivalents to total assets;
- PROF is the ratio of operating profits to total fixed assets;
- EPL is the Employment Protection Index, Version 1 (OECD, 2004) . The index includes the costs for employers of firing workers with regular contracts and it is measured according to the strictness in the regulations for regular procedural inconvenience, notice and severance pay for no-fault individual dismissals, and difficulty of dismissals. It also includes the degree of strictness of labour regulations for temporary workers related to hiring practices such as type of contracts considered acceptable or number of successive contracts or renewals. The index is measured both for the fixed-term con- tracts and for temporary agency workers. The overall EPL index ranges theoretically from 0 to 6;
- RII is the sectoral regulation impact index, based on OECD Regulation Impact indicators (Conway and Nicoletti, 2006). This indicator measures the knock-on-

effects of non-manufacturing regulation on the cost structures faced by firms that use the output of non-manufacturing sectors as intermediate inputs in the production process. The index is calculated as follows

$$RII_{k,t} = \sum_{j} NMR_{j,t} * w_{k,j} \tag{6}$$

where the variable $NMR_{j,t}$ is an indicator of anti-competitive regulation in non-manufacturing sector j at time t and the weight $w_{j,k}$ is the total input requirement of sector k for intermediate inputs from non- manufacturing sector j;

- CAP MK is the Capital market size index. The measure is the sum of outstanding stocks, bonds and bank loans as a share of GDP (ECB, 2013);

- FIN EFF is the Financial Efficiency index. It is measured as private credit by deposit money banks and other financial institutions to GDP (from the World Bank Financial Structure Dataset);

- FIN DEV is the Financial Development index. It is measured as Deposit Money to Central Bank Assets (from the World Bank Financial Structure Dataset).