NÚMERO 34 / Dezembro'11

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NOTAS ECONÓMICAS
REVISTA DA FACULDADE DE ECONOMIA DA UNIVERSIDADE DE COIMBRA

NÚMERO 34/Dezembro'11/PREÇO7,5 /ISSN:0872-4733:32

REVISTA DA FACULDADE DE ECONOMIA DA UNIVERSIDADE DE COIMBRA

Ficha técnica

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propriedade	Faculdade de Economia da Universidade de Coimbra Av. Dias da Silva, 165 3004 – 512 COIMBRA – PORTUGAL Tel.: + 351 239 79 05 00 Fax: + 351 239 40 35 11
apoios	**FCT** Fundação para a Ciência e a Tecnologia POCTI (QCA III)
número avulso	
Portugal	7,5 €
outros países	20 €
condições de assinatura	
Portugal	Individual: 15 € Instituições: 22,5 € Estudantes universitários: 12,5 €
outros países	Individual: 40 € Instituições: 50 €
ISSN	0872-4733-32
depósito legal	64932/93

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REVISTA DA FACULDADE DE ECONOMIA DA UNIVERSIDADE DE COIMBRA

sumário

Especialistas que colaboraram na apreciação do mérito científico dos artigos

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Artigos

Input-Output Modelling Based on Total-Use Rectangular Tables: Is this a Better Way?

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abstract

Input-output tables can be presented in different formats, according to three main criteria: 1) symmetric or rectangular format; 2) total or domestic-use flows and 3) valuation prices (basic prices – bp or purchasers' prices – *pp*). Official National Accounts (at least in EU) produce in a regular base a total use rectangular table at *pp* – also known as the Make and Use (M&U) format – that is different from the lay-out upon which traditional input-output models were developed (domestic use, symmetric, *bp*). The problem with this latter one is of course that it is only available at times in many countries. The objective of this paper is to prove (under common hypotheses) the equivalence between two alternative procedures, from the point of view of the results of an input-output model: 1) to convert the M&U input-output table into the traditional format – a domestic-use symmetric table at *bp* – and then implement the model; 2) to perform the direct modelling of the original table (the total-use rectangular table at *pp*). That equivalence is illustrated with Portuguese data for the year 2002.

resumo

Os quadros de Input-output podem obedecer a diferentes formatos, consoante três critérios principais: 1) formato simétrico ou rectangular; 2) inclusão ou não de produtos importados nos fluxos de uso; 3) sistema de valorização de preços (preços de base ou preços de aquisição). Pelo menos na UE, os quadros produzidos numa base regular por parte das Contas Nacionais oficiais são quadros de fluxos totais (incluindo importações), rectangulares e a preços de aquisição. Este é um formato diferente daquele em que os modelos tradicionais de input-output foram desenvolvidos (fluxos domésticos, simétricos, a preços de base). Obviamente, o problema é que, em muitos países, os quadros de input-output com essas características são disponibilizados apenas não regularmente. O objectivo deste artigo é provar a equivalência, sob hipóteses comuns, entre dois procedimentos alternativos: 1) converter a matriz de input-output rectangular no formato tradicional – matriz simétrica, de fluxos domésticos e a preços de base – e só depois implementar o modelo; 2) desenvolver o modelo directamente a partir do quadro original (rectangular, com fluxos totais e preços de aquisição). Esta equivalência é demonstrada usando dados das matrizes portuguesas, para o ano 2002.

JEL Classification: C67, E01.

1. Introduction

Input-output tables can be classified according to three main criteria: 1) symmetric or rectangular format; 2) total use or domestic use flows and 3) valuation of goods and services. As a rule, the classical literature on input-output is based on symmetric matrices, with domestic flows, at basic prices. By a symmetric format we mean that the inner part of the input-output table has the same products or the same industries in its rows and columns. As a hypothesis, the classic Leontief tables assumed that each industry produced one and only one product. In input-output jargon, those tables depict product-by-product or industry-by-industry relationships. Remark, however, that in fact each industry may produce several secondary products beyond its main product that is referred in its denomination. Yet, since the end of the 1960's, when the United Nations introduced the 1968 System of National Accounts, countries are recommended (at the national level) to compile and publish the input-output tables on a rectangular, or Make and Use format as it is known as well. In these tables the above-mentioned classical restrictive hypothesis is avoided. The idea is to combine two tables to depict Supply (or Make) and Use product-by-industry relationships. The Use matrix gives information on product consumption made by industries and final users. As to the Make matrix, its columns depict how the various industries contribute to the products' output, while reading along the rows it gives us the distribution of each industry's output over the several products: the primary product of that industry and its various secondary products. Since the number of products included in the model may be higher than the number of industries, this format is called rectangular.

As for the total or domestic-use criterion that refers to the type of flows represented in the intermediate transactions that are part of the Use table and also in the several components of the final demand. Intermediate consumption of products (made by industries) and final uses (made by households, government, firms and foreign countries) involve the use of products which are not only domestically produced, but are also imported. A total-use table records the whole amount of inputs used, whether these have been produced within the country (or the region, depending on whether we are dealing with a national or a regional model) or imported. Conversely, if intermediate and final use flows are expurgated from the value of imported products, then we are facing a domestic (or intra-regional) use table.

Finally, the third criterion is related to the different prices at which goods and services may be evaluated. Current input-output tables may involve two different price systems: basic prices (*bp*), the closest to the value of production factor costs, or purchasers' prices (*pp*), which include taxes on the products (deducted from subsidies) and trade and transport margins.

Combining these criteria in several manners, many different types of input-output tables can be constructed. However, in practice, the starting point to the construction of these tables is usually the total flow Make and Use (M&U) rectangular table at purchasers' prices, since this is the standard format in which statistical information is gathered and published by official statistical institutes, that follows the recommendations of international National Accounts manuals.

The main issue that this paper deals with is whether there is any benefit, for modelling purposes, in relying upon a domestic use symmetric table, or it is equivalent to implement the model directly from the total use rectangular table. That means that we aim to compare two different procedures for input-output modelling, when the original data is produced and available on a total use rectangular format: 1) firstly convert the table into a domestic use symmetric table at basic prices, and then implement the model or 2) perform the direct modelling of the total use rectangular table at purchasers' prices, *i.e.*, implementing the model on the basis of the table in its original format.

Many authors have thought the first procedure as the most adequate for input-output model applications. For example, in what respects the symmetric feature of the table, the EUROSTAT itself advocates in its Input-output manual that «For analytical purposes a relationship is needed

between the inputs and the outputs irrespective of whether the products have been produced by the primary industry or by other industries as their secondary output» (EUROSTAT, 2002, p. 23); as a consequence, symmetric input-output tables «are compiled mainly to be used in input-output analysis» (p. 230). Concerning the content of the intermediate and final use flows, the same manual states that «the separation of domestically-produced and imported goods and services is of great importance for analytical purposes» (p. 145), leading to the option for domestic flow tables.

However, other authors, such as Madsen and Jensen-Butler (1999), Kauppila (1999) and Piispala (1998), suggest that the direct use of the M&U format has considerable advantages at different levels, namely:

- In the assembling process of the tables, since M&U tables are exempt of additional hypotheses (conversely to product-by-product or industry-by-industry tables), being more directly connected to the data collected by official statistical agencies.
- Make and Use tables are more easily intelligible for potential users of the model, since they resemble reality in a closer way.
- M&U format is more suitable for application in certain fields of research which deal specifically with spatial interaction flows of commodities such as: environmental modelling (for example, when flows of products to be used in different industries are attached with flows of polluting elements, such as CO2) and trade modelling (given that it is easier to incorporate trade statistics, which report trade taking place with products and not with the output of industries, in broad terms).
- Finally, as it will be demonstrated as well in this paper, the direct modelling of the rectangular table is a more timesaving procedure, which can be considered as an advantage of this alternative over the first one (involving the previous transformation into a symmetric table).

This paper is divided into five Sections, including this Introduction. In the next Section, the input-output model based on the M&U framework will be presented. The three main criteria used to classify input-output tables are the scope of Section 3. We proceed there to a detailed discussion of the assumed hypotheses used in the transformation of the M&U format into the classic symmetric domestic-use frame, that may be the same (and must be the same for comparison purposes) that are implicit in the rectangular approach. A practical test will be carried out in Section 4, aiming to compare with Portuguese data the results obtained from both above mentioned procedures of building an input-output model. The last Section presents a summary of the main conclusions.

2. Input-output modelling based on a M&U matrix, with total use flows, at purchasers' prices

In this Section we deal with the rectangular or M&U model, with total-use flows, at purchasers' prices (*pp*) – as it is a less well known procedure of implementing an input-output model –, in order to demonstrate how it can de be directly modelled, avoiding its previous transformation in a symmetric matrix of domestic flows at basic prices (*bp*).

The simplified structure of an M&U matrix, with total-use flows, at purchasers' prices can be illustrated as in Figure 1, in which: $\mathbf{U}^{pp}$ and $\mathbf{V}^{bp}$ represent the Use and the Make matrix. The Use matrix refers to the product intermediate consumption by industries. It is a product-by-industry matrix: its rows refer to products and its columns to industries. It is also of the total-use kind and it is a *pp* matrix. The Make matrix $\mathbf{V}^{bp}$ depicts the industries that produce each product, as primary or secondary production. In Figure 1, industries are along the rows and products in the columns. Although the M&U model works with *pp* flows, this specific matrix is *bp*. $\mathbf{g}^{bp}$ denotes the vector of industry production, at ***bp***; $\mathbf{p}^{pp}$ identifies the vector of product output, at *pp*; $\mathbf{y}^{pp}$ is the vector of products' final use (both domestically produced and imported); $\mathbf{m}$, $\mathbf{d}$ and $\mathbf{l}$, stand for the vectors of product imports, margins and net taxes on products that proceeds either to the transformation of domestic to total supply and from *bp* valuation to *pp*. Finally, $\mathbf{w}$ represents the vector of the industries' value added.

Figure 1 – Make and Use matrix – simplified structure

	Products	Industries	Final Uses	Total
Products	**0**	$\mathbf{U}^{pp}$	$\mathbf{y}^{pp}$	$\mathbf{p}^{pp}$
Industries	$\mathbf{V}^{bp}$	**0**	–	$\mathbf{g}^{bp}$
Value Added	**0**	**w**		
Imports	**m**	**0**		
Margins	**d**	**0**		
Taxes less subsidies	**l**	**0**		
Total	$\mathbf{p}^{pp}$	$\mathbf{g}^{bp}$		

The relationships involved in the M&U setting can be written in algebraic terms. Using matrix and vector notation, the industry balance may be expressed by[1]:

$$\mathbf{g}^{bp} = \mathbf{V}^{bp}\mathbf{i} = \left(\mathbf{U}^{pp}\right)'\mathbf{i} + \mathbf{w}' \tag{1}$$

At product level, the balance can be expressed as:

$$\mathbf{p}^{pp} = \left(\mathbf{V}^{bp}\right)'\mathbf{i} + \mathbf{m}' + \mathbf{d}' + \mathbf{l}' = \mathbf{U}^{pp}\mathbf{i} + \mathbf{y}^{pp} \tag{2}$$

The nuclear part of the M&U table is represented by the shadowed quadrants in Figure 1. Dividing all the elements of $\mathbf{U}^{pp}$ and $\mathbf{V}^{bp}$ by the correspondent column totals $\mathbf{g}^{bp}$ and $\mathbf{p}^{pp}$, we obtain the following partitioned matrix, composed by the matrices **Q** and **S** and two zero-filled matrices:

$$\mathbf{D} = \begin{bmatrix} \mathbf{0} & \mathbf{Q} \\ \mathbf{S} & \mathbf{0} \end{bmatrix}.^{2}$$

Using matrix D, we can write the matrix system:

$$\begin{bmatrix} \mathbf{0} & \mathbf{Q} \\ \mathbf{S} & \mathbf{0} \end{bmatrix}\begin{bmatrix} \mathbf{p}^{pp} \\ \mathbf{g}^{bp} \end{bmatrix} + \begin{bmatrix} \mathbf{y}^{pp} \\ \mathbf{0} \end{bmatrix} = \begin{bmatrix} \mathbf{p}^{pp} \\ \mathbf{g}^{bp} \end{bmatrix} \tag{3}$$

This system may be manipulated in order to the outputs vector:

$$\left(\mathbf{I} - \mathbf{D}\right)\begin{bmatrix} \mathbf{p}^{pp} \\ \mathbf{g}^{bp} \end{bmatrix} = \begin{bmatrix} \mathbf{y}^{pp} \\ \mathbf{0} \end{bmatrix} \Leftrightarrow \begin{bmatrix} \mathbf{p}^{pp} \\ \mathbf{g}^{bp} \end{bmatrix} = \left(\mathbf{I} - \mathbf{D}\right)^{-1}\begin{bmatrix} \mathbf{y}^{pp} \\ \mathbf{0} \end{bmatrix} \Leftrightarrow \begin{bmatrix} \mathbf{p}^{pp} \\ \mathbf{g}^{bp} \end{bmatrix} = \begin{bmatrix} \mathbf{I} & -\mathbf{Q} \\ -\mathbf{S} & \mathbf{I} \end{bmatrix}^{-1}\begin{bmatrix} \mathbf{y}^{pp} \\ \mathbf{0} \end{bmatrix} \tag{4}$$

1 We will use the vector **i**, consisting of a column-vector filled by 1s, to compute the column sum of the correspondent matrix and the sign ' to indicate a transpose of a matrix or a column-vector.
2 It should be noted that even if the matrices $\mathbf{U}^{pp}$ and $\mathbf{V}^{bp}$ are not square, the partitioned matrix composed of these two (and of zero matrices of the appropriate dimension) will be square. Consider, for example, that there are 30 industries and 50 products. In this case, the matrix $\mathbf{U}^{pp}$ will have a dimension of 50*30 and $\mathbf{V}^{bp}$ will be a 30*50 matrix. Consequently, the partitioned matrix **D** will have a dimension of 80*80 and **I – D** can be inverted.

3. Análise Empírica

Applying the general formulas for computing the inverse of a partitioned matrix[3], we obtain:

$$\begin{bmatrix} \mathbf{I} & -\mathbf{Q} \\ -\mathbf{S} & \mathbf{I} \end{bmatrix}^{-1} = \begin{bmatrix} \mathbf{I}+\mathbf{Q}(\mathbf{I}-\mathbf{SQ})^{-1}\mathbf{S} & \mathbf{Q}(\mathbf{I}-\mathbf{SQ})^{-1} \\ (\mathbf{I}-\mathbf{SQ})^{-1}\mathbf{S} & (\mathbf{I}-\mathbf{SQ})^{-1} \end{bmatrix} \quad (5)$$

or

$$\begin{bmatrix} \mathbf{I} & -\mathbf{Q} \\ -\mathbf{S} & \mathbf{I} \end{bmatrix}^{-1} = \begin{bmatrix} (\mathbf{I}-\mathbf{QS})^{-1} & (\mathbf{I}-\mathbf{QS})^{-1}\mathbf{Q} \\ \mathbf{S}(\mathbf{I}-\mathbf{QS})^{-1} & \mathbf{I}+\mathbf{S}(\mathbf{I}-\mathbf{QS})^{-1}\mathbf{Q} \end{bmatrix} \quad (6)$$

Inserting equation (6) into (4), and multiplying these partitioned matrices, we get:

$$\mathbf{p}^{\mathbf{pp}} = (\mathbf{I}-\mathbf{QS})^{-1}\mathbf{y}^{\mathbf{pp}} \quad (7)$$

and

$$\mathbf{g}^{\mathbf{bp}} = \mathbf{S}(\mathbf{I}-\mathbf{QS})^{-1}\mathbf{y}^{\mathbf{pp}} \quad (8)$$

The first equation allows us to compute the impact on total product supply originated by changes in final demand for products $(\frac{\partial \mathbf{p}^{\mathbf{pp}}}{\partial \mathbf{y}^{\mathbf{pp}}})$. Therefore, this is a product-by-product relationship. The second equation is an industry-by-product relationship; it shows the impact on industry's supply caused by changes in final demand for products $(\frac{\partial \mathbf{g}^{\mathbf{bp}}}{\partial \mathbf{y}^{\mathbf{pp}}})$. As for the right hand blocks in (5), the lower right hand, $\mathbf{(I-SQ)^{-1}}$, depicts an industry-by-industry relationship: it gives us $\frac{\partial \mathbf{g}^{\mathbf{bp}}}{\partial(\mathbf{S}\mathbf{y}^{\mathbf{pp}})}$, where $\mathbf{Sy^{pp}}$ is the final demand by industries, transformed from $\mathbf{y^{pp}}$. The upper right hand corner, $\mathbf{Q(I-SQ)^{-1}}$, accounts for the impact on product demand, including imports, margins and taxes, created by changes in the demand directed at domestic industries $(\frac{\partial \mathbf{p}^{\mathbf{pp}}}{\partial(\mathbf{S}\mathbf{y}^{\mathbf{pp}})})$. Hence, it is a product-by-industry relationship.

We may then conclude that by performing a rectangular or M&U model (at *pp*, with total flows) we get within one single model product-by-product, industry-by-industry, product-by-industry and even industry-by-product relationships. This may be seen as an advantage over symmetric models. In these latter, each model provides only one type of relationship: the product-by-product symmetric model generates only a product-by-product impact equation; if we want to quantify an industry-by-industry impact, we will need to build an industry-by-industry symmetric table and develop the corresponding model.

3 These formulas can be found, for example, in Barnett (1990), pp. 71-72.

3. Deriving symmetric, domestic-use tables, at basic prices, from the standard M&U format: which issues and assumptions?

It is now time to look at the other way, namely at the previous transformation of the rectangular, total-use, *pp* table (the M&U format) into the classic Leontief-type symmetric, domestic-use, *bp* structure, that in this alternative procedure is the base of the input-output modelling. As a rule the rooted-survey information to deal with this transformation is very scarce, so we mainly have to resort to reasonable assumptions. These assumptions must be the same, for comparisons purposes, of those that are implicit in the M&U direct modelling. This section is devoted to the discussion of these assumptions.

3.1. Symmetric and rectangular input-output tables revisited.

The simplifying hypothesis adopted by the traditional symmetric input-output table is that each product is produced by one single industry and each industry produces one single product. However, in reality, the most common situation is that each industry produces a growing diversity of products, one of these being the primary product and the others the secondary ones. These secondary products can be divided into two categories: subsidiary products and by-products (EUROSTAT, 2002); subsidiary products are those secondary products which are technologically dissociated from the primary product; by-products are outputs that unavoidably result from the primary product production process, therefore being technologically related to it. As a rule, national Make and Use tables, following the SNA (System of National Accounts) recommendations, involve some partial refining in the Industry classification. This is due to the fact that industries are grouped according to the concept of kind-of-activity unit, and not according to the concept of enterprise. The term kind-of-activity unit (KAU) is used to denote a part of an institutional unit in which only one particular type of economic activity is carried out (Jackson, 2000). Thus, as a rule, enterprises «must be partitioned into smaller and more homogeneous units, with regard to the kind of production» (ESA, 1995, paragraph 2.105). So, in the National Accounts' industry classification, each industry consists of a group of KAUs which are «engaged in the same or a similar kind of activity» (ESA, 1995, paragraph 2.108). This means that most of the subsidiary products produced in each enterprise is classified under a different industry heading, the one that produces those products as its main activity. Exceptions to this procedure occur whenever it is not possible to separate the secondary from the primary activity, either because secondary production is of by-product nature, or because the available information obtained from enterprises does not allow for separation (this being the case with most small firms, which have no accounting documents which allow for their partitioning into different KAUs). As a result, the values of production recorded outside the main diagonal in the Make matrix are mostly by-products, along with some residual subsidiary products that could not be separated from the main activity in the firms in which they were produced. The presence of these flows outside the main diagonal of the Make matrix – that represent the production by industries of products that do not fall in their core business – is the reason why the M&U model is not of symmetric type. As a consequence in the Use matrix each column refers to one industry that may produce more than one product; but their inputs still consist of single products. The Use matrix is then of product-by-industry kind.

Thus, symmetric input-output tables (SIOT) cannot be built directly with the statistical data collected by regular firm surveys. As a consequence this kind of tables can only be achieved in a derivative way, departing from the M&U tables, and assuming some hypotheses in order to calculate the product-by-product (or industry-by-industry) intermediate consumption flows[4]. Two alternative hypotheses, connecting the products' output and the industries' output may be used in the transformation of product-by-industry matrixes in symmetric ones, either of product-by-product or of industry-by-industry type: the industry technology assumption (ITA) and the commodity technology assumption (CTA).

4 As well as to compute the value added by products, or, in industry-by-industry tables, the final demand by industries.

In the ITA case each industry has its own technology, which is common to all the commodities it produces. Thus, the technology assigned to each product depends on the industry where it is produced (ten Raa and Rueda-Cantuche, 2007). This kind of assumption is usually pointed out as preferable when the majority of secondary production is of by-product nature (Miller and Blair, 2009). On its turn, CTA assumes that each product is always produced by the same technology, regardless of the industry in which it is produced. For this reason, it is best suited to treat subsidiary production (Miller and Blair, 2009). In this paper we will deal with both the hypotheses, namely when in Section 4 we proceed with real data and compare the actual values of the input-output multipliers.

3.2.Total use flows versus domestic use flows.

Another major issue concerning input-output tables is the treatment of imported products. In a total Use table, as the one that is comprised in the M&U format, all the use flows (intermediate and final) also include imported products, beyond national produced flows. In fact, this means that the intermediate Use matrix reflects true technical relationships: each of its elements indicates the total amount of a certain input used to produce a certain output. Data collected by means of surveys to firms can be directly used to produce these types of tables. The same does not apply to domestic flow tables. In this case, a Use matrix of imported products is needed in order to subtract its value from the total Use table. Direct information to construct such an Imports matrix is very rare. It is in fact very difficult for many firms to know the origin (imported or domestically produced) of several of their inputs. In many cases, firms buy inputs from wholesale traders, hence ignoring their origin. For similar reasons, the computation of final demand domestic flows, based on direct information, is also very hard (or even more complex, since the number of intermediate traders between the importing firm and the final user is usually greater). Being so, Import matrices are very often built merely by resorting to plausible assumptions, seldom complemented by direct information on some particular products.

The most common assumption – and the one that we adopt in this paper – is the imports proportionality hypothesis which asserts that, for each product, the share of imports in any type of use (intermediate or final) of that product is the same and is given by the proportion of imports on total supply of the same product. For example, if 40% of steel's total supply is imported, it is assumed that, in every industry which uses steel, 40% is imported and the same applies to any type of final use. This means that imports are differentiated by type of product but not by type of use.

Although controversial, this hypothesis is adopted in many cases, alone or combined with the incorporation of direct information, even when the domestic-use symmetric table is assembled by the official entities. In what concerns to the estimation of the imports matrix, for example, even OECD recognizes that this happens, stating that «Techniques used to construct the import matrix data vary between countries, but every country in the OECD database made, to some extent, use of the import proportionality assumption in the construction of their import matrices» (OECD, 2000, p.12). Moreover, the Input-output database provided by OECD (consisting of symmetric industry-by-industry tables) is compiled using this kind of assumptions, whenever supplementary information is not available (Yamano and Ahmad, 2006).

One crucial point on this assumption is the product disaggregation level that is applied (EUROSTAT, 2002). If the import coefficients are calculated at a much aggregated level, the imports proportionality hypothesis may not be acceptable. Thus, the most detailed level of disaggregation available on import data should be used. This does not usually originate a great deal of trouble on national tables since international imports data by products is available at a very detailed product level[5]. On the other hand, several authors note that some final uses, like

5 The magnitude of the errors coming from such an assumption, however, can only be accounted for when there is a benchmark survey-based imports matrix against which the estimated one can be compared. This is done in Oosterhaven and Stelder (2007), in their comparison between four alternative non-survey inter-country input-output table construction methods, for nine Asian countries and the USA. In one of the non-survey input-

exports, for example, have less incorporation of imported products than others, like investment. In order to take this differentiation into account, they have proposed to exclude exports from the import proportionality assumption, assuming that there are no re-exports. This is done, for example, in Miller and Blair (2009), and Jackson (1998). As emphasized by Lahr (2001), this approach should be preferred only in those cases in which the researcher knows that the export vector has no (or almost no) re-exports. In the present work, however, the import proportionality assumption will be taken uniformly throughout the various types of intermediate and final uses.

3.3. Basic versus purchasers' prices.

Different concepts can be used in the valuation of input-output flows of goods and services, ranging from the factor cost to the purchaser's price. The valuation at factor costs represents the production price and reflects better the production function of each product (Martins, 2004). At the opposite, the purchasers' prices represent the amount paid to obtain «a unit of a good or service at the time and place required by the purchaser» (EUROSTAT, 2002, p. 121). In spite of this multiplicity of concepts, however, in practice SNA input-output tables use only two price concepts: basic price and purchaser's price. Basic prices are similar to factor costs, except for the fact that basic prices include other taxes and subsidies on production, which are not possible to allocate to specific products[6]. Basic prices (*bp*) can be obtained from purchasers' prices (*pp*), subtracting the taxes on products less subsidies on products and the trade and transport margins.

The published M&U tables usually employ *pp* concept to balance supply and use. It is however, sometimes argued, that this valuation is not sufficiently homogeneous to be used for input-output analytical purposes; for example, the ESA's Input-Output Manual states that «a valuation at purchasers' prices is a less homogeneous option as the shares of trade and transport margins differ from industry to industry and also from and between the final uses; the same is true for the shares of product taxes less subsidies» (EUROSTAT, 2002, p.124). It is also true that basic prices are closer to the concept of production costs involved in the technical relationships used in input-output analysis. These relationships assume that a certain amount of an input represents the same physical unit irrespective of the production process in which it is used (EUROSTAT, 2002).

Hence, it would be desirable that prices were cleared from margins and taxes which differently affect the diverse uses of the products. The problem lies in the compilation of the valuation matrices required to transform *pp* into *bp*, since direct information on the value of margins and taxes comprised in each use flow is very scarce. In fact, when someone buys a certain item, he/she doesn't know very often the amount of margins and sometimes taxes comprised in the price that has to be paid. In the absence of direct information to construct valuation matrices and obtain a basic price valuated table, the proposal is to assume the same kind of proportionality hypothesis than for imports: the margin (net taxes) rate comprised in any type of use (intermediate or final) of that product is assumed to be the same for each product, and is given by the proportion of margins (net taxes) on total supply of the same product.

What is the plausibility of such an assumption? In this case, it is useful to look at each of the following items separately: Value Added Tax (VAT), margins, other taxes on products and subsidies on products. In what concerns non-deductible VAT[7], the problem is quite complex. Ideally, direct information should be available in order to: 1) identify the type of users who support non-deductible VAT. Non-deductible VAT is, in fact, supported mainly by households and, in

output tables, they assume that there is no imports matrix and use the imports proportionality assumption to indirectly estimate it. The comparison between this table and the benchmark (which is a semi-survey based inter-country table) allow the authors to conclude that in general, «The tests show that the impact of using self-sufficiency ratios to estimate the domestic flows is small (…)» (Oosterhaven and Stelder, 2007, p. 258).

6 Taxes (subsidies) on products are those that «are payable per unit for some goods or services produced or transacted» (EUROSTAT, 2002, p. 200); examples: Value added taxes, import duties or tobacco product tax. Taxes (or subsidies) on production are those paid (or received) by firms as a direct result of their production activity, «independently of the quantity or value of the goods and services produced or sold» (*idem*, p. 200).

7 Deductible VAT is not included in the *pp* valuation.

some exceptional cases, by firms, either falling upon intermediate consumption or Gross Fixed Capital Formation (e.g. firms exempt from VAT and sometimes not allowed to deduct it from their purchases) and 2) Perform the linkage between the different VAT taxes and the product classification in the Use matrix; if the level of aggregation is high, some problems can arise because groups of products may well involve different VAT taxes (EUROSTAT, 2002).

Treating margins on a proportional assumption basis is also not completely realistic. In fact, it has to be recognized that different users of a product pay different margins on it. For example, a manufacture will certainly pay a smaller amount of margins on stationery materials than the final consumer. Finally, the use of the proportional assumption in the case of other taxes and subsidies is less controversial. These taxes and subsidies fall upon specific products and as a rule all the users have to support them. For example, taxes on gasoline have to be paid equally by any type of user of this product. As for imports, in any of the items mentioned in this Section, the proportionality assumption must be applied at the most disaggregated level of product classification. This is important in order to avoid situations in which groups of products are heterogeneous in respect to margins or tax rates.

In this paper, however, as our purpose is confined to the theoretical argument of the equivalence of different approaches, the proportionality assumption is allowed by simplification to all these flows, concerning the transformation of *pp* on *bp*.

4. A test with Portuguese data

In this Section, it will be shown that the direct modelling of the rectangular M&U matrices, with total use flows and at *pp*, that adopts a framework that is equal or very close from the official statistics, is exactly equivalent to the modelling of a domestic flow symmetric table (at *bp*), when it is derived from the former one, using similar assumptions. To do so, we will begin by computing the input-output multipliers obtained both through the direct modelling of the rectangular table, and through the product-by-product and industry-by-industry symmetric tables that can be obtained from the same rectangular frame. Then we focus on the analysis of the multipliers and conclude that insofar of the method we use for achieving them, we get exactly the same results.

Although this paper focuses in real data from the Portuguese economy, and makes the option of showing the results obtained by both the methods, to conclude that actually they are the same, a mathematical proof of our argument is also provided in an Appendix.

4.1. Deriving the input-output multipliers

With the purpose of comparing the multipliers produced by both methods, we begin by performing a rectangular model, including the computation of the associated inverse matrices. The data in which we based this experience is the Portuguese Make and Use tables for the year 2002, at current prices, provided by the Portuguese Statistics National Institute (INE)[8]. Every year, since 1995, INE provides a set of National Accounts tables, which includes a M&U table. Products and industries are usually presented in a 60 by 60 disaggregate level (ESA95 – A60 classification). The level of aggregation used in this paper, however, corresponds to a less disaggregated classification also provided by INE containing only 31 products and 31 industries. The Portuguese Make matrices are heavily diagonal, meaning that most of the production has been affected by its primary producing industry, in the process of partial refining of Industries' classification, as it has been previously explained. Intermediate and final uses of goods and services are composed of both domestically produced and imported products, but no import matrices are regularly compiled. Additionally, these Use flows are valuated at *pp*. Thus our first step was to implement an input-output rectangular model, as the one described in section 2, based in the M&U table provided by the INE.

8 We are thankful to INE, for its kindness in providing us with the Make table, for the working year, which is not currently published. For the remaining information we downloaded it from the INE's official website: www.ine.pt.

It is important to emphasize that the model developed in section 2 implicitly assumes the ITA hypothesis. Although we did not develop that model in that section, it is possible as well to settle a CTA-based rectangular model. In this model the sub-matrix **S** of (3) – **S** represents the relative contributions of each industry to the supply of each product – is replaced by $\mathbf{H^{-1}\,(I-\hat{e})(I-\hat{f}-\hat{n})}$. **H** is derived as well from $\mathbf{V^{bp}}$, but it displays the product's structure of each industry output. That means that we have now calculated fixed coefficients along the rows of $\mathbf{V^{bp}}$, and not anymore along its columns as we had done in **S**. **c** ($\hat{\mathbf{e}}$), **f** ($\hat{\mathbf{f}}$) and **n** ($\hat{\mathbf{n}}$)[9] mean the import, margin and taxes (less subsidies) coefficient vectors (diagonal matrixes), that result from dividing vectors **m**, **d** and **l** (inserted in Figure 1) by the total supply of products $\mathbf{p^{pp}}$. In fact, pre-multiplying by $\mathbf{(I-\hat{e})(I-\hat{f}-\hat{n})}$ transforms one vector of total supplies at purchasers prices in its equivalent with domestic supplies at basic prices.

Therefore under CTA, instead of equation (3), we have:

$$\begin{bmatrix} \mathbf{0} & \mathbf{Q} \\ \mathbf{H^{-1}(I-\hat{c})(I-\hat{f}-\hat{n})} & \mathbf{0} \end{bmatrix}\begin{bmatrix} \mathbf{p^{pp}} \\ \mathbf{g^{bp}} \end{bmatrix}+\begin{bmatrix} \mathbf{y^{pp}} \\ \mathbf{0} \end{bmatrix}=\begin{bmatrix} \mathbf{p^{pp}} \\ \mathbf{g^{bp}} \end{bmatrix}\Rightarrow$$
$$\begin{bmatrix} \mathbf{p^{pp}} \\ \mathbf{g^{bp}} \end{bmatrix}=\begin{bmatrix} \mathbf{I} & \mathbf{-Q} \\ \mathbf{-H^{-1}(I-\hat{c})(I-\hat{f}-\hat{n})} & \mathbf{I} \end{bmatrix}^{-1}\begin{bmatrix} \mathbf{y^{pp}} \\ \mathbf{0} \end{bmatrix} \quad (9)$$

The multipliers produced by that version of the rectangular model are the cells of the inverted block matrix defined as follows:

$$\begin{bmatrix} \mathbf{I+Q\left[I-H^{-1}(I-\hat{c})(I-\hat{f}-\hat{n})Q\right]^{-1}H^{-1}(I-\hat{c})(I-\hat{f}-\hat{n})} & \mathbf{Q\left[I-H^{-1}(I-\hat{c})(I-\hat{f}-\hat{n})Q\right]^{-1}} \\ \mathbf{\left[I-H^{-1}(I-\hat{c})(I-\hat{f}-\hat{n})Q\right]^{-1}H^{-1}(I-\hat{c})(I-\hat{f}-\hat{n})} & \mathbf{\left[I-H^{-1}(I-\hat{c})(I-\hat{f}-\hat{n})Q\right]^{-1}} \end{bmatrix} \quad (10)$$

After computing the two sets (ITA and CTA-based) of M&U multipliers, we have to derive as well the product-by-product and the industry-by-industry domestic-flow symmetric tables valuated at *bp*, in order to allow for the comparison of the two kinds of the multipliers. Remember that there is no regular production and publication of any symmetric tables (product-by-product or industry-by-industry) in Portugal and in several other EU countries. Thus, whenever the researcher wants to make use of symmetric domestic flow tables he/she may have to assemble the import matrix and to symmetrize the table, relying on a set of different hypotheses [10]. The methodology used to build the SIOTs must follow exactly the same hypotheses than when we were dealing with the direct modelling of the M&U tables. The method involved three stages:

1. Computing Use matrices for margins and for taxes (less subsidies), in order to subtract them from the purchasers' prices Use table and obtain the basic prices Use table.
2. Computing the Use matrix of imported products, in order to subtract it from the basic prices Use table and thus obtain the domestic flow basic prices Use table. To do this, the proportionality hypotheses were used. In practice, most of the countries that construct an official import matrix also support their work in this kind of hypothesis (OECD, 2000).
3. Obtaining the product-by-product and industry-by-industry symmetric tables, resorting either to the ITA hypothesis or accepting the CTA instead.

9 We are using notation ^ to represent a diagonal matrix with the non-null entries being the elements of the correspondent column or row-vector.

10 It must be noted, however, that semi-official domestic flow symmetric input-output tables at basic prices has been provided every five years, since 1995. The compiling work was not directly done by the INE, but by a partnership between it and a governmental body: the Planning and Prospective Department. The description of the methodology of assembling these tables, and the matrices themselves, are available, for instance, at Dias (2008).

4.2 Multipliers' comparison

The results of the partitioned matrix inversion, based on the M&U table, are displayed in Annex A.1 and A.2, corresponding to ITA and CTA hypotheses, respectively. We may find the product-by-product multipliers in the upper left-hand blocks of these partitioned matrices. For example, when we assume ITA in the Annex A.1, this upper left-hand block corresponds to $\mathbf{(I - QS)^{-1}}$ in (6) and it shows the impact of changes in $\mathbf{y^{pp}}$ over $\mathbf{p^{pp}}$. Let's take value 0.0217, located at [EE, DJ] in that matrix: this cell means that when final demand for «DJ – Basic metals and fabricated metal products» valuated at *pp* is exposed to an unitary increase, the direct and indirect extra demand (at *pp*) for product «EE – Electricity, gas and water supply» increases 0.0217 units. This increase also includes the increase for imported «EE» products, since the effect evaluated here is on $\mathbf{p^{pp}}$ as a whole. The correspondent product-by-product multiplier in the CTA-based partitioned matrix (Annex A.2) is 0.0229, which illustrates the fact that a different technological assumption does not originate extremely diverse values.

However, these multipliers comprised in the upper left-hand blocks of the matrices of Annexes A.1 and A.2 cannot be directly compared with the results obtained through domestic flows *bp* product-by-product symmetric tables, displayed in the Annexes A.3 and A.4. The reason is that in those blocks of those two annexes we have the impacts of the total demands – addressed to the domestic economy but also to imports, at *pp* – on total transactions, also at *pp*, imports included; that is of $\mathbf{y^{pp}}$ on $\mathbf{p^{pp}}$. On the other hand, in symmetric models the results we should reach concern only shocks on domestic perceived demand, at *bp*, and their effect on domestic production valuated at *bp* as well. That means that for comparison purposes the upper left-hand blocks of the matrices of the Annexes A.1 and A.2 must be previously transformed by pre-multiplying those blocks by the diagonal matrixes $\mathbf{(I - \hat{c})}$ and $\mathbf{(I - \hat{f} - \hat{n})}$, where $\mathbf{c}$, $\mathbf{f}$ and $\mathbf{n}$ mean the import, margin and taxes (less subsidies) coefficients, in a first step, and then in a second stage post-multiplying by the inverses of those matrixes[11]. When we do that with our [EE, DJ] entry of 0.0217 pulled apart of ITA-based Annex A.1 matrix, we divide it by 0.6086 and 0.8874 and multiply it by 0.9886 and 0.9815, getting 0.0390. This is exactly the same value that is displayed in the [EE, DJ] cell of the domestic flow product-by-product inverse matrix (*bp*) of the Annex A.3. As for the CTA-technology we proceed in the same way with 0.0229 extracted from the [EE, DJ] upper left-hand block of the matrix of the Annex A.2, and we obtain 0.0412 that is the cell [EE, DJ] of the domestic flow, *bp*, product-by-product matrix derived by CTA, depicted in Annex A.4. In fact, the matrices included in Annexes A.3 and A.4 as a whole may be obtained starting from the upper left-hand blocks of the matrices of Annexes A.1 and A.2 and applying the recommended transformations.

The lower right-hand blocks of the partitioned inverse matrices (Annexes A.1 and A.2) tell us about the industry-by-industry relationships. They correspond to the inverse matrices implicit in equations (5) and (6) for ITA and (10) for CTA. From these matrices one can assess the effects in each industry and in the total economy-wide caused by changes in the demand addressed to each industry. Looking again at the ITA case (Annex A.1), if the demand addressed to the output of industry «DJ» increases by 1, the «EE» industry will have to increase 0.0395 (through direct and indirect effects). As referred to before, the values of these lower right-hand block matrices should be equal to the values of the inverse matrices derived from a domestic flow industry-by-industry symmetric table (valuated at *bp*), constructed taking as original data the same rectangular table, and using similar hypotheses. Such matrices are presented in Annex A.5 for ITA and in Annex A.6 for CTA. In this case direct comparison is allowed, so then the same value 0.0395 may be found in the corresponding entry of the matrix of the Annex A.5. The same conclusion may be drawn to CTA-based matrices: as can be easily checked the lower right-hand block of the table in A.2 is the same matrix that is depicted in A.6.

11 Because the final impacts on $\mathbf{p^{pp}}$ and the initial shocks on $\mathbf{y^{pp}}$ must be both transformed multiplying by $\mathbf{(I - \hat{c})(I - \hat{f} - \hat{n})}$, then, for counterbalancing, each multiplier is multiplied by the transformation coefficient corresponding to its row and divided by the one corresponding to its column.

5. Conclusions

The main issue of the present essay fell upon input-output modelling when the starting available matrix produced by official statistics is a total-flow rectangular table at purchasers' prices. Two alternative procedures have been analyzed: 1) to perform the direct modelling of the total-flow rectangular table at purchasers' prices; 2) to convert the initial matrix into a domestic-flow symmetric table at basic prices and then implement the traditional Leontief-type input-output model. It has then been proved that, when the hypotheses used to make the table symmetric and to operate the conversion from total use to domestic use flows (and from purchasers' prices to basic prices) are also used in the direct modelling of the starting rectangular matrix, the results we obtain are exactly the same. Thus, there is not a clear advantage, in most cases, in performing a previous transformation of the original tables, as some authors advise, into the symmetric domestic flow format, before implementing the model. Of course, in specific context – for instance, if one wishes to infer only the direct and indirect impact on domestic production resulting from an increase of final demand towards domestic products, it may be more appropriate to build the adequate symmetric input-output table (domestic-use and basic prices), instead of going into the process of solving the whole rectangular system previously described.

The equivalence between the results of both alternative procedures has been attested through a numerical example. In fact, an algebraic proof may be produced as well, as we have done in the Mathematical Appendix ahead. The numerical example consisted in using the Portuguese M&U table as a starting point (which is a total-flow rectangular table at purchasers' prices) and implementing the input-output model, applying both the previously referred procedures. As we expected, the input-output multipliers when referring to the same impact and the same effect are exactly the same, either by one or by the other procedure. We may even say, following that equivalence, that the direct use of the rectangular format has an important advantage over the use of symmetric tables: in the rectangular framework, the simple inversion of a partitioned matrix generates a set of four different inverse matrices (product-by-product, industry-by-industry, product-by-industry and industry-by-product ones); conversely, the symmetric tables originate only one type of inverse matrix (product-by-product or industry-by-industry).

In this paper, the development of the input-output model directly from the total-flow rectangular table at purchasers' prices, involved the use of proportionality hypotheses concerning imports, margins and taxes comprised in the intermediate and final use flows. Additionally, the model was developed in two versions – one using ITA and another using CTA. The proportionality and the technology hypotheses adopted are of course controversial. This doesn't however jeopardize the validity of the conclusions, as the important is that the same hypotheses have been used either in the direct modelling of the starting matrix, or in the conversion of this matrix into a domestic-flow symmetric table at basic prices. Besides, in many cases, even the official organisms of statistics use these kinds of simplifying hypotheses (or similar procedures) when assembling symmetric tables. In other cases, of course, these hypotheses are sometimes complemented or substituted by the inclusion of direct information, which however and as a rule can be incorporated in the rectangular model as well. For example, if a true import matrix is available, it is obviously better to use such information than to use the proportionality hypothesis (even though the gathering of direct information involves high costs and, in many cases, originates only a marginal improvement in the results). That however does not refute our point that equivalent hypotheses generate equivalent results.

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Annex A.1 – Partitioned matrix inverse; ITA (results from the rectangular M&U model with total flows at *pp*)

	AA	BB	CA	CB	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK
AA	1,1313	0,0020	0,0000	0,0036	0,2065	0,0215	0,0079	0,2728	0,0518	0,0004	0,0036	0,0064	0,0061	0,0038	0,0017
BB	0,0009	1,0188	0,0000	0,0002	0,0021	0,0001	0,0001	0,0002	0,0001	0,0020	0,0005	0,0001	0,0002	0,0001	0,0001
CA	0,0074	0,0085	1,0000	0,0449	0,0042	0,0045	0,0032	0,0058	0,0053	0,2236	0,0177	0,0056	0,0185	0,0044	0,0023
CB	0,0016	0,0003	0,0000	1,0420	0,0021	0,0006	0,0005	0,0014	0,0012	0,0001	0,0028	0,0011	0,1045	0,0025	0,0014
DA	0,1426	0,0046	0,0000	0,0049	1,1568	0,0061	0,0205	0,0372	0,0148	0,0002	0,0053	0,0036	0,0046	0,0034	0,0020
DB	0,0053	0,0035	0,0000	0,0057	0,0018	1,3699	0,0099	0,0049	0,0027	0,0001	0,0041	0,0086	0,0046	0,0046	0,0014
DC	0,0002	0,0001	0,0000	0,0001	0,0001	0,0017	1,3394	0,0004	0,0006	0,0000	0,0001	0,0016	0,0001	0,0004	0,0001
DD	0,0041	0,0008	0,0000	0,0030	0,0042	0,0035	0,0022	1,3501	0,0164	0,0001	0,0014	0,0047	0,0148	0,0077	0,0028
DE	0,0101	0,0087	0,0000	0,0169	0,0263	0,0106	0,0205	0,0235	1,2621	0,0005	0,0126	0,0158	0,0307	0,0131	0,0084
DF	0,0239	0,0356	0,0000	0,1754	0,0121	0,0100	0,0077	0,0198	0,0118	1,0247	0,0277	0,0108	0,0403	0,0108	0,0043
DG	0,0352	0,0040	0,0000	0,0409	0,0182	0,0495	0,0457	0,0235	0,0572	0,0017	1,1454	0,1930	0,0519	0,0292	0,0172
DH	0,0042	0,0016	0,0000	0,0024	0,0142	0,0080	0,0030	0,0139	0,0139	0,0002	0,0081	1,0654	0,0126	0,0155	0,0162
DI	0,0118	0,0014	0,0000	0,0097	0,0127	0,0022	0,0024	0,0041	0,0062	0,0006	0,0043	0,0058	1,1101	0,0140	0,0052
DJ	0,0089	0,0042	0,0000	0,0141	0,0177	0,0095	0,0193	0,0297	0,0128	0,0008	0,0115	0,0408	0,0445	1,2001	0,0359
DK	0,0038	0,0024	0,0000	0,0082	0,0006	0,0011	0,0029	0,0097	0,0042	0,0005	0,0008	0,0191	0,0038	0,0113	1,3312
DL	0,0024	0,0032	0,0000	0,0061	0,0029	0,0029	0,0024	0,0047	0,0044	0,0002	0,0025	0,0079	0,0021	0,0015	0,0113
DM	0,0012	0,0001	0,0000	0,0022	0,0010	0,0014	0,0010	0,0017	0,0018	0,0001	0,0015	0,0028	0,0026	0,0056	0,0244
DN	0,0008	0,0005	0,0000	0,0012	0,0010	0,0154	0,0027	0,0032	0,0055	0,0001	0,0014	0,0078	0,0033	0,0133	0,0021
EE	0,0219	0,0088	0,0000	0,0851	0,0159	0,0222	0,0133	0,0251	0,0269	0,0026	0,0141	0,0173	0,0345	0,0217	0,0085
FF	0,0155	0,0058	0,0000	0,0228	0,0117	0,0091	0,0105	0,0202	0,0158	0,0027	0,0081	0,0088	0,0279	0,0244	0,0140
GG	0,0081	0,0113	0,0000	0,0152	0,0045	0,0038	0,0027	0,0072	0,0058	0,0005	0,0035	0,0054	0,0105	0,0038	0,0035
HH	0,0048	0,0051	0,0000	0,0131	0,0050	0,0075	0,0071	0,0093	0,0081	0,0005	0,0046	0,0057	0,0117	0,0086	0,0055
II	0,0171	0,0272	0,0000	0,1006	0,0199	0,0193	0,0178	0,0381	0,0365	0,0011	0,0184	0,0216	0,0585	0,0237	0,0150
JJ	0,0312	0,0258	0,0000	0,0551	0,0258	0,0327	0,0289	0,0530	0,0365	0,0016	0,0197	0,0230	0,0442	0,0229	0,0228
KK	0,0526	0,0335	0,0000	0,0964	0,0642	0,0499	0,0443	0,0625	0,0783	0,0023	0,0568	0,0492	0,0780	0,0434	0,0331
LL	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
MM	0,0004	0,0009	0,0000	0,0012	0,0008	0,0011	0,0009	0,0011	0,0014	0,0000	0,0008	0,0011	0,0016	0,0014	0,0008
NN	0,0027	0,0009	0,0000	0,0011	0,0010	0,0007	0,0008	0,0011	0,0014	0,0000	0,0007	0,0004	0,0011	0,0011	0,0006
OO	0,0019	0,0019	0,0000	0,0038	0,0023	0,0021	0,0018	0,0027	0,0037	0,0001	0,0023	0,0018	0,0035	0,0018	0,0010
PP	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
COLUMN SUM	1,5836	1,2229	1,0000	1,7722	1,6103	1,6601	1,6087	2,0902	1,6327	1,2672	1,3102	1,5122	1,6205	1,6011	1,6020
AA	0,7502	0,0015	0,0000	0,0026	0,1564	0,0144	0,0058	0,1804	0,0344	0,0003	0,0026	0,0044	0,0042	0,0026	0,0014
BB	0,0002	0,4059	0,0000	0,0001	0,0010	0,0001	0,0001	0,0001	0,0001	0,0000	0,0001	0,0001	0,0001	0,0001	0,0000
CA	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
CB	0,0013	0,0002	0,0000	0,3590	0,0017	0,0005	0,0004	0,0013	0,0010	0,0001	0,0023	0,0009	0,0898	0,0021	0,0012
DA	0,0718	0,0027	0,0000	0,0032	0,5794	0,0032	0,0149	0,0187	0,0078	0,0001	0,0028	0,0020	0,0025	0,0018	0,0012
DB	0,0033	0,0022	0,0000	0,0037	0,0013	0,7943	0,0240	0,0032	0,0026	0,0001	0,0046	0,0056	0,0027	0,0043	0,0014
DC	0,0002	0,0001	0,0000	0,0001	0,0001	0,0014	0,8021	0,0003	0,0004	0,0000	0,0001	0,0025	0,0001	0,0003	0,0001
DD	0,0033	0,0007	0,0000	0,0025	0,0033	0,0028	0,0019	1,0281	0,0127	0,0001	0,0012	0,0059	0,0115	0,0068	0,0026
DE	0,0067	0,0057	0,0000	0,0111	0,0185	0,0075	0,0139	0,0157	0,8173	0,0003	0,0082	0,0169	0,0206	0,0089	0,0041
DF	0,0070	0,0099	0,0000	0,0476	0,0036	0,0028	0,0027	0,0061	0,0048	0,2745	0,0078	0,0051	0,0118	0,0034	0,0019
DG	0,0111	0,0013	0,0000	0,0127	0,0070	0,0166	0,0138	0,0185	0,0171	0,0005	0,3570	0,0672	0,0165	0,0091	0,0041
DH	0,0027	0,0008	0,0000	0,0017	0,0095	0,0049	0,0170	0,0082	0,0074	0,0002	0,0055	0,4901	0,0087	0,0074	0,0083
DI	0,0090	0,0013	0,0000	0,0051	0,0095	0,0019	0,0019	0,0077	0,0048	0,0004	0,0029	0,0049	0,9244	0,0108	0,0073
DJ	0,0054	0,0024	0,0000	0,0071	0,0096	0,0054	0,0109	0,0147	0,0067	0,0005	0,0070	0,0335	0,0244	0,6794	0,0044
DK	0,0015	0,0010	0,0000	0,0034	0,0016	0,0013	0,0010	0,0038	0,0017	0,0001	0,0015	0,0082	0,0134	0,0082	0,4270
DL	0,0014	0,0013	0,0000	0,0025	0,0012	0,0012	0,0010	0,0019	0,0018	0,0001	0,0015	0,0044	0,0007	0,0011	0,0171
DM	0,0009	0,0013	0,0000	0,0011	0,0005	0,0008	0,0005	0,0001	0,0005	0,0000	0,0007	0,0009	0,0011	0,0048	0,0247
DN	0,0008	0,0004	0,0000	0,0009	0,0006	0,0148	0,0021	0,0149	0,0044	0,0000	0,0011	0,0051	0,0021	0,0105	0,0021
EE	0,0213	0,0084	0,0000	0,0789	0,0155	0,0224	0,0132	0,0243	0,0254	0,0008	0,0141	0,0169	0,0315	0,0211	0,0082
FF	0,0151	0,0057	0,0000	0,0225	0,0116	0,0090	0,0105	0,0195	0,0153	0,0026	0,0080	0,0085	0,0293	0,0248	0,0116
GG	0,0458	0,0647	0,0000	0,0884	0,0355	0,0185	0,0251	0,0527	0,0418	0,0021	0,0251	0,0316	0,0647	0,0241	0,0219
HH	0,0047	0,0049	0,0000	0,0122	0,0052	0,0060	0,0069	0,0085	0,0075	0,0005	0,0046	0,0052	0,0105	0,0077	0,0051
II	0,0165	0,0254	0,0000	0,0943	0,0191	0,0184	0,0170	0,0358	0,0341	0,0010	0,0176	0,0209	0,0551	0,0226	0,0144
JJ	0,0288	0,0234	0,0000	0,0482	0,0244	0,0300	0,0261	0,0485	0,0332	0,0015	0,0186	0,0216	0,0405	0,0215	0,0209
KK	0,0398	0,0255	0,0000	0,0747	0,0480	0,0373	0,0334	0,0469	0,0621	0,0017	0,0426	0,0476	0,0595	0,0338	0,0251
LL	0,0035	0,0018	0,0000	0,0074	0,0037	0,0028	0,0029	0,0037	0,0122	0,0001	0,0029	0,0027	0,0057	0,0026	0,0018
MM	0,0008	0,0010	0,0000	0,0016	0,0010	0,0012	0,0010	0,0011	0,0021	0,0000	0,0008	0,0012	0,0019	0,0015	0,0009
NN	0,0028	0,0009	0,0000	0,0012	0,0011	0,0008	0,0008	0,0019	0,0009	0,0000	0,0003	0,0009	0,0019	0,0003	0,0007
OO	0,0021	0,0021	0,0000	0,0041	0,0024	0,0023	0,0019	0,0029	0,0041	0,0001	0,0025	0,0020	0,0038	0,0019	0,0011
PP	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
COLUMN SUM	1,0603	0,6024	0,0000	1,3531	0,9665	1,0331	1,0612	1,5738	1,1647	0,3066	0,5806	0,7962	1,3397	0,9327	0,6444

Annex A.1 – Partitioned matrix inverse; ITA (results from the rectangular M&U model with total flows at *pp*) (cont.)

	DL	DM	DN	EE	FF	GG	HH	II	JJ	KK	LL	MM	NN	OO	PP
AA	0,0022	0,0018	0,0244	0,0022	0,0129	0,0815	0,0884	0,0054	0,0031	0,0077	0,0058	0,0030	0,0255	0,0061	0,0000
BB	0,0001	0,0000	0,0001	0,0001	0,0001	0,0008	0,0112	0,0003	0,0002	0,0002	0,0002	0,0001	0,0003	0,0002	0,0000
CA	0,0021	0,0018	0,0048	0,1346	0,0185	0,0570	0,0085	0,0216	0,0038	0,0074	0,0057	0,0042	0,0182	0,0136	0,0000
CB	0,0006	0,0011	0,0071	0,0014	0,0016	0,0141	0,0025	0,0015	0,0006	0,0016	0,0025	0,0005	0,0006	0,0015	0,0000
DA	0,0023	0,0013	0,0050	0,0025	0,0041	0,0880	0,3145	0,0030	0,0049	0,0030	0,0115	0,0084	0,0046	0,0077	0,0000
DB	0,0055	0,0058	0,0087	0,0018	0,0052	0,0280	0,0132	0,0031	0,0009	0,0026	0,0027	0,0011	0,0175	0,0090	0,0000
DC	0,0000	0,0004	0,0118	0,0001	0,0000	0,0044	0,0000	0,0000	0,0001	0,0004	0,0000	0,0001	0,0001	0,0000	0,0000
DD	0,0025	0,0028	0,0241	0,0026	0,0224	0,0461	0,0035	0,0035	0,0016	0,0045	0,0025	0,0014	0,0015	0,0108	0,0000
DE	0,0036	0,0047	0,0157	0,0109	0,0128	0,2050	0,0180	0,0256	0,0210	0,0315	0,0158	0,0182	0,0134	0,0357	0,0000
DF	0,0055	0,0042	0,0145	0,0757	0,0824	0,1731	0,0242	0,0885	0,0071	0,0188	0,0506	0,0181	0,0723	0,0334	0,0000
DG	0,0206	0,0138	0,0082	0,0113	0,0456	0,1394	0,0145	0,0108	0,0041	0,0111	0,0015	0,0047	0,1116	0,0265	0,0000
DH	0,0455	0,0159	0,0028	0,0036	0,0151	0,1123	0,0056	0,0056	0,0027	0,0094	0,0038	0,0018	0,0053	0,0015	0,0000
DI	0,0046	0,0060	0,0136	0,0060	0,1818	0,0607	0,0172	0,0061	0,0023	0,0096	0,0077	0,0026	0,0035	0,0071	0,0000
DJ	0,0030	0,0030	0,0084	0,0125	0,1185	0,2184	0,0180	0,0155	0,0055	0,0177	0,0084	0,0040	0,0036	0,0151	0,0000
DK	0,0011	0,0153	0,0085	0,0057	0,0133	0,0542	0,0007	0,0025	0,0017	0,0041	0,0045	0,0017	0,0035	0,0032	0,0000
DL	1,1852	0,0091	0,0048	0,0018	0,0128	0,1887	0,0138	0,0457	0,0092	0,0133	0,0069	0,0051	0,0100	0,0033	0,0000
DM	0,0025	1,1575	0,0051	0,0017	0,0028	0,1237	0,0025	0,0015	0,0011	0,0035	0,0159	0,0036	0,0018	0,0024	0,0000
DN	0,0018	0,0171	1,0512	0,0015	0,0118	0,0281	0,0115	0,0030	0,0031	0,0035	0,0050	0,0042	0,0036	0,0162	0,0000
EE	0,0063	0,0070	0,0158	1,5565	0,0350	0,1857	0,0071	0,0245	0,0132	0,0173	0,0051	0,0126	0,0181	0,0618	0,0000
FF	0,0076	0,0065	0,0114	0,0254	1,3516	0,1896	0,0142	0,0426	0,0171	0,0489	0,0158	0,0135	0,0095	0,0401	0,0000
GG	0,0038	0,0028	0,0049	0,0045	0,0066	1,1418	0,0086	0,0229	0,0030	0,0136	0,0073	0,0032	0,0072	0,0063	0,0000
HH	0,0066	0,0030	0,0037	0,0056	0,0074	0,1470	1,0066	0,0128	0,0127	0,0153	0,0106	0,0065	0,0108	0,0108	0,0000
II	0,0183	0,0108	0,0138	0,0357	0,0335	0,6520	0,0170	1,1741	0,0094	0,0486	0,0459	0,0185	0,0235	0,1253	0,0000
JJ	0,0189	0,0125	0,0288	0,0520	0,0530	0,4466	0,0402	0,0608	1,1010	0,0908	0,0207	0,0152	0,0276	0,0589	0,0000
KK	0,0488	0,0276	0,0423	0,1112	0,0886	1,4554	0,1061	0,1518	0,2448	1,2285	0,1113	0,0736	0,1049	0,2232	0,0000
LL	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	1,0000	0,0000	0,0000	0,0000	0,0000
MM	0,0017	0,0012	0,0011	0,0017	0,0025	0,0123	0,0011	0,0015	0,0018	0,0015	0,0022	1,0069	0,0005	0,0012	0,0000
NN	0,0004	0,0006	0,0000	0,0000	0,0007	0,0046	0,0013	0,0006	0,0001	0,0006	0,0011	0,0004	1,0651	0,0006	0,0000
OO	0,0018	0,0011	0,0038	0,0009	0,0033	0,0632	0,0007	0,0124	0,0046	0,0182	0,0030	0,0185	0,0032	1,1227	0,0000
PP	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	1,0000
COLUMN SUM	1,4818	1,7153	1,4226	2,1818	2,2286	5,3840	1,8061	1,8026	1,6102	1,6220	1,4121	1,2527	1,4669	1,8831	1,0000
AA	0,0015	0,0011	0,0163	0,0017	0,0087	0,0601	0,0541	0,0045	0,0024	0,0063	0,0046	0,0022	0,0179	0,0051	0,0000
BB	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CB	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DB	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DC	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DD	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DF	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DG	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DI	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DJ	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DK	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DL	0,4475	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DM	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
EE	[illegible]	[illegible]	[illegible]	1,4481	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FF	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
GG	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
HH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
II	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
JJ	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
KK	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MM	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
NN	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
OO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
PP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
COLUMN SUM	0,7617	0,6416	0,8606	1,8206	1,3378	10,3477	1,4588	1,6864	1,3260	1,4648	1,3448	1,2103	1,4661	1,6664	1,0000

Annex A.1 – Partitioned matrix inverse; ITA (results from the rectangular M&U model with total flows at *pp*) (cont.)

	AA	BB	CA	CB	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK
AA	0.1565	0.0051	0.0000	0.0046	0.4552	0.0366	0.0131	0.3562	0.0792	0.0013	0.0105	0.0109	0.0031	0.0065	0.0040
BB	0.0005	0.0470	0.0000	0.0005	0.0041	0.0002	0.0002	0.0001	0.0000	0.0000	0.0002	0.0002	0.0002	0.0002	0.0000
CA	0.0113	0.0049	0.0000	0.0276	0.0078	0.0078	0.0029	0.0033	0.0016	0.0000	0.0021	0.0021	0.0114	0.0048	0.0028
CB	0.0024	0.0007	0.0000	0.0540	0.0041	0.0009	0.0003	0.0017	0.0017	0.0005	0.0008	0.0008	0.1405	0.0041	0.0031
DA	0.2157	0.0114	0.0000	0.0083	0.3552	0.0103	0.0499	0.0483	0.0225	0.0007	0.0151	0.0066	0.0064	0.0051	0.0050
DB	0.0060	0.0089	0.0000	0.0078	0.0033	0.5364	0.0668	0.0052	0.0035	0.0004	0.0060	0.0183	0.0053	0.0054	0.0043
DC	0.0003	0.0002	0.0000	0.0002	0.0002	0.0026	0.5661	0.0003	0.0010	0.0000	0.0002	0.0023	0.0002	0.0005	0.0003
DD	0.0062	0.0019	0.0000	0.0035	0.0060	0.0042	0.0035	0.4561	0.0253	0.0005	0.0038	0.0076	0.0197	0.0134	0.0060
DE	0.0153	0.0018	0.0000	0.0211	0.0554	0.0174	0.0337	0.0303	0.4035	0.0015	0.0336	0.0214	0.0419	0.0243	0.0155
DF	0.0061	0.0890	0.0000	0.2191	0.0223	0.0167	0.0126	0.0251	0.0176	0.0906	0.0837	0.0212	0.0522	0.0203	0.0151
DG	0.0020	0.0100	0.0000	0.0076	0.0051	0.0034	0.0013	0.0075	0.0035	0.0041	0.4845	0.4184	0.0031	0.0021	0.0022
DH	0.0064	0.0034	0.0000	0.0031	0.0100	0.0199	0.0049	0.0109	0.0106	0.0035	0.0240	0.5449	0.0176	0.0014	0.0410
DI	0.0180	0.0035	0.0000	0.0092	0.0145	0.0057	0.0042	0.0115	0.0030	0.0011	0.0127	0.0054	0.1803	0.0061	0.0031
DJ	0.0149	0.0103	0.0000	0.0151	0.0142	0.0149	0.0017	0.0111	0.0112	0.0031	0.0114	0.0063	0.0092	0.5618	0.0288
DK	0.0055	0.0092	0.0000	0.0150	0.0055	0.0059	0.0003	0.0074	0.0028	0.0015	0.0029	0.0419	0.0124	0.0029	0.7442
DL	0.0051	0.0030	0.0000	0.0115	0.0055	0.0043	0.0007	0.0057	0.0045	0.0005	0.0026	0.0127	0.0122	0.0143	0.0042
DM	0.0017	0.0072	0.0000	0.0030	0.0017	0.0022	0.0015	0.0011	0.0011	0.0000	0.0021	0.0011	0.0022	0.0029	0.0021
DN	0.0012	0.0015	0.0000	0.0031	0.0016	0.0015	0.0044	0.0021	0.0124	0.0000	0.0009	0.0161	0.0044	0.0031	0.0054
EE	0.0331	0.0015	0.0000	0.1068	0.0301	0.0364	0.0022	0.0328	0.0337	0.0020	0.0428	0.0325	0.1133	0.0402	0.0233
FF	0.0234	0.0139	0.0000	0.0303	0.0221	0.0155	0.0177	0.0255	0.0234	0.0150	0.0218	0.0155	0.0358	0.0446	0.0313
GG	0.0123	0.0083	0.0000	0.0182	0.0076	0.0064	0.0042	0.0083	0.0088	0.0013	0.0065	0.0065	0.0142	0.0058	0.0085
HH	0.0073	0.0128	0.0000	0.0189	0.0069	0.0127	0.0116	0.0116	0.0121	0.0007	0.0137	0.0104	0.0156	0.0159	0.0148
II	0.0250	0.0680	0.0000	0.1283	0.0311	0.0322	0.0286	0.0474	0.0553	0.0039	0.0484	0.0416	0.0781	0.0431	0.0391
JJ	0.0472	0.0649	0.0000	0.0883	0.0481	0.0553	0.0467	0.0678	0.0536	0.0058	0.0566	0.0447	0.0588	0.0418	0.0585
KK	0.0190	0.0839	0.0000	0.1280	0.1216	0.0839	0.0716	0.0798	0.1170	0.0085	0.1616	0.0838	0.1031	0.0794	0.0824
LL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MM	0.0009	0.0023	0.0000	0.0011	0.0016	0.0018	0.0014	0.0014	0.0021	0.0002	0.0022	0.0009	0.0022	0.0021	0.0021
NN	0.0041	0.0023	0.0000	0.0014	0.0019	0.0018	0.0019	0.0024	0.0022	0.0000	0.0022	0.0003	0.0015	0.0023	0.0021
OO	0.0023	0.0043	0.0000	0.0042	0.0042	0.0024	0.0022	0.0031	0.0035	0.0000	0.0024	0.0003	0.0042	0.0023	0.0021
PP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
COLUMN SUM	0.8365	0.8605	0.0000	0.8827	1.2852	1.1350	1.1317	1.3600	1.0374	1.0944	1.1183	1.0691	1.0913	1.1174	1.0120
AA	1.1351	0.0037	0.0000	0.0033	0.2733	0.0245	0.0096	0.2370	0.0530	0.0009	0.0074	0.0075	0.0056	0.0048	0.0028
BB	0.0003	1.0189	0.0000	0.0001	0.0017	0.0001	0.0001	0.0001	0.0001	0.0000	0.0004	0.0001	0.0001	0.0001	0.0001
CA	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CB	0.0020	0.0006	0.0000	1.0421	0.0004	0.0008	0.0007	0.0014	0.0014	0.0004	0.0007	0.0017	0.1098	0.0033	0.0025
DA	0.1099	0.0069	0.0000	0.0041	1.1536	0.0066	0.0249	0.0247	0.0118	0.0004	0.0088	0.0037	0.0031	0.0034	0.0026
DB	0.0050	0.0056	0.0000	0.0048	0.0023	1.3665	0.0383	0.0034	0.0027	0.0005	0.0064	0.0117	0.0035	0.0042	0.0022
DC	0.0002	0.0002	0.0000	0.0002	0.0002	0.0017	1.3395	0.0002	0.0006	0.0000	0.0002	0.0015	0.0002	0.0004	0.0002
DD	0.0049	0.0017	0.0000	0.0028	0.0053	0.0035	0.0029	1.3489	0.0195	0.0004	0.0051	0.0061	0.0151	0.0108	0.0045
DE	0.0101	0.0144	0.0000	0.0143	0.0362	0.0117	0.0221	0.0199	1.2618	0.0013	0.0245	0.0184	0.0269	0.0161	0.0104
DF	0.0109	0.0249	0.0000	0.0608	0.0067	0.0067	0.0044	0.0073	0.0092	1.0218	0.0285	0.0108	0.0154	0.0063	0.0046
DG	0.0160	0.0033	0.0000	0.0165	0.0109	0.0064	0.0029	0.0157	0.0076	0.0090	1.1432	0.1301	0.0218	0.0166	0.0092
DH	0.0051	0.0020	0.0000	0.0023	0.0127	0.0060	0.0025	0.0077	0.0083	0.0026	0.0116	1.0402	0.0081	0.0033	0.0151
DI	0.0137	0.0032	0.0000	0.0074	0.0154	0.0050	0.0031	0.0091	0.0076	0.0016	0.0099	0.0074	1.1182	0.0191	0.0154
DJ	0.0082	0.0061	0.0000	0.0151	0.0185	0.0084	0.0174	0.0172	0.0105	0.0015	0.0176	0.0456	0.0222	1.2883	0.1280
DK	0.0053	0.0026	0.0000	0.0043	0.0050	0.0051	0.0015	0.0033	0.0028	0.0004	0.0030	0.0163	0.0163	0.0124	1.7645
DL	0.0021	0.0032	0.0000	0.0045	0.0022	0.0020	0.0016	0.0021	0.0021	0.0003	0.0024	0.0062	0.0049	0.0051	0.0288
DM	0.0009	0.0023	0.0000	0.0015	0.0008	0.0010	0.0007	0.0008	0.0009	0.0001	0.0014	0.0018	0.0014	0.0043	0.0040
DN	0.0003	0.0016	0.0000	0.0011	0.0011	0.0145	0.0008	0.0035	0.0015	0.0000	0.0002	0.0035	0.0026	0.0161	0.0024
EE	0.0321	0.0212	0.0000	0.1033	0.0293	0.0361	0.0216	0.0311	0.0398	0.0029	0.0412	0.0345	0.1092	0.0395	0.0227
FF	0.0228	0.0143	0.0000	0.0299	0.0218	0.0151	0.0172	0.0247	0.0225	0.0085	0.0211	0.0156	0.0352	0.0438	0.0323
GG	0.0153	0.1629	0.0000	0.1155	0.0536	0.0436	0.0329	0.0617	0.0587	0.0100	0.0730	0.0529	0.0897	0.0398	0.0449
HH	0.0071	0.0122	0.0000	0.0158	0.0069	0.0116	0.0109	0.0108	0.0112	0.0007	0.0128	0.0096	0.0144	0.0144	0.0121
II	0.0250	0.0699	0.0000	0.1258	0.0357	0.0308	0.0274	0.0448	0.0523	0.0038	0.0475	0.0395	0.0793	0.0414	0.0355
JJ	0.0435	0.0590	0.0000	0.0836	0.0461	0.0507	0.0429	0.0613	0.0503	0.0054	0.0541	0.0419	0.0545	0.0385	0.0535
KK	0.0589	0.0641	0.0000	0.0964	0.0609	0.0627	0.0540	0.0577	0.0885	0.0064	0.1208	0.0712	0.0783	0.0598	0.0622
LL	0.0046	0.0046	0.0000	0.0076	0.0067	0.0046	0.0046	0.0046	0.0067	0.0005	0.0068	0.0051	0.0071	0.0048	0.0046
MM	0.0009	0.0023	0.0000	0.0021	0.0016	0.0020	0.0015	0.0016	0.0021	0.0001	0.0027	0.0004	0.0021	0.0021	0.0022
NN	0.0042	0.0024	0.0000	0.0016	0.0021	0.0014	0.0021	0.0021	0.0022	0.0000	0.0023	0.0009	0.0013	0.0024	0.0021
OO	0.0031	0.0057	0.0000	0.0053	0.0045	0.0029	0.0030	0.0033	0.0037	0.0000	0.0029	0.0034	0.0048	0.0033	0.0027
PP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
COLUMN SUM	1.4029	1.5136	1.0000	1.7427	1.8514	1.7608	1.7347	2.0172	1.7624	1.1046	1.4760	1.6039	1.8623	1.7246	1.8196

Annex A.1 – Partitioned matrix inverse; ITA (results from the rectangular M&U model with total flows at *pp*) (cont.)

	DL	DM	DN	EE	FF	GG	HH	II	JJ	KK	LL	MM	NN	OO	PP
AA	0.0049	0.0040	0.0431	0.0022	0.0134	0.0110	0.1013	0.0059	0.0036	0.0066	0.0055	0.0030	0.0258	0.0093	0.0000
BB	0.0002	0.0001	0.0002	0.0001	0.0001	0.0004	0.0126	0.0003	0.0002	0.0003	0.0005	0.0001	0.0003	0.0002	0.0000
CA	0.0048	0.0041	0.0031	0.1456	0.0178	0.0055	0.0005	0.0093	0.0024	0.0029	0.0037	0.0012	0.0184	0.0145	0.0000
CB	0.0014	0.0029	0.0141	0.0014	0.0329	0.0018	0.0003	0.0017	0.0007	0.0018	0.0015	0.0005	0.0003	0.0018	0.0000
DA	0.0057	0.0034	0.0118	0.0025	0.0046	0.0121	0.3539	0.0095	0.0053	0.0065	0.0115	0.0064	0.0567	0.0035	0.0000
DB	0.0139	0.0153	0.1211	0.0014	0.0054	0.0049	0.0148	0.0034	0.0011	0.0020	0.0037	0.0011	0.0178	0.0103	0.0000
DC	0.0018	0.0010	0.0232	0.0001	0.0003	0.0005	0.0003	0.0001	0.0002	0.0004	0.0003	0.0001	0.0001	0.0003	0.0000
DD	0.0069	0.0089	0.1815	0.0021	0.0056	0.0069	0.0044	0.0035	0.0015	0.0044	0.0026	0.0014	0.0015	0.0121	0.0000
DE	0.0024	0.0121	0.0298	0.0110	0.0130	0.0350	0.0031	0.0298	0.0245	0.0366	0.1155	0.0194	0.0123	0.0405	0.0000
DF	0.0121	0.0099	0.0277	0.0786	0.0643	0.0295	0.0099	0.0998	0.0078	0.0154	0.0306	0.0101	0.0722	0.0371	0.0000
DG	0.0020	0.0009	0.0098	0.0117	0.0426	0.0226	0.0159	0.0117	0.0048	0.0100	0.0095	0.0047	0.1125	0.0335	0.0000
DH	0.1169	0.0488	0.0645	0.0024	0.0190	0.0141	0.0092	0.0103	0.0035	0.0109	0.0088	0.0018	0.0059	0.0014	0.0000
DI	0.0065	0.0043	0.0035	0.0064	0.1620	0.0106	0.0195	0.0031	0.0031	0.0055	0.0077	0.0026	0.0033	0.0017	0.0000
DJ	0.1610	0.1736	0.1292	0.0121	0.1208	0.0074	0.0205	0.0195	0.0035	0.0112	0.0054	0.0040	0.0092	0.0171	0.0000
DK	0.0192	0.0499	0.0103	0.0045	0.0055	0.0091	0.0083	0.0031	0.0014	0.0035	0.0045	0.0019	0.0033	0.0031	0.0000
DL	0.4871	0.1083	0.0035	0.0215	0.0051	0.0059	0.0159	0.0276	0.0105	0.0176	0.0059	0.0024	0.0051	0.0057	0.0000
DM	0.0077	0.4742	0.0035	0.0015	0.0005	0.0010	0.0002	0.0035	0.0012	0.0021	0.0120	0.0002	0.0013	0.0011	0.0000
DN	0.0042	0.0476	0.1618	0.0013	0.0119	0.0045	0.0153	0.0033	0.0035	0.0054	0.0080	0.0042	0.0032	0.0183	0.0000
EE	0.0193	0.0185	0.0693	0.5812	0.0308	0.0307	0.0417	0.0262	0.0150	0.0155	0.0361	0.0092	0.0181	0.0722	0.0000
FF	0.0179	0.0139	0.0210	0.0354	0.3728	0.0510	0.0159	0.0451	0.0191	0.0355	0.0159	0.0102	0.0102	0.0481	0.0000
GG	0.0080	0.0051	0.0074	0.0046	0.0101	0.0150	0.0096	0.0055	0.0043	0.0115	0.0076	0.0032	0.0072	0.0102	0.0000
HH	0.0152	0.0088	0.0137	0.0059	0.0074	0.0058	0.0104	0.0059	0.0138	0.0146	0.0165	0.0057	0.0203	0.0214	0.0000
II	0.0086	0.0050	0.0433	0.0366	0.0323	0.1144	0.0300	0.2934	0.0438	0.0439	0.0459	0.0268	0.0228	0.1428	0.0000
JJ	0.0432	0.0331	0.0905	0.0540	0.0647	0.0770	0.0462	0.0994	0.1156	0.1090	0.0207	0.0190	0.0279	0.0998	0.0000
KK	0.1083	0.0731	0.0797	0.1147	0.0899	0.2641	0.1177	0.1654	0.2795	0.2848	0.1112	0.0730	0.1082	0.2641	0.0000
LL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MM	0.0044	0.0033	0.0021	0.0011	0.0006	0.0021	0.0013	0.0019	0.0016	0.0016	0.0022	0.0005	0.0008	0.0013	0.0000
NN	0.0009	0.0005	0.0035	0.0008	0.0008	0.0008	0.0013	0.0005	0.0005	0.0007	0.0011	0.0004	0.0004	0.0005	0.0000
OO	0.0003	0.0023	0.0121	0.0021	0.0051	0.0105	0.0085	0.0135	0.0035	0.0211	0.0084	0.0105	0.0092	0.1428	0.0000
PP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
COLUMN SUM	1.1995	1.1089	1.1914	1.1447	1.2801	0.8397	0.9013	0.9622	0.5812	0.6812	0.4119	0.2457	0.6703	1.0031	0.0000
AA	0.0035	0.0028	0.0289	0.0016	0.0093	0.0078	0.0726	0.0043	0.0027	0.0047	0.0040	0.0022	0.0183	0.0065	0.0000
BB	0.0001	0.0001	0.0001	0.0001	0.0001	0.0003	0.0091	0.0002	0.0001	0.0002	0.0001	0.0000	0.0002	0.0002	0.0000
CA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CB	0.0012	0.0024	0.0111	0.0012	0.0264	0.0016	0.0002	0.0014	0.0007	0.0016	0.0020	0.0005	0.0003	0.0014	0.0000
DA	0.0034	0.0021	0.0062	0.0011	0.0029	0.0074	0.1623	0.0057	0.0034	0.0043	0.0062	0.0035	0.0281	0.0053	0.0000
DB	0.0089	0.0093	0.0710	0.0012	0.0039	0.0035	0.0089	0.0025	0.0009	0.0016	0.0024	0.0008	0.0104	0.0064	0.0000
DC	0.0013	0.0007	0.0141	0.0001	0.0002	0.0004	0.0002	0.0003	0.0001	0.0003	0.0002	0.0001	0.0001	0.0006	0.0000
DD	0.0049	0.0071	0.1404	0.0011	0.0042	0.0066	0.0039	0.0033	0.0016	0.0036	0.0026	0.0012	0.0013	0.0094	0.0000
DE	0.0154	0.0082	0.0199	0.0073	0.0087	0.0231	0.0133	0.0191	0.0156	0.0240	0.1102	0.0126	0.0082	0.0266	0.0000
DF	0.0041	0.0032	0.0089	0.0220	0.0183	0.0088	0.0073	0.0288	0.0022	0.0045	0.0096	0.0030	0.0212	0.0110	0.0000
DG	0.0112	0.0109	0.0222	0.0028	0.0134	0.0074	0.0055	0.0045	0.0011	0.0035	0.0025	0.0015	0.0347	0.0091	0.0000
DH	0.0572	0.0225	0.0298	0.0010	0.0089	0.0060	0.0042	0.0048	0.0015	0.0048	0.0039	0.0008	0.0027	0.0041	0.0000
DI	0.0073	0.0182	0.0155	0.0049	0.1436	0.0085	0.0147	0.0071	0.0030	0.0078	0.0060	0.0028	0.0025	0.0081	0.0000
DJ	0.0665	0.0909	0.0695	0.0075	0.0720	0.0504	0.0113	0.0221	0.0034	0.0095	0.0053	0.0021	0.0055	0.0231	0.0000
DK	0.0099	0.0173	0.0054	0.0024	0.0145	0.0049	0.0083	0.0018	0.0006	0.0017	0.0018	0.0005	0.0018	0.0014	0.0000
DL	1.1845	0.0416	0.0033	0.0111	0.0127	0.0127	0.0065	0.0225	0.0042	0.0051	0.0031	0.0022	0.0077	0.0102	0.0000
DM	0.0054	1.1619	0.0031	0.0007	0.0014	0.0012	0.0011	0.0033	0.0007	0.0011	0.0051	0.0004	0.0002	0.0017	0.0000
DN	0.0029	0.0045	1.0830	0.0007	0.0067	0.0058	0.0068	0.0018	0.0018	0.0016	0.0041	0.0024	0.0017	0.0025	0.0000
EE	0.0180	0.0180	0.0287	1.3565	0.0334	0.0304	0.0404	0.0262	0.0155	0.0151	0.0350	0.0092	0.0177	0.0711	0.0000
FF	0.0180	0.0140	0.0207	0.0285	1.3519	0.0513	0.0159	0.0448	0.0203	0.0373	0.0158	0.0099	0.0102	0.0452	0.0000
GG	0.0055	0.0072	0.0517	0.0324	0.0639	1.1530	0.0622	0.1488	0.0368	0.0773	0.0466	0.0216	0.0495	0.0727	0.0000
HH	0.0139	0.0079	0.0125	0.0057	0.0071	0.0041	1.0099	0.0231	0.0132	0.0139	0.0151	0.0053	0.0183	0.0196	0.0000
II	0.0369	0.0263	0.0418	0.0352	0.0333	0.1083	0.0291	1.2766	0.0438	0.0446	0.0435	0.0253	0.0221	0.1342	0.0000
JJ	0.0409	0.0310	0.0464	0.0505	0.0603	0.0747	0.0430	0.0628	1.1091	0.1029	0.0214	0.0152	0.0278	0.0951	0.0000
KK	0.0834	0.0562	0.0582	0.0854	0.0662	0.1900	0.0879	0.1244	0.2075	1.1966	0.0829	0.0544	0.0806	0.1891	0.0000
LL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000
MM	0.0047	0.0034	0.0024	0.0010	0.0013	0.0028	0.0016	0.0024	0.0022	0.0022	0.0016	1.0007	0.0012	0.0015	0.0000
NN	0.0011	0.0008	0.0036	0.0005	0.0009	0.0012	0.0013	0.0010	0.0006	0.0008	0.0013	0.0005	1.0003	0.0005	0.0000
OO	0.0008	0.0022	0.0118	0.0010	0.0048	0.0109	0.0082	0.0131	0.0033	0.0211	0.0084	0.0099	0.0091	1.1342	0.0000
PP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
COLUMN SUM	1.7028	1.6317	1.8109	1.8836	2.5640	1.7704	1.5349	1.8903	1.5134	1.4242	1.3448	1.2114	1.4998	1.9816	1.0000

Annex A.2 – Partitioned matrix inverse: CTA (results from the rectangular M&U model with total flows at *pp*)

	AA	BB	CACB	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK
AA	1,1239	0,0010	0,0008	0,2174	0,0216	0,0080	0,2939	0,0535	0,0004	0,0023	0,0047	0,0056	0,0032	0,0013
BB	0,0002	1,0193	0,0000	0,0022	0,0001	0,0001	0,0001	0,0001	0,0000	0,0003	0,0001	0,0001	0,0001	0,0001
CACB	0,0084	0,0097	1,0267	0,0083	0,0048	0,0034	0,0080	0,0061	0,2481	0,0116	0,0250	0,1224	0,0069	0,0032
DA	0,1405	0,0035	0,0013	1,1641	0,0095	0,0302	0,0391	0,0149	0,0002	0,0048	0,0029	0,0040	0,0031	0,0018
DB	0,0053	0,0034	0,0016	0,0015	1,3852	0,0400	0,0018	0,0011	0,0004	0,0019	0,0075	0,0031	0,0018	0,0008
DC	0,0002	0,0000	0,0000	0,0001	0,0013	1,3484	-0,0003	0,0000	0,0000	0,0000	0,0002	0,0001	0,0001	0,0000
DD	0,0038	0,0005	0,0006	0,0042	0,0020	0,0026	1,3764	0,0172	0,0002	0,0012	0,0030	0,0148	0,0067	0,0015
DE	0,0084	0,0035	0,0048	0,0284	0,0092	0,0207	0,0234	1,2749	0,0003	0,0133	0,0128	0,0300	0,0132	0,0058
DF	0,0248	0,0005	0,0524	0,0117	0,0048	0,0016	0,0202	0,0118	1,0382	0,0305	0,0110	0,0280	0,0107	0,0057
DG	0,0395	0,0033	0,0118	0,0161	0,0500	0,0448	0,0547	0,0579	0,0253	1,1700	0,2302	0,0503	0,0277	0,0114
DH	0,0031	0,0015	0,0007	0,0146	0,0074	0,0335	0,0109	0,0103	0,0000	0,0081	1,0466	0,0125	0,0145	0,0167
DI	0,0111	0,0010	0,0066	0,0120	0,0018	0,0023	0,0083	0,0056	0,0004	0,0042	0,0038	1,1209	0,0142	0,0084
DJ	0,0083	0,0037	0,0034	0,0178	0,0073	0,0189	0,0213	0,0108	0,0011	0,0105	0,0389	0,0436	1,3281	0,0620
DK	0,0034	0,0022	0,0022	0,0035	0,0025	0,0017	0,0057	0,0037	0,0006	0,0031	0,0210	0,0327	0,0068	1,1159
DL	0,0029	0,0027	0,0024	0,0021	0,0024	0,0016	0,0034	0,0038	0,0006	0,0023	0,0030	0,0079	0,0048	0,0301
DM	0,0009	0,0021	0,0005	0,0003	0,0009	0,0002	0,0005	0,0007	0,0001	0,0008	-0,0022	0,0010	0,0028	0,0024
DN	0,0008	0,0002	0,0003	0,0008	0,0126	0,0025	0,0041	0,0092	0,0001	0,0012	0,0071	0,0030	0,0169	0,0012
EE	0,0229	0,0095	0,0257	0,0163	0,0241	0,0138	0,0262	0,0273	0,0082	0,0155	0,0188	0,0844	0,0229	0,0090
FF	0,0143	0,0050	0,0259	0,0111	0,0084	0,0105	0,0191	0,0149	0,0034	0,0078	0,0070	0,0239	0,0248	0,0124
GG	0,0084	0,0116	0,0046	0,0088	0,0093	0,0024	0,0068	0,0068	0,0012	0,0033	0,0030	0,0093	0,0029	0,0024
HH	0,0047	0,0051	0,0039	0,0047	0,0074	0,0089	0,0088	0,0079	0,0008	0,0047	0,0050	0,0107	0,0088	0,0054
II	0,0185	0,0276	0,0355	0,0185	0,0183	0,0164	0,0382	0,0362	0,0074	0,0170	0,0201	0,0518	0,0242	0,0139
JJ	0,0313	0,0259	0,0156	0,0255	0,0328	0,0284	0,0534	0,0358	0,0037	0,0200	0,0222	0,0404	0,0219	0,0234
KK	0,0506	0,0325	0,0250	0,0625	0,0484	0,0425	0,0569	0,0773	0,0048	0,0571	0,0455	0,0883	0,0408	0,0313
LL	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
MM	0,0004	0,0005	0,0004	0,0008	0,0011	0,0003	0,0010	0,0014	0,0001	0,0008	0,0011	0,0016	0,0014	0,0008
NN	0,0025	0,0005	0,0003	0,0010	0,0007	0,0005	0,0020	0,0006	0,0001	0,0003	0,0004	0,0008	0,0000	0,0007
OO	0,0017	0,0015	0,0010	0,0021	0,0015	0,0017	0,0021	0,0038	0,0000	0,0022	0,0014	0,0029	0,0014	0,0005
PP	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
AA	0,7978	0,0007	0,0006	0,1543	0,0153	0,0057	0,2085	0,0380	0,0003	0,0016	0,0033	0,0039	0,0022	0,0009
BB	0,0001	0,4184	0,0000	0,0009	0,0000	0,0001	0,0001	0,0000	0,0000	0,0001	0,0000	0,0001	0,0000	0,0000
CACB	0,0023	0,0024	0,2486	0,0015	0,0012	0,0008	0,0019	0,0015	0,0606	0,0028	0,0012	0,0297	0,0017	0,0008
DA	0,0272	0,0001	0,0005	0,1153	0,0025	0,0157	0,0082	0,0064	0,0001	-0,0006	0,0007	0,0016	0,0014	0,0008
DB	0,0030	0,0015	0,0009	0,0008	0,8385	0,0228	0,0014	-0,0001	0,0002	-0,0005	0,0021	0,0017	0,0009	0,0003
DC	0,0001	0,0000	0,0000	0,0000	0,0008	0,8240	-0,0002	0,0003	0,0000	0,0000	-0,0015	0,0000	0,0001	0,0000
DD	0,0030	0,0001	0,0004	0,0033	0,0012	0,0016	1,1186	0,0139	0,0001	0,0009	0,0016	0,0119	0,0054	0,0012
DE	0,0056	0,0017	0,0032	0,0196	0,0063	0,0135	0,0157	0,8568	0,0006	0,0089	0,0049	0,0201	0,0089	0,0039
DF	0,0073	0,0100	0,0155	0,0034	0,0022	0,0022	0,0060	0,0035	0,3068	0,0090	0,0033	0,0085	0,0032	0,0017
DG	0,0123	-0,0001	0,0035	0,0061	0,0156	0,0138	0,0191	0,0204	-0,0065	0,4225	0,0764	0,0162	0,0076	0,0035
DH	0,0014	0,0006	0,0003	0,0076	0,0037	0,0164	0,0053	0,0004	0,0001	0,0004	0,5875	0,0061	0,0018	0,0081
DI	0,0035	0,0007	-0,0063	0,0056	0,0013	0,0018	0,0064	0,0043	-0,0013	0,0030	0,0020	0,8656	0,0107	0,0053
DJ	0,0045	0,0020	0,0019	0,0101	0,0025	0,0104	0,0102	0,0067	0,0009	0,0050	0,0212	0,0246	0,7600	0,0391
DK	0,0012	0,0008	0,0008	0,0012	0,0009	0,0004	0,0017	0,0010	0,0002	0,0011	0,0067	0,0126	-0,0115	0,4622
DL	0,0004	0,0009	0,0006	0,0006	0,0007	0,0005	0,0010	0,0010	0,0001	0,0006	0,0008	0,0026	-0,0003	0,0104
DM	0,0002	0,0005	0,0000	-0,0004	0,0004	-0,0005	-0,0001	0,0000	0,0000	0,0002	-0,0288	0,0003	-0,0026	0,0001
DN	0,0002	0,0001	0,0001	0,0003	0,0062	0,0012	-0,0153	0,0041	0,0000	0,0002	0,0016	0,0012	0,0048	-0,0004
EE	0,0231	0,0092	0,0264	0,0166	0,0245	0,0142	0,0269	0,0278	0,0083	0,0158	0,0193	0,0867	0,0230	0,0092
FF	0,0106	0,0041	0,0032	0,0069	0,0085	0,0095	0,0183	0,0128	0,0022	0,0064	0,0055	0,0189	0,0228	0,0115
GG	0,0505	0,0693	0,0288	0,0157	0,0155	0,0103	0,0283	0,0315	0,0075	0,0177	0,0107	0,0404	0,0106	0,0070
HH	0,0043	0,0047	0,0035	0,0043	0,0067	0,0081	0,0080	0,0072	0,0007	0,0043	0,0045	0,0097	0,0079	0,0049
II	0,0158	0,0237	0,0303	0,0178	0,0175	0,0140	0,0347	0,0350	0,0071	0,0163	0,0192	0,0494	0,0222	0,0133
JJ	0,0300	0,0250	0,0150	0,0246	0,0317	0,0274	0,0516	0,0345	0,0036	0,0193	0,0214	0,0389	0,0211	0,0225
KK	0,0368	0,0194	0,0185	0,0475	0,0369	0,0313	0,0354	0,0589	-0,0061	0,0447	0,0355	0,0482	0,0287	0,0248
LL	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
MM	0,0004	0,0010	0,0004	0,0008	0,0011	0,0003	0,0011	0,0014	0,0001	0,0008	0,0011	0,0016	0,0014	0,0008
NN	0,0025	0,0005	0,0003	0,0010	0,0007	0,0005	0,0020	0,0006	0,0001	0,0003	0,0004	0,0008	0,0000	0,0007
OO	0,0014	0,0015	0,0006	0,0019	0,0015	0,0015	0,0018	0,0031	0,0000	0,0020	0,0012	0,0021	0,0011	0,0005
PP	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000

Annex A.2 – Partitioned matrix inverse: CTA (results from the rectangular M&U model with total flows at *pp*) (cont.)

	DL	DM	DN	EE	FF	GG	HH	II	JJ	KK	LL	MM	NN	OO	PP
AA	0.0017	0.0013	0.0227	0.0015	0.0134	0.0403	0.0939	0.0044	0.0024	0.0051	0.0038	0.0028	0.0252	0.0073	0.0000
BB	0.0001	0.0000	0.0001	0.0001	0.0001	0.0019	0.0116	0.0003	0.0001	0.0002	0.0001	0.0001	0.0003	0.0002	0.0000
CACB	0.0004	0.0004	0.0124	0.1838	0.0489	0.0557	0.0114	0.0029	0.0029	0.0058	0.0013	0.0049	0.0192	0.0151	0.0000
DA	0.0021	0.0011	0.0059	0.0018	0.0038	0.0599	0.2955	0.0077	0.0031	0.0050	0.0102	0.0061	0.0221	0.0063	0.0000
DB	0.0056	0.0055	0.0567	0.0005	0.0045	0.0176	0.0120	0.0025	0.0005	0.0012	0.0035	0.0009	0.0173	0.0066	0.0000
DC	0.0007	0.0003	0.0129	0.0002	0.0001	-0.0070	0.0009	0.0002	0.0001	0.0003	0.0002	0.0001	0.0001	0.0006	0.0000
DD	0.0022	0.0031	0.1016	-0.0015	0.0143	0.0314	0.0238	0.0025	0.0012	0.0036	0.0008	0.0012	0.0113	0.0103	0.0000
DE	0.0090	0.0042	0.0168	0.0104	0.0119	0.2094	0.0161	0.0270	0.0203	0.0334	0.0110	0.0164	0.0128	0.0372	0.0000
DF	0.0048	0.0032	0.0142	0.0899	0.0604	0.1767	0.0241	0.0932	0.0053	0.0130	0.0315	0.0101	0.0734	0.0344	0.0000
DG	0.0233	0.0115	0.0380	0.0102	0.0419	0.0927	0.0139	0.0092	0.0029	0.0077	0.0051	0.0043	0.1143	0.0274	0.0000
DH	0.0538	0.0161	0.0366	0.0028	0.0185	0.1029	0.0219	0.0089	0.0018	0.0066	0.0024	0.0016	0.0052	0.0070	0.0000
DI	0.0037	0.0069	0.0110	-0.0052	0.1851	0.0558	0.0171	0.0051	0.0022	0.0083	0.0025	0.0020	0.0031	0.0067	0.0000
DJ	0.0683	0.0658	0.0700	0.0047	0.1365	0.2072	0.0179	0.0123	0.0034	0.0142	0.0048	0.0034	0.0091	0.0145	0.0000
DK	0.0075	0.0153	0.0052	0.0043	0.0344	0.0500	0.0211	0.0026	0.0022	0.0031	0.0038	0.0011	0.0033	0.0027	0.0000
DL	1.2065	0.0415	0.0052	0.0587	0.0519	0.1575	0.0131	0.0544	0.0083	0.0066	0.0077	0.0046	0.0124	0.0226	0.0000
DM	0.0030	1.1804	0.0033	0.0005	0.0014	0.1281	0.0214	0.0050	0.0004	0.0011	0.0160	0.0006	0.0015	0.0022	0.0000
DN	0.0016	0.0161	1.0908	0.0002	0.0115	0.0534	0.0126	0.0023	0.0032	0.0069	0.0035	0.0042	0.0032	0.0165	0.0000
EE	0.0031	0.0068	0.0153	1.6235	0.0218	0.1873	0.0388	0.0248	0.0126	0.0151	0.0346	0.0241	0.0187	0.0666	0.0000
FF	0.0070	0.0046	0.0106	0.0097	1.3710	0.1694	0.0129	0.0376	0.0136	0.0136	0.0005	0.0090	0.0096	0.0410	0.0000
GG	0.0021	0.0017	0.0037	0.0044	0.0043	1.1668	0.0088	0.0229	0.0029	0.0102	0.0067	0.0031	0.0072	0.0062	0.0000
HH	0.0092	0.0030	0.0070	0.0056	0.0066	0.1588	1.0390	0.0237	0.0119	0.0130	0.0172	0.0055	0.0209	0.0193	0.0000
II	0.0152	0.0060	0.0218	0.0375	0.0261	0.7198	0.0254	1.2894	0.0370	0.0380	0.0455	0.0263	0.0224	0.1324	0.0000
JJ	0.0174	0.0117	0.0261	0.0548	0.0516	0.4590	0.0400	0.0611	1.1038	0.1009	0.0070	0.0146	0.0283	0.0604	0.0000
KK	0.0432	0.0252	0.0378	0.1145	0.0789	1.5410	0.1030	0.1530	0.2498	1.2435	0.0899	0.0721	0.1086	0.2315	0.0000
LL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000
MM	0.0018	0.0012	0.0011	0.0018	0.0006	0.0124	0.0011	0.0018	0.0018	0.0014	0.0025	1.0066	0.0003	0.0011	0.0000
NN	0.0004	0.0002	0.0002	0.0003	0.0007	0.0041	0.0010	0.0006	0.0001	0.0003	0.0011	0.0004	1.0839	0.0004	0.0000
OO	0.0012	0.0010	0.0069	0.0023	0.0025	0.0595	0.0214	0.0125	0.0035	0.0209	0.0057	0.0106	0.0096	1.1330	0.0000
PP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
AA	0.0012	0.0009	0.0161	0.0007	0.0095	0.0286	0.0667	0.0031	0.0017	0.0036	0.0027	0.0020	0.0179	0.0052	0.0000
BB	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0046	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0000
CACB	0.0009	0.0006	0.0030	0.0374	0.0121	0.0160	0.0028	0.0061	0.0007	0.0014	0.0027	0.0012	0.0048	0.0031	0.0000
DA	0.0009	0.0005	0.0021	0.0008	0.0011	-0.0133	0.1535	0.0031	0.0018	0.0022	0.0048	0.0030	0.0284	0.0026	0.0000
DB	0.0032	0.0030	0.0190	0.0005	0.0024	-0.0001	0.0076	0.0012	0.0002	0.0006	0.0019	0.0004	0.0101	0.0049	0.0000
DC	0.0003	0.0002	0.0077	0.0002	0.0000	-0.0091	0.0001	0.0000	0.0000	0.0002	0.0001	0.0000	0.0000	0.0003	0.0000
DD	0.0017	0.0024	0.0768	-0.0013	0.0456	0.0117	0.0025	0.0017	0.0002	0.0026	0.0005	0.0009	0.0003	0.0083	0.0000
DE	0.0059	0.0027	0.0105	0.0065	0.0079	0.1330	0.0121	0.0160	0.0136	0.0216	0.0034	0.0126	0.0083	0.0246	0.0000
DF	0.0014	0.0010	0.0042	0.0257	0.0176	0.0519	0.0211	0.0275	0.0016	0.0036	0.0093	0.0030	0.0217	0.0102	0.0000
DG	0.0077	0.0039	0.0127	0.0031	0.0135	-0.0502	0.0241	0.0093	0.0027	0.0079	0.0039	0.0012	0.0327	0.0089	0.0000
DH	0.0230	0.0069	0.0170	0.0013	0.0080	0.0474	0.0235	0.0043	0.0007	0.0025	0.0013	0.0007	0.0022	0.0031	0.0000
DI	0.0008	0.0008	0.0003	-0.0025	0.1477	0.0418	0.0131	0.0037	0.0017	0.0063	0.0017	0.0015	0.0022	0.0050	0.0000
DJ	0.0387	0.0363	0.0363	0.0032	0.0910	0.1721	0.0130	0.0068	0.0018	0.0079	0.0026	0.0019	0.0051	0.0080	0.0000
DK	0.0012	0.0008	0.0007	0.0017	0.0112	0.0103	0.0027	0.0007	0.0001	0.0010	0.0015	0.0004	0.0014	0.0008	0.0000
DL	0.5030	0.0164	-0.0007	0.0116	0.0123	-0.0349	0.0248	0.0205	0.0031	0.0018	0.0027	0.0017	0.0075	0.0040	0.0000
DM	-0.0013	0.4444	-0.0015	0.0001	-0.0005	0.0395	0.0001	-0.0044	-0.0001	0.0000	0.0057	0.0001	0.0003	0.0000	0.0000
DN	0.0003	0.0044	0.6097	-0.0001	0.0052	0.0017	0.0065	0.0010	0.0016	0.0014	0.0047	0.0022	0.0015	0.0046	0.0000
EE	0.0082	0.0070	0.0167	1.6984	0.0285	0.1923	0.0386	0.0256	0.0136	0.0135	0.0290	0.0254	0.0192	0.0705	0.0000
FF	0.0083	0.0038	0.0094	-0.0512	1.3489	0.1447	0.0161	0.0218	0.0125	0.0488	-0.0247	0.0063	0.0081	0.0351	0.0000
GG	0.0174	0.0033	0.0135	0.0181	0.0467	1.4639	0.0364	0.1502	0.0164	0.0517	0.0434	0.0170	0.0432	0.0406	0.0000
HH	0.0056	0.0027	0.0064	0.0052	0.0060	0.1446	0.9199	0.0215	0.0108	0.0118	0.0097	0.0047	0.0153	0.0152	0.0000
II	0.0140	0.0077	0.0209	0.0343	0.0239	0.6602	0.0243	1.2367	0.0339	0.0364	0.0416	0.0255	0.0214	0.1269	0.0000
JJ	0.0168	0.0113	0.0252	0.0529	0.0500	0.4438	0.0386	0.0591	1.0673	0.0975	0.0067	0.0140	0.0273	0.0580	0.0000
KK	0.0321	0.0193	0.0285	0.0842	0.0583	1.1329	0.0749	0.1041	0.1841	1.1262	-0.0648	0.0539	0.0792	0.1684	0.0000
LL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.1264	0.0000	0.0000	0.0000	0.0000
MM	0.0019	0.0012	0.0011	0.0018	0.0006	0.0125	0.0011	0.0018	0.0018	0.0014	0.0022	1.0167	0.0003	0.0011	0.0000
NN	0.0004	0.0002	0.0002	0.0003	0.0007	0.0041	0.0010	0.0006	0.0001	0.0003	0.0005	0.0004	1.0894	0.0004	0.0000
OO	0.0011	0.0009	0.0060	-0.0019	0.0021	0.0549	0.0201	0.0115	0.0033	0.0195	-0.0057	0.0098	0.0089	1.0537	0.0000
PP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000

Annex A.2 – Partitioned matrix inverse: CTA (results from the rectangular M&U model with total flows at *pp*) (cont.)

	AA	BB	CACB	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK
AA	0,1990	0,0040	0,0036	0,4053	0,0362	0,0133	0,3623	0,0796	0,0018	0,0096	0,0101	0,0074	0,0060	0,0034
BB	0,0005	0,0472	0,0003	0,0049	0,0002	0,0002	0,0003	0,0002	0,0001	0,0003	0,0002	0,0003	0,0003	0,0003
CACB	0,0141	0,0240	0,1145	0,0119	0,0062	0,0057	0,0104	0,0093	0,8448	0,0325	0,0105	0,1591	0,0129	0,0085
DA	0,2164	0,0107	0,0056	0,3059	0,0100	0,0486	0,0435	0,0222	0,0016	0,0155	0,0061	0,0055	0,0064	0,0047
DB	0,0077	0,0053	0,0067	0,0029	0,6436	0,0662	0,0039	0,0025	0,0015	0,0078	0,0172	0,0042	0,0041	0,0018
DC	0,0002	0,0000	0,0000	0,0001	0,0024	0,5700	0,0000	0,0000	0,0000	0,0001	0,0022	0,0001	0,0003	0,0001
DD	0,0061	0,0015	0,0033	0,0075	0,0034	0,0033	0,4661	0,0257	0,0010	0,0034	0,0072	0,0193	0,0131	0,0055
DE	0,0154	0,0221	0,0215	0,0595	0,0172	0,0341	0,0900	0,4082	0,0068	0,0360	0,0276	0,0399	0,0245	0,0154
DF	0,0389	0,0906	0,2175	0,0222	0,0169	0,0126	0,0257	0,0172	0,1341	0,0349	0,0225	0,0381	0,0291	0,0148
DG	0,0537	0,0086	0,0509	0,0341	0,0849	0,0742	0,0998	0,0885	0,1099	0,4747	0,4321	0,0992	0,0544	0,0307
DH	0,0062	0,0036	0,0039	0,0279	0,0126	0,0850	0,0150	0,0162	0,0015	0,0239	0,0946	0,0168	0,0285	0,0413
DI	0,0177	0,0029	0,0078	0,0242	0,0032	0,0037	0,0109	0,0085	0,0029	0,0121	0,0090	0,1573	0,0255	0,0214
DJ	0,0144	0,0096	0,0166	0,0339	0,0136	0,0314	0,0300	0,0171	0,0268	0,0307	0,0833	0,0576	0,5810	0,2402
DK	0,0053	0,0058	0,0103	0,0095	0,0049	0,0029	0,0075	0,0059	0,0027	0,0090	0,0419	0,0428	0,0180	0,2803
DL	0,0048	0,0075	0,0105	0,0044	0,0042	0,0030	0,0047	0,0052	0,0026	0,0072	0,0117	0,0108	0,0124	0,0751
DM	0,0014	0,0076	0,0024	0,0009	0,0016	0,0004	0,0010	0,0011	0,0006	0,0022	0,0197	0,0017	0,0075	0,0063
DN	0,0010	0,0013	0,0014	0,0018	0,0212	0,0042	0,0077	0,0123	0,0005	0,0036	0,0160	0,0040	0,0304	0,0051
EE	0,0343	0,0226	0,1093	0,0305	0,0409	0,0229	0,0393	0,0411	0,0240	0,0438	0,0372	0,1103	0,0426	0,0295
FF	0,0228	0,0131	0,0281	0,0215	0,0146	0,0174	0,0247	0,0221	0,0148	0,0223	0,0149	0,0321	0,0466	0,0318
GG	0,0123	0,0288	0,0191	0,0077	0,0083	0,0041	0,0088	0,0088	0,0049	0,0094	0,0083	0,0126	0,0057	0,0084
HH	0,0093	0,0132	0,0197	0,0091	0,0126	0,0116	0,0115	0,0123	0,0008	0,0136	0,0103	0,0144	0,0169	0,0139
II	0,0259	0,0706	0,1291	0,0363	0,0317	0,0251	0,0470	0,0552	0,0288	0,0487	0,0410	0,0696	0,0433	0,0365
JJ	0,0477	0,0656	0,0681	0,0493	0,0559	0,0471	0,0662	0,0544	0,0186	0,0576	0,0454	0,0546	0,0417	0,0582
KK	0,0802	0,0869	0,1276	0,1215	0,0540	0,0713	0,0747	0,1175	0,0320	0,1636	0,0946	0,0952	0,0786	0,0621
LL	0,0000	0,0000	0,0000	0,0002	0,0000	0,0000	0,0000	0,0002	0,0000	0,0000	0,0000	0,0000	0,0002	0,0002
MM	0,0006	0,0024	0,0017	0,0015	0,0018	0,0014	0,0014	0,0021	0,0004	0,0024	0,0022	0,0021	0,0025	0,0021
NN	0,0041	0,0021	0,0013	0,0018	0,0013	0,0012	0,0024	0,0022	0,0003	0,0006	0,0007	0,0010	0,0001	0,0017
OO	0,0027	0,0047	0,0047	0,0042	0,0032	0,0028	0,0030	0,0055	0,0011	0,0065	0,0031	0,0041	0,0028	0,0024
PP	0,0000	0,0000	0,0000	0,0002	0,0000	0,0000	0,0000	0,0002	0,0000	0,0000	0,0000	0,0000	0,0002	0,0002
AA	1,1412	0,0029	0,0026	0,2876	0,0257	0,0094	0,2571	0,0565	0,0013	0,0068	0,0072	0,0052	0,0043	0,0024
BB	0,0002	1,0194	0,0001	0,0017	0,0001	0,0001	0,0001	0,0001	0,0000	0,0003	0,0001	0,0001	0,0001	0,0001
CACB	0,0034	0,0058	1,0278	0,0029	0,0020	0,0014	0,0025	0,0023	0,2054	0,0078	0,0026	0,0387	0,0031	0,0021
DA	0,1071	0,0045	0,0020	1,1486	0,0034	0,0257	0,0102	0,0080	0,0004	0,0064	0,0016	0,0020	0,0026	0,0021
DB	0,0044	0,0047	0,0037	0,0015	1,3847	0,0359	0,0023	0,0001	0,0007	0,0036	0,0092	0,0024	0,0018	0,0009
DC	0,0001	-0,0001	-0,0001	0,0002	0,0013	1,3483	0,0000	0,0005	0,0000	0,0000	0,0012	0,0000	0,0001	0,0000
DD	0,0048	0,0009	0,0024	0,0063	0,0026	0,0026	1,3787	0,0207	0,0007	0,0026	0,0056	0,0156	0,0104	0,0044
DE	0,0103	0,0147	0,0143	0,0373	0,0114	0,0227	0,0201	1,2751	0,0039	0,0254	0,0182	0,0267	0,0164	0,0102
DF	0,0108	0,0268	0,0643	0,0066	0,0050	0,0037	0,0076	0,0051	1,0396	0,0251	0,0066	0,0113	0,0099	0,0044
DG	0,0180	-0,0003	0,0135	0,0113	0,0291	0,0260	0,0242	0,0311	0,0373	1,1696	0,1550	0,0222	0,0180	0,0097
DH	0,0029	0,0016	0,0015	0,0142	0,0063	0,0286	0,0065	0,0065	0,0004	0,0109	1,0493	0,0081	0,0122	0,0212
DI	0,0139	0,0020	0,0052	0,0184	0,0024	0,0027	0,0083	0,0065	-0,0036	0,0090	0,0067	1,1201	0,0197	0,0162
DJ	0,0060	0,0054	0,0092	0,0191	0,0070	0,0177	0,0163	0,0094	0,0032	0,0173	0,0470	0,0323	1,3321	0,1343
DK	0,0219	0,0021	0,0030	0,0023	0,0017	0,0007	0,0026	0,0022	0,0010	0,0033	0,0183	0,0169	0,0011	1,1134
DL	0,0007	0,0005	0,0026	0,0010	0,0011	0,0008	0,0012	0,0015	0,0006	0,0018	0,0039	0,0032	0,0035	0,0298
DM	0,0002	0,0024	0,0001	-0,0008	0,0001	-0,0015	-0,0003	-0,0002	0,0001	0,0000	0,0046	-0,0003	0,0005	0,0005
DN	0,0003	0,0004	0,0005	0,0006	0,0116	0,0021	-0,0016	0,0064	0,0002	0,0017	0,0084	0,0016	0,0147	0,0016
EE	0,0357	0,0232	0,1123	0,0318	0,0420	0,0235	0,0342	0,0421	0,0247	0,0450	0,0381	0,1133	0,0429	0,0242
FF	0,0202	0,0110	0,0216	0,0184	0,0122	0,0157	0,0215	0,0195	0,0122	0,0192	0,0124	0,0282	0,0419	0,0297
GG	0,0762	0,1845	0,1208	0,0448	0,0354	0,0223	0,0497	0,0528	0,0294	0,0564	0,0369	0,0760	0,0308	0,0362
HH	0,0068	0,0120	0,0152	0,0083	0,0115	0,0105	0,0104	0,0109	0,0095	0,0124	0,0094	0,0131	0,0145	0,0127
II	0,0248	0,0677	0,1237	0,0348	0,0304	0,0269	0,0450	0,0529	0,0276	0,0467	0,0393	0,0666	0,0415	0,0351
JJ	0,0460	0,0632	0,0654	0,0476	0,0540	0,0454	0,0638	0,0524	0,0179	0,0556	0,0438	0,0526	0,0402	0,0569
KK	0,0613	0,0594	0,0970	0,0927	0,0666	0,0570	0,0535	0,0864	0,0204	0,1367	0,0766	0,0726	0,0622	0,0647
LL	0,0000	0,0000	0,0000	0,0002	0,0000	0,0000	0,0000	0,0002	0,0000	0,0000	0,0000	0,0000	0,0002	0,0002
MM	0,0006	0,0024	0,0017	0,0015	0,0018	0,0014	0,0014	0,0021	0,0004	0,0024	0,0022	0,0021	0,0025	0,0021
NN	0,0041	0,0021	0,0013	0,0018	0,0013	0,0012	0,0025	0,0009	0,0003	0,0006	0,0007	0,0010	0,0001	0,0017
OO	0,0023	0,0043	0,0036	0,0037	0,0028	0,0025	0,0026	0,0041	0,0008	0,0057	0,0027	0,0030	0,0023	0,0021
PP	0,0000	0,0000	0,0000	0,0002	0,0000	0,0000	0,0000	0,0002	0,0000	0,0000	0,0000	0,0000	0,0002	0,0002

Annex A.2 – Partitioned matrix inverse: CTA (results from the rectangular M&U model with total flows at *pp*) (cont.)

	DL	DM	DN	EE	FF	GG	HH	II	JJ	KK	LL	MM	NN	OO	PP
AA	0,0042	0,0035	0,0492	0,0016	0,0136	0,0090	0,1035	0,0049	0,0030	0,0056	0,0052	0,0026	0,0255	0,0085	0,0000
BB	0,0002	0,0001	0,0002	0,0001	0,0001	0,0003	0,0128	0,0003	0,0002	0,0002	0,0002	0,0001	0,0003	0,0003	0,0000
CACB	0,0057	0,0067	0,0228	0,1517	0,0506	0,0111	0,0127	0,0272	0,0034	0,0064	0,0128	0,0049	0,0198	0,0165	0,0000
DA	0,0058	0,0041	0,0116	0,0021	0,0040	0,0111	0,3246	0,0065	0,0049	0,0056	0,0112	0,0065	[illegible]	0,0078	0,0000
DB	0,0135	0,0148	0,1212	0,0012	0,0046	0,0041	0,0146	0,0026	0,0009	0,0014	0,0034	0,0010	0,0175	0,0037	0,0000
DC	0,0016	0,0009	0,0234	0,0000	0,0001	0,0003	0,0002	0,0002	0,0001	0,0004	0,0002	0,0001	0,0001	0,0006	0,0000
DD	0,0054	0,0085	0,1890	0,0007	0,0572	0,0064	0,0043	0,0034	0,0016	0,0042	0,0025	0,0013	0,0013	0,0120	0,0000
DE	0,0221	0,0115	0,0299	0,0113	0,0126	0,0355	0,0207	0,0294	0,0249	0,0172	0,0158	0,0196	0,0126	0,0414	0,0000
DF	0,0118	0,0087	0,0267	0,0474	0,0816	0,0124	0,0269	0,0365	0,0082	0,0147	0,0309	0,0109	0,0729	0,0177	0,0000
DG	0,0567	0,0319	0,0729	0,0120	0,0420	0,0217	0,0156	0,0106	0,0036	0,0066	0,0068	0,0044	0,1136	0,0090	0,0000
DH	0,1293	0,0434	0,0650	0,0037	0,0150	0,0189	0,0090	0,0069	0,0028	0,0130	0,0037	0,0017	0,0053	0,0083	0,0000
DI	0,0091	0,0242	0,0202	0,0021	0,1962	0,0098	0,0191	0,0079	0,0032	0,0087	0,0073	0,0023	0,0032	0,0077	0,0000
DJ	0,1651	0,1777	0,1325	0,0100	0,1324	0,0366	0,0229	0,0156	0,0050	0,0167	0,0092	0,0033	0,0082	0,0167	0,0000
DK	0,0186	0,0419	0,0101	0,0066	0,0153	0,0067	0,0029	0,0025	0,0011	0,0037	0,0046	0,0011	0,0036	0,0037	0,0000
DL	0,4963	0,1108	0,0088	0,0296	0,0327	0,0318	0,0148	0,0579	0,0098	0,0118	0,0090	0,0050	0,0198	0,0239	0,0000
DM	0,0054	0,4787	0,0075	0,0011	0,0015	0,0201	0,0017	0,0076	0,0025	0,0014	0,0138	0,0029	0,0015	0,0027	0,0000
DN	0,0038	0,0483	0,1631	0,0008	0,0118	0,0042	0,0132	0,0029	0,0034	0,0032	0,0080	0,0042	0,0029	0,0184	0,0000
EE	0,0196	0,0185	0,0297	0,0006	0,0165	0,0310	0,0431	0,0268	0,0149	0,0146	0,0372	0,0247	0,0182	0,0741	0,0000
FF	0,0174	0,0133	0,0203	0,0230	0,3773	0,0306	0,0152	0,0450	0,0220	0,0689	0,0156	0,0084	0,0060	0,0486	0,0000
GG	0,0077	0,0045	0,0072	0,0050	0,0097	0,0252	0,0095	0,0254	0,0040	0,0114	0,0073	0,0032	0,0073	0,0106	0,0000
HH	0,0150	0,0084	0,0135	0,0061	0,0070	0,0259	0,0133	0,0253	0,0137	0,0145	0,0165	0,0056	0,0259	0,0214	0,0000
II	0,0373	0,0233	0,0422	0,0398	0,0294	0,1153	0,0296	0,3025	0,0423	0,0429	0,0460	0,0266	0,0226	0,1441	0,0000
JJ	0,0431	0,0329	0,0504	0,0570	0,0539	0,0789	0,0459	0,0676	0,1179	0,1111	0,0218	0,0156	0,0288	0,0688	0,0000
KK	0,1067	0,0718	0,0749	0,1181	0,0835	0,2584	0,1187	0,1685	0,2039	0,2667	0,1126	0,0741	0,1097	0,2583	0,0000
LL	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
MM	0,0044	0,0032	0,0021	0,0018	0,0008	0,0021	0,0013	0,0019	0,0020	0,0015	0,0023	0,0055	0,0008	0,0013	0,0000
NN	0,0009	0,0008	0,0005	0,0003	0,0007	0,0007	0,0011	0,0006	0,0001	0,0004	0,0011	0,0004	0,0835	0,0004	0,0000
OO	0,0041	0,0025	0,0120	0,0022	0,0027	0,0107	0,0065	0,0136	0,0052	0,0072	0,0052	0,0109	0,0061	0,1425	0,0000
PP	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
AA	0,0030	0,0025	0,0321	0,0012	0,0097	0,0070	0,0735	0,0035	0,0021	0,0041	0,0037	0,0020	0,0181	0,0061	0,0000
BB	0,0001	0,0002	0,0001	0,0000	0,0000	0,0001	0,0092	0,0001	0,0001	0,0001	0,0001	0,0000	0,0001	0,0001	0,0000
CACB	0,0014	0,0016	0,0066	0,0369	0,0123	0,0027	0,0031	0,0066	0,0008	0,0016	0,0031	0,0012	0,0048	0,0040	0,0000
DA	0,0022	0,0013	0,0039	0,0009	0,0011	0,0046	0,1694	0,0033	0,0021	0,0023	0,0055	0,0031	0,0288	0,0034	0,0000
DB	0,0077	0,0079	0,0895	0,0006	0,0024	0,0021	0,0084	0,0014	0,0005	0,0007	0,0015	0,0005	0,0101	0,0023	0,0000
DC	0,0007	0,0005	0,0141	0,0000	0,0000	0,0001	0,0001	0,0000	0,0001	0,0003	0,0001	0,0000	0,0000	0,0004	0,0000
DD	0,0042	0,0066	0,1502	0,0006	0,0463	0,0049	0,0033	0,0024	0,0013	0,0032	0,0019	0,0010	0,0010	0,0096	0,0000
DE	0,0143	0,0078	0,0198	0,0076	0,0083	0,0236	0,0138	0,0196	0,0163	0,0248	0,0105	0,0132	0,0085	0,0277	0,0000
DF	0,0035	0,0027	0,0079	0,0359	0,0162	0,0087	0,0079	0,0291	0,0026	0,0044	0,0091	0,0036	0,0218	0,0111	0,0000
DG	0,0189	0,0103	0,0247	0,0025	0,0136	0,0055	0,0045	0,0005	0,0010	0,0024	0,0015	0,0012	0,0435	0,0032	0,0000
DH	0,0486	0,0223	0,0336	0,0017	0,0092	0,0099	0,0044	0,0040	0,0009	0,0047	0,0017	0,0009	0,0022	0,0037	0,0000
DI	0,0068	0,0185	0,0163	0,0006	0,1506	0,0074	0,0146	0,0058	0,0024	0,0074	0,0055	0,0017	0,0023	0,0056	0,0000
DJ	0,0940	0,1005	0,0736	0,0056	0,0760	0,0207	0,0113	0,0087	0,0028	0,0094	0,0050	0,0021	0,0051	0,0094	0,0000
DK	0,0052	0,0145	0,0025	0,0021	0,0128	0,0029	0,0020	0,0010	0,0004	0,0012	0,0018	0,0004	0,0014	0,0012	0,0000
DL	1,2056	0,0451	0,0017	0,0116	0,0125	0,0106	0,0057	0,0216	0,0034	0,0036	0,0030	0,0017	0,0075	0,0086	0,0000
DM	-0,0022	1,1787	0,0004	0,0001	-0,0009	0,0064	0,0002	0,0011	-0,0001	0,0020	0,0048	0,0001	0,0003	0,0001	0,0000
DN	0,0013	0,0260	1,0884	0,0003	0,0053	0,0019	0,0072	0,0013	0,0018	0,0015	0,0043	0,0022	0,0015	0,0094	0,0000
EE	0,0201	0,0192	0,0305	1,6254	0,0293	0,0318	0,0442	0,0275	0,0149	0,0152	0,0385	0,0253	0,0193	0,0762	0,0000
FF	0,0158	0,0117	0,0180	0,0201	1,3886	0,0270	0,0135	0,0395	0,0180	0,0571	0,0135	0,0085	0,0055	0,0403	0,0000
GG	0,0465	0,0254	0,0387	0,0369	0,0551	1,1586	0,0565	0,1009	0,0225	0,0699	0,0452	0,0193	0,0446	0,0626	0,0000
HH	0,0137	0,0078	0,0123	0,0056	0,0063	0,0236	1,0094	0,0230	0,0124	0,0131	0,0150	0,0051	0,0157	0,0192	0,0000
II	0,0358	0,0223	0,0404	0,0375	0,0282	0,1105	0,0283	1,2911	0,0406	0,0411	0,0441	0,0255	0,0217	0,1381	0,0000
JJ	0,0416	0,0318	0,0488	0,0550	0,0520	0,0760	0,0443	0,0644	1,1138	0,1075	0,0209	0,0150	0,0276	0,0661	0,0000
KK	0,0670	0,0583	0,0573	0,0954	0,0617	0,2159	0,0976	0,1393	0,2464	1,2230	0,0964	0,0636	0,0932	0,2177	0,0000
LL	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	1,0000	0,0000	0,0000	0,0000	0,0000
MM	0,0045	0,0032	0,0022	0,0018	0,0008	0,0021	0,0013	0,0019	0,0020	0,0016	0,0024	1,0056	0,0008	0,0013	0,0000
NN	0,0009	0,0008	0,0005	0,0003	0,0007	0,0007	0,0011	0,0006	0,0001	0,0004	0,0011	0,0004	1,0838	0,0004	0,0000
OO	0,0045	0,0025	0,0110	-0,0024	0,0024	0,0096	0,0077	0,0126	0,0054	0,0214	0,0051	0,0096	0,0061	1,1333	0,0000
PP	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	1,0000

Annex A.3 – Domestic flow *bp* product-by-product inverse matrix: ITA (symmetric model)

	AA	BB	CA	CB	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK
AA	1.1313	0.0033	0.0000	0.0030	0.2595	0.0042	0.0087	0.2305	0.0515	0.0009	0.0069	0.0086	0.0053	0.0047	0.0029
BB	0.0002	1.0188	0.0000	0.0001	0.0016	0.0001	0.0001	0.0001	0.0001	0.0000	0.0003	0.0001	0.0001	0.0001	0.0001
CA	0.0000	0.0000	1.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000
CB	0.0019	0.0035	0.0000	1.0400	0.0031	0.0006	0.0007	0.0014	0.0014	0.0004	0.0063	0.0018	0.1083	0.0037	0.0027
DA	0.1135	0.0060	0.0000	0.0034	1.1568	0.0064	0.0256	0.0260	0.0117	0.0004	0.0080	0.0038	0.0034	0.0033	0.0027
DB	0.0047	0.0052	0.0000	0.0043	0.0021	1.3694	0.0068	0.0037	0.0024	0.0003	0.0009	0.0103	0.0031	0.0043	0.0021
DC	0.0002	0.0001	0.0000	0.0001	0.0001	0.0078	1.3394	0.0003	0.0009	0.0000	0.0001	0.0030	0.0001	0.0004	0.0002
DD	0.0049	0.0015	0.0000	0.0031	0.0062	0.0047	0.0029	1.3901	0.0194	0.0004	0.0032	0.0076	0.0154	0.0111	0.0055
DE	0.0102	0.0145	0.0000	0.0144	0.0056	0.0119	0.0224	0.0302	1.2621	0.0013	0.0038	0.0213	0.0271	0.0161	0.0108
DF	0.0049	0.0043	0.0000	0.0049	0.0063	0.0040	0.0034	0.0069	0.0048	1.0247	0.0216	0.0060	0.0146	0.0055	0.0043
DG	0.0199	0.0035	0.0000	0.0184	0.0121	0.0093	0.0052	0.0236	0.0302	0.0345	1.1464	0.1377	0.0241	0.0187	0.0109
DH	0.0032	0.0019	0.0000	0.0021	0.0133	0.0066	0.0268	0.0081	0.0081	0.0005	0.0114	1.0434	0.0084	0.0141	0.0202
DI	0.0135	0.0026	0.0000	0.0070	0.0180	0.0030	0.0030	0.0097	0.0068	0.0016	0.0043	0.0074	1.1181	0.0194	0.0175
DJ	0.0080	0.0057	0.0000	0.0098	0.0182	0.0087	0.0172	0.0177	0.0099	0.0017	0.0179	0.0482	0.0320	1.3001	0.1314
DK	0.0022	0.0024	0.0000	0.0043	0.0057	0.0021	0.0013	0.0031	0.0035	0.0004	0.0039	0.0156	0.0171	0.0097	1.1029
DL	0.0021	0.0033	0.0000	0.0046	0.0023	0.0020	0.0015	0.0025	0.0028	0.0003	0.0041	0.0056	0.0051	0.0064	0.0301
DM	0.0009	0.0028	0.0000	0.0011	0.0007	0.0009	0.0006	0.0008	0.0007	0.0001	0.0016	0.0013	0.0010	0.0038	0.0041
DN	0.0009	0.0008	0.0000	0.0009	0.0010	0.0119	0.0023	0.0055	0.0060	0.0001	0.0021	0.0083	0.0023	0.0157	0.0035
EE	0.0021	0.0209	0.0000	0.1040	0.0294	0.0361	0.0217	0.0311	0.0364	0.0026	0.0363	0.0342	0.1097	0.0390	0.0253
FF	0.0227	0.0135	0.0000	0.0296	0.0216	0.0150	0.0173	0.0249	0.0228	0.0097	0.0224	0.0189	0.0357	0.0458	0.0345
GG	0.0718	0.1991	0.0000	0.1128	0.0497	0.0378	0.0259	0.0534	0.0577	0.0076	0.0803	0.0457	0.0818	0.0491	0.0393
HH	0.0095	0.0115	0.0000	0.0151	0.0084	0.0114	0.0105	0.0106	0.0109	0.0006	0.0126	0.0097	0.0139	0.0142	0.0125
II	0.0237	0.0625	0.0000	0.1159	0.0345	0.0300	0.0269	0.0445	0.0507	0.0036	0.0482	0.0391	0.0718	0.0482	0.0349
JJ	0.0413	0.0567	0.0000	0.0600	0.0450	0.0485	0.0412	0.0565	0.0489	0.0051	0.0483	0.0470	0.0516	0.0371	0.0507
KK	0.0718	0.0760	0.0000	0.1159	0.1101	0.0764	0.0680	0.0720	0.1066	0.0077	0.1466	0.0903	0.0937	0.0724	0.0759
LL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MM	0.0009	0.0024	0.0000	0.0019	0.0015	0.0019	0.0014	0.0014	0.0021	0.0001	0.0023	0.0022	0.0022	0.0035	0.0021
NN	0.0041	0.0021	0.0000	0.0014	0.0019	0.0013	0.0012	0.0023	0.0009	0.0000	0.0005	0.0007	0.0011	0.0002	0.0016
OO	0.0025	0.0043	0.0000	0.0044	0.0038	0.0031	0.0026	0.0031	0.0061	0.0003	0.0056	0.0033	0.0041	0.0027	0.0023
PP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
SUM	**1.6027**	**1.5135**	**1.0000**	**1.7423**	**1.8415**	**1.7612**	**1.7348**	**2.0108**	**1.7574**	**1.1046**	**1.6896**	**1.6127**	**1.8914**	**1.7239**	**1.6250**

	DL	DM	DN	EE	FF	GG	HH	II	JJ	KK	LL	MM	NN	OO	PP
AA	0.0035	0.0026	0.0008	0.0015	0.0088	0.0092	0.0083	0.0039	0.0034	0.0057	0.0036	0.0020	0.0159	0.0060	0.0000
BB	0.0001	0.0000	0.0001	0.0000	0.0000	0.0002	0.0020	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0000
CA	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CB	0.0011	0.0022	0.0105	0.0011	0.0248	0.0019	0.0022	0.0013	0.0006	0.0017	0.0019	0.0004	0.0007	0.0013	0.0000
DA	0.0032	0.0019	0.0064	0.0014	0.0035	0.0078	0.1682	0.0047	0.0027	0.0048	0.0060	0.0034	0.0298	0.0045	0.0000
DB	0.0079	0.0040	0.0683	0.0010	0.0031	0.0040	0.0087	0.0120	0.0006	0.0017	0.0022	0.0007	0.0103	0.0054	0.0000
DC	0.0011	0.0006	0.0134	0.0001	0.0002	0.0005	0.0002	0.0002	0.0001	0.0003	0.0002	0.0001	0.0001	0.0005	0.0000
DD	0.0048	0.0068	0.1407	0.0016	0.0403	0.0062	0.0035	0.0030	0.0015	0.0039	0.0021	0.0011	0.0012	0.0083	0.0000
DE	0.0155	0.0094	0.0184	0.0073	0.0068	0.0232	0.0134	0.0182	0.0159	0.0231	0.0103	0.0126	0.0083	0.0095	0.0000
DF	0.0093	0.0031	0.0076	0.0272	0.0175	0.0081	0.0074	0.0263	0.0022	0.0051	0.0083	0.0038	0.0157	0.0102	0.0000
DG	0.0175	0.0131	0.0342	0.0041	0.0146	0.0083	0.0057	0.0041	0.0016	0.0045	0.0028	0.0016	0.0361	0.0104	0.0000
DH	0.0581	0.0213	0.0307	0.0030	0.0091	0.0094	0.0044	0.0049	0.0015	0.0051	0.0019	0.0009	0.0026	0.0041	0.0000
DI	0.0073	0.0178	0.0152	0.0048	0.1404	0.0089	0.0145	0.0095	0.0038	0.0092	0.0058	0.0019	0.0026	0.0064	0.0000
DJ	0.0629	0.0626	0.0705	0.0070	0.0713	0.0211	0.0111	0.0090	0.0032	0.0103	0.0051	0.0022	0.0052	0.0096	0.0000
DK	0.0075	0.0164	0.0048	0.0023	0.0136	0.0038	0.0032	0.0015	0.0006	0.0018	0.0006	0.0016	0.0016	0.0014	0.0000
DL	1.1852	0.0437	0.0038	0.0118	0.0135	0.0133	0.0083	0.0236	0.0043	0.0061	0.0038	0.0021	0.0082	0.0107	0.0000
DM	0.0033	1.1670	0.0030	0.0006	0.0010	0.0078	0.0006	0.0031	0.0005	0.0015	0.0051	0.0003	0.0007	0.0014	0.0000
DN	0.0024	0.0243	1.0810	0.0007	0.0061	0.0035	0.0069	0.0017	0.0018	0.0021	0.0042	0.0022	0.0016	0.0095	0.0000
EE	0.0195	0.0165	0.0302	1.1566	0.0353	0.0308	0.0404	0.0257	0.0146	0.0186	0.0350	0.0232	0.0175	0.0736	0.0000
FF	0.0186	0.0141	0.0211	0.0294	1.3515	0.0215	0.0154	0.0445	0.0182	0.0235	0.0154	0.0097	0.0097	0.0462	0.0000
GG	0.0534	0.0218	0.0488	0.0213	0.0691	1.1418	0.0559	0.1457	0.0288	0.0660	0.0427	0.0187	0.0425	0.0870	0.0000
HH	0.0141	0.0080	0.0124	0.0054	0.0068	0.0234	1.0084	0.0222	0.0124	0.0136	0.0147	0.0051	0.0186	0.0189	0.0000
II	0.0400	0.0269	0.0414	0.0337	0.0315	0.1023	0.0277	1.2741	0.0412	0.0488	0.0421	0.0244	0.0208	0.1285	0.0000
JJ	0.0402	0.0297	0.0448	0.0489	0.0478	0.0660	0.0364	0.0981	1.1010	0.0981	0.0182	0.0131	0.0245	0.0577	0.0000
KK	0.1072	0.0678	0.0728	0.1034	0.0756	0.2247	0.1063	0.1462	0.2831	1.2265	0.1004	0.0660	0.0976	0.2260	0.0000
LL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000
MM	0.0042	0.0031	0.0021	0.0017	0.0009	0.0021	0.0013	0.0019	0.0030	0.0017	0.0023	1.0060	0.0008	0.0013	0.0000
NN	0.0009	0.0006	0.0005	0.0003	0.0008	0.0008	0.0014	0.0005	0.0002	0.0005	0.0011	0.0004	1.0051	0.0005	0.0000
OO	0.0035	0.0028	0.0115	0.0025	0.0029	0.0097	0.0077	0.0121	0.0050	0.0165	0.0078	0.0094	0.0059	1.1227	0.0000
PP	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
SUM	**1.7987**	**1.6362**	**1.8119**	**1.8758**	**1.9940**	**1.7693**	**1.6327**	**1.8496**	**1.5190**	**1.4224**	**1.3449**	**1.2115**	**1.4697**	**1.6821**	**1.0000**

Annex A.4 – Domestic flow *bp* product-by-product inverse matrix: CTA (symmetric model)

	AA	BB	CACB	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK
AA	1,1359	0,0018	0,0022	0,2739	0,0249	0,0088	0,2481	0,0535	0,0009	0,0044	0,0083	0,0049	0,0038	0,0021
BB	0,0001	1,0159	0,0009	0,0016	0,0001	0,0001	0,0001	0,0001	0,0000	0,0003	0,0001	0,0001	0,0001	0,0001
CACB	0,0033	0,0058	1,0287	0,0028	0,0019	0,0013	0,0024	0,0021	0,2108	0,0177	0,0224	0,0375	0,0038	0,0019
DA	0,1118	0,0057	0,0039	1,1641	0,0052	0,0282	0,0393	0,0118	0,0005	0,0072	0,0031	0,0038	0,0030	0,0024
DB	0,0047	0,0053	0,0040	0,0017	1,2852	0,0389	0,0014	0,0010	0,0003	0,0031	0,0090	0,0025	0,0029	0,0009
DC	0,0002	0,0000	0,0000	0,0001	0,0014	1,3464	-0,0002	0,0005	0,0000	0,0006	0,0003	0,0000	0,0001	0,0000
DD	0,0045	0,0011	0,0039	0,0059	0,0025	0,0035	1,3764	0,0209	0,0002	0,0029	0,0045	0,0154	0,0037	0,0038
DE	0,0084	0,0143	0,0137	0,0371	0,0112	0,0228	0,0198	1,3749	0,0021	0,0253	0,0170	0,0265	0,0162	0,0280
DF	0,0102	0,0252	0,0639	0,0089	0,0045	0,0034	0,0070	0,0046	1,0382	0,0031	0,0061	0,0104	0,0054	0,0058
DG	0,0190	0,0029	0,0178	0,0129	0,0298	0,0254	0,0249	0,0305	0,0024	1,1700	0,1839	0,0224	0,0176	0,0101
DH	0,0023	0,0018	0,0016	0,0137	0,0061	0,0271	0,0089	0,0077	0,0000	0,0115	1,0499	0,0082	0,0133	0,0209
DI	0,0125	0,0018	0,0018	0,0182	0,0029	0,0027	0,0080	0,0054	0,0011	0,0090	0,0098	1,1209	0,0197	0,0190
DJ	0,0088	0,0052	0,0079	0,0183	0,0067	0,0168	0,0147	0,0088	0,0021	0,0182	0,0439	0,0314	1,3361	0,1261
DK	0,0020	0,0029	0,0037	0,0028	0,0018	0,0011	0,0028	0,0022	0,0003	0,0034	0,0188	0,0175	0,0059	1,1199
DL	0,0018	0,0039	0,0043	0,0017	0,0016	0,0012	0,0018	0,0029	0,0008	0,0027	0,0078	0,0043	0,0037	0,0053
DM	0,0005	0,0027	0,0009	0,0002	0,0005	0,0001	0,0003	0,0004	0,0002	0,0008	-0,0016	0,0005	0,0029	0,0022
DN	0,0085	0,0065	0,0068	0,0105	0,0112	0,0322	0,0122	0,0055	0,0001	0,0119	0,0073	0,0051	0,0198	0,0221
EE	0,0330	0,0317	0,1083	0,0301	0,0367	0,0223	0,0335	0,0368	0,0221	0,0430	0,0370	0,1083	0,0412	0,0222
FF	0,0071	0,0121	0,0249	0,0204	0,0138	0,0168	0,0237	0,0215	0,0120	0,0213	0,0138	0,0309	0,0448	0,0305
GG	0,0308	0,1689	0,1136	0,0459	0,0358	0,0288	0,0504	0,0506	0,0052	0,0644	0,0351	0,0728	0,0511	0,0351
HH	0,0060	0,0115	0,0150	0,0076	0,0113	0,0103	0,0100	0,0106	0,0036	0,0121	0,0090	0,0137	0,0140	0,0122
II	0,0229	0,0640	0,1219	0,0329	0,0284	0,0253	0,0424	0,0505	0,0251	0,0446	0,0374	0,0631	0,0393	0,0323
JJ	0,0418	0,0573	0,0594	0,0429	0,0487	0,0415	0,0507	0,0413	0,0119	0,0601	0,0362	0,0471	0,0358	0,0512
KK	0,0890	0,0728	0,1138	0,1071	0,0748	0,0633	0,0644	0,1053	0,0180	0,1475	0,0838	0,0821	0,0883	0,0718
LL	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
MM	0,0020	0,0024	0,0017	0,0015	0,0018	0,0014	0,0013	0,0021	0,0003	0,0024	0,0022	0,0021	0,0028	0,0021
NN	0,0042	0,0022	0,0013	0,0015	0,0013	0,0013	0,0025	0,0035	0,0003	0,0035	0,0021	0,0015	0,0021	0,0016
OO	0,0028	0,0025	0,0039	0,0036	0,0028	0,0026	0,0042	0,0045	0,0011	0,0051	0,0052	0,0035	0,0029	0,0030
PP	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
	1,5881	1,5158	1,7157	1,8513	1,7534	1,7565	2,0321	1,7981	1,4381	1,6713	1,5875	1,7322	1,7288	1,6118

	DL	DM	DN	EE	FF	GG	HH	II	JJ	KK	LL	MM	NN	OO	PP
AA	0,0027	0,0023	0,0261	0,0027	0,0081	0,0046	0,0857	0,0031	0,0018	0,0008	0,0025	0,0015	0,0185	0,0054	0,0000
BB	0,0000	0,0000	0,0001	0,0000	0,0000	0,0001	0,0002	0,0001	0,0001	0,0001	0,0001	0,0000	0,0001	0,0001	0,0000
CACB	0,0013	0,0015	0,0054	0,0283	0,0118	0,0029	0,0029	0,0064	0,0007	0,0014	0,0029	0,0011	0,0046	0,0029	0,0000
DA	0,0027	0,0016	0,0082	0,0016	0,0021	0,0059	0,1745	0,0044	0,0023	0,0023	0,0024	0,0023	0,0298	0,0080	0,0000
DB	0,0060	0,0085	0,0638	0,0056	0,0028	0,0078	0,0088	0,0076	0,0004	0,0008	0,0021	0,0005	0,0702	0,0057	0,0000
DC	0,0010	0,0089	0,0150	0,0000	0,0001	-0,0001	0,0001	0,0001	0,0001	0,0002	0,0001	0,0000	0,0002	0,0004	0,0000
DD	0,0042	0,0086	0,1550	-0,0013	0,0454	0,0042	0,0033	0,0021	0,0011	0,0031	0,0008	0,0013	0,0018	0,0091	0,0000
DE	0,0145	0,0079	0,0093	0,0071	0,0081	0,0234	0,0132	0,0155	0,0154	0,0245	0,0077	0,0129	0,0083	0,0276	0,0000
DF	0,0055	0,0034	0,0074	0,0244	0,0189	0,0065	0,0073	0,0277	0,0027	0,0038	0,0088	0,0027	0,0202	0,0105	0,0000
DG	0,0158	0,0118	0,0253	0,0031	0,0151	0,0065	0,0052	0,0080	0,0011	0,0009	0,0018	0,0015	0,0401	0,0105	0,0000
DH	0,0843	0,0216	0,0084	0,0016	0,0094	0,0061	0,0044	0,0047	0,0010	0,0047	0,0012	0,0008	0,0029	0,0038	0,0000
DI	0,0059	0,0113	0,0151	-0,0041	0,1481	0,0075	0,0144	0,0042	0,0019	0,0060	0,0018	0,0015	0,0023	0,0052	0,0000
DJ	0,0689	0,0066	0,0122	0,0026	0,0159	0,0131	0,0108	0,0072	0,0021	0,0035	0,0029	0,0015	0,0041	0,0088	0,0000
DK	0,0071	0,0114	0,0089	0,0017	0,0140	0,0124	0,0031	0,0011	0,0004	0,0014	0,0011	0,0004	0,0011	0,0045	0,0000
DL	1,2363	0,0463	0,0031	0,0131	0,0125	0,0111	0,0093	0,0244	0,0039	0,0045	0,0033	0,0023	0,0020	0,0108	0,0000
DM	0,0015	1,1684	0,0023	0,0065	0,0009	0,0081	0,0008	0,0030	0,0002	0,0004	0,0055	0,0005	0,0006	0,0009	0,0000
DN	0,0030	0,0158	1,0869	0,0081	0,0067	0,0201	0,0019	0,0043	0,0018	0,0027	0,0045	0,0029	0,0011	0,0092	0,0000
EE	0,0190	0,0180	0,0294	1,2339	0,0370	0,0311	0,0423	0,0294	0,0140	0,0141	0,0130	0,0245	0,0106	0,0249	0,0000
FF	0,0165	0,0121	0,0186	0,0081	1,2718	0,0261	0,0146	0,0386	0,0154	0,0877	0,0805	0,0081	0,0083	0,0445	0,0000
GG	0,0849	0,0649	0,0305	0,0266	0,0565	1,1265	0,0546	0,0123	0,0191	0,0069	0,0036	0,0180	0,0474	0,0303	0,0000
HH	0,0134	0,0072	0,0109	0,0053	0,0061	0,0242	1,0269	0,0231	0,0121	0,0120	0,0153	0,0046	0,0160	0,0192	0,0000
II	0,0340	0,0256	0,0387	0,0254	0,0385	0,1175	0,0261	1,2584	0,0385	0,0288	0,0417	0,0247	0,0226	0,1336	0,0000
JJ	0,0273	0,0579	0,0429	0,0485	0,0451	0,0465	0,0253	0,0849	1,1388	0,0877	0,0851	0,0229	0,0248	0,0891	0,0000
KK	0,0449	0,0816	0,0850	0,1060	0,0733	0,0379	0,1843	0,1500	0,2575	1,2435	0,0813	0,0851	0,0863	0,1337	0,0000
LL	0,0000	0,0080	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	1,0000	0,0000	0,0000	0,0000	0,0000
MM	0,0045	0,0037	0,0024	0,0018	0,0058	0,0021	0,0015	0,0059	0,0024	0,0032	0,0025	1,0050	0,0019	0,0042	0,0000
NN	0,0029	0,0080	0,0064	0,0022	0,0001	0,0001	0,0011	0,0008	0,0001	0,0004	0,0011	0,0004	1,0038	0,0004	0,0000
OO	0,0021	0,0024	0,0012	0,0056	0,0023	0,0001	0,0074	0,0125	0,0035	0,0037	0,0051	0,0065	0,0052	1,1520	0,0000
PP	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	1,0000
	1,7035	1,5289	1,6053	1,5456	1,8654	1,7062	1,6263	1,8885	1,5622	1,6251	1,2719	1,2883	1,4251	1,8058	1,0000

Annex A.5 – Domestic flow *bp* industry-by-industry inverse matrix: ITA (symmetric model)

	AA	BB	CA	CB	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK
AA	1,1351	0,0507	0,0000	0,0059	0,2133	0,0285	0,0646	0,3370	0,0530	0,0089	0,0074	0,0075	0,0066	0,0046	0,0035
BB	0,0005	1,0158	0,0000	0,0007	0,0070	0,0001	0,0001	0,0001	0,0001	0,0003	0,0004	0,0001	0,0002	0,0001	0,0001
CA	0,0000	0,0000	1,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
CB	0,0029	0,0006	0,0000	1,0451	0,0038	0,0026	0,0027	0,0079	0,0019	0,0059	0,0070	0,0011	0,1085	0,0134	0,0025
DA	0,1036	0,0068	0,0000	0,0041	1,1534	0,0058	0,0249	0,0747	0,0118	0,0054	0,0085	0,0037	0,0035	0,0054	0,0029
DB	0,0050	0,0056	0,0000	0,0048	0,0023	1,3095	0,0388	0,0034	0,0027	0,0025	0,0041	0,0117	0,0038	0,0043	0,0022
DC	0,0003	0,0002	0,0000	0,0003	0,0002	0,0017	1,3025	0,0002	0,0089	0,0003	0,0003	0,0015	0,0002	0,0004	0,0002
DD	0,0045	0,0057	0,0000	0,0055	0,0063	0,0035	0,0076	1,1489	0,0165	0,0054	0,0071	0,0061	0,0063	0,0116	0,0049
DE	0,0101	0,0144	0,0000	0,0143	0,0362	0,0117	0,0223	0,0199	1,2679	0,0079	0,0245	0,0126	0,0268	0,0167	0,0105
DF	0,0706	0,0788	0,0000	0,0808	0,0347	0,0357	0,0584	0,0375	0,0340	1,0258	0,0535	0,0186	0,0254	0,0680	0,0046
DG	0,0566	0,0201	0,0000	0,0155	0,0158	0,0382	0,0226	0,0273	0,0370	0,0263	1,1444	0,1351	0,0313	0,0789	0,0256
DH	0,0051	0,0053	0,0000	0,0062	0,0123	0,0053	0,0256	0,0071	0,0065	0,0068	0,0116	1,0465	0,0087	0,0155	0,0181
DI	0,0131	0,0000	0,0000	0,0074	0,3184	0,0036	0,0031	0,0060	0,0070	0,0076	0,0060	0,0075	1,1160	0,0150	0,0164
DJ	0,0085	0,0061	0,0000	0,0101	0,0136	0,0084	0,0174	0,0175	0,0183	0,0056	0,0176	0,0455	0,0039	1,2663	0,1360
DK	0,0024	0,0026	0,0000	0,0045	0,0030	0,0021	0,0015	0,0035	0,0029	0,0054	0,0036	0,0153	0,0036	0,0176	1,1345
DL	0,0021	0,0032	0,0000	0,0045	0,0022	0,0025	0,0016	0,0023	0,0021	0,0023	0,0034	0,0055	0,0046	0,0057	0,0255
DM	0,0009	0,0025	0,0000	0,0018	0,0006	0,0016	0,0007	0,0009	0,0009	0,0011	0,0016	0,0079	0,0011	0,0043	0,0045
DN	0,0035	0,0016	0,0000	0,0017	0,0031	0,0125	0,0025	0,0055	0,0146	0,0025	0,0412	0,0062	0,0026	0,0061	0,0055
EE	0,0327	0,0274	0,0000	0,1593	0,0293	0,0361	0,0218	0,0311	0,0386	0,0269	0,0412	0,0345	0,1385	0,0286	0,0227
FF	0,0028	0,0140	0,0000	0,0268	0,0216	0,0151	0,0113	0,0247	0,0229	0,0085	0,0227	0,0156	0,0052	0,0438	0,0022
GG	0,0763	0,1676	0,0000	0,1159	0,0576	0,0436	0,0326	0,0617	0,0561	0,0180	0,0730	0,0528	0,0667	0,0346	0,0449
HH	0,0071	0,0133	0,0000	0,0158	0,0085	0,0116	0,0108	0,0135	0,0113	0,0061	0,0136	0,0085	0,0144	0,0142	0,0132
II	0,0256	0,0638	0,0000	0,1206	0,0357	0,0308	0,0274	0,0449	0,0523	0,0308	0,0475	0,0386	0,0735	0,0414	0,0355
JJ	0,0405	0,0590	0,0000	0,0536	0,3481	0,0507	0,0429	0,0673	0,0582	0,0354	0,0541	0,0418	0,0545	0,0338	0,0535
KK	0,0559	0,0641	0,0000	0,0464	0,0569	0,0627	0,0548	0,0577	0,0685	0,0384	0,1286	0,0712	0,0780	0,0596	0,0622
LL	0,0045	0,0065	0,0000	0,0078	0,0061	0,0046	0,0058	0,0069	0,0061	0,0055	0,0063	0,0061	0,0071	0,0048	0,0045
MM	0,0009	0,0026	0,0000	0,0021	0,0016	0,0026	0,0016	0,0016	0,0025	0,0016	0,0021	0,0024	0,0026	0,0043	0,0025
NN	0,0043	0,0029	0,0000	0,0016	0,0021	0,0214	0,0014	0,0035	0,0012	0,0020	0,0026	0,0029	0,0016	0,0004	0,0019
OO	0,0031	0,0025	0,0000	0,0026	0,0045	0,0026	0,0026	0,0035	0,0051	0,0025	0,0046	0,0031	0,0046	0,0025	0,0027
PP	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
SUM	1,6329	1,5139	1,0000	1,7427	1,8554	1,7506	1,7347	2,0173	1,7626	1,3048	1,8150	1,6030	1,6523	1,7246	1,6166

	DL	DM	DN	EE	FF	GG	HH	II	JJ	KK	LL	MM	NN	OO	PP
AA	0,0035	0,0026	0,0259	0,0016	0,0050	0,0076	0,0726	0,0043	0,0021	0,0041	0,0040	0,0022	0,0150	0,0065	0,0000
BB	0,0001	0,0001	0,0001	0,0001	0,0001	0,0002	0,0051	0,0002	0,0001	0,0001	0,0001	0,0000	0,0002	0,0002	0,0000
CA	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
CB	0,0013	0,0024	0,0111	0,0015	0,0264	0,0016	0,0023	0,0014	0,0067	0,0016	0,0020	0,0025	0,0037	0,0014	0,0000
DA	0,0032	0,0024	0,0065	0,0017	0,0075	0,0024	0,1523	0,0051	0,0032	0,0041	0,0065	0,0032	0,0190	0,0065	0,0000
DB	0,0068	0,0066	0,0110	0,0012	0,0058	0,0025	0,0089	0,0025	0,0029	0,0018	0,0024	0,0068	0,0138	0,0064	0,0000
DC	0,0013	0,0007	0,0141	0,0001	0,0002	0,0004	0,0003	0,0003	0,0001	0,0003	0,0003	0,0002	0,0007	0,0002	0,0000
DD	0,0049	0,0071	0,1484	0,0017	0,0429	0,0056	0,0039	0,0033	0,0016	0,0039	0,0023	0,0013	0,0013	0,0098	0,0000
DE	0,0154	0,0085	0,0184	0,0063	0,0095	0,0031	0,0113	0,0111	0,0015	0,0129	0,0130	0,0075	0,0108	0,0065	0,0000
DF	0,0041	0,0025	0,0065	0,0220	0,0180	0,0065	0,0078	0,0255	0,0021	0,0049	0,0095	0,0030	0,0215	0,0110	0,0000
DG	0,0577	0,0195	0,0223	0,0035	0,0136	0,0024	0,0035	0,0048	0,0011	0,0033	0,0073	0,0017	0,0048	0,0053	0,0000
DH	0,0575	0,0225	0,0256	0,0016	0,0089	0,0039	0,0045	0,0045	0,0015	0,0045	0,0015	0,0085	0,0021	0,0041	0,0000
DI	0,0071	0,0195	0,0155	0,0049	0,1436	0,0089	0,0141	0,0071	0,0029	0,0025	0,0029	0,0029	0,0025	0,0029	0,0000
DJ	0,0665	0,0095	0,0695	0,0075	0,0725	0,0034	0,0113	0,0069	0,0024	0,0066	0,0053	0,0025	0,0065	0,0069	0,0000
DK	0,0090	0,0173	0,0054	0,0024	0,0145	0,0040	0,0033	0,0016	0,0009	0,0017	0,0016	0,0009	0,0015	0,0016	0,0000
DL	1,1545	0,0416	0,0038	0,0111	0,0123	0,0027	0,0060	0,0020	0,0041	0,0061	0,0037	0,0030	0,0071	0,0102	0,0000
DM	0,0034	1,1678	0,0037	0,0087	0,0014	0,0079	0,0011	0,0035	0,0007	0,0011	0,0051	0,0004	0,0039	0,0017	0,0000
DN	0,0025	0,0245	1,0830	0,0061	0,0065	0,0056	0,0065	0,0018	0,0015	0,0019	0,0041	0,0021	0,0071	0,0055	0,0000
EE	0,0188	0,0180	0,0287	1,5585	0,0234	0,0204	0,0404	0,0263	0,0150	0,0181	0,0250	0,0233	0,0177	0,0211	0,0000
FF	0,0080	0,0145	0,0081	0,0097	1,3619	0,0315	0,0119	0,0545	0,0083	0,0073	0,0156	0,0058	0,0119	0,0455	0,0000
GG	0,0655	0,0072	0,0517	0,0324	0,0659	1,1530	0,0623	0,1489	0,0365	0,0773	0,0465	0,0216	0,0425	0,0727	0,0000
HH	0,0088	0,0039	0,0156	0,0061	0,0071	0,0024	1,0089	0,0031	0,0034	0,0118	0,0151	0,0063	0,0136	0,0156	0,0000
II	0,0080	0,0265	0,0410	0,0082	0,0353	0,1065	0,0291	1,2168	0,0456	0,0440	0,0435	0,0253	0,0221	0,1545	0,0000
JJ	0,0429	0,0213	0,0484	0,0285	0,0800	0,0747	0,0430	0,0632	1,1081	0,1029	0,0214	0,0415	0,0276	0,0659	0,0000
KK	0,0852	0,0663	0,0582	0,0684	0,0663	0,1583	0,0679	0,1246	0,3075	1,1968	0,1625	0,0548	0,0595	0,1651	0,0000
LL	0,0025	0,0028	0,0045	0,0132	0,0081	0,0125	0,0063	0,0089	0,0130	0,0131	1,0259	0,0040	0,0055	0,0154	0,0000
MM	0,0041	0,0056	0,0059	0,0035	0,0017	0,0038	0,0035	0,0055	0,0025	0,0030	0,0075	1,0061	0,0073	0,0051	0,0000
NN	0,0011	0,0008	0,0009	0,0025	0,0009	0,0012	0,0013	0,0016	0,0009	0,0008	0,0013	0,0005	1,0633	0,0009	0,0000
OO	0,0028	0,0035	0,0118	0,0030	0,0038	0,0109	0,0061	0,0031	0,0061	0,0011	0,0080	0,0098	0,0067	1,1242	0,0000
PP	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	1,0000
SUM	1,7026	1,6317	1,8169	1,8835	2,0858	1,7104	1,6549	1,6523	1,5134	1,6252	1,3448	1,2114	1,4688	1,8816	1,0000

Annex A.6 – Domestic flow *bp* industry-by-industry inverse matrix: CTA (symmetric model)

	AA	BB	CACB	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK
AA	1,1412	0,0029	0,0028	0,2876	0,0257	0,0084	0,2511	0,0565	0,0013	0,0868	0,0072	0,0652	0,0045	0,0024
BB	0,0007	1,4184	0,0001	0,0017	0,0001	0,0001	0,0001	0,0001	0,0003	0,0003	0,0002	0,0001	0,0001	0,0001
CACB	0,0034	0,0058	1,0218	0,0029	0,0020	0,0014	0,0025	0,0023	0,2084	0,0619	0,0026	0,0087	0,0051	0,0021
DA	0,1071	0,0045	0,0020	1,1488	0,0034	0,0257	0,0102	0,0080	0,0084	0,0084	0,0019	0,0027	0,0029	0,0021
DB	0,0044	0,0047	0,0020	0,0016	1,3447	0,0389	0,0022	0,0008	0,0007	0,0408	0,0062	0,0022	0,0018	0,0009
DC	0,0001	-0,0001	-0,0001	0,0000	0,0012	1,3483	0,0008	0,0005	0,0005	0,0000	0,0012	0,0008	0,0001	0,0000
DD	0,0048	0,0058	0,0049	0,0068	0,0076	0,0026	1,2707	0,0301	0,0017	0,0076	0,0055	0,0156	0,0104	0,0044
DE	0,0103	0,0147	0,0140	0,0273	0,0114	0,0227	0,0201	1,2251	0,0029	0,0254	0,0182	0,0067	0,0184	0,0102
DF	0,0138	0,0268	0,0842	0,0086	0,0050	0,0037	0,0016	0,0052	1,0398	0,0251	0,0062	0,0112	0,0059	0,0044
DG	0,0180	-0,0003	0,0158	0,0113	0,0091	0,0290	0,0245	0,0311	0,0277	1,1896	0,1550	0,0222	0,0150	0,0097
DH	0,0029	0,0015	0,0015	0,0142	0,0082	0,0268	0,0085	0,0085	0,0084	0,0109	1,3483	0,0061	0,0122	0,0212
DI	0,0136	0,0050	0,0052	0,0184	0,0024	0,0027	0,0053	0,0058	-0,0036	0,0080	0,0067	1,1501	0,0161	0,0162
DJ	0,0080	0,0054	0,0080	0,0191	0,0610	0,0177	0,0162	0,0094	0,0022	0,0113	0,0470	0,0023	1,3351	0,1340
DK	0,0018	0,0071	0,0039	0,0025	0,0017	0,0007	0,0029	0,0020	0,0013	0,0033	0,0183	0,0168	0,0011	1,1114
DL	0,0001	0,0005	0,0029	0,0010	0,0011	0,0068	0,0012	0,0015	0,0082	0,0015	0,0039	0,0033	0,0035	0,0298
DM	0,0002	0,0024	0,0001	-0,0006	0,0001	-0,0015	-0,0003	-0,0003	0,0001	0,0000	0,0048	-0,0003	0,0002	0,0005
DN	0,0003	0,0084	0,0005	0,0050	0,0116	0,0021	-0,0016	0,0084	0,0082	0,0017	0,0084	0,0016	0,0141	0,0019
EE	0,0052	0,0225	0,1128	0,0318	0,0420	0,0288	0,0342	0,0421	0,0247	0,0458	0,0383	0,1133	0,0428	0,0242
FF	0,0025	0,0115	0,0216	0,0154	0,0122	0,0157	0,0215	0,0196	0,0122	0,0182	0,0134	0,0262	0,0418	0,0281
GG	0,0752	0,1845	0,1508	0,0448	0,0604	0,0220	0,0407	0,0628	0,0244	0,0694	0,0368	0,0740	0,0508	0,0362
HH	0,0098	0,0128	0,0153	0,0043	0,0115	0,0103	0,0104	0,0105	0,0035	0,0124	0,0066	0,0131	0,0145	0,0121
II	0,0249	0,0877	0,1251	0,0346	0,0304	0,0288	0,0459	0,0528	0,0265	0,0461	0,0383	0,0688	0,0415	0,0351
JJ	0,0400	0,0302	0,0454	0,0476	0,0540	0,0464	0,0424	0,0324	0,0179	0,0558	0,0403	0,0526	0,0402	0,0269
KK	0,0613	0,0584	0,0810	0,0391	0,0665	0,0579	0,0533	0,0654	0,0284	0,1261	0,0748	0,0728	0,0623	0,0641
LL	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
MM	0,0006	0,0024	0,0017	0,0015	0,0018	0,0014	0,0014	0,0021	0,0004	0,0024	0,0022	0,0021	0,0026	0,0021
NN	0,0041	0,0021	0,0013	0,0016	0,0013	0,0013	0,0025	0,0006	0,0003	0,0005	0,0007	0,0016	0,0001	0,0011
OO	0,0023	0,0043	0,0036	0,0037	0,0026	0,0029	0,0026	0,0046	0,0009	0,0051	0,0037	0,0034	0,0032	0,0021
PP	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
SUM	1,6603	1,5221	1,7108	1,8489	1,7031	1,7342	2,2226	1,7665	1,4284	1,4726	1,9062	1,7326	1,7258	1,6185

	DL	DM	DN	EE	FF	GG	HH	II	JJ	KK	LL	MM	NN	OO	PP
AA	0,0036	0,0025	0,0021	0,0012	0,0097	0,0070	0,0735	0,0035	0,0021	0,0041	0,0037	0,0020	0,0181	0,0061	0,0000
BB	0,0001	0,0002	0,0001	0,0002	0,0002	0,0001	0,0002	0,0001	0,0001	0,0001	0,0001	0,0000	0,0001	0,0001	0,0000
CACB	0,0014	0,0016	0,0028	0,0089	0,0123	0,0037	0,0031	0,0088	0,0008	0,0016	0,0051	0,0015	0,0046	0,0049	0,0000
DA	0,0022	0,0013	0,0033	0,0005	0,0011	0,0045	0,1694	0,0005	0,0021	0,0025	0,0029	0,0027	0,0185	0,0054	0,0000
DB	0,0017	0,0078	0,0035	0,0005	0,0029	0,0021	0,0084	0,0014	0,0008	0,0007	0,0018	0,0008	0,0111	0,0053	0,0000
DC	0,0003	0,0005	0,0141	0,0000	0,0009	0,0001	0,0001	0,0000	0,0001	0,0002	0,0001	0,0000	0,0000	0,0004	0,0000
DD	0,0042	0,0086	0,1503	0,0006	0,0463	0,0049	0,0033	0,0024	0,0013	0,0022	0,0018	0,0010	0,0010	0,0099	0,0000
DE	0,0142	0,0011	0,0152	0,0017	0,0082	0,0025	0,0136	0,0156	0,0156	0,0246	0,0105	0,0032	0,0052	0,0277	0,0000
DF	0,0035	0,0027	0,0076	0,0235	0,0155	0,0081	0,0076	0,0031	0,0022	0,0044	0,0091	0,0032	0,0212	0,0111	0,0000
DG	0,0189	0,0102	0,0247	0,0025	0,0155	0,0055	0,0045	0,0085	0,0074	0,0024	0,0015	0,0015	0,0098	0,0088	0,0000
DH	0,0686	0,0229	0,0038	0,0017	0,0063	0,0065	0,0044	0,0048	0,0009	0,0047	0,0017	0,0007	0,0022	0,0037	0,0000
DI	0,0092	0,0105	0,0153	0,0024	0,1508	0,0074	0,0146	0,0050	0,0029	0,0074	0,0025	0,0011	0,0022	0,0052	0,0000
DJ	0,0848	0,1105	0,0795	0,0085	0,0770	0,0097	0,0113	0,0087	0,0038	0,0084	0,0053	0,0021	0,0061	0,0094	0,0000
DK	0,0053	0,0145	0,0058	0,0024	0,0075	0,0023	0,0026	0,0024	0,0024	0,0013	0,0018	0,0014	0,0014	0,0031	0,0000
DL	1,3258	0,0451	0,0217	0,0115	0,0125	0,0168	0,0025	0,0218	0,0034	0,0008	0,0032	0,0017	0,0079	0,0298	0,0000
DM	-0,0002	1,1787	0,0004	0,0001	-0,0004	0,0054	0,0002	0,0001	-0,0001	0,0000	0,0044	0,0007	0,0003	0,0001	0,0000
DN	0,0014	0,0026	1,0854	0,0000	0,0025	0,0013	0,0029	0,0013	0,0022	0,0015	0,0044	0,0039	0,0012	0,0094	0,0000
EE	0,0301	0,0192	0,0308	1,0254	0,0303	0,0318	0,0442	0,0275	0,0148	0,0152	0,0053	0,0255	0,0183	0,0492	0,0000
FF	0,0156	0,0117	0,0165	0,0087	1,3896	0,0270	0,0125	0,0385	0,0186	0,0871	0,0135	0,0083	0,0083	0,0402	0,0000
GG	0,0452	0,0354	0,0357	0,0038	0,0551	1,1582	0,0582	0,1659	0,0228	0,0098	0,0453	0,0160	0,0349	0,0633	0,0000
HH	0,0153	0,0016	0,0123	0,0056	0,0063	0,0236	1,2084	0,0230	0,0124	0,0131	0,0153	0,0057	0,0181	0,0162	0,0000
II	0,0358	0,0223	0,0404	0,0075	0,0382	0,1185	0,0383	1,2911	0,0408	0,0411	0,0441	0,0226	0,0211	0,1381	0,0000
JJ	0,0418	0,0318	0,0466	0,0652	0,0522	0,0780	0,0443	0,0644	1,1136	0,1075	0,0207	0,0159	0,0279	0,0667	0,0000
KK	0,0676	0,0583	0,0673	0,0054	0,0817	0,3159	0,0916	0,1593	0,2464	1,2293	0,0664	0,0659	0,0624	0,2177	0,0000
LL	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	1,0000	0,0000	0,0000	0,0000	0,0000
MM	0,0045	0,0035	0,0022	0,0015	0,0026	0,0031	0,0029	0,0019	0,0029	0,0016	0,0024	1,0084	0,0025	0,0025	0,0000
NN	0,0006	0,0006	0,0003	0,0003	0,0007	0,0002	0,0011	0,0009	0,0001	0,0004	0,0011	0,0008	1,0833	0,0009	0,0000
OO	0,0026	0,0036	0,0115	-0,0026	0,0024	0,0068	0,0077	0,0176	0,0054	0,0214	0,0061	0,0068	0,0061	1,1332	0,0000
PP	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	1,0000
SUM	1,7628	1,6246	1,8837	1,3437	1,9816	1,7149	1,8306	1,8617	1,5138	1,6076	1,3415	1,2134	1,3765	1,8788	1,0000

Mathematical Appendix

This appendix makes the mathematical proof of the full equivalence of the two methods considered in this paper, besides the practical example that was provided above. ITA is the reference technological assumption in this appendix, although an equivalent proof can be made for CTA.

Let us start with the product-by-product case. Our aim is to show that the multipliers inserted in the inverse matrix of the symmetric, domestic-flow, *bp* table (like the ones of Annex A.3), are the same that may be inferred of the upper left-hand part of the M&U's inverse (as in Annex A.1).

The multipliers of this upper left-hand block correspond to equation (7). The first step is to re-write (7) for domestic flows at *bp*. Defining $\hat{\mathbf{t}} = (\mathbf{I} - \hat{\mathbf{e}})\,(\mathbf{I} - \hat{\mathbf{f}} - \hat{\mathbf{n}})$ as the diagonal matrix that proceeds (through pre-multiplication) to the transformation of a column-vector (or of each column of one matrix) of total-flows at *pp* into its equivalent with domestic-flows at *bp*, then:

$$\left(\mathbf{p}^{N}\right)^{bp} = \hat{\mathbf{t}}\,\mathbf{p}^{pp} \quad \text{and} \quad \left(\mathbf{y}^{N}\right)^{bp} = \hat{\mathbf{t}}\,\mathbf{y}^{pp} \tag{A.1}$$

(in this appendix the superscript *N* means domestic flows and *bp*/*pp* basic or purchasers prices)

On the other hand: $\left(\mathbf{Q}^{N}\right)^{bp} = \hat{\mathbf{t}}\,\mathbf{Q}$ (A.2)

(because $\mathbf{Q} = \mathbf{U}^{pp}\left(\hat{\mathbf{g}}^{bp}\right)^{-1}$ and $\left(\mathbf{Q}^{N}\right)^{bp} = \left(\mathbf{U}^{N}\right)^{bp}\left(\hat{\mathbf{g}}^{bp}\right)^{-1}$ by the «technical» coefficient definition. So $\left(\mathbf{U}^{N}\right)^{bp} = \hat{\mathbf{t}}\,\mathbf{U}^{pp} \Rightarrow \left(\mathbf{Q}^{N}\right)^{bp} = \hat{\mathbf{t}}\,\mathbf{Q}$).

As for the matrix $\mathbf{S}$ (in (7) as well), this one was already calculated with domestic production only, and it was evaluated at *bp*. However, the denominator in these coefficients were the cells of $\mathbf{p}^{pp}$: the total product supplies, with imports included, at *pp*. This means: $\mathbf{S} = \mathbf{V}^{bp}\left(\hat{\mathbf{p}}^{pp}\right)^{-1}$.

Being $\mathbf{S}^{N} = \mathbf{V}^{bp}\left[\left(\hat{\mathbf{p}}^{N}\right)^{bp}\right]^{-1}$ instead, then:

$$\mathbf{S}^{N} = \mathbf{V}^{bp}\left(\hat{\mathbf{t}}\,\hat{\mathbf{p}}^{pp}\right)^{-1} = \mathbf{V}^{bp}\left(\hat{\mathbf{p}}^{pp}\right)^{-1}\hat{\mathbf{t}}^{-1} = \mathbf{S}\,\hat{\mathbf{t}}^{-1} \tag{A.3}$$

Making use of these results, and returning to (7), we may then conclude that:

$$\begin{aligned}
&\mathbf{p}^{pp} = \left(\mathbf{I} - \mathbf{QS}\right)^{-1}\mathbf{y}^{pp} \\
&\hat{\mathbf{t}}\,\mathbf{p}^{pp} = \hat{\mathbf{t}}\left(\mathbf{I} - \mathbf{QS}\right)^{-1}\hat{\mathbf{t}}^{-1}\,\mathbf{t}\,\mathbf{y}^{pp} \\
&\left(\mathbf{p}^{N}\right)^{bp} = \left[\hat{\mathbf{t}}\left(\mathbf{I} - \mathbf{QS}\right)\hat{\mathbf{t}}^{-1}\right]^{-1}\left(\mathbf{y}^{N}\right)^{bp} \quad \text{by (A.1)} \\
&\left(\mathbf{p}^{N}\right)^{bp} = \left(\mathbf{I} - \hat{\mathbf{t}}\,\mathbf{QS}\,\hat{\mathbf{t}}^{-1}\right)^{-1}\left(\mathbf{y}^{N}\right)^{bp} \\
&\left(\mathbf{p}^{N}\right)^{bp} = \left[\mathbf{I} - \left(\mathbf{Q}^{N}\right)^{bp}\mathbf{S}^{N}\right]^{-1}\left(\mathbf{y}^{N}\right)^{bp} \quad \text{by (A.1) and (A.3)}
\end{aligned} \tag{A.4}$$

On the other hand, remark that the symmetric model is not based on $\left(\mathbf{U}^{N}\right)^{bp}$, as this is a product--by-industry matrix. Let $\left(\mathbf{Z}^{N}\right)^{bp}$ denote instead the intermediate consumption matrix of the symmetric product-by-product domestic-flow table (at basic prices). This matrix includes the products needed for the production of each product. Making use of the ITA assumption, $\left(\mathbf{Z}^{N}\right)^{bp}$ can be computed by the equation:

$$\left(\mathbf{Z}^{N}\right)^{bp} = \left(\mathbf{Q}^{N}\right)^{bp}\mathbf{V}^{bp} \qquad \text{(A.5)}$$

The corresponding «technical» coefficients matrix is:

$$\mathbf{A}^{N} = \left(\mathbf{Z}^{N}\right)^{bp}\left[\left(\hat{\mathbf{p}}^{N}\right)^{bp}\right]^{-1}$$

$$\mathbf{A}^{N} = \left(\mathbf{Q}^{N}\right)^{bp}\mathbf{V}^{bp}\left[\left(\hat{\mathbf{p}}^{N}\right)^{bp}\right]^{-1} = \left(\mathbf{Q}^{N}\right)^{bp}\mathbf{S}^{N} \quad \text{by (A.5) and (A.3), so} \qquad \text{(A.6)}$$

$$\left(\hat{\mathbf{p}}^{N}\right)^{bp} = \left(\mathbf{I}-\mathbf{A}^{N}\right)^{-1}\left(\mathbf{y}^{N}\right)^{bp} \Rightarrow \left(\mathbf{p}^{N}\right)^{bp} = \left[\mathbf{I}-\left(\mathbf{Q}^{N}\right)^{bp}\mathbf{S}^{N}\right]^{-1}\left(\mathbf{y}^{N}\right)^{bp}$$

which is the same than the outcome of (A.4).

Concerning now the industry-by-industry case, the symmetric domestic-flow ITA-based table (at basic prices) comprises an intermediate consumption matrix $\left(\mathbf{Z}_{\mathbf{I}}^{N}\right)^{bp}$ derived as follows:

$$\left(\mathbf{Z}_{\mathbf{I}}^{N}\right)^{bp} = \mathbf{S}^{N}\left(\mathbf{U}^{N}\right)^{bp}, \quad \text{so}$$

$$\left(\mathbf{Z}_{\mathbf{I}}^{N}\right)^{bp}\left(\hat{\mathbf{g}}^{bp}\right)^{-1} = \mathbf{S}^{N}\left(\mathbf{U}^{N}\right)^{bp}\left(\hat{\mathbf{g}}^{bp}\right)^{-1} \quad \text{and} \qquad \text{(A.7)}$$

$$\mathbf{A}_{\mathbf{I}}^{N} = \mathbf{S}^{N}\left(\mathbf{Q}^{N}\right)^{bp} \Rightarrow \left(\mathbf{I}-\mathbf{A}_{\mathbf{I}}^{N}\right)^{-1} = \left(\mathbf{I}-\mathbf{S}^{N}\left(\mathbf{Q}^{N}\right)^{bp}\right)^{-1}$$

It is straightforward that this is the same than the lower right-hand block in equation (6), displayed as well in our example in Annex A.1, as:

$$\mathbf{S}^{N}\left(\mathbf{Q}^{N}\right)^{bp} = \mathbf{S}\hat{\mathbf{t}}^{-1}\hat{\mathbf{t}}\mathbf{Q} = \mathbf{S}\mathbf{Q} \quad \text{by (A.2) and (A.3)} \qquad \text{(A.8)}$$

Financial Constraints and Exports: An Analysis of Portuguese Firms During the European Monetary Integration*

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abstract

Financial constraints are a key determinant that hinders firms' ability to export. This paper analyses the nexus between these constraints and firms' engagement in international trade, as well as it explores the impact of the European monetary integration process upon firms' financial constraints. Therefore, we estimate cash to cash-flow sensitivities for different periods (1996-2000 and 2001-2004) and different groups of firms, according to their exporting and importing activity. Our results indicate that, depending on their international openness, the European monetary integration seems to have generally helped reducing the degree of financial constraints faced by Portuguese firms. Additionally, our findings suggest that rather than unconstrained firms self-selecting into exporting firms' constraints were reduced after they started exporting.

resumo

As restrições financeiras são um factor fundamental que inibe as exportações das empresas. Este texto analisa estas relações, bem como o impacto da Integração Monetária Europeia nas restrições ao financiamento das empresas. Para este efeito, estimámos a sensibilidade da liquidez ao cash-flow em períodos distintos (1996-2000 e 2001-2004) e para diferentes empresas, segundo a sua actividade exportadora e importadora. Os resultados indicam que a Integração Monetária Europeia reduziu o nível de restrições financeiras das empresas portuguesas, apesar deste efeito ter sido desigual para empresas consoante o seu grau de abertura ao exterior. Por fim, os resultados sugerem que ao invés de apenas empresas sem restrições ao financiamento serem capazes de exportar, estas restrições diminuem com o inicio da actividade exportadora.

JEL Classification: F14, F36, G32.

* Acknowledgments: We thank the Editor and an anonymous referee for their helpful comments and suggestions. Financial support from FCT (Portuguese Science Foundation) and GEMF is greatly appreciated. Filipe Silva would like to thank the financial support provided by FCT through the doctoral grant SFRH/BD/44067/2008 (POPH/FSE program).

1. Introduction

The causality between financial constraints and openness to foreign markets is rather unclear. On the one hand, *open* firms may have access to foreign finance and, especially if they are strong exporters, see their domestic credit conditions improve. On the other, these firms may only export because they were able to overcome the financial constraint barriers. Effectively, there are additional costs to explore foreign markets and the required investment may be financially constrained. As a result, only firms that are not financially constrained are able to export.

This paper explores how financial constraints relate to the openness of firms to foreign markets, in particular to their exporting and importing activities. Additionally, it evaluates the changes in firms' levels of constraints driven by a monetary integration process (the European Common Currency). While we find an inverse relationship between export intensity and financial constraints, we cast some doubts on the argument stating that only unconstrained firms self-select into export behaviour. In fact, a priori constrained firms are also able to export and there are significant improvements in firms' ability to raise external funds once they start exporting. Furthermore, we argue that while in general the monetary integration reduced the constraints faced by Portuguese firms, these were affected differently depending on their importing and exporting activities.

After the accession to the European Economic Communities (now the European Union, EU) in 1986, Portugal experienced not only the creation of the Common Market in 1992, but most of all the introduction of the Common Currency in 2001. The monetary integration that culminated in the Euro brought several changes, of which we should point out the reduction of interest rates (annualised benchmark interest rate fell from 7.2% in 1996 to 2.1% in 2004)[1] and the promotion of deeper integration of financial markets within the Euro area. Not only could economic agents obtain finance in the Euro area cheaper and in an easier manner, but also the adoption of a stronger currency has eased the access of Portuguese firms to foreign finance.

This paper is the first, to our knowledge, to analyse the effects of the European Monetary Integration on firms' ability to raise external funds. Additionally, along with the recent text of Silva (2011b), it is the first to analyse the relationship between openness to foreign markets, exports and firms' constraints for Portugal. Furthermore the relatively large time span of our unique dataset (see Silva and Carreira, 2010) allows us to compare two distinct periods (before and after monetary integration), which, as far as we know, is novel in the analysis of financial constraints at the firm level[2].

The importance of this paper with respect to policy making seems also worthwhile mentioning. On the one hand, it provides insights on the effects that monetary integrations have upon firms financial constraints, which is relevant not only to understand the subsequent behaviour of Portuguese firms after the introduction of the Euro, but also for policymakers in countries now joining the Common Currency. On the other, the clarification of the relationship between constraints, degree of openness and, most importantly, export activity, provides further evidence that is crucial to devise the adequate incentives to alleviate constraints and ultimately foster exports.

The paper is organized as follows. Section 2 makes a brief discussion of the literature on financial constraints, firms' exports and monetary integration. In Section 3 we discuss the dataset. Section 4 describes our empirical methodology, while Section 5 presents the main results. Finally, Section 6 pulls the pieces together and concludes.

1 Annualised Euribor and Lisbor at 3 months with adjusted Lisbor by the mean difference in common years (see Appendix for details).
2 Focusing on firm size issues and using different datasets, Cabral and Mata (2003) and Oliveira and Fortunato (2006) have also analyzed the role of financial constraints. The former use entrepreneurs' age as a proxy for wealth (ultimately for financial constraints) to analyse the evolution of firm size distribution; the latter estimate the impact of cash-flow upon firm employment growth (significant cash-flow coefficients are usually regarded as indicating the presence of financial constraints).

2. Firms' financial constraints

2.1. Measuring financial constraints

The abstract nature of the concept of financial constraints (albeit for subjective firm self-evaluation, it is not directly measurable) has challenged researchers, mostly on empirical grounds, to consistently measure these constraints. In fact, even on theoretical grounds, it is difficult to come up with a clear-cut definition of financial constraints. If on the one hand, we can broadly say that financial constraints exist whenever there is a wedge between the costs of obtaining internal and external funds – following Kaplan and Zingales's (1997) definition that virtually covers every firm –, on the other, we prefer to define financial constraints as the inability of a firm to raise the necessary amounts (usually due to external finance shortage) to finance their investment and growth.

Despite theoretical literature identifies difficulties in the access of firms to external funds, empirically there is no consensus on how to measure financial constraints (see Hubbard, 1998 or Carreira and Silva, 2010 for a discussion). While some authors may resort to the primordial Fazzari, Hubbard and Petersen (1988) measure of Investment-Cash Flow Sensitivities (e.g. Bond *et al.*, 2003), others check if parameter restrictions of a derived reduced form Euler equation for investment, based on Whited (1992), are satisfied (e.g. Harhoff, 1998).

Recently, analyzing firm's demand for cash, Almeida *et al.* (2004) advance that the level of financial constraints can be measured by the sensitivity of cash to cash-flows (CCFS). They argue that only constrained firms will manage liquidity to maximize their value. The rationale behind is that while constrained firms need to save cash out of cash flows in order to take advantage of future investment opportunities, unconstrained firms do not, as they are able to resort to external finance. Meanwhile, firms that hold cash incur in opportunity costs associated with present investment opportunities. As a result, only constrained firms will need to optimize their cash stocks along the time, in order to maximize their profits and hedge against future shocks. Therefore, one can expect that estimates on the sensitivity of cash stocks to cash-flow would be positive and significant for constrained firms, while no such relation should be expected for unconstrained ones. In fact, Hahn (2010) supports that holding liquid assets may work as a good hedging policy for firms, when there are imperfections in financial markets. To our knowledge, only a few works have used this approach so far (see Silva and Carreira, 2010 for details).

Finally, other strategies include the construction of indexes based on variables that are generally agreed to be good proxies of constraints or, if data is available, resort to the subjective firms' self-evaluation of constraints (see Carreira and Silva, 2010).

2.2. Financial constraints, trade and monetary integration

Financial constraints seem to be an important factor to take into account when analysing international trade, as suggested, for example, by the theoretical models of Chaney (2005), Manova (2010) and Broll and Wahl (2011). These models are based on Melitz (2003), that already recognizes the importance of fixed costs when firms decide to export. However, in such models, financial constraints are seen as an exogenous barrier to export, even though we provide evidence that firms that start exporting experience a reduction in constraints. Shipping goods across countries may entail significant additional costs than selling them in the domestic market, not to mention jurisdiction differences between countries (Bekaert and Hodrick, 2008). Even though one should expect a negative relationship between financial constraints and exports, it is not clear whether exporting reduces financial constraints or unconstrained firms self-select into exporting. On the one hand, start exporting may lead to more stable cash-flows due to sales diversification, that hedge against demand side shocks (Bridges and Guariglia, 2008). Moreover, exporting may signal efficiency to investors (Ganesh-Kumar *et al.*, 2001), not to mention that such firms may additionally gain access to foreign finance. On the other hand, firms face significant sunk costs when they start exporting, thus financial constraints may work as a major barrier to

export activity. In fact, Bellone *et al.* (2010), for French firms, find that financial constraints work as an *ex-ante* barrier to export, since less constrained firms self-select into exporting behaviour. Examples of this self-selection effect can also be found in Greenway *et al.* (2007) for the UK, Manole and Spatareanu (2010) for the case of Czech firms, Forlani (2010) and Minetti and Zhu (2011) for Italian firms or in Berman and Hericourt (2010) for 9 developing and emerging economies. Therefore, if financial constraints work as a major barrier to export then, in order to foster exports, incentives particularly designed to alleviate such constraints are certainly warranted[3]. Recently, for the Portuguese case, Silva (2011b) analyses firms financial condition prior to export and uses an index of constraints based on Bellone *et al.* (2010) as dependent variable for treatment effects estimation of the impact of exports upon financial constraints. His results support that not only there is a self-selection effect, but also that such constraints are reduced once firms engage in exporting activity.

When it comes to financial development and integration, while previous empirical literature, in general, found that it alleviates firms' financial constraints (Carreira and Silva, 2010), recent studies analysing the impact of financial crises, put these results into perspective. As an example, Popov and Ongena (2011), comparing both Western and Central with Eastern European countries, find that interbank market integration has reduced the level of constraints, especially in highly competitive banking sector markets. However, there were significant risks of overleveraging when integration took place at an accelerated pace. Nonetheless, Amiti and Weinstein (2009), for Japan, find that financial constraints severely affect exporting activity during financial crisis, while Chor and Manova (2011), using US imports data find that, during the recent financial crisis, higher interbank interest rates led to lower exports especially for firms in more financially constrained sectors. For the European case, we should also stress that monetary integration came along, among others, with the loss monetary policy instruments. Still, the levels of financial constraints seem to be lower in bank-based systems (see Carreira and Silva, 2010 for a survey or Hernández-Cánovas and Martínez-Solano, 2010 for an example), especially for short-term finance (Kunt and Maksimovic, 2002). Gorg and Spaliara (2009), comparing firms operating in the UK and France, find that firm failure is more sensible to financial variables for firms in the «market-oriented system» of the UK. Additionally, they find that continuous export behaviour increases firm survival.

Overall, not only there is still much to be said with respect to the causality flows between financial constraints and degree of openness, but also the real benefits of the European monetary integration process are, still nowadays, rather unclear and very debatable. Specifically, despite the extensive literature on firm's financial constraints, the consequences of such processes upon the ability of firms to raise the necessary amounts to invest, grow and export are still to be fully explored. Keeping in mind that no consistent measure of financial constraints has yet been developed, we test the following hypothesis: *i)* Monetary integration alleviates financial constraints and benefits mostly open firms; *ii)* Financially unconstrained firms self-select into exporting activity. Inferences using this sample, representative of Portuguese firms, may be made with respect to, at least, other bank-based economies.

3. Data

The dataset used in this work was constructed from the combination of *Inquérito às Empresas Harmonizado* (IEH), an annual business survey, and *Ficheiro de Unidades Estatísticas* (FUE), both collected by the Portuguese National Statistical Office (INE). The former dataset comprises information on firms' balance sheets, while resorting to the latter, that contains information about firm's generic characteristics – including size, age and main sector of activity –, allows to track firms trough time, thus constructing a large unbalanced panel of firms[4].

3 Note that, for the Portuguese case, Silva (2011a) finds that production subsidies neither significantly increase the probability that firms start to export nor increase their export intensity, even though production subsidies may not be particularly designed to foster exports, as the author argues.
4 These two data sources were matched using a code number, also provided by INE, that uniquely identifies each firm for different surveys along the successive years.

For the purpose of this paper the following cleaning procedures were made. First, we eliminated firms with less than 20 employees due to the lack of quality of information reported by such firms. Second, we focus only on the industry and part of the services sector, thus eliminating the agricultural and financial sectors (the latter would bias the estimation favouring unconstrained firms). Observations that were reported either missing or with unreasonable values were dropped[5]. As a result we have a large unbalanced panel of 22.651 firms for the period 1996-2004 resulting in 86.455 observations. Further details on the construction and description of the variables used are available in the Appendix.

The advantage of using this dataset is that it comprises information from firm's balance sheets for the universe of firms operating in Portugal with more than 100 employees and a large representative sample of Portuguese firms with more than 20 employees. The final dataset is representative of the Portuguese economy, covering all sectors and industries of economic activity (with the exceptions previously outlined). Finally, the large sample period (1996-2004) is sufficient to take into account macroeconomic cyclical variations as well as it covers the monetary integration process.

However, a major pitfall of this dataset is the inexistence of market information about firms. Since we only have access to a code number of each firm, we are not able to match the dataset with information from, for example, stock markets. Still, only a few firms in Portugal are publicly traded (most of them within the financial sector), hence the benefits of such extension of the dataset would be negligible. Additionally, information on firms is limited to a relatively low level of disaggregation of balance sheets. Finally, by dropping from the database all firms with less than 20 employees, we are cutting off a significant number of observations. Even though information on these firms lacks in quality and further increases the unbalancedness of the panel, smaller firms would, *a priori,* be more financially constrained (e.g. Cabral and Mata, 2003 or Oliveira and Fortunado, 2006, both for the Portuguese case). Consequently, our results might be slightly downward biased when it comes to the level of firms' financial distress. Nevertheless, such firms are typically closed (see section 5.1 for the relationship between size and openness), therefore they would not influence the analysis on exporting and importing activities.

4. Methodology

Almeida *et al.* (2004) construct an alternative model of liquidity demand and derive an empirical equation to estimate CCFS. The financial nature of the cash stock variable is a shield against missmeasurements in Tobin's Q (usual control for investment opportunities) and investment opportunities hidden in cash-flow because it is not expected that firms will increase their cash stocks if cash-flow signals a new\better investment opportunity, unless they are financially constrained. However, as pointed by Acharya *et al.* (2007), financially constrained firms will only use cash to increase cash stocks if hedging needs are high (investment opportunities), otherwise they use cash to reduce debt. Therefore, we control both for debt issuances as well as for investment opportunities. Additionally, as pointed by Almeida *et al.* (2011) in a subsequent paper, cash may not be the only way to transfer resources across time, since firms may invest in relatively liquid assets, other than cash. As a result, we try to control for this effect through investment in non-cash net working capital and financial investments.

Keeping these caveats in mind, we follow of Lin (2007) and use the sum of net debt and equity issuances **($ISS_{i,t}$)**, as well as interest rate variation, instead of the variation of short-term deb. The former modification is due to the fact that debt and equity issuances, while being a signal of easier access to external funds, might have a significant impact upon cash stocks (by accounting procedures), so we control for such effect. With respect to the latter, firms may decide to reduce their borrowings or pay back debt according to expected interest expenses. However, instead of

5 In some specific circumstances, unreasonable values suffered a treatment in order to achieve coherent values. These cases include specific observations whose correct values were possible to obtain from other variables or resulting from changes in signal mistyping errors.

benchmark interest rate variation, in our baseline specification we use variations of interest paid ($\Delta INT_{i,t}$), which allows for firm heterogeneity and thus can also be seen as a form of credit rating. Furthermore, we also control for financial investments ($FinI_{i,t}$), that not only are a demand for cash but may also work as an alternative way to transfer resources across time. In both specifications, all variables are scaled by total assets (except the control for firm size). As a result, we have the following empirical specification:

$$\Delta CS_{i,t} = \beta_0 + \beta_1 CF_{i,t} + \beta_2 \Delta y_{i,t} + \beta_3 S_{i,t} + \beta_4 I_{i,t} + \beta_5 \Delta NWC_{i,t} + \beta_6 ISS_{i,t} + \beta_7 \Delta INT_{i,t} + \beta_8 FinI_{i,t} + d_k + \varepsilon_{i,t} \quad (1)$$

where $\Delta CS_{i,t}$ is the variation in cash stocks of firm *i* in period *t*, $CF_{i,t}$ the cash-flow, $S_{i,t}$ is a control for firm size (log of total assets), $I_{i,t}$ investment, $\Delta NWC_{i,t}$ is the variation of noncash net working capital, d_k are two-digit industry dummies (CAE rev. 2.1) and $\varepsilon_{i,t}$ the error term. We do not have financial markets information that would allow us to compute Tobin's Q. Therefore, we use sales growth ($\Delta y_{i,t}$) to proxy investment opportunities. This measure is often used in empirical work on countries with less developed financial markets where information on firm's market value is scarcer (see for eg. Budina *et al.*, 2000 or Konings *et al.*, 2003). Additionally, the use of Tobin's Q is also methodologically questionable. Firstly, marginal Q is unobservable, so researchers use average Q as a proxy – see Hayashi (1981) for the derivation of average Q. Secondly, the introduction of Q directly into the estimation of investment models for the purpose of analysing financial constraints may cause the sensitivities to cash-flows to be overestimated, as they might contain information about investment opportunities that were not captured by Q – Alti, 2003, in a model where financial frictions are absent, shows that, even after Q correction, firms exhibit sensitivities to cash-flow.

The financial and investment covariates are endogenous, so we estimate the model using instrumental variables (IV\GMM) with fixed effects to take account of unobserved firm-level heterogeneity and panel-robust standard errors. The set of instruments includes twice lagged cash flow, twice lagged sales growth, lagged investment, lagged variation of noncash net working capital, number of employees, lagged bond issuance and lagged variation in interest payments[6].

In an attempt to capture the effects of monetary and financial integration, we split our sample into two major periods, before and after integration (i.e. up to 2000 and from 2001 onwards). Even though the integration processes is continuous, we pick this breakpoint for two main reasons. First, we only have access to the period 1996-2004, consequently, to guarantee a consistent estimation that takes advantage of lagged variables, we must guarantee that the subpanels have at least a 3 year depth (preferably 4 year to have a larger number of observations for a more efficient estimation)[7]. Accordingly, our breakpoint should be either on 1999 or 2000. Second, since the Euro was introduced on the 1st January 2001, a landmark for the monetary integration process, we expect that the possible benefits would be observed from 2001 onwards. Additionally, it is reasonable to expect that the real effects of the potential benefits from the ongoing integration process before 2001 would be subject to a «policy lag», therefore only having a significant impact on firms during the subsequent period. As a result, we expect that the bulk impact of the integration process would be felt during the period 2001-2004[8].

6 Note that if the methodology is applied to a large number of observations, coefficients are usually found to be statistically significant, since the precision of the estimate is higher. However, one should still expect that such coefficients are higher for financially constrained groups of firms. Comparison of CCFS estimates with other studies can be found in Silva and Carreira (2010).

7 The limitation of the period of analysis (1996-2004) is due to methodological changes on the collection of data by INE.

8 Note that this second period not only captures a downward economic cycle, but it also corresponds to higher bilateral exchange rates (convergence was before 2001 but effects might be time lagged) which affects the capacity of firms to export and import (although very debatable, degree of openness should account for this

In order to capture the effects of integration upon financial constraints by different classes of firms, according to their degree of openness to foreign markets, we construct a score that identifies firms as closed, open and, within open firms, those with low and high levels of openness (see Appendix for further detail). Consequently, we obtain different subsamples of firms depending on their exposure to European markets. Over the period, the EU, on average, accounts for 75% of the total exports and 89% of imports. As a result, we focus mainly on the degree of openness towards the EU. In fact, the results using a broader definition that covers total exports and imports remain unchanged[9]. The same procedure is made with respect to exports and imports, that we then classify as levels of export and import intensity, respectively. With the purpose of comparing the CCFS estimates across subsamples, we compute the confidence intervals and perform formal Wald tests[10]. The robustness of the inverse relationship between financial constraints, degree of openness, export and import intensities is checked by introducing interaction terms between cash-flow and these variables (Table A1 in appendix).

Finally, in order to compare firms' constraints before and after shifting into open, exporting or importing activity, we group firms that moved from closed to open, started exporting and importing, respectively. We further divide the period of time, for each firm, according to the moment they shifted.

5. Empirical results

5.1. Summary statistics

Table 1*a* allows us to compare mean values, before and after monetary integration as well as by degree of openness, of the main variables used in the estimation. It is clear that after monetary integration mean variation of cash stocks and size (total assets) increased during the period, while mean cash-flow, sales growth, investment, debt and equity issuances, benchmark interest rate and degree of openness decreased (columns 2 and 3)[11]. Additionally, while firms faced a mean decrease in interest paid, the mean variation in non cash net working capital increased. If instead we compare different levels of openness, it is possible to see that, for the whole period, differences between less open and highly open firms (columns 5 and 6) are, in general, larger than differences between closed and slightly open firms (columns 4 and 5). This indicates that firms with no or a low level of openness appear to be quite similar. However, when we further distinguish between levels of export and import intensity (Table 1*b*, columns 1-3 and 4-6, respectively), this pattern is not as clear. While firms with higher levels of both import and export intensity are larger and face both lower cash stock variation and higher cash-flows (which should be expected at least for heavy exporters and might be a sign of lower constraints), intensive exporters are distinct from intensive importers when it comes to sales growth. In fact, while for higher levels of export intensity firms face lower sales growth, the opposite is true for higher levels of import intensity. This is rather puzzling, in particular for the case of exporters, since we would expect that sales would increase with higher levels of export intensity, even though it may well depend upon economic growth abroad. This odd result is also evident when we compare firms before and after they shifted into exporting or importing (columns 7-10)[12]. In addition, for both of these groups of firms, they face larger cash stocks variation and lower cash-flows, once they shifted, which is in contrast with the statistics found for different intensities.

inverse sign effects). Conversely, the previous period, not only captures an economic expansion period, but also carries the effects of the implementation of the Common market in 1992. This latter effect is, however, expected to be transversal to the whole period.

9 Statistics not reported but available from authors upon request.

10 For simplicity, we omit confidence intervals and test statistics (available from the authors on request) and only report if estimates were found to be statistically different or not.

11 We should note that the economic downturn that came after 2001 may be affecting, to a larger extent some of these variables (e.g. exports or sales growth).

12 Nevertheless, this is in line with the downward economic cycle that came after 2001, which, for the Portuguese case, is clear from the reduction in sales growth in the second major period of analysis (Table 1a).

TABLE 1a – Summary Statistics

VARIABLES	Period			Degree of Openness		
	1996-2004	1996-2000	2001-2004	NO	LOW	HIGH
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta CS_{i,t}$	0.002	0.001	0.003	0.003	0.003	0.001
	(0.062)	(0.064)	(0.061)	(0.070)	(0.055)	(0.059)
$CF_{i,t}$	0.085	0.091	0.081	0.083	0.082	0.089
	(0.089)	(0.089)	(0.088)	(0.098)	(0.085)	(0.083)
$\Delta y_{i,t}$	0.037	0.073	0.015	0.040	0.041	0.030
	(0.288)	(0.280)	(0.290)	(0.326)	(0.269)	(0.264)
$S_{i,t}$	15.539	15.441	15.599	15.074	15.698	15.840
	(1.448)	(1.508)	(1.406)	(1.508)	(1.476)	(1.237)
$I_{i,t}$	0.063	0.077	0.054	0.068	0.061	0.060
	(0.081)	(0.091)	(0.074)	(0.090)	(0.077)	(0.076)
$\Delta NWC_{i,t}$	-0.048	-0.060	-0.040	-0.051	-0.046	-0.047
	(0.166)	(0.179)	(0.157)	(0.189)	(0.155)	(0.152)
$ISS_{i,t}$	0.035	0.058	0.021	0.036	0.037	0.032
	(0.209)	(0.218)	(0.203)	(0.227)	(0.201)	(0.198)
$FinI_{i,t}$	0.039	0.038	0.040	0.039	0.042	0.036
	(0.088)	(0.086)	(0.090)	(0.096)	(0.090)	(0.079)
$\Delta INT_{i,t}$	-0.001	0.000	-0.001	-0.000	-0.000	-0.001
	(0.007)	(0.008)	(0.007)	(0.008)	(0.007)	(0.007)
R	0.030	0.037	0.026			
	(0.008)	(0.007)	(0.005)			
OPEN	0.125	0.134	0.119			
	(0.175)	(0.180)	(0.171)			
Observations	17,283	6,600	10,683	5,757	5,444	6,066
N. of firms	4,771	2,606	3,333	1,537	1,462	1,632

Notes: Mean values and standard deviations, given in parentheses, of the main variables used in the estimations. Some of the statistics in this table were reported in Silva and Carreira (2011)

Table 1c reports the Spearman's correlation coefficients for the main variables used and by different sub-periods[13]. Firstly, we should point that the positive association between cash-flow and both changes in cash stocks and investment is slightly larger for the first period, which may provide the first insights on possible differences in CCFS (as well as ICFS)[14]. Secondly, we should highlight that whereas in the first period there is a significant positive correlation between the benchmark interest rate and sales growth, this association is negative and significant in the second period (which may well result from the economic cycle). Meanwhile, the correlation

13 We avoid using Pearson's correlation coefficients due to the non-normality of a large number of variables.
14 We test the alternative ICFS methodology and in fact results point to larger sensitivities in the first period (0.61 against 0.23, significant at 5% level). Statistics not reported but available from authors on request.

TABLE 1b – Summary Statistics

VAR.	Period						Degree of Openness			
	NO	LOW	HIGH	NO	LOW	HIGH	Before	After	Before	After
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$\Delta CS_{i,t}$	0.004	0.003	0.000	0.003	0.002	0.002	0.001	0.003	0.000	0.003
	(0.067)	(0.055)	(0.058)	(0.069)	(0.057)	(0.058)	(0.057)	(0.055)	(0.058)	(0.056)
$CF_{i,t}$	0.083	0.085	0.088	0.081	0.083	0.091	0.094	0.085	0.089	0.081
	(0.095)	(0.081)	(0.084)	(0.096)	(0.085)	(0.082)	(0.086)	(0.084)	(0.084)	(0.084)
$\Delta y_{i,t}$	0.045	0.033	0.027	0.036	0.037	0.038	0.066	0.035	0.051	0.024
	(0.313)	(0.261)	(0.266)	(0.323)	(0.271)	(0.256)	(0.292)	(0.271)	(0.272)	(0.279)
$S_{i,t}$	15.226	15.817	15.809	15.106	15.663	15.947	15.724	15.818	15.827	15.793
	(1.540)	(1.302)	(1.301)	(1.496)	(1.450)	(1.229)	(1.413)	(1.414)	(1.469)	(1.434)
$I_{i,t}$	0.067	0.056	0.062	0.066	0.060	0.062	0.074	0.054	0.067	0.056
	(0.089)	(0.075)	(0.074)	(0.088)	(0.076)	(0.077)	(0.092)	(0.072)	(0.079)	(0.079)
$\Delta NWC_{i,t}$	-0.050	-0.039	-0.051	-0.050	-0.049	-0.044	-0.053	-0.039	-0.048	-0.047
	(0.181)	(0.148)	(0.154)	(0.187)	(0.154)	(0.149)	(0.175)	(0.168)	(0.169)	(0.167)
$ISS_{i,t}$	0.040	0.034	0.028	0.035	0.033	0.037	0.060	0.026	0.044	0.024
	(0.222)	(0.194)	(0.200)	(0.226)	(0.202)	(0.194)	(0.222)	(0.197)	(0.230)	(0.197)
$\Delta INT_{i,t}$	-0.000	-0.001	-0.001	-0.000	-0.001	-0.001	-0.000	-0.000	-0.000	-0.001
	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)	(0.006)	(0.008)	(0.007)	(0.008)	(0.006)
$FinI_{i,t}$	0.040	0.037	0.040	0.039	0.043	0.036	0.042	0.049	0.048	0.049
	(0.094)	(0.082)	(0.084)	(0.094)	(0.091)	(0.078)	(0.092)	(0.105)	(0.100)	(0.108)
Observ.	8,039	4,315	4,913	6,652	5,066	5,550	990	990	1,302	1,302
N. of firms	2,210	1,144	1,333	1,782	1,374	1,523	300	300	397	397

Notes: Mean values and standard deviations, given in parentheses, of the main variables used in the estimations.

between benchmark interest rate and cash-stock variation is only significantly negative for the first period. This latter pattern is also verified when it comes to the correlation between exports and both cash stock variation and sales growth. Additionally, there is a strong positive association between size and both export and import intensity, suggesting that larger firms are those that export and import the most, which is not unexpected[15]. Furthermore, the extremely high and significant correlation between import and export intensities is also as expected and indicates that defining degree of openness as the combination of both is sensible. Finally, the positive correlation between cash-flow and both export and import intensity is higher and strongly significant for the second period, pointing to potentially larger benefits for international firms after the Monetary integration.

15 In fact, the correlation between size (total assets) and degree of openness is positive, high and statistically significant. The same is true if instead of total assets we use number of employees as a measure of size (spearman's rho is 0.23*). Furthermore, for different size classes (with thresholds at 50, 100 and 250 employees) the mean degree of openness is 0.07, 0.11, 0.16 and 0.17 for small, medium-small, medium-large and large firms, respectively.

TABLE 1c – Spearman's rank correlation coefficients for the different periods

1996-2004	ΔCS	CF	$\Delta y_{i,t}$	S	I	ΔNWC	ISS	ΔINT	$FinI_{i,t}$	R	Export	Import	Open
ΔCS	1.000												
CF	0.0830*	1.000											
$\Delta y_{i,t}$	0.1185*	0.2395*	1.000										
S	-0.0012	-0.0539*	0.0386*	1.000									
I	-0.0274*	0.3205*	0.1594*	-0.0189	1.000								
ΔNWC	-0.2525*	0.0051	0.0248*	0.0518*	-0.2827*	1.000							
ISS	0.1105*	-0.1433*	0.1740*	0.0437*	0.2043*	0.003	1.000						
ΔINT	-0.0089	-0.0742*	0.1246*	0.0164	0.0876*	0.0354*	0.2125*	1.000					
$FinI_{i,t}$	-0.0218*	-0.0736*	-0.0324*	0.4043*	-0.0404*	-0.0135	0.0065	-0.0019	1.000				
R	-0.0307*	0.0360*	0.0888*	-0.0514*	0.1318*	-0.0377*	0.0598*	0.1180*	-0.0054	1.000			
Export	-0.0202	0.0492*	-0.0254*	0.2135*	0.0260*	-0.0028	-0.0188	-0.0340*	0.0817*	0.0121	1.000		
Import	-0.0101	0.0507*	0.0131	0.2876*	0.0130	0.0303*	0.0009	-0.0199	0.0819*	0.0232*	0.5501*	1.000	
Open	-0.0170	0.0477*	-0.0092	0.2581*	0.0145	0.0175	-0.0083	-0.0281*	0.0761*	0.0239*	0.8256*	0.8619*	1.000
1996-2000													
ΔCS	1.000												
CF	0.0896*	1.000											
$\Delta y_{i,t}$	0.1277*	0.2170*	1.000										
S	-0.0158	-0.0619*	0.0426*	1.000									
I	-0.0170	0.3496*	0.1211*	-0.0216	1.000								
ΔNWC	-0.2372*	-0.0336*	0.0284	0.0671*	-0.3055*	1.000							
ISS	0.1087*	-0.1491*	0.1596*	0.0736*	0.1926*	0.0616*	1.000						
ΔINT	-0.0196	-0.0828*	0.1289*	0.0327*	0.0727*	-0.0073	0.2039*	1.000					
$FinI_{i,t}$	-0.0192	-0.0599*	-0.0265	0.4242*	-0.0338*	0.0030	0.0189	0.0064	1.000				
R	-0.0700*	-0.0241	0.0564*	0.0202	-0.0244	0.0549*	0.0073	0.3142*	0.0005	1.000			
Export	-0.0386*	0.0374*	-0.0544*	0.2311*	0.0341*	0.0018	-0.0128	-0.0258	0.0653*	-0.0178	1.000		
Import	-0.0254	0.0248	0.0062	0.3251*	0.0099	0.0445*	0.0158	-0.0013	0.0925*	0.0004	0.5372*	1.000	
Open	-0.0386*	0.0245	-0.0334*	0.2862*	0.0128	0.0286	0.0014	-0.0149	0.0720*	-0.0091	0.8264*	0.8536*	1.000
2001-2004													
ΔCS	1.000												
CF	0.0766*	1.000											
$\Delta y_{i,t}$	0.1115*	0.2462*	1.000										
S	0.0131	-0.0372*	0.0587*	1.000									
I	-0.0362*	0.2822*	0.1487*	0.0098	1.000								
ΔNWC	-0.2698*	0.0540*	0.0419*	0.0270	-0.2460*	1.000							
ISS	0.1135*	-0.1520*	0.1671*	0.0285	0.1892*	0.0215	1.000						
ΔINT	0.0055	-0.0747*	0.1088*	0.0065	0.0872*	-0.0144	0.2191*	1.000					
$FinI_{i,t}$	-0.0243	-0.0850*	-0.0349*	0.3846*	-0.0442*	0.0009	-0.0030	-0.0086	1.000				
R	-0.0207	-0.0143	-0.1026*	-0.0165	0.0263	-0.0287	-0.0152	-0.0829*	0.0113	1.000			
Export	-0.0015	0.0573*	-0.0050	0.2009*	0.0101	-0.0032	-0.0308*	-0.0458*	0.0984*	-0.0013	1.000		
Import	0.0049	0.0717*	0.0138	0.2550*	0.0065	0.0194	-0.0185	-0.0416*	0.0724*	0.0208	0.5619*	1.000	
Open	0.0044	0.0658*	0.0057	0.2361*	0.0051	0.0106	-0.0245	-0.0450*	0.0809*	0.0161	0.8248*	0.8693*	1.000

Notes: Rank correlation coefficients were calculated using Sidak's adjustment.
* denotes statistical significance at the .01 level.

5.2. Monetary integration

Portuguese firms, during the period 1996-2004 were, on average, financially constrained. Table 2 shows that before monetary integration firms saved, on average, 25 cents out of each euro of cash flow, meanwhile after integration the CCFS was reduced to 0.183 (first line of columns 2 and 3, respectively). A formal Wald test rejects the hypothesis that the CCFS coefficient after integration is the same as before integration, at the 95% level. If we abstain from controlling for the money market, the difference in CCFS is also large and statistically significant (columns 6 and 7)[16]. Noteworthy differences are also found with respect to the impact of sales growth, size, debt and equity issuances and interest payments variations in the cash policy of firms. The Euro landmark is further emphasized if year dummies are introduced (column 1). Even though a comparison between the two periods with year dummies is not econometrically feasible, in a regression over the whole period 1996-2004, only the dummy corresponding to 2000 is statistically significant[17]. This may indicate that, in this particular year, there were changes that significantly affected firms' cash policy. Alternatively, if we control for the evolution of the benchmark interest rate (columns 4 and 5), it is possible to observe that not only the CCFS difference between periods is much lower (and not statistically significant), but also that there is a huge difference in the impact of the benchmark interest rate between periods (negative for the first period and not different from zero in the second)[18]. This result indicates that the evolution of interest rates (fell from 7.2% in 1996 to 2.1% in 2004), that mirrors the integration process, were an important determinant of firms' cash policy. Therefore, even if firms anticipated this effect, it helps in explaining the differences in CCFS between periods (columns 2-3 and 6-7) and supports the analysis distinguishing each period.

16 Silva and Carreira (2010) refer to a few benchmark CCFS coefficients from other studies.
17 The use of lagged variables both as independent\endogenous variables and instruments imposes that a number of year dummies must be dropped due to collinearity. However, we tested simpler regressions and results do not differ substantially. Namely, either d5 (2000) is the only significant dummy (always at 1% level) or dummies corresponding to previous years are slightly significant (at either 5% or 10% levels), while 2000 remains the most significant.
18 Note that the introduction of the benchmark interest rate, that is common to all firms – even though in practice firms are able to negotiate with banks\lenders their own interest rate (the reason to use interest paid) – implies that neither year dummies nor interest paid can be used in the estimation.

TABLE 2 – CCFS estimation with different controls for money market

	Dummies	Baseline estimation		Benchmark interest rate		No controls	
VARIABLES	1996-2004	1996-2000	2001-2004	1996-2000	2001-2004	1996-2000	2001-2004
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$CF_{i,t}$	0.185***	0.245***	0.184***	0.221***	0.190***	0.245***	0.188***
	(0.017)	(0.037)	(0.027)	(0.037)	(0.027)	(0.037)	(0.027)
$\Delta y_{i,t}$	0.015***	0.020***	0.011**	0.021***	0.010**	0.019***	0.010**
	(0.003)	(0.007)	(0.004)	(0.007)	(0.004)	(0.007)	(0.004)
$S_{i,t}$	0.015***	0.028**	0.043***	0.042***	0.040***	0.023*	0.040***
	(0.004)	(0.012)	(0.008)	(0.013)	(0.008)	(0.012)	(0.008)
$I_{i,t}$	-0.220***	-0.241***	-0.241***	-0.244***	-0.242***	-0.237***	-0.243***
	(0.012)	(0.022)	(0.017)	(0.022)	(0.017)	(0.022)	(0.017)
$\Delta NWC_{i,t}$	-0.149***	-0.155***	-0.159***	-0.148***	-0.161***	-0.151***	-0.161***
	(0.006)	(0.012)	(0.009)	(0.012)	(0.009)	(0.012)	(0.009)
$ISS_{i,t}$	0.079***	0.103***	0.071***	0.095***	0.071***	0.102***	0.071***
	(0.004)	(0.009)	(0.006)	(0.009)	(0.006)	(0.009)	(0.006)
$\Delta INT_{i,t}$	-0.130***	-0.252***	-0.235***	-0.241***	-0.237***	-0.243***	-0.237***
	(0.017)	(0.048)	(0.030)	(0.047)	(0.030)	(0.048)	(0.030)
R				-0.734***	-0.100		
				(0.129)	(0.128)		
1999	-0.002						
	(0.002)						
2000	-0.009***						
	(0.002)						
2002	-0.001						
	(0.002)						
2003	0.001						
	(0.002)						
Observations	15,277	5,212	8,756	5,212	8,756	5,212	8,756
N. of firms	4,771	2,606	3,333	2,606	3,333	2,606	3,333
R-squared	0.184	0.212	0.201	0.224	0.199	0.211	0.199
Hansen p-val.	0.289	0.393	0.134	0.282	0.0976	0.312	0.0912

Notes: Regression of equation (1) as baseline estimation (columns 2 and 3). In column (1) we introduce year dummies, while in columns (4) and (5) we use the benchmark interest rate (R). In columns (6) and (7) we omit both $\Delta INT_{i,t}$ and R. All regressions include two-digit industry dummies (CAE rev.2.1). Robust standard errors in parentheses. ***, **, and * denote statistical significance at the .01, .05, and .10 levels, respectively. Tables with confidence intervals and further test statistics available from the authors on request. Some of the statistics in this table were reported in Silva and Carreira (2011)

TABLE 3 – CCFS estimation by openness towards the EU

OPENESS VARIABLES	NO	LOW	HIGH	NO		YES		LOW		HIGH	
	1996-2004	1996-2000	2001-2004	1996-2000	2001-2004	1996-2000	2001-2004	1996-2000	2001-2004	1996-2000	2001-2004
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
$CF_{i,t}$	0.269***	0.173***	0.107***	0.284***	0.272***	0.208***	0.151***	0.167**	0.221***	0.240***	0.110***
	(0.035)	(0.030)	(0.027)	(0.062)	(0.056)	(0.047)	(0.032)	(0.068)	(0.049)	(0.065)	(0.043)
$\Delta y_{i,t}$	0.018***	0.011**	0.014***	0.031**	0.012*	0.015*	0.008	0.022*	0.004	0.009	0.013*
	(0.005)	(0.005)	(0.005)	(0.013)	(0.007)	(0.008)	(0.005)	(0.012)	(0.008)	(0.011)	(0.007)
$S_{i,t}$	0.018**	0.018***	0.025***	0.025	0.032**	0.026*	0.059***	-0.010	0.055***	0.048**	0.070***
	(0.008)	(0.006)	(0.007)	(0.024)	(0.014)	(0.015)	(0.009)	(0.022)	(0.014)	(0.021)	(0.012)
$I_{i,t}$	-0.252***	-0.200***	-0.222***	-0.263***	-0.266***	-0.224***	-0.243***	-0.161***	-0.234***	-0.251***	-0.260***
	(0.023)	(0.022)	(0.019)	(0.042)	(0.032)	(0.029)	(0.020)	(0.044)	(0.036)	(0.040)	(0.027)
$\Delta NWC_{i,t}$	-0.166***	-0.134***	-0.161***	-0.168***	-0.177***	-0.148***	-0.163***	-0.137***	-0.150***	-0.166***	-0.182***
	(0.012)	(0.011)	(0.011)	(0.025)	(0.018)	(0.014)	(0.011)	(0.022)	(0.018)	(0.019)	(0.017)
$ISS_{i,t}$	0.080***	0.078***	0.076***	0.108***	0.069***	0.098***	0.075***	0.107***	0.076***	0.092***	0.067***
	(0.008)	(0.008)	(0.008)	(0.018)	(0.012)	(0.011)	(0.008)	(0.015)	(0.012)	(0.016)	(0.011)
$\Delta INT_{i,t}$	-0.484***	-0.081	-0.552***	-0.082	-0.685**	-0.301	-0.196	0.186	0.071	-0.704**	-0.492**
	(0.177)	(0.144)	(0.168)	(0.306)	(0.285)	(0.202)	(0.156)	(0.266)	(0.218)	(0.312)	(0.229)
$FinI_{i,t}$	-0.198***	-0.116***	-0.107***	-0.404***	-0.286***	-0.246***	-0.242***	-0.215***	-0.264***	-0.305***	-0.221***
	(0.046)	(0.030)	(0.030)	(0.100)	(0.083)	(0.055)	(0.033)	(0.077)	(0.062)	(0.081)	(0.037)
Observations	4,299	4,163	5,173	1,274	2,497	3,400	5,502	1,282	2,340	1,802	2,789
N. of firms	1,537	1,462	1,632	637	1,008	1,700	2,160	641	960	901	1,093
R-squared	0.221	0.180	0.180	0.265	0.235	0.199	0.211	0.202	0.207	0.212	0.236
Hansen p-val.	0.251	0.200	0.729	0.268	0.182	0.930	0.514	0.986	0.540	0.621	0.477

Notes: Regression of equation (1). Firms' openness score definition in Appendix. All regressions include two-digit industry dummies (CAE rev.2.1). Robust standard errors in parentheses. ***, **, and * denote statistical significance at the .01, .05, and .10 levels, respectively. Tables with confidence intervals and further test statistics available from the authors on request. Some of the statistics in this table were reported in Silva and Carreira (2011)

5.3. Exporting and importing

As expected, Table 3 shows that there might be an inverse relationship between the degree of openness to foreign markets and financial constraints since, for the whole period, the higher the openness, the lower is the CCFS (columns 1-3 report the CCFS estimates that are all statistically different). This result may arise either because more open firms may have better access to foreign finance or only unconstrained firms are able to exploit foreign markets.

Interestingly, when we split the sample by the two major periods, we find a reduction in constraints for open firms (columns 6 and 7), while the level of financial constraints of closed firms remains mostly unchanged (columns 4 and 5). However, depending on the degree of openness, firms' financial constraints were either reduced (columns 10 and 11) or, if not equal (estimates in columns 8 and 9 are not statistically different), were amplified. This is a puzzling result since we would expect, *a priori*, that even though the reduction in constraints should be larger for highly open firms, firms with lower levels of openness should also exhibit a reduction in constraints, given that monetary integration should benefit mostly those firms that also have businesses overseas (through exchange rate stability and access to both foreign banks and financial markets). Additional differences arise between firms with low and high levels of openness with respect to the impacts of sales growth, investment and variation of interest paid. We also tested the inclusion of real GDP growth or unemployment, in order to capture possible influences of the economic cycle, nevertheless the results remain very similar. Results remain unchanged if we additionally control for the benchmark interest rate, number of employees or age or even if, instead of degree of openness-EU, we use total degree of openness[19].

These results indicate that while highly open firms benefited the most with the integration, closed firms experienced no changes with respect to constraints and, most interestingly, slightly open firms faced, if not the same, higher constraints in the second period. This odd result arises for firms that have very small degrees of openness – smaller than 0.5%, while for firms between 0.5% and 1% the results are as previously hypothesised[20]. This might, however, be associated with larger competition for funds in the integrated markets, since firms with low degrees of openness might not be as visible abroad as they would be in the domestic market, while at the same time, losing their advantage on the domestic market, where lenders will then opt to finance domestic or even foreign firms with better prospects. In fact, if we compare the level of constraints of these firms with those of closed firms, the difference in CCFS estimates is larger for the initial period than for the second period. One could argue that lenders would no longer distinguish between slightly open and closed firms.

If instead we look at firm export and import activity separately, we see that firms with higher export or import intensities are less financially constrained, as expected, even though the pattern is clearer for the case of exports – while for exports (Table 4, columns 1-3) all estimates are statistically different, for the case of imports (Table 5, columns 1-3), high intensity estimates are not statistically different from those of lower intensity. However, when we compare the levels of constraints before and after monetary integration, distinct patterns arise. While no significant differences between periods are found for firms that either imported or not (Table 5, columns 4-7), firms that either exported or not (Table 4, columns 4-7) seem to have experienced a slight reduction in constraints with integration (a formal Wald test only rejects that the coefficients are statistically equal at the 90% level). Nevertheless, the levels of constraints for non-exporting firms in the second period is much larger than those of exporting firms in the first period (Table 4, columns 5 and 6, respectively)[21].

If we further distinguish between low and high levels of export and import intensities, we find a clear contrast between these firms. Whereas for high export intensity firms, financial constraints

19 Statistics not reported but available from authors upon request.
20 Statistics not reported but available from authors upon request.
21 Note that the reduction in constraints for non-exporting firms, even though apparently unexpected, goes in line with the general findings in section 5.2.

levels remain unchanged at low levels (estimates in columns 10 and 11 of Table 4 are not statistically different), high intensity importers experienced a clear reduction in constraints (Table 5, columns 10 and 11). These results suggest that firms that rely mostly on imports accrued larger benefits from integration than did export driven firms. This may arise because the former saw their credit conditions improved overseas, while the latter already benefited from a privileged position before integration, corroborated by the CCFS estimates for the first period (Table 5, column 10). Conversely, while there is a clear increase in financial constraints for firms with lower import intensities (Table 5, columns 8 and 9), the level of constraints for firms with low export intensity, if not lower, remains practically unchanged in the second period (Table 4, columns 8 and 9 report CCFS estimates that are not statistically different). This result clarifies the higher CCFS, after integration, found for firms with lower degree of openness, provided it is due to an higher contribution of importing firms rather than exporting ones.

TABLE 4 – CCFS estimation by export intensity-EU

EXPORT VARIABLES	NO	LOW	HIGH	NO		YES		LOW		HIGH	
	1996-2004	1996-2000	2001-2004	1996-2000	2001-2004	1996-2000	2001-2004	1996-2000	2001-2004	1996-2000	2001-2004
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
$CF_{i,t}$	0.271***	0.135***	0.062**	0.313***	0.269***	0.151***	0.099***	0.186*	0.119**	0.130**	0.098**
	(0.027)	(0.036)	(0.027)	(0.059)	(0.041)	(0.047)	(0.035)	(0.106)	(0.056)	(0.051)	(0.045)
$\Delta y_{i,t}$	0.014***	0.010	0.015***	0.030***	0.009	0.017**	0.015***	0.030**	0.005	0.006	0.021***
	(0.004)	(0.006)	(0.005)	(0.011)	(0.006)	(0.008)	(0.006)	(0.014)	(0.008)	(0.010)	(0.008)
$S_{i,t}$	0.016***	0.021**	0.019***	0.013	0.043***	0.040**	0.042***	0.077***	0.014	0.044**	0.052***
	(0.006)	(0.008)	(0.007)	(0.019)	(0.012)	(0.016)	(0.011)	(0.024)	(0.016)	(0.021)	(0.015)
$I_{i,t}$	-0.253***	-0.210***	-0.174***	-0.253***	-0.271***	-0.235***	-0.203***	-0.275***	-0.211***	-0.212***	-0.200***
	(0.018)	(0.024)	(0.020)	(0.036)	(0.026)	(0.031)	(0.021)	(0.048)	(0.032)	(0.039)	(0.028)
$\Delta NWC_{i,t}$	-0.158***	-0.155***	-0.142***	-0.158***	-0.167***	-0.159***	-0.156***	-0.164***	-0.170***	-0.156***	-0.156***
	(0.010)	(0.013)	(0.011)	(0.020)	(0.014)	(0.015)	(0.013)	(0.026)	(0.020)	(0.019)	(0.017)
$ISS_{i,t}$	0.086***	0.087***	0.063***	0.111***	0.079***	0.100***	0.064***	0.109***	0.081***	0.087***	0.047***
	(0.007)	(0.008)	(0.008)	(0.015)	(0.009)	(0.012)	(0.008)	(0.017)	(0.012)	(0.016)	(0.011)
$\Delta INT_{i,t}$	-0.420***	-0.385**	-0.359**	-0.039	-0.553**	-0.381*	-0.449**	-0.748**	-0.373	-0.258	-0.333
	(0.139)	(0.186)	(0.169)	(0.241)	(0.223)	(0.222)	(0.177)	(0.352)	(0.254)	(0.292)	(0.235)
$FinI_{i,t}$	-0.162***	-0.161***	-0.079**	-0.241***	-0.321***	-0.322***	-0.190***	-0.369***	-0.207***	-0.294***	-0.181***
	(0.032)	(0.035)	(0.032)	(0.075)	(0.061)	(0.071)	(0.030)	(0.088)	(0.049)	(0.101)	(0.042)
Observations	6,475	3,293	4,299	1,984	3,804	2,762	4,333	1,022	1,833	1,580	2,280
N. of firms	2,210	1,144	1,333	992	1,500	1,381	1,689	511	742	790	884
R-squared	0.212	0.210	0.154	0.241	0.231	0.225	0.194	0.282	0.218	0.202	0.188
Hansen p-val.	0.228	0.509	0.728	0.173	0.665	0.875	0.633	0.791	0.237	0.782	0.819

Notes: Regression of equation (1). Firms' export intensity scores definition in Appendix. All regressions include two-digit industry dummies (CAE rev.2.1). Robust standard errors in parentheses. ***, **, and * denote statistical significance at the .01, .05, and .10 levels, respectively. Tables with confidence intervals and further test statistics available from the authors on request.

TABLE 5 – CCFS estimation by import intensity-EU

IMPORT VARIABLES	NO	LOW	HIGH	NO		YES		LOW		HIGH	
	1996-2004	1996-2000	2001-2004	1996-2000	2001-2004	1996-2000	2001-2004	1996-2000	2001-2004	1996-2000	2001-2004
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
$CF_{i,t}$	0.259***	0.142***	0.118***	0.278***	0.271***	0.192***	0.168***	0.078	0.211***	0.307***	0.126***
	(0.033)	(0.032)	(0.030)	(0.061)	(0.053)	(0.051)	(0.034)	(0.066)	(0.053)	(0.092)	(0.047)
$\Delta y_{i,t}$	0.017***	0.014**	0.005	0.033***	0.010	0.016*	0.008	0.017	0.008	0.009	0.003
	(0.005)	(0.006)	(0.005)	(0.012)	(0.007)	(0.009)	(0.006)	(0.012)	(0.009)	(0.014)	(0.008)
$S_{i,t}$	0.017**	0.018***	0.020***	0.017	0.032**	0.032**	0.061***	0.009	0.054***	0.071***	0.052***
	(0.007)	(0.007)	(0.007)	(0.023)	(0.013)	(0.016)	(0.010)	(0.023)	(0.013)	(0.024)	(0.015)
$I_{i,t}$	-0.248***	-0.176***	-0.253***	-0.238***	-0.264***	-0.245***	-0.242***	-0.135***	-0.251***	-0.280***	-0.263***
	(0.022)	(0.024)	(0.019)	(0.041)	(0.030)	(0.032)	(0.022)	(0.049)	(0.041)	(0.040)	(0.028)
$\Delta NWC_{i,t}$	-0.159***	-0.132***	-0.167***	-0.165***	-0.172***	-0.150***	-0.168***	-0.145***	-0.143***	-0.147***	-0.192***
	(0.011)	(0.013)	(0.012)	(0.023)	(0.016)	(0.014)	(0.013)	(0.023)	(0.020)	(0.021)	(0.018)
$ISS_{i,t}$	0.077***	0.066***	0.091***	0.103***	0.067***	0.095***	0.075***	0.098***	0.067***	0.095***	0.095***
	(0.008)	(0.008)	(0.008)	(0.016)	(0.011)	(0.012)	(0.009)	(0.020)	(0.013)	(0.018)	(0.012)
$\Delta INT_{i,t}$	-0.483***	-0.166	-0.267	-0.118	-0.623**	-0.369*	-0.273	-0.044	-0.041	-0.663*	-0.216
	(0.165)	(0.151)	(0.177)	(0.290)	(0.266)	(0.219)	(0.167)	(0.254)	(0.238)	(0.382)	(0.257)
$FinI_{i,t}$	-0.188***	-0.102***	-0.117***	-0.305***	-0.272***	-0.267***	-0.232***	-0.172***	-0.257***	-0.379***	-0.204***
	(0.042)	(0.031)	(0.031)	(0.104)	(0.070)	(0.058)	(0.035)	(0.066)	(0.066)	(0.084)	(0.038)
Observations	4,925	3,865	4,614	1,426	2,845	3,076	4,977	1,142	2,109	1,532	2,461
N. of firms	1,782	1,374	1,523	713	1,156	1,538	1,967	571	871	766	984
R-squared	0.212	0.155	0.192	0.250	0.225	0.194	0.211	0.182	0.193	0.240	0.231
Hansen p-val.	0.341	0.241	0.857	0.337	0.209	0.999	0.531	0.632	0.988	0.479	0.126

Notes: Regression of equation (1). Firms' import intensity scores definition in Appendix. All regressions include two-digit industry dummies (CAE rev.2.1). Robust standard errors in parentheses. ***, **, and * denote statistical significance at the .01, .05, and .10 levels, respectively. Tables with confidence intervals and further test statistics available from the authors on request.

In order to verify if firms' constraints were actually reduced with shifting, there is no longer a point in analysing firm openness, since if a firm starts importing, even though there might be a constraints alleviating effect due to relationships established abroad, the opposite effect might be larger due to a possible necessity of importing goods (either machinery or raw materials) that boosts the demand for cash (this pattern is clear from the comparison of columns 5 and 6 in Table 6). However, if we look at firms that started exporting, it is clear that the self-selection effect (financial constraints barrier) is not as large as the benefits accruing from access to better finance either abroad or at home, as we can see from the comparison of the estimates from columns 4 and 5 (CCFS coefficients dropped from 0.265 to 0.145 and are statistically different). If instead estimates on CCFS before and after starting to export would be similar, then this would suggest that less constrained firms would self-select into exporting[22]. These results are

22 We should note that there is a significant reduction in the number of firms from the samples corresponding to the periods before shifting to those after shifting, which results from the estimator used, that requires at least 3

confirmed if, instead of splitting the sample, we interact cash-flow with a binary indicator for the shifting status – before and after shifting (Table A1 in appendix). Nevertheless, even after starting to export, these firms still face significant constraints as they save, on average, 15 cents out of each extra euro of cash-flow. Finally, the fact that, on average, firms before starting to export present high CCFS (they save 27 cents out of each euro of extra cash-flow), casts serious doubts on the hypothesis that only unconstrained firms self-select into exporting activity.

TABLE 6 – CCFS for shifting firms

VARIABLES	OPEN		EXPORT		IMPORT	
	Before	After	Before	After	Before	After
	(1)	(2)	(3)	(4)	(5)	(6)
$CF_{i,t}$	0.155*	0.178**	0.265***	0.145**	0.060	0.211***
	(0.090)	(0.074)	(0.094)	(0.063)	(0.061)	(0.062)
$\Delta y_{i,t}$	0.025*	0.015	0.018	0.013	0.011	0.016*
	(0.013)	(0.011)	(0.013)	(0.010)	(0.011)	(0.009)
$S_{i,t}$	0.024	0.004	0.013	0.025	0.010	-0.002
	(0.017)	(0.018)	(0.015)	(0.020)	(0.013)	(0.015)
	-0.201***	-0.182***	-0.222***	-0.186***	-0.198***	-0.189***
$I_{i,t}$	(0.050)	(0.038)	(0.044)	(0.041)	(0.044)	(0.036)
	-0.130***	-0.138***	-0.152***	-0.137***	-0.135***	-0.153***
$\Delta NWC_{i,t}$	(0.028)	(0.021)	(0.025)	(0.022)	(0.026)	(0.021)
	0.036**	0.088***	0.083***	0.070***	0.043***	0.087***
$ISS_{i,t}$	(0.016)	(0.018)	(0.016)	(0.017)	(0.014)	(0.016)
	-0.145	-0.221	0.072	-0.023	0.036	0.098
$\Delta INT_{i,t}$	(0.294)	(0.392)	(0.279)	(0.393)	(0.287)	(0.367)
	-0.160***	-0.198**	-0.152***	-0.219**	-0.171**	-0.116
$FinI_{i,t}$	(0.059)	(0.101)	(0.041)	(0.087)	(0.068)	(0.090)
Observations	788	788	731	731	942	942
N. of firms	330	330	300	300	397	397
R-squared	0.183	0.215	0.222	0.214	0.179	0.233
Hansen p-val.	0.528	0.887	0.947	0.493	0.636	0.985

Notes: Regression of equation (1) for groups of firms that moved from closed to open, started exporting those that started importing. All regressions include two-digit industry dummies (CAE rev.2.1). Robust standard errors in parentheses. ***, **, and * denote statistical significance at the .01, .05, and .10 levels, respectively. Tables with confidence intervals and further test statistics available from the authors upon request.

periods of observations for consistent estimation. This means that if a firm shifted in 1997 we will not have sufficient years to estimate the CCFS «before shifting», while such firm will appear in the «after shifting» CCFS estimation. To tackle this issue, we only estimate «after shifting» CCFS for those firms whose «before shifting» CCFS was feasible. Accordingly we have a smaller subsample of firms for which results are indeed comparable.

6. Concluding Remarks

In this paper we investigate the extent to which the European monetary integration has influenced firms' financial distress, as well as the impact of financial constraints upon firms with different exporting and importing activities.

Our main findings suggest that firms with higher degrees of openness and particularly those with higher export intensities face much lower financial constraints. Additionally, while we cast some doubts on the argument that only unconstrained firms self-select into exporting activity, we show that firms face lower constraints once they start exporting.

Furthermore, we find that financial and monetary integration has helped in reducing firms' financial constraints. Only for low intensity importers did the level of constraints increase. While this process benefited mostly firms that were highly open, there was no substantial effect upon firms that relied solely on their domestic market. Overall, these results show that these integration processes alleviate firms' financial constraints by easing their access to finance abroad and reducing the price of money in domestic markets.

Further research should aim at extending this analysis to a wider time span, particularly covering the recent financial crisis, as well as at comparing the level of constraints for exporting firms across different economies.

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Appendix: Construction of variables

Size (S): Computed as log inflation-adjusted assets (deflation through the GDP deflator)

Investment (I | invest): Measured as additions to plant, property and equipment- gross investment.

Output (Y | y): Measured as total sales and services.

Cash- flow (CF | cf): Computed as net income before taxes plus depreciation.

Cash stock (CS | cs): Measured as total cash holdings.

Investment Opportunities (ΔY | Δy): Since we do not have financial markets information that would allow us to compute Tobin's Q, we use sales growth to proxy for investment opportunities.

Debt and equity issuances (ISS): Sum of debt and equity issuances. For the year 2001 equity issuances are reported as missing. The reason lies in legal changes that took place with the introduction of the Euro (most firms adjusted their equity not necessarily meaning issuing equity).

Non-cash net working capital (NWK | nwk): Difference between non-cash current assets and current liabilities.

Variation of interest paid (ΔINT): Variation of interest paid by firms, that may also reflect a firm-specific rating, scaled by total assets.

Financial investments (*FinI*): Firms' financial investments, scaled by total assets.

Benchmark interest rate (R): Annualised Euribor and Lisbor at 3 months with adjusted Lisbor by the mean difference in common years. We needed to compute our own series by joining two series made available by Banco de Portugal (Euribor for the period after the introduction of the Euro and Lisbor for the period before). The same change in monetary policy decision making, that accompanied the introduction of the Euro led to significant difficulties in finding comparable benchmark interest rates for the periods before and after 2000. Accordingly we focus on the interbank interest rate. Additionally we focus on the 3 months rate in order to avoid capturing the expectations incorporated in longer period rates. such as 1 year.

Degree of openness to foreign markets (OPEN): Score that captures the degree of openness of firms to foreign markets that in its turn is obtained by the sum of export and import intensity (normalized by sales) divided by 2. A firm scores 1 (no) if it is closed and 4 (yes) if open. Scores 2 (low) and 3 (high) are obtained by dividing open firms (score 4) at the mean degree of openness. Initially we divided firms into terciles by their degree of openness, however the use of terciles implies that a significant number of non exporting\importing firms are included in the second tercile (about 40% of firms rely solely on the domestic market).

Export intensity (EXP): Total exports to the EU divided by total sales. Export intensity scores are obtained in the same manner as openness scores (described above).

Import intensity (IMP): Total imports from the EU divided by total sales. Import intensity scores are obtained in the same manner as openness scores (described above).

All variables of interest were winsorized at 1% level in order to avoid problems with outliers in the estimation procedures. Deflators used include the Industrial Production Price Index and Labour Cost Index, both drawn from INE, and the GDP deflator, drawn from the Portuguese Central Bank (BdP). Nevertheless, no deflators were used when a variable was constructed as a ratio of two nominal values (normalized). In such cases we assume that the price growth rates are homogeneous. All variables in low caps result from a normalization procedure (the variable of interest is divided by total assets). Real GDP growth (Euro 16 area) as well as unemployment rates were obtained from Eurostat.

The data is representative, at the sectoral and industrial levels, of the Portuguese economy. We

have information on the disaggregated CAE rev. 2.1 industrial classification at the 5-digit level (Portuguese classification system). All industries are present in the dataset, even though we exclude the agricultural sector and the financial services industry for reasons explained in section 3.

TABLE A1 – Relationship between openness, exports, imports and financial constraints using interactions

VARIABLES	Open	Export	Import	Export shift
	(1)	(2)	(3)	(4)
$CF_{i,t}$	0.207***	0.207***	0.198***	0.238***
	(0.020)	(0.019)	(0.019)	(0.049)
$Open_{i,t}$	0.001			
	(0.011)			
$CF_{i,t} * Open_{i,t}$	-0.249***			
	(0.074)			
$Export_{i,t}$		0.006		
		(0.007)		
$CF_{i,t} * Export_{i,t}$		-0.159***		
		(0.043)		
$Import_{i,t}$			0.001	
			(0.008)	
$CF_{i,t} * Import_{i,t}$			-0.199***	
			(0.066)	
$Shift_{i,t}$				0.014***
				(0.005)
$CF_{i,t} * Shift_{i,t}$				-0.113***
				(0.039)
$\Delta y_{i,t}$	0.014***	0.014***	0.014***	0.010
	(0.003)	(0.003)	(0.003)	(0.007)
$S_{i,t}$	0.017***	0.017***	0.017***	0.013
	(0.004)	(0.004)	(0.004)	(0.008)
$I_{i,t}$	-0.222***	-0.223***	-0.221***	-0.194***
	(0.012)	(0.012)	(0.012)	(0.026)
ΔNWC	-0.150***	-0.150***	-0.150***	-0.128***
	(0.006)	(0.006)	(0.006)	(0.015)
$ISS_{i,t}$	0.078***	0.078***	0.078***	0.069***
	(0.004)	(0.004)	(0.004)	(0.010)
ΔINT	-0.338***	-0.336***	-0.333***	0.065
	(0.088)	(0.088)	(0.088)	(0.188)
$FinI_{i,t}$	-0.129***	-0.129***	-0.128***	-0.104***
	(0.018)	(0.018)	(0.018)	(0.031)
Observations	15,259	15,259	15,260	1,773
N. of firms	4,765	4,765	4,765	514
R-squared	0.183	0.183	0.183	0.170
Hansen p-val.	0.218	0.229	0.222	0.534

Notes: Regression of equation (1) with interaction terms for cash-flow and degree of openness, export intensity and import intensity (columns 1-3, respectively), as well as with a binary indicator for firms before and after shifting to export activity (column 4). All regressions include industry dummies (2-digit CAE rev.2.1). Robust standard errors in parentheses. ***, **, and * denote statistical significance at the .01, .05, and .10 levels, respectively. Tables with confidence intervals and further test statistics available from the authors upon request.

1848: A Primeira Crise da Teoria Económica*

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abstract

Este artigo tem por objecto o esclarecimento de uma conjuntura particular na história das ideias económicas, especificamente a de 1848. Este foi um ano de crise económica, financeira, política mas também de crise das ideias económicas.

Desta crise resultou o abalar da hegemonia da escola clássica em geral e uma recomposição do campo das ideias económicas, designadamente das de natureza teórica.

Procura-se fundamentalmente esclarecer os contornos e os mecanismos daquela recomposição, designadamente as condições que determinaram a a manutenção da hegemonia da escola clássica e em particular a nova configuração que esta assumiu.

resumo

This paper aims at clarifying a specific period in the history of the economic ideas: 1848. It was an year of economic, financial, political crisis, which inevitably led also to a crisis in the field of economic ideas.

The classical economy at large, as the mainstream economic school, was questioned leaving ground to a recomposition in the field of the economic ideas, especially concerning its theoretical nature.

The basic features and mechanisms of that recomposition are examined to understand the determinant conditions for the classical school to remain as the mainstream school, even if it took a new configuration.

JEL Classification: B10

* Uma versão preliminar deste estudo foi apresentada no 30º Encontro da Associação Portuguesa de História Económica e Social realizado no ISEG, em Lisboa, em 19 e 20 de Novembro de 2010.

'It is the second crisis [of economic theory] in our lifetime – there were others before.'

Joan Robinson

'Aprés 1848, sur une ère où les contraditions de classes son parvenues à complète maturation, celles-ci apparaissent au grand jour lors des combats de Juin à Paris, oú, pour la premiére fois les travailleurs luttent pour leurs propres objectifs. L'issue en est la dissolution complète de l'école ricardienne.'

Henryk Grossmann

1. Introdução

A evolução do campo do saber científico económico é marcada por períodos mais ou menos longos de relativa estabilidade, períodos nos quais é clara a hegemonia de um dado sistema teórico e em que há um acumular incremental do saber, mas também por momentos de crise, tendencialmente mais breves, em que essa hegemonia é questionada por sistemas até então dominados ou recém constituídos. De uma conjuntura de crise pode resultar a definição de uma nova hegemonia, e uma rotura no processo de acumulação do saber, como pode resultar a confirmação de uma hegemonia preexistente, ainda que o sistema teórico hegemónico possa nessa situação surgir parcialmente remodelado.

Os demais campos em que se expressam as ideias económicas, o doutrinário, o da política económica e o do senso comum, são condicionados, e eles próprios condicionam, a evolução do campo científico, não obstante manterem uma relativa autonomia em face deste último.

Por outro lado, a evolução, e em particular a emergência e o desfecho das crises da ideias económicas, é condicionada pela evolução da economia e da sociedade em geral e em particular pela relação de forças sociais dentro do próprio campo científico –, pela evolução do contexto intelectual amplo em que tal evolução decorre e pelo desenvolvimento imanente da lógica da teoria económica, não obstante a dificuldade de em cada momento histórico se poder avaliar com rigor o peso relativo de cada um destes factores.

O objectivo do presente *paper* é descrever um momento de crise da teoria económica, justamente no sentido em que é posta em causa uma dada hegemonia e em que ocorre uma recomposição parcial desse campo do saber – que é um 'espaço de uma luta concorrencial (…) em que está em jogo o monopólio da autoridade científica' (Bourdieu, 1976: 88) –, procurando evidenciar alguns dos mecanismos próprios desse momento. Outras dimensões da crise das ideias teóricas, em particular a sua articulação com eventuais crises de índole doutrinária, político-económica ou do próprio senso comum não são aqui consideradas de forma sistemática. Em momento ulterior será possível aprofundar essas articulações bem como proceder a comparações com outros momentos de crise vividos ao longo dos dois últimos séculos, de modo a esboçar uma teoria das crises das ideias económicas.

A *dèmarche* que aqui se propõe não é inteiramente inédita. Foram já produzidos estudos sobre diversos momentos de crise das ideias económicas, de que são exemplos marcantes Robinson (1972) e Bell e Kristoll (1981), ou até Thompson (2008) – este com a particularidade rara de se referir ao senso comum –, para além dos múltiplos estudos que incidiram sobre os anos subsequentes à Grande Depressão ou sobre a crise actual. No entanto, nenhum desses estudos tomou por objecto central a crise de 1848, muito embora alguns manuais da especialidade tomem aquele ano como um momento de viragem na história da teoria económica (*vd*. por todos Vaggi e Groenewegen, 2003). Acresce que nem a generalidade dos estudos sobre a viragem do

ambiente intelectual na Europa naquele período (*vd*. por todos Namier, 1992) nem tão pouco a generalidade dos estudos de natureza predominantemente económica e/ou financeira sobre esse momento chave da história europeia referem, pelo menos de forma sistemática, o plano das ideias económicas (*vg.* Berger e Spoerer, 2001; Dornbusch e Frenkel, 1984; Hyndman, 1932).

Assim, na secção 2 expressam-se os dados fundamentais da crise económica, financeira e política que em 1848 assolou as sociedades europeias e enquadrou a crise das ideias económicas. Na secção 3 fixam-se os traços fundamentais da crise das ideias económicas ocorrida nesse mesmo período e as transformações no campo dos saberes económicos que dela decorreram. Na secção 4 enunciam-se algumas conclusões sobre os mecanismos da crise, mecanismos eventualmente comuns a outras crises dos sistemas teórico-económicos.

2. A Europa em 1848

1848 é antes do mais um ano situado no termo da fase B do segundo ciclo de Kondratiev, isto é, no termo de uma fase de aproximadamente três décadas durante a qual as economias nacionais europeias, em particular as mais modernas, conheceram um abrandamento do seu ritmo de crescimento e uma queda continuada do índice geral de preços.

A crise conjuntural que então emergiu foi uma crise geral no sentido em que abrangeu a maioria dos países do continente europeu, particularmente os mais avançados no processo de modernização, e a generalidade dos sectores da vida social, designadamente da económica, sendo que neste último plano se revelou ainda como crise mista, ainda quando atingiu as economias mais desenvolvidas. O grande peso das actividades primárias no conjunto da actividade económica determinou que a sobreprodução industrial e consequente queda dos preços, próprias de uma crise moderna, se articulou com uma crise de subprodução de bens alimentares de origem agrícola e com o consequente aumento dos preços destes produtos, como é próprio de uma economia que não superou ainda completamente o *Ancien Régime*.

Pelo menos no caso francês, a crise começou por ser uma crise agrícola, resultante de um período de más colheitas em 1845 e nos anos subsequentes, atingindo em seguida as indústrias produtoras de bens de consumo e a nascente indústria de bens de produção, designadamente dos relativos ao sector têxtil. Às restrições ao mercado interno, resultantes da quebra dos rendimentos reais dos agricultores mas também do operariado industrial, juntou-se a quebra das exportações.

A diminuição das reservas metálicas do Banco de França, em resultado do significativo aumento das importações de bens alimentares, e a crescente desconfiança do público transformaram a crise económica em crise financeira. Não obstante o limitado desenvolvimento do sistema bancário, assistiu-se então à redução do crédito, ao aumento das taxas de juro e a um movimento de falências bancárias, o qual atingiu o maior banco privado francês de então, a *Caisse du Commerce et de l'Industrie*.

Outra dimensão da crise resultou da especulação e posterior colapso do valor dos títulos das companhias ferroviárias após meados de 1846, limitando drasticamente os fundos necessários para a continuação da construção das linhas e paralisando as concessões. Esta crise sectorial acarretou sérias dificuldades para outros sectores importantes da economia, designadamente para a mineração do ferro e do carvão e para a siderurgia.

Na Inglaterra, à época a economia nacional mais desenvolvida, a crise foi semelhante. Na sua origem esteve também uma quebra na produção agrícola, a que se seguiu a contracção da produção industrial (porventura menos intensa que no caso francês), o colapso da especulação no sector ferroviário e duas importantes crises bancárias consecutivas (também elas acompanhadas da diminuição significativa das reservas metálicas) que, para além de contribuírem para o refrear da especulação bolsista, atingiram as actividades comerciais em geral e a produção industrial, nomeadamente nas zonas Liverpool e Manchester, aquelas em que esta actividade tinha maior expressão (*vd*. Arnould, 1989: 14-21 em especial, Berger e Spoerer, 2001 e McCartney e Arnold, 2003).

Estes processos cumulativos determinaram a primeira grande vaga de desemprego na Europa e articularam-se com a emergência de fortes tensões sociais e de movimentos revolucionários na generalidade das sociedades europeias, tanto nas centrais como nas periféricas. A própria Inglaterra conheceu então uma forte agitação cartista sob o lema 'pão ou revolução', mas foi em França que esta dimensão da crise se fez sentir de forma mais marcante, resultando num processo revolucionário violento e na instauração de um novo regime político.

A resposta à crise económica e financeira foi balbuciante, desde logo porque a capacidade regulação estatal naqueles dois países, designadamente para controlar a bolha especulativa no sector das ferrovias, se revelou débil, como débeis se revelaram, uma vez declarada a crise, os mecanismos de intervenção susceptíveis de quebrar os processos cumulativos que haviam conduzido à sua generalização. Na ausência de uma visão teórica do fenómeno em causa, tal regulação assentou em preconceitos doutrinários liberais e em ideias de senso comum, limitando-se a intervenções discricionárias no âmbito da política monetária, em particular na tentativa de fixação das taxas de juro.

Em qualquer caso, dezoito meses após o início da era das revoluções 'todos os regimes que ela derrubara (menos um) tinham sido restabelecidos' (Hobsbawm, 1988: 23). Apenas em França, e num período breve que se seguiu à revolução de Fevereiro, foi possível a instauração de uma 'República rodeada de instituições sociais' (Marx, 1971 [1850]: 57) e com ela o desenhar de um novo tipo de regulação e a definição de uma política económica orientada para o combate ao desemprego, designadamente através da limitação da jornada de trabalho a 10 horas diárias, da criação dos *ateliers nationaux* e do encorajamento à criação de cooperativas. No entanto, tal modelo de regulação durou pouco tempo. O início de uma nova fase de crescimento económico associado à recuperação política das forças ameaçadas por aquela Segunda República conduziu ao desmantelar do que restava dos mecanismos inerentes àquele modelo de regulação e ao aprofundar dos dados fundamentais do quadro liberal entretanto afastado mas rapidamente retomado pelo Segundo Império a partir de 1852.

As demais sociedades europeias, incluindo aquelas em que as formas sociais pouco foram transformadas pela crise – o espaço alemão foi porventura o mais afectado já que aí adveio a eliminação da servidão – e em que as formas políticas se aproximaram de novo do absolutismo, foram também elas marcadas pela introdução ou reforço de políticas económicas liberais ou liberalizantes. Outras ainda, como Portugal ou a Rússia, em que a crise política não se fez sentir directamente, não deixaram de ser atingidas elos ecos de 1848.

3. A recomposição do campo do saber teórico

Este contexto de crise da sociedade burguesa não deixou de afectar a esfera das ideias económicas nos seus múltiplos planos, muito embora o ritmo evolutivo destas não se conforme inteiramente com os ciclos da economia. Nuns casos de uma forma mais directa e imediata (a política económica e o senso comum), nos outros casos de uma forma mais mediata mas igualmente efectiva (a doutrina e a ciência). Centremo-nos por ora na crise da economia enquanto ciência.

3.1. A hegemonia do sistema teórico clássico

À data da crise, o campo da ideias económicas, ainda que de limitada dimensão e estruturação, era dominado pelos intérpretes do sistema teórico clássico, o qual havia acompanhado a ascensão do capitalismo. Este sistema tinha-se desenvolvido e hegemonizado o campo dos saberes teóricos a partir de finais do século XVIII com da difusão da *Riqueza das Nações* de Adam Smith. A partir daí, com as contribuições de David Ricardo e de Jean-Baptiste Say, entre outros, definiu-se uma visão essencialmente estática, polarizada na temática da produção e distribuição do excedente e na ideia que o mercado através do jogo livre da oferta e da procura regula os fluxos de mercadorias e conduz a economia a um ponto de equilíbrio estável. De acordo com a lei dos mercados de Say, dado basilar desta corrente, a procura resulta dos

rendimentos gerados pela oferta, isto é, na produção, pelo que, independentemente do volume, esta poderá sempre escoar-se sem prejuízo do pleno emprego dos factores de produção, incluindo o trabalho. Neste quadro, o equilíbrio era tomado como o estado natural da economia, de modo que as oscilações económicas não teriam lugar, ou seriam pouco importantes, a não ser em resultado de um eventual choque exógeno (más colheitas, guerras, perturbações financeiras, …) sempre susceptível de absorção espontânea pela economia.

Os *Princípios de economia política* de Stuart Mill, originalmente publicados em 1848, representam o fim do ricardianismo. Encerravam a fase de progresso analítico da economia clássica e assinalavam o início de um período 'de estagnação – um estado que foi universalmente considerado como de maturidade da ciência, se não de decadência' (Schumpeter, 1994: 380). Nos *Princípios*, Mill alcançava, entre outros progressos analíticos, uma mais clara destrinça entre estática e dinâmica, mas a respeito das crises não revelava uma visão significativamente diversa da dos seus antecessores. A *Riqueza das Nações* de Smith bem como os *Princípios da economia política e de tributação* de Ricardo continham já múltiplas referências às más práticas bancárias e Mill, na mesma linha, continuou a atribuir as crises, em particular a da segunda metade dos anos 1840, à especulação financeira e às restrições ao crédito decorrentes da 'retirada do mercado financeiro de parte considerável do capital que costuma supri-lo' (Mill, 1988 [1848]: 183). Em consequência, sugeriu como solução 'a suspensão da lei bancária de 1844' (*idem*: 184), que conferia o monopólio da emissão monetária ao Banco de Inglaterra e exigia a cobertura integral dessas emissões por reservas de ouro. Na sua visão não havia lugar a outro tipo de intervenção pública já que no fundamental se mantinha apegado à ideia que os mercados, pelo menos os não financeiros, se auto equilibram.

No decurso das décadas que medeiam entre 1776 e 1848, a economia revelava-se uma ciência não unificada, de modo que o sistema teórico clássico surgia então acompanhado e disputado na sua posição hegemónica, por outras correntes teóricas. Em alguns casos por correntes que derivavam do próprio sistema clássico, mas sempre por correntes com menor alcance analítico e diversa expressão social. Sucedeu mesmo que algumas dessas correntes – eventualmente representadas por um reduzido número de autores – enfraqueceram ou dissolveram-se mesmo antes ainda da crise teórica de meados do século. É este o caso de Sismondi, um autor originalmente smithiano mas que, escrevendo ainda antes da primeira crise do capitalismo moderno, aceitou o ponto de vista de que a crescente proletarização e a exploração dos trabalhadores pelos empresários eram regras inelutáveis da economia capitalista e, por outro lado, recusou a ideia de ajustamento automático dos mercados gerado pelo sistema de concorrência, admitindo em seu lugar a existência de uma tendência para a sobreprodução conducente a crises periódicas de gravidade crescente (*Novos princípios de economia política,* de 1819). Como consequência tornou-se adversário do liberalismo, advogando uma intervenção mitigada do Estado em ordem a limitar as consequências sociais das crises e em particular o desemprego.

Pouco depois, Thomas Malthus (*Princípios de economia política*, de 1820), que entretanto havia já formulado as suas célebres leis da população e contribuído para a teoria da renda diferencial da terra, retomou a ideia cara a Sismondi de que a economia capitalista tem um tendência inata para o subconsumo, refinando-a embora com a formulação do princípio da procura efectiva e com a afirmação que o crescimento da produção deve fundar-se num crescimento prévio da procura. Na sua óptica, a causa das crises era o excesso de capital e de produtos relativamente aos mercados. A solução adviria assim do aumento do número de improdutivos, do desenvolvimento do comércio interno e externo e de uma política consistente de obras públicas.

O socialismo ricardiano, primacialmente representado por William Thompson (*Investigação sobre os princípios da distribuição da riqueza mais própria para gerar a felicidade humana*, de 1824) e por Thomas Hodgskin (*Defesa do trabalho contra as pretensões do capital*, de 1825), foi outro dos sistemas teóricos presentes no campo do saber económico nos anos de 1820 e 1830. A sua problemática central era a da repartição do rendimento e os seus elementos analíticos advinham fundamentalmente da teoria ricardiana do valor-trabalho. No essencial, estes autores consideravam a renda fundiária e o lucro como rendimento confiscado aos operários, muito

embora em termos política económica propusessem políticas de redistribuição do rendimento e a criação de banco público, mas não transformações revolucionárias em matéria de propriedade dos meios de produção. A excepção era John Bray que sustentava a ideia de transição para uma futura economia colectivizada. Esta corrente teve, aliás, alguma continuidade em autores da chamada 'crítica proletária', designadamente em Constantin Pecqueur, ele próprio um participante activo da revolução de 1848, mas a problemática das crises económicas era-lhe estranha.

Pela mesma época floresceram inúmeras manifestações de um pensamento económico reformador procurando atalhar os males decorrentes da implantação do capitalismo moderno, males esses particularmente visíveis nos períodos de crise. São disso exemplo as doutrinas económicas moralistas que surgiram 'em defesa daqueles cuja sobrevivência estava ameaçada pelo progresso tecnológico e industrial' (Thompson, 1988: 55) bem como as doutrinas cooperativistas, ligadas ou não ao socialismo utópico. Denunciando ambas as correntes as más condições de vida e as assimetrias de poder inerentes à economia capitalista e propondo arranjos institucionais mais ou menos elaborados quanto à forma de superar tais fenómenos, criticaram a economia política clássica pelos resultados a que as políticas económicas nela inspiradas condiziam, mas não procederam à crítica teórica nem alcançaram dimensão e consistência analíticas susceptíveis de dar corpo a um sistema teórico alternativo.

3.2. A crise teórica e a sua sequência

Em qualquer caso, a evidência de uma economia capitalista disfuncional, isto é, com desemprego, associada à emergência da 'questão social' e à crise política nesta segunda metade da década de 1840, precipitou um período de turbulência disciplinar de que resultou o questionar da ortodoxia teórica dominante e a afirmação de concepções divergentes e críticas dessa mesma ortodoxia. Essa afirmação, reflectindo variedade de posições filosóficas, políticas e de interesses sociais, não foi contudo suficientemente poderosa, nem no plano social nem no analítico, para que alguma dessas concepções pudesse tomar o lugar daquela ortodoxia. Foi só já no decurso dos anos 1870 que emergiu uma nova corrente dominante, a neoclássica, implicando uma mudança do foco da análise económica para a problemática do consumidor e a generalização da análise marginal, sem contudo pôr em causa – reforçando até – os dados fundamentais da doutrina liberal.

Até lá, os *Princípios* de Stuart Mill, mantiveram-se como uma importante referência na divulgação da ciência económica, surgindo quase imediatamente a seu lado, e com forte impacto no Continente europeu, uma renovada apologética do capitalismo concorrencial e do *laissez-faire* sintetizada desde logo por Frédéric Bastiat (*Harmonias económicas*, de 1850), que de alguma forma traduzia uma evolução na continuidade do consenso clássico. Foi já então aí visível um enfraquecimento ou abandono de tópicos e conceitos importantes da reflexão teórica, designadamente dos da etapa ricardiana, como o de classe social, a teoria do valor-trabalho e a problemática da distribuição, em favor de uma visão em que todas as interacções humanas se reduziam a actos de troca mercantil fundados na utilidade, muito embora Bastiat nunca demonstrasse com exactidão como é que a utilidade determinava o valor dos serviços produtivos e dos produtos deles resultantes.

Sinal que as crises económicas se mantinham no terreno do 'impensável' é facto de os raros estudos sobre essas mesmas crises terem uma natureza meramente descritiva. O de Clément Juglar, no qual, aliás, a recusa da lei de Say era apenas implícita (*Das crises comerciais e do seu retorno periódico em França, em Inglaterra e nos Estados Unidos*, de 1862), foi porventura o de maior impacto. Reflexões aprofundadas sobre a natureza das crises financeiras surgiram apenas em meados dos anos 1870 com Walter Bagehot (*Lombard Street: a description of the money market*, de 1873) e a passagem a estudos de natureza académica não apenas sobre as crises mas mais latamente sobre a mecânica dos ciclos económicos já só ocorreu no findar do século com os trabalhos de Tugan-Baranovsky (*The Industrial Crises in England*, de 1894).

Entre as correntes divergentes do sistema clássico emergiu o marxismo, 'revelando as roturas operadas entre as classes' (Bernard, 1963: 253) e procurando dar ao movimento operário e ao

socialismo os elementos de uma análise crítica e sistemática da realidade capitalista. Ganhou dimensão social e teórica a partir da publicação do *Manifesto Comunista*, justamente em 1848. Afastava-se aí a ideia que as crises eram essencialmente um resultado da especulação e não da sobreprodução, referiam-se 'as crises comerciais que, na sua repetição periódica, e cada vez mais ameaçadoras, põem em causa a existência de toda a sociedade burguesa' e notava-se que 'nas crises declara-se uma epidemia social (…) a epidemia do excesso de produção. A sociedade vê-se de repente transportada para um estádio de momentânea barbárie; (…) a indústria e o comércio parecem-lhe aniquilados' (Marx e Engels, 1975 [1848]: 66). No entanto, o *Manifesto* era um texto essencialmente doutrinário, com uma dimensão teórico-económica limitada. Nele, bem como no *Trabalho Assalariado e Capital*, de 1849 – 'o primeiro texto [marxista] propriamente teórico' (Rubel, 1963: 1595) –, e em alguns artigos dos mesmos autores por essa época publicados na *Nova Gazeta Renana*, surgia uma interpretação da dinâmica secular da acumulação capitalista formulada em termos muito genéricos mas não ainda, como sucederia mais tarde em *O Capital*, uma teoria desenvolvida do modo de produção capitalista e uma teorização, ainda que inacabada, das crises económicas. Ainda assim, o *Manifesto* continha algumas medidas com evidente impacto no desenrolar das crises financeiras, desde logo a proposta de 'centralização do crédito nas mãos do Estado por meio de um banco nacional com capital do Estado e monopólio exclusivo' (*idem*: 85).

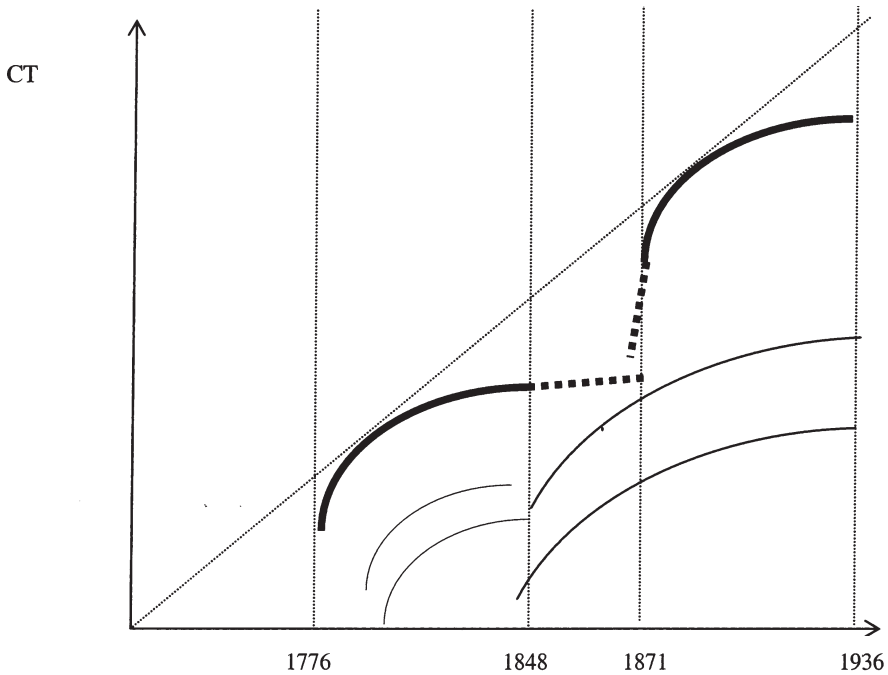
Este processo de reconfiguração do campo teórico, que deixou o marxismo à margem dos círculos académicos, envolveu também a emergência da corrente historicista. Esta partia da crítica da ideia, cara aos economistas clássicos, de leis económicas universais para atender privilegiadamente aos processos de evolução das economias, sublinhando a interdependência entre as actividades económicas, as políticas e as culturais e bem assim o papel das instituições no conformar dos comportamentos colectivos, em oposição ao individualismo próprio da metodologia adoptada pela generalidades dos autores da escola clássica. Contrastando com esta escola, os economistas historicistas tomavam a economia nacional como categoria analítica fundamental e procuravam refundar a teoria económica no conhecimento dos factos concretos de modo chegar ao conhecimento das fases e das regras explicativas da evolução das economias nacionais. Esta *dèmarche* afastava-se também da de Marx já que, ao contrário desta, os representantes da corrente historicista recusavam considerar a validade das leis enunciadas pelos economistas clássicos mesmo quando referidas apenas ao sistema capitalista. Um primeiro momento importante da afirmação desta corrente foi a publicação por Wilhelm Roscher, ainda em 1843, do *Compêndio de um curso de economia política segundo o método histórico*, mas foi num ensaio posterior (*Teoria das crises*, de 1849), que se debruçou especificamente sobre a problemática da sobreprodução e das crises económicas, rejeitando a lei de Say e referindo que 'como Lord Lauderdale muito justamente notou, a poupança só é verdadeiramente fecunda na medida em que se desenvolve paralelamente a uma efectiva procura de trabalho ou a uma efectiva procura crescente de bens e de serviços' (cit. Hutchison, 1975: 357).

A situação da crise teórica descrita pode assim representar-se conforme a Figura 1.

Tal como no período anterior à crise, emergiram nesta fase outras abordagens da problemática económica, as quais, no entanto, dado o seu limitado alcance analítico não se constituíram, pelo menos no imediato, em sistema teórico nem trouxeram contribuições para a teoria das crises. Foi o caso, entre outros, do *apport* de Heinrich Gossen (*Desenvolvimento das leis das relações humanas*, de 1854), introduzindo o conceito de utilidade marginal, que viria a ter enorme relevância no âmbito do sistema teórico neoclássico.

À margem destas correntes emergiram sobretudo visões doutrinárias, frequentemente desenvolvimentos ou reelaborações de linhas de pensamento já existentes antes de 1848. Estão neste caso o cooperativismo, o qual, uma vez abandonada a ideia de construção de comunidades humanas *sui generis*, se converteu numa ideia menos ambiciosa e circunscrita à organização de algumas actividades económicas, e o socialismo cristão, que assentou num conjunto disperso de noções económicas visando a moralização do mercado pela aplicação de princípios éticos em matéria de valor e distribuição.

Figura 1



Obs. – CT significa conhecimento teórico.
A bissectriz representa uma curva de possibilidade de produção de saber teórico ao longo da qual se dispõem os diversos sistemas. Significa também que há efectivo progresso – acumulação de saber – ao longo do tempo. Note-se, contudo, que o referido progresso é apenas verificável no interior de um mesmo sistema teórico ou no âmbito da 'evolução e aplicação dos instrumentos analíticos' (Pasinetti, 202: 134), mas não na sucessão de sistemas teóricos (a não ser por uma eventual regra normativa imposta a priori).
As linhas a traço forte representam as correntes maioritárias (e socialmente dominantes) e as linhas a traço fino representam as correntes minoritárias (e socialmente dominadas), o que supõe uma concorrência desigual no campo das ideias económicas.
A parte das linhas que surge ponteada indica fase de formação ou decomposição do sistema teórico.
A migração conceitual de uns sistemas para outros não está representada no diagrama.
Também não está representado o sistema de relações microssociais que compõem o campo científico e que constituem o suporte material dos discursos teóricos.

4. Conclusões

A crise teórica de 1848 foi breve, como breve foi a crise económica e política que a condicionou, mas nem por isso os seus efeitos foram despiciendos. Ela resultou na reconfiguração do campo do saber económico, e em particular na transformação parcial do sistema clássico, mas não na substituição deste enquanto sistema teórico hegemónico, o que só aconteceu nos anos 1870 – mais de duas décadas após o início da crise – com a revolução marginalista. No curto prazo, a solução da crise teórica foi um regresso à hegemonia do sistema clássico, ainda que enfraquecido no seu potencial inovador e parcialmente transformado. Contudo, esse desfecho da crise não era inapelável; outros desfechos da crise política e económica poderiam ter determinado outro desfecho da crise teórica.

Na circunstância concreta, esta crise revelou que, não obstante aquela transformação e a emergência de sistemas alternativos, o sistema teórico clássico continuou a ser socialmente considerado verdadeiro, já que legitimador das formas de regulação e controlo liberais favoráveis aos interesses históricos dos grupos sociais dominantes. Como justamente observou um historiador do pensamento económico, 'o socialmente perigoso não podia, em hipótese alguma, ser verdadeiro' (Meek, 1971: 97).

É também dado importante desta crise o facto de nenhuma das correntes minoritárias, e socialmente dominadas, se converter no decurso da crise em corrente maioritária, e socialmente dominante, a não ser o historicismo no limitado ao espaço alemão, em resultado da inexistência à data de uma economia e de uma cultura económica globalizadas, do relativo atraso económico daquele espaço e da fraqueza da tradição clássica na cultura económica local. Aliás, este exemplo confirma que o critério de verdade é em última análise um critério de utilidade social.

Os vários sistemas teóricos, e em particular os dominantes, formam-se a partir quer de elementos analíticos originais, quer de elementos teóricos resultantes da decomposição de sistemas anteriores, quer ainda de contribuições téoricas avulsas preexistentes e irrompem na cena do pensamento económico, em articulação com transformações no campo social, enquanto sistemas novos e originais. Por regra – e essa regra aplica-se à crise de 1848 – não há passagem de sistemas dominados a dominantes.

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Teses de Doutoramento

Doutoramento em Economia

The interaction between human capital, foreign trade and economic growth: an empirical approach

Micaela Andreia Alegria Antunes

Along this dissertation we present five distinct studies, following different approaches but all with a common element: they take into account the impact of foreign trade on growth, the relevance of the balance-of-payments as a constraint to growth and the linkages between human capital and external trade.

The study begins with the analysis of the role of human capital and foreign trade on the growth of several sets of countries (World, high-, middle- and low-income countries, Europe, OECD and the EMU countries), between 1980 and 2000. The human capital proxies used take into account quantitative and qualitative aspects to measure their impact on growth. The degree of openness and the net foreign balance are used as proxies for external trade to reveal their importance on growth as well. The interaction between human capital and foreign trade measures allows us to investigate the existence of technology and knowledge transfers, through trade.

We also consider the EU set of countries checking for the existence of conditional convergence over the period 1980 to 2004. In this part we try to reconcile the neoclassical and Post-Keynesian theories of growth at least at the empirical level. To do so, we introduce into the neoclassical growth model the ratio of the income-elasticity of the demand for exports over that of imports, to test the importance of the balance-of-payments constraint hypothesis on growth. It is shown that this demand factor fits well into the supply-orientated growth model even for countries with a single currency and a common monetary policy implying fixed exchange rates.

The study extends the growth analysis to the regional level and focuses on Portugal over

the period 1996 to 2005. The intention is to analyse the growth process among the NUTS3 regions and the relevance of human capital and regional foreign trade for regional growth. The share of employment in the main activity sectors is also considered to verify whether labour sectoral allocation is important for regional growth.

Additionally, we check for the existence of joint effects between human capital and foreign trade on regional growth and examine the differences between *Litoral* and *Interior*.

Furthermore, we use the balance-of-payments constraint approach to explain the growth performance of the Portuguese economy over the last four decades. We employ «Thirlwall's Law» to predict actual growth in Portugal over the whole period and various overlapping periods and the McCombie test is implemented to test the accuracy of the Law. Differences in the growth performance between the pre- and post-accession periods are considered and it is shown that Portugal grew slower when joined the EU. This finding is combined with a higher income-elasticity of demand for imports and a slower growth of exports in the latter period.

In the final part of the study we analyse a simultaneous equation model of growth with circular and cumulative causation characteristics. The model uses a demand-orientated approach to determine the relationships among the investment-output ratio and the growth of domestic income, exports, prices and productivity. The idea is to identify the driving forces of growth, with causal linkages that turn the process self-sustained. We are especially interested in the performance of Portugal, for the 1965-2006 period. The results show that there are three main breaks that obstruct the complete functioning of the circular and cumulative process, namely: (i) the investment-output ratio does not positively and significantly affect productivity growth; (ii) productivity growth is apparently not relevant for the growth of domestic price and (iii) price growth does not affect export growth. Therefore, there are essential links in the cumulative process that fail to generate faster growth in Portugal.

The general conclusion of the study is that foreign trade is essential for growth both at the individual country level and at the regional level. Foreign trade can be properly combined with human capital measures, and both affect the growth process significantly being in line with the knowledge and technology diffusion hypothesis.

Balance-of-payments problems can also restrain growth and cannot be ignored when the aim is to explain growth. If a country wishes to growth faster it has to improve its competitiveness by turning its products more attractive, both in the domestic and external markets by improving the supply characteristics associated with the non-price features. Also, the competitiveness of an economy is highly associated with human capital qualifications.

Universidade de Coimbra, 29 de Abril de 2011

Doutoramento em Economia

Território e inovação : uma aplicação às regiões europeias

Maria Alberta Couto Cruz de Oliveira

Nesta dissertação, procuram-se respostas a três questões interligadas que nos parecem relevantes para a formulação de políticas de inovação regional bem sucedidas para a Região Norte de Portugal. Antes de mais, de um ponto de vista conceptual, é necessário enquadrar a problemática da inovação no quadro teórico do pensamento territorial bem como no referencial da literatura sobre a inovação de base regional.

Revela-se aqui premente a construção de grelhas de comparação sobre taxinomias do território, como a própria sugestão de conceitos que permitam aprofundar algumas realidades ainda a descoberto na literatura. No essencial, o território surge como um actor activo no processo de desenvolvimento regional, desempenhando o enquadramento institucional da actividade que sobre ele se desenvolve, sendo um referencial incontornável para o eventual sucesso de percursos de inovação. Nesse sentido, a ligação entre território e inovação tem de passar pela conceptualização evolucionista, entendida no seu sentido mais moderno, isto é, de combinação de evolucionismo e institucionalismo. A problematização dos sistemas regionais de inovação é enriquecida quando se segue este percurso de análise, que ao mesmo tempo constitui referência fundamental para as questões subsequentes.

Tendo em mente um quadro evolucionista e institucionalista de referência, desenvolve-se nesta dissertação uma aplicação a este domínio das técnica econométricas mais adequadas, designadas por *evolumetrics* na Escola de Augsburg. O propósito central, sendo a Região Norte inserida no quadro mais amplo das regiões da UE, passa por compreender se de facto existe uma heterogeneidade regional em matéria de inovação na Europa, e os factores determinantes dessa heterogeneidade. A questão da existência é resolvida mediante o mapeamento de índices de eficiência técnica no processo de inovação, obtidos por uma metodologia não paramétrica, constatando-se a relevância do abandono do paradigma do agente representativo. De facto, a diversidade ao nível na inovação regional que caracteriza a UE permite quando muito identificar regiões com características semelhantes, mas nunca uma região tipo, tal a disparidade dos indicadores de eficiência. No que se refere à identificação de factores explicativos, usamos um modelo de regressão de quantis para dados de contagem, que aplicado ao caso vertente, nos permitiu compreender a importância diferenciada das variáveis determinantes no sucesso da inovação no quadro das diversas regiões europeias. As variáveis usadas e os resultados validam ainda considerações de natureza institucionalista: o enquadramento institucional torna-se variável ao longo dos diversos patamares de sucesso da inovação. Nesta análise foi-nos dado constatar que, não só a Região Norte de Portugal se situa num patamar de pequeno relevo a nível de capacidade de inovação, como existem debilidades estruturais no quadro de regiões em que se insere.

Finalmente, centrando a atenção nesse estudo de caso que constitui a Região Norte, e utilizando quer entrevistas directas, quer inquéritos por questionário, procuramos uma caracterização do Norte em termos de um dos mais populares instrumentos de política de inovação regional: os Parques de Ciência e Tecnologia.

Após o desenvolvimento de uma taxinomia específica para os parques e a caracterização do ambiente envolvente da inovação em Portugal, analisamos então os dados recolhidos nos parques da Região Norte, junto das empresas que os integram. Torna-se claro que a inovação regional é estrangulada nestes parques por factores que dependem claramente de um deficiente desenho institucional. A sobreposição de parques com funções idênticas num tecido industrial pouco baseado na inovação e a ausência de agências de capital de risco nos parques financiando os projectos inovadores, são dois elementos que merecem destaque na explicação dessa deficiência. Por outro

lado, a mencionada proliferação de parques é um sub-produto da inexistência de níveis de coordenação política intermédios entre as autarquias e o Governo, que resulta na ausência de uma visão especificamente regional, com custos para o estabelecimento em qualquer parque da necessária massa crítica. O que sem dúvida preside a outro dos problemas identificados, em co-responsibilidade com a ausência no parque de uma gestão de topo efectivamente qualificada: o não estabelecimento nos parques de parcerias informais entre as empresas, troca de conhecimentos tácitos sobre produtos e tecnologias inovadoras, etc. Em suma, o desenho dos parques na Região Norte não favorece um efectivo *networking*.

Universidade de Coimbra, 17 de Maio de 2011

Doutoramento em Pós-Colonialismos e Cidadania Global

Para além de um Índico de desespero e revoltas: Uma análise feminista pós--colonial das estratégias de autoridade e poder das mulheres de Moçambique e Timor-Leste

Maria Teresa Henriques da Cunha Martins

Quem define o que é o poder, tem [o] poder e esta é uma dissertação sobre o poder de pronunciamento, reflexão, criação, e decisão das mulheres especialmente daquelas a quem quase nunca e quase nada é perguntado.

Apresento um estudo comparativo que se alimenta das experiências, subjectividades e inteligibilidades de mulheres vendedeiras dos mercados informais e líderes de associações populares de dois lugares geograficamente situados: as cidades de Maputo, na costa oriental da África Austral, e Dili na costa norte da Ilha de Timor no extremo do Sudeste Asiático.

Este trabalho desenvolve-se através do desdobramento teórico, analítico e empírico de cinco hipóteses principais: 1/ a crítica às centralidades dominantes das relações internacionais que revela racionalidades que resistem, subsistem e re-imaginam mapas, rotas e outras afinidades e outros cosmopolitismos; 2/ a desobediência ao pensamento dominante sobre a insolvência económica das vendedeiras de bazar e dumba-nengue coloca em realce as associações populares de mulheres e os chamados mercados informais como espaços-tempo empobrecidos, todavia activos, dinâmicos, criativos, com recursos intersubjectivos que resultam em criação de respostas e soluções que podem constituir-se como os novos topoi de uma outra economia e organização societal; 3/ a transgressão da ideia de que, tanto o patriarcado como o colonialismo nada deixaram de fora do seu domínio lançando um debate sobre a poli-racionalidade emancipatória que transmuta e perverte gastas presunções sobre a libertação das mulheres e dos homens; 4/ o poder de escrutinar a modernidade e a colonialidade dos feminismos modernos,

descentrando e localizando-os traz a manha, a obliquidade, o silêncio ou o obscuro, para dentro das epistemologias feministas de retaguarda que apoiam a resistência primeiro e, depois, a libertação; 5/ quando as mulheres definem e recriam o poder enfrentam severas hostilidades contextuais e estruturais porque as gramáticas-bibliotecas coloniais e sexistas resistem. Muitas mulheres enfrentam a violência das escalas quando querem que as suas narrativas se mantenham libertas, activas e performativas.

Há muitas coisas que separam as mulheres e as tornam singulares umas das outras e umas diante das outras. Tornamo-nos mulheres de muitas e variadas maneiras e existimos sociologicamente com essas diferenças. Todavia o poder de saber, de afirmar o que é poder e fazer saber que se sabe, é um poder que as mulheres de qualquer lugar do mundo podem reconhecer e fazer acontecer na sua infinita capacidade de existir, criar e resistir.

Universidade de Coimbra, 01 de Junho de 2011

Doutoramento em Sociologia (Sociologia do Estado, do Direito e da Administração)

Feminismo de estado em Portugal: mecanismos, estratégias, políticas e metamorfoses

Rosa Filomena Brás Lopes Monteiro

Neste quase quarenta anos de democracia, Portugal eliminou da legislação a discriminação em razão do sexo, assumiu o compromisso internacional com a agenda da igualdade e com as políticas de acção positiva e de «*mainstreaming* de género», e criou dois mecanismos oficiais permanentes para a igualdade de mulheres e homens. Temos o que tem sido considerado como uma boa legislação que parece demonstrar a vontade e acção do Estado português na promoção da igualdade entre os sexos. Porém, a constatação de inefectividades múltiplas na implementação das políticas foi uma das inquietações na origem deste trabalho, que cruza os campos da sociologia do Estado e da ciência política, da sociologia dos movimentos sociais e das relações sociais de sexo. O Estado Português tem vindo a assumir políticas de promoção da igualdade de mulheres e homens desde 1970, concretamente com a criação do principal mecanismo oficial para a igualdade (CCF/CIDM), actualmente a Comissão para a Cidadania e Igualdade de Género (CIG). Esta Comissão corporiza, no nosso país, o que tem sido considerado como uma forma de feminismo institucional, fenómeno estudado internacionalmente pela abordagem do feminismo de Estado. Por isso, sobre ela incidiu a pesquisa aqui apresentada.

Como quadro de referência conceptual usei a abordagem do feminismo de Estado que traduz a ideia de que a determinada altura o Estado, anteriormente visto pela maioria dos movimentos feministas como um opositor e rival patriarcal, terá passado a ser ele mesmo um aliado das causas das mulheres, incluindo-as nas suas agendas políticas. Considera-se que os mecanismos oficiais para a igualdade têm sido aliados dos movimentos de mulheres na representação descritiva e substantiva das mulheres, variando os seus níveis de sucesso em função de factores essencialmente ligados ao

ambiente sociopolítico e às características dos movimentos de mulheres.

Adoptei o conceito de feminismo de Estado por ele ser um conceito racional que traduz a interinfluência estratégica entre movimentos de mulheres, mecanismos como a Comissão e restantes agentes estatais e políticos na produção de resultados políticos, nomeadamente de políticas de igualdade. A produção destas políticas é vista como um processo complexo, multidimensional não dependente apenas da acção dominante de um tipo de agente (Estado, partidos políticos ou movimentos sociais), ainda que em determinados contextos um ou outro possa prevalecer

O objectivo central deste estudo dirigiu-se, portanto, ao questionamento do papel e da acção da Comissão, como articuladora e agente pivô entre os movimentos de mulheres e o Estado na promoção de reivindicações, políticas e legislação para a igualdade de mulheres e homens, traduzindo-se esta acção no conceito de feminismo de Estado. Neste estudo procuro demonstrar o papel do mecanismo oficial para a igualdade em função de factores propostos na literatura, como sejam os de estruturas de oportunidades políticas e as estruturas de mobilização.

A pesquisa empírica foi realizada com, base num estudo de caso sobre a Comissão, que requereu uma abordagem qualitativa composta, em termos de fontes de Investigação, pela realização de 53 entrevistas semi-estruturadas e pela análise de material de arquivo (actas e documentos diversos) de legislação, publicações e artigos de imprensa.

A análise permitiu identificar quatro tipos de categorias em termos de efectividade e resultados (*insider, marginal, simbólico, ausente*) do feminismo de Estado em torno de agendas ou áreas políticas específicas (capítulo 4); e ainda quatro fases na evolução do feminismo de Estado – *emergente, potenciado, formal e desafiado* (capítulo 5). Foi possível concluir que a Comissão foi ao longo dos anos, em Portugal, uma portadora decisiva das reivindicações feministas perante o Estado, com impactos diferenciados consoante factores e variáveis relativos essencialmente ao contexto sociopolítico de actuação, a características/estratégias dos movimentos de mulheres, mas também consoante características sua específicas que a capacitaram (ou não) a efectivar a sua missão de participação na produção de legislação e de políticas. Ela foi um núcleo feminista no Estado, foi uma aliada dos movimentos de mulheres portugueses, numa aliança que evoluiu ao longo dos mais de 30 anos analisados, e ao longo dos quais tem alavancado as questões das mulheres e das políticas de igualdade sexual em Portugal, ainda que com um sucesso bastante limitado e condicionado, no que designei de hiato entre o possível e o real.

Universidade de Coimbra, 11 de Julho de 2011

Doutoramento em Gestão de Empresas (Estratégia)

Cultura competitiva, empreendedorismo, inovação e performance: um estudo aplicado às empresas

Afonso Clemente Zinga

Este estudo tem como objectivo analisar os factores que afectam o empreendedorismo e a inovação, a examinar como estes factores se combinam, em conjunto, para formar a cultura competitiva nas organizações e analisar como se inter-relacionam para melhorar a sua *performance*. Com base numa amostra de 208 empresas, os resultados obtidos a partir da modelagem de equações estruturais apontam no sentido de que a cultura competitiva é formada pela constelação do empreendedorismo, da inovação, da orientação para o mercado, da aprendizagem organizacional e da liderança transformacional e influencia positivamente a *performance* das empresas. Em segundo lugar, os resultados indicam que a liderança transformacional e a orientação para o mercado exercem efeitos directos na aprendizagem organizacional, e afectam indirectamente o empreendedorismo e a inovação. Os resultados revelam ainda que o empreendedorismo tem implicações directas na inovação. Adicionalmente, os resultados indicam que o empreendedorismo não influencia directamente a *performance*. A *performance* é influenciada indirectamente pela inovação. Em terceiro lugar, para melhor compreender a complexidade destes constructos e das suas relações, utilizando a modelagem de redes neuronais, os resultados obtidos sugerem que a *performance* é influenciada por novas variáveis latentes, intermediárias, designadas de neurónios ocultos: a responsividade ao mercado, as competências dinâmicas e a cultura da organização, e ao mesmo tempo sugerem que as competências gerenciais, de *marketing* e dinâmicas são recursos relevantes para o empreendedorismo e a inovação.

Universidade de Coimbra, 26 de Setembro de 2011

Doutoramento em Sociologia (Sociologia do Desenvolvimento e da Transformação Social

Para Além dos Números – As consequências pessoais do desemprego: trajectória de empobrecimento, experiências e políticas

Jorge Manuel Alves Caleiras

Este trabalho apresenta os resultados de uma investigação, cujo objectivo central passou por conhecer melhor as consequências pessoais do desemprego, em particular a relação deste com situações de pobreza. Embora estas duas realidades – desemprego e pobreza – não se sobreponham necessariamente, a verdade é que, com frequência, se encontram. Foi, aliás, nesta ideia que se fundou a hipótese de partida – a de que o desemprego é gerador de situações de risco de pobreza. Em que medida é que o desemprego pode tornar-se fonte de pobreza? E como é que esta relação se passa num «*território-laboratório*» concreto (o distrito de Coimbra) e num tempo definido (2000-20059? Eis duas questões, inicialmente formuladas, que serviram de fio condutor à pesquisa.

Reconhecendo que o desemprego não pode ser visto como uma realidade social ontologicamente dissociada dos indivíduos, isto é, separada dos desempregados, assumiu-se que as consequências que ele gera estão antes de mais inscritas nas histórias pessoais, singulares e irredutíveis, daqueles que o experimentam.

Nesse sentido, como próprio título indica – «*Para Além dos Números…*» –, o método seguido consistiu em não entender o desemprego apenas pelo lado das consequências macro (redução da capacidade produtiva, aumento da despesa pública, etc.), mas sim em focalizar o olhar nas consequências na vida dos próprios desempregados (*micro*-análise).

Deste modo, a preocupação de conhecer a relação «a partir de dentro» fez colocar os desempregados no centro da discussão e remeteu o estudo para um patamar experiencial que exigiu grande proximidade do objecto. Depois de uma análise estatística

«clássica» e de uma análise longitudinal de trajectórias de desempregados, baseada numa matriz extraída da base de dados nacional da segurança social, o estudo baixou de nível de pormenorização até se atingir a expressão mais fina e individualizada, conseguida pela via da aplicação de entrevistas aos próprios desempregados e a actores que operam no domínio das políticas sociais e de emprego.

A conjugação de resultados obtida aponta no sentido de considerar que, embora de forma diferenciada, as consequências geradas pelo desemprego, tanto no plano objectivo quanto no subjectivo, desencadeiam ou acentuam múltiplas manifestações de pobreza, que, na sua maioria, podem designar-se de «suaves» e «integradas». Nesse sentido, defende-se que, à semelhança das manifestações de pobreza mais «severas», conhecidas e intervencionadas através do Rendimento Social de Inserção, estas, embora menos visíveis, «envergonhadas» e, portanto, mais complexas, não podem por isso, deixar de ser combatidas, também elas, pela via da intervenção pública. Perante elas, o Estado não pode lavar as mãos como Pilatos.

Universidade de Coimbra, 29 de Setembro de 2011