World Input-Output Database

Accounting relations in bilateral value added trade

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Accounting relations in bilateral value added trade

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Abstract

The increasing international fragmentation of production has triggered the development of a number of widely used indicators accounting for value added flows in the world economy. This paper generalises these measures by simultaneously considering the import side and focusing on bilateral gross and value added trade flows. It discusses how these indicators relate to each other, the role of double counting in bilateral value added trade, and aggregation issues in global value added flows. Using the World Input-Output Database (WIOD) selected results on bilateral value added trade for EU-27, US, and China over the period 1995-2011 are presented.

JEL: F1, F15, F19

Keywords: production fragmentation, value added trade, vertical specialisation, bilateral trade

1 Introduction

The increasing international integration of production and corresponding trade in intermediates has become an increasingly important phenomenon over the last decades. This phenomenon has triggered attention from trade economists both from a theoretical (see e.g. Grossman and Rossi-Hansberg, 2008; Feenstra, 2010) and an empirical perspective (e.g. Varian, 2007; Linden et al., 2009; Hummels et al., 2001; Daudin et al., 2011; Johnson and Noguera, 2012; Koopman et al., 2011, 2014), from a policy perspective (e.g. Baldwin, 2011, 2012) and from policy makers (e.g. Jara and Escaith, 2012, for an overview). The empirical literature - spanning product level case studies, firm level analysis, studies relying on detailed trade data, and input-output data - produced a wide range of results documenting the increasing fragmentation of production in several aspects. Using global input-output tables, which are becoming recently available, allows for a better understanding of the implications with respect to value added flows across countries.[1] Based on such data a variety of indicators has been developed accounting for a country's engagement in international production. These include measures of vertical specialisation as in Hummels et al. (2001) and value added trade as in Johnson and Noguera (2012) and Koopman et al. (2011) with all of them focusing on a country's total exports. This paper generalises these approaches in two ways: It takes the mirror-flows of imports in gross and value added terms into account and more

[1] The special issue of Economic Systems Research, Volume 25(1) 2013, provides an overview.

importantly focuses on measuring bilateral value added flows on the basis of global input-output tables together with discussing aggregation issues.

Building on the recent contributions tackling to track value added flows across countries two main concepts might be distinguished. The first accounts for the value added of a country which is directly and indirectly embodied in final consumption of another country, a concept put forward in Johnson and Noguera (2012). The typical question would be: 'How much value added is created in a country due to final consumption in the other countries?' The second concept calculates the domestic and foreign value added embodied in a country's gross exports. The typical question would be: 'How much value added from the exporting and other countries is embodied in this country's exports?'. This is conceptually close to measure the import content of exports as outlined in Hummels et al. (2001) and other contributions like Daudin et al. (2011). Koopman et al. (2011) provides a further decomposition of a country's gross exports to be discusses later. Though the underlying reasoning differs, both concepts seem to be closely related to each other as the value added exports to export ratio, i.e. the VAX ratio as named in Johnson and Noguera (2012), is numerically close to a country's domestic value added content in its exports. The first contribution of this paper is therefore to neatly compare these two approaches and discuss similarities and differences (see also Koopman et al., 2011, in this respect).

A second contribution of this paper is to generalise these measures by simultaneously considering a country's value added imports. By definition, if there are exports there must also be imports further implying that - by definition - the world trade balance in value added terms as well as for gross trade has to be zero. Considering both a country's value added exports and imports allows for a discussion of a country's net trade position in value added terms. Both concepts lead to the same result at the aggregate level: net trade in value added terms equals net trade in gross terms. In essence, this results from the fact that from a National Accounting perspective net trade equals a country's net savings position.

The third contribution of this paper is to apply the recently developed decomposition of a country's gross exports into value added terms in Koopman et al. (2011) at the bilateral level. First, this allows for a detailed account of the relationships between the two concepts mentioned above and the role of third countries, e.g. as providers of intermediates, in two countries bilateral value added trade. Second, it is shown that when adding up the bilateral value added trade components over partner countries result in the overall measures with respect to value added trade flows.

The bilateral framework developed in this paper therefore allows for capturing the accounting relations with respect to value added trade in a bilateral perspective. In Section 2 the notation is introduced and the two concepts mentioned above are defined with respect to value added exports and imports. It is shown that both concepts result in the same net trade figures. This section then proceeds with a decomposition of bilateral gross exports allowing to neatly disentangle global accounting relations in bilateral value added flows and shows that double counted terms cancel out in the aggregation procedure. Making use of the two approaches it is shown in the Appendix how the indicators of the decomposition as proposed in Koopman et al. (2011) can be calculated in a computationally straightforward and cheap way . Section 3 then provides selected empirical results based on the WIOD database with a focus on bilateral trade flows between three major economies - US, China and the EU-27 - over the period 1995-2011. Section 4 then provides a bilateral decomposition of the bilateral net trade positions. Section 5 concludes.

2 A tale of two concepts

In this section the notation and the algebra for these two concepts measuring value added flows between countries as described in the introduction is introduced. This is followed by a discussion showing that both lead to the same trade balance which themselves equal a countries' trade balance in gross terms, i.e. gross exports minus gross imports. In doing so this also shows how these concepts can be applied for considering bilateral trade flows. Looking at some indicators suggest that there is a tight relation between these two measures. This will be investigated in detail by applying a decomposition for the bilateral flows which allows to neatly show how these are related to each other, discuss the problem of 'double counting' with respect to aggregation of bilateral value added flows over trading partners. This then finally can be used to see more clearly why net trade in value added terms equals net trade in gross terms for a countries' total trade, but not in bilateral terms.

2.1 Notation

In this section the basic notation capturing the basic relationships between value added creation, final demand and trade is introduced. Based on an input-output approach the well-known fundamental equation is $\mathbf{x} = \mathbf{A}\mathbf{x}+\mathbf{f} = \mathbf{L}\mathbf{f}$. $\mathbf{x}$ denotes a $CG \times 1$ vector of gross output (with C being the number of countries and G the number of products considered). $\mathbf{A} = [a_{ij}^{rs}]_{i,j=1,\dots G}^{r,s=1,\dots,C}$ is a $CG \times CG$ matrix of technical input-output coefficients with each element denoting the input used in a particular industry in one country per unit of gross output. $\mathbf{f}$ denotes the $CG \times 1$ vector of final demand. The second part rearranges this equation such that gross output is written as a function of the Leontief inverse, $\mathbf{L} = (\mathbf{I} - \mathbf{A})^{-1}$ (where $\mathbf{I}$ denotes the identity matrix), and the final demand vector. For three countries and using partitioned matrices this equation can be written as follows:

$$\begin{aligned}
\begin{bmatrix} \mathbf{x}^1 \\ \mathbf{x}^2 \\ \mathbf{x}^3 \end{bmatrix} &= \begin{bmatrix} \mathbf{A}^{11} & \mathbf{A}^{12} & \mathbf{A}^{13} \\ \mathbf{A}^{21} & \mathbf{A}^{22} & \mathbf{A}^{23} \\ \mathbf{A}^{31} & \mathbf{A}^{32} & \mathbf{A}^{33} \end{bmatrix} \begin{bmatrix} \mathbf{x}^1 \\ \mathbf{x}^2 \\ \mathbf{x}^3 \end{bmatrix} + \begin{bmatrix} \mathbf{f}^1 \\ \mathbf{f}^2 \\ \mathbf{f}^3 \end{bmatrix} = \begin{bmatrix} \mathbf{L}^{11} & \mathbf{L}^{12} & \mathbf{L}^{13} \\ \mathbf{L}^{21} & \mathbf{L}^{22} & \mathbf{L}^{23} \\ \mathbf{L}^{31} & \mathbf{L}^{32} & \mathbf{L}^{33} \end{bmatrix} \begin{pmatrix} \mathbf{f}^{11} + \mathbf{f}^{12} + \mathbf{f}^{13} \\ \mathbf{f}^{21} + \mathbf{f}^{22} + \mathbf{f}^{23} \\ \mathbf{f}^{31} + \mathbf{f}^{32} + \mathbf{f}^{33} \end{pmatrix} \\
&= \begin{bmatrix} \mathbf{L}^{11} & \mathbf{L}^{12} & \mathbf{L}^{13} \\ \mathbf{L}^{21} & \mathbf{L}^{22} & \mathbf{L}^{23} \\ \mathbf{L}^{31} & \mathbf{L}^{32} & \mathbf{L}^{33} \end{bmatrix} \left(\mathbf{f}^1 + \mathbf{f}^2 + \mathbf{f}^3 \right)
\end{aligned}$$

$\mathbf{x}^r$ $(r = 1, 2, 3)$ denotes the $G \times 1$ vector of gross output in country r, $\mathbf{L}^{rs}$ the respective $G \times G$ submatrix of the Leontief inverse and $\mathbf{f}^{rs}$ the $G \times 1$ vector of final demand of country s in country r. It is important to distinguish between demand for final products which are produced in country c and thus includes exports, i.e. the $G \times 1$ vector $\tilde{\mathbf{f}}^c = \mathbf{f}^{cr} + \mathbf{f}^{cs} + \mathbf{f}^{ct}$, and the $CG \times 1$ vector denoting country c's final demand (domestically and imported), i.e. $\mathbf{f}^c = \left((\mathbf{f}^{rc})', (\mathbf{f}^{sc})', (\mathbf{f}^{tc})' \right)'$. Pre-multiplying this equation with a $1 \times CG$ vector of value added coefficients, i.e. value added per unit of gross output $\mathbf{v}$, results in value added and will be used to calculate trade in value added terms. (For notational convenience let us denote vectors $\mathbf{v}$ and its subvectors $\mathbf{v}^c$ as row vectors.)

2.2 Measuring "trade in value added"

Johnson and Noguera (2012) introduced the concept of "value added exports" which related to gross exports is referred to as VAX ratio. As, by definition, this also implies "value added imports" of some countries, suggesting to refer to this concept in more general terms as "trade in value added". The basic question asked is how much value added created in a particular country r is absorbed via final demand in the other countries or was created due to final demand in other countries. Value added exports of country 1 to all other countries include value added created in country 1 to satisfy final demand in countries 2 and 3 or - using other terminology - which is absorbed abroad (see Johnson and Noguera, 2012). Selecting the appropriate terms in the above equation gives:

$$\begin{aligned} \text{VAX}^1 &= \begin{bmatrix} \mathbf{v}^1 & \mathbf{0} & \mathbf{0} \end{bmatrix} \begin{bmatrix} \mathbf{L}^{11} & \mathbf{L}^{12} & \mathbf{L}^{13} \\ \mathbf{L}^{21} & \mathbf{L}^{22} & \mathbf{L}^{23} \\ \mathbf{L}^{31} & \mathbf{L}^{32} & \mathbf{L}^{33} \end{bmatrix} \begin{pmatrix} \mathbf{0} + \mathbf{f}^{12} + \mathbf{f}^{13} \\ \mathbf{0} + \mathbf{f}^{22} + \mathbf{f}^{23} \\ \mathbf{0} + \mathbf{f}^{32} + \mathbf{f}^{33} \end{pmatrix} \\ &= \mathbf{v}^1\mathbf{L}^{11}(\mathbf{f}^{12} + \mathbf{f}^{13}) + \mathbf{v}^1\mathbf{L}^{12}(\mathbf{f}^{22} + \mathbf{f}^{23}) + \mathbf{v}^1\mathbf{L}^{13}(\mathbf{f}^{32} + \mathbf{f}^{33}) \end{aligned}$$

As the concern is to calculate value added created in country 1 the value added coefficients for the other countries are set to zero. Further, as the concept of value added exports does not include how much value added is created in 1 to satisfy country 1's final demand itself, the entries of this country's final demand vector are set to zero, $\mathbf{f}^1 = \mathbf{0}$. The first term in the second line therefore is value added created in country 1 to satisfy final demand imports (in gross terms) of countries 2 and 3 from country 1. The second terms captures value added created in country 1 to satisfy country 2 domestic demand and demand via imports in gross terms from country 3. As production of these final demand goods also uses intermediate inputs from 1 these embody value added created in this country and therefore count as country 1's value added exports. An analogous interpretation holds for the third term. In particular, this equation excludes, for example, subvector $\mathbf{f}^{21}$ which would appear in the second term (in the second line of the equation above) as $\mathbf{v}^1\mathbf{L}^{12}\mathbf{f}^{21}$. This would capture value added created in 1 needed to satisfy final demand imports of 1 from 2. Thus, this would include value added of country 1 embodied in intermediates exports to 2, which come back and are absorbed in country 1 as final goods and thus would not be "value added exports". These re-imports of country 1 value added are not accounted for as value added exports as not absorbed in the other countries as final demand. An analogous argument holds for $\mathbf{f}^{31}$. In the general case for many countries this expression can be written as

$$\text{VAX}^r = \mathbf{v}^r\mathbf{L}\mathbf{f}^{-r} \tag{1}$$

where $\mathbf{v}^r$ denotes a $NC \times 1$ vector of value added coefficients with non-negative entries for country r and zeros for the other countries, and $\mathbf{f}^{-r}$ the consumption vector of all countries except r, i.e. $\mathbf{f}^{-r} = \mathbf{f} - \mathbf{f}^r$.

Value added imports of country 1 from all other countries should account for value added created in countries 2 and 3 to satisfy final demand of country 1. Again selecting the appropriate terms the equation

has to be written as:

$$\begin{aligned}\text{VAM}^r &= \begin{bmatrix}\mathbf{0} & \mathbf{v}^2 & \mathbf{v}^3\end{bmatrix}\begin{bmatrix}\mathbf{L}^{11} & \mathbf{L}^{12} & \mathbf{L}^{13}\\ \mathbf{L}^{21} & \mathbf{L}^{22} & \mathbf{L}^{23}\\ \mathbf{L}^{31} & \mathbf{L}^{32} & \mathbf{L}^{33}\end{bmatrix}\begin{pmatrix}\mathbf{f}^{11}+\mathbf{0}+\mathbf{0}\\ \mathbf{f}^{21}+\mathbf{0}+\mathbf{0}\\ \mathbf{f}^{31}+\mathbf{0}+\mathbf{0}\end{pmatrix}\\ &= (\mathbf{v}^2\mathbf{L}^{21}+\mathbf{v}^3\mathbf{L}^{31})\mathbf{f}^{11}+(\mathbf{v}^2\mathbf{L}^{22}+\mathbf{v}^3\mathbf{L}^{32})\mathbf{f}^{21}+(\mathbf{v}^2\mathbf{L}^{23}+\mathbf{v}^3\mathbf{L}^{33})\mathbf{f}^{31}\end{aligned}$$

The first term (in the second line) accounts for value added created in countries 2 and 3 to satisfy country 1's domestic demand, the second term denotes value added created in both countries to satisfy country 1's demand for final products imported from country 2, and analogously for the third term. In general notation this can be written as

$$\text{VAM}^r = \mathbf{v}^{-r}\mathbf{L}\mathbf{f}^r \tag{2}$$

where $\mathbf{v}^{-r}$ defines a $NC \times 1$ vector of value added coefficients with entries for country r set to zero, i.e. $\mathbf{v}^{-r} = \mathbf{v} - \mathbf{v}^r$.

Having defined value added exports and imports of a country, net value added exports, or net trade in value added, is defined as the difference between these two:

$$\text{NVAX}^r = \text{VAX}^r - \text{VAM}^r \tag{3}$$

Inserting equations (1) and (2) and some simple manipulations shows that these net value added exports equal a country's GDP minus its final consumption, i.e. overall savings. By definition of national accounts this is equal to a country's net exports, as

$$\text{NVAX}^r = \mathbf{v}^r\mathbf{L}\mathbf{f}^{-r} - \mathbf{v}^{-r}\mathbf{L}\mathbf{f}^r = \mathbf{v}^r\mathbf{L}\mathbf{f}^{-r} + \mathbf{v}^r\mathbf{L}\mathbf{f}^r - \mathbf{v}^r\mathbf{L}\mathbf{f}^r - \mathbf{v}^{-r}\mathbf{L}\mathbf{f}^r = \mathbf{v}^r\mathbf{L}\mathbf{f} - \mathbf{v}\mathbf{L}\mathbf{f}^r = \text{GDP}^r - \boldsymbol{\iota}'\mathbf{f}^r = \text{NX}^r$$

which uses that $\mathbf{x} = \mathbf{L}\mathbf{f}$ and that the value added coefficient vector can be written as $\mathbf{v} = \boldsymbol{\iota}'(\mathbf{I} - \mathbf{A})$ (where $\boldsymbol{\iota}'$ denotes a $1 \times CG$ summation vector). This shows that net value added exports are country r's GDP, the value added coefficients vector times the gross output vector, minus the level of country r's final demand (for both domestic and imported final products). Thus, a country's net trade in value added is its GDP minus its final demand expenditures which therefore is also the country's trade balance in gross terms. If a country's GDP is larger (smaller) than its final consumption it is running a trade surplus (deficit) which is well known from national accounting.

This concept also lends to be defined for bilateral relations. Using notation from above bilateral value added and net value added exports can be written as

$$\text{VAX}^{rs} = \mathbf{v}^r\mathbf{L}\mathbf{f}^s \qquad \text{and} \qquad \text{NVAX}^{rs} = \text{VAX}^{rs} - \text{VAX}^{sr} \tag{4}$$

as $\text{VAX}^{sr} = \text{VAM}^{rs} = \mathbf{v}^s\mathbf{L}\mathbf{f}^r$, i.e. value added exports of country s to r are mirrored as the value added imports of r from s. Note that when summing up over country r's trading partners this results in this country's total value added exports and imports and net value added exports. The latter, as shown above, equals a country's net exports in gross terms.

2.3 Measuring the "value added content in trade"

The alternative measure is to calculate the content of value added as embodied in a country's gross exports and imports and the subsequent net flows of value added embodied in gross trade flows. This

therefore focuses on the domestic and foreign value added embodied in a country's gross exports and imports, a concept used in the literature on the factor content of trade like in Trefler and Zhu (2010). Koopman et al. (2011) provides a decomposition of a country's exports which will be investigated in more detail in the next section.

Using the same notation as above allows one to discuss the value added content of trade from the viewpoint of country 1 without loss in generality. Following Trefler and Zhu (2010) the vector of gross exports and imports can be written as

$$\mathbf{t}^1 = \begin{pmatrix} \mathbf{e}^{1*} \\ -\mathbf{e}^{21} \\ -\mathbf{e}^{31} \end{pmatrix}$$

$\mathbf{e}^{rs}$ denotes country s's imports from r or country r's exports to s. For further use vectors $\mathbf{e}^{1*} = \mathbf{e}^{12} + \mathbf{e}^{13}$ are defined. Country r's imports are included in negative terms. One should note that these trade vectors include both trade in final goods and trade in intermediates which sums up to a country's total gross exports or imports, i.e. $\mathbf{e}^{rs} = \mathbf{f}^{rs} + \mathbf{z}^{rs}$ where $\mathbf{z}^{rs}$ denotes country r's imports of intermediates from s and analogously for the other terms. As imports are included in negative terms, summing up the vector, i.e. $\boldsymbol{\iota}'\mathbf{t}^1$, results in country 1's net trade in gross terms.

To calculate value added content of gross trade one has to pre-multiply the Leontief inverse with the value added coefficients vector and post-multiply with the trade vector as defined above. It is again enlightening to write the equation in detail for three countries

$$\begin{aligned} \text{NVAiT}^1 &= \begin{pmatrix} \mathbf{v}^1 & \mathbf{v}^2 & \mathbf{v}^3 \end{pmatrix} \begin{pmatrix} \mathbf{L}^{11} & \mathbf{L}^{12} & \mathbf{L}^{13} \\ \mathbf{L}^{21} & \mathbf{L}^{22} & \mathbf{L}^{23} \\ \mathbf{L}^{31} & \mathbf{L}^{32} & \mathbf{L}^{33} \end{pmatrix} \begin{pmatrix} \mathbf{e}^{1*} \\ -\mathbf{e}^{21} \\ -\mathbf{e}^{31} \end{pmatrix} \\ &= \begin{pmatrix} 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} \mathbf{v}^1\mathbf{L}^{11}\mathbf{e}^{1*} & -\mathbf{v}^1\mathbf{L}^{12}\mathbf{e}^{21} & -\mathbf{v}^1\mathbf{L}^{13}\mathbf{e}^{31} \\ \mathbf{v}^2\mathbf{L}^{21}\mathbf{e}^{1*} & -\mathbf{v}^2\mathbf{L}^{22}\mathbf{e}^{21} & -\mathbf{v}^2\mathbf{L}^{23}\mathbf{e}^{31} \\ \mathbf{v}^3\mathbf{L}^{31}\mathbf{e}^{1*} & -\mathbf{v}^3\mathbf{L}^{32}\mathbf{e}^{21} & -\mathbf{v}^3\mathbf{L}^{33}\mathbf{e}^{31} \end{pmatrix} \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \end{aligned}$$

The first column of the matrix in the second line captures country 1's domestic, $\mathbf{v}^1\mathbf{L}^{11}\mathbf{e}^{1*}$, and foreign, $\sum_{r=2,3} \mathbf{v}^r\mathbf{L}^{r1}\mathbf{e}^{1*}$, value added content of exports. Note that the sum of these make up the total value of country 1's exports in gross terms. The elements in the second and third column in the first row of this matrix captures country 1's value added exports which are returning back home from country 2 or 3, i.e. intermediates exported which after some processing return back home as either final goods or again intermediates. Note, that in this definition this would taken into account as imports of value added. The remaining diagonal elements include direct value added imports, whereas the remaining off-diagonal elements include value added imports via third countries. For example, the term $-\mathbf{v}^3\mathbf{L}^{32}\mathbf{e}^{21}$ can be interpreted as value added from country 3 embodied in imports of country 1 from 2. In general terms, the equation becomes

$$\text{NVAiT}^r = \mathbf{vLt}^r \tag{5}$$

and the value added trade flow matrix (as in the previous equation) would be achieved by diagonalizing the value added coefficients and trade vectors, i.e. $\mathbf{NVAiT}^r = \hat{\mathbf{v}}\mathbf{L}\hat{\mathbf{t}}^r$. The respective parts discussed above and needed further below for a further assessment are then calculated as follows: The domestic

and foreign value added content of a country's exports is

$$\text{DVAiX}^r = \mathbf{v}^r\mathbf{L}\mathbf{e}^r \qquad \text{and} \qquad \text{FVAiX}^{r(s)} = \mathbf{v}^s\mathbf{L}\mathbf{e}^r \tag{6}$$

where $\mathbf{e}^r$ in this case denotes a $CG \times 1$ with country r's exports entering positive and zeros otherwise. Re-imported value added can be written as

$$\text{DVAiM}^r = \mathbf{v}^r\mathbf{L}\mathbf{e}^{-r} \tag{7}$$

where $\mathbf{e}^{-r} = \mathbf{e} - \mathbf{e}^r$ with $\mathbf{e}$ denoting a $CG \times 1$ vector with each countries exports.

Equation (5) can be used to again identify the relation between net trade in value added and in gross terms. Using again $\mathbf{v} = \boldsymbol{\iota}'(\mathbf{I} - \mathbf{A})$ shows

$$\text{NVAiT}^r = \mathbf{v}\big(\mathbf{I} - \mathbf{A}\big)^{-1}\mathbf{t} = \boldsymbol{\iota}'\big(\mathbf{I} - \mathbf{A}\big)\big(\mathbf{I} - \mathbf{A}\big)^{-1}\mathbf{t} = \boldsymbol{\iota}'\mathbf{t} = \text{NX}^r$$

i.e. the net content of value added in trade equals the net trade in gross terms. From this and the considerations above, i.e. a country's net exports equals its net value added exports, it follows that

$$\text{NVAX}^r = \text{NVAiT}^r = \text{NX}^r.$$

i.e. a country's trade balance does not change when measured in value added terms, as income minus consumption of (domestic and foreign) final goods, i.e. its savings, equals its net exports. This is discussed in more detail in Appendix Section A.1.

Again, this can also be looked at in bilateral relations. Considering only gross export flows between countries 1 and 2 without loss of generality, net value added in trade between 1 and 2 becomes

$$\begin{aligned}
\text{NVAiT}^{12} &= \begin{pmatrix}\mathbf{v}^1 & \mathbf{v}^2 & \mathbf{v}^3\end{pmatrix}\begin{pmatrix}\mathbf{L}^{11} & \mathbf{L}^{12} & \mathbf{L}^{13}\\ \mathbf{L}^{21} & \mathbf{L}^{22} & \mathbf{L}^{23}\\ \mathbf{L}^{31} & \mathbf{L}^{32} & \mathbf{L}^{33}\end{pmatrix}\begin{pmatrix}\mathbf{e}^{12}\\ -\mathbf{e}^{21}\\ \mathbf{0}\end{pmatrix}\\
&= \begin{pmatrix}1 & 1 & 1\end{pmatrix}\begin{pmatrix}\mathbf{v}^1\mathbf{L}^{11}\mathbf{e}^{12} & -\mathbf{v}^1\mathbf{L}^{12}\mathbf{e}^{21} & 0\\ \mathbf{v}^2\mathbf{L}^{21}\mathbf{e}^{12} & -\mathbf{v}^2\mathbf{L}^{22}\mathbf{e}^{21} & 0\\ \mathbf{v}^3\mathbf{L}^{31}\mathbf{e}^{12} & -\mathbf{v}^3\mathbf{L}^{32}\mathbf{e}^{21} & 0\end{pmatrix}\begin{pmatrix}1\\1\\1\end{pmatrix}
\end{aligned}$$

Analogous interpretations as for a country's total trade hold here as well. One can see that country 3 still plays a role as gross exports of country 1 to 2 embody value added from country 3. To see this more clearly and the relation and difference between the two concepts one gains further insights by using a decomposition approach as outlined in the next section.

2.4 Decomposition of bilateral flows

2.4.1 Bilateral decomposition

To gain deeper insights in the relationships of these two measures and resulting identity of net exports, net value added exports and net value added in trade it is useful to employ the decomposition introduced in Koopman et al. (2011) applied for bilateral trade relations. This will also lead to insights in the role of double-counting in value added trade. In this section this is done by using a 3-country model and

for notational convenience neglect the sectoral dimension. According to equation (6) and its subsequent discussion, a country's exports can be split into its domestic and foreign value added part. Splitting further a country's exports into final goods exports and intermediate exports this can be written as

$$e^{12} = \text{VA}(e^{12}) = \sum_{r=1}^{3} v^r l^{r1} f^{12} + \sum_{r=1}^{3} v^r l^{r1} z^{12} = \sum_{r=1}^{3} v^r l^{r1} f^{12} + \sum_{r=1}^{3} v^r l^{r1} a^{12} x^2 \tag{8}$$

Applying the property of inverse matrices as in Koopman et al. (2011), the domestic content of intermediate goods exports, i.e. the term $v^1 l^{11} a^{12} x^2$, can be replaced by

$$\begin{aligned} v^1 l^{11} a^{12} x^2 &= v^1 \Big(l^{12}(1 - a^{22}) - l^{13} a^{32} \Big) x^2 = v^1 l^{12} (1 - a^{22}) x^2 - v^1 l^{13} a^{32} x^2 \\ &= v^1 l^{12} \big(a^{21} x^1 + a^{23} x^3 + f^{21} + f^{22} + f^{23} \big) - v^1 l^{13} a^{32} x^2 \\ &= (v^1 l^{12} f^{21} + v^1 l^{12} a^{21} x^1) + (v^1 l^{12} f^{23} + v^1 l^{12} a^{23} x^3) + v^1 l^{12} f^{22} - v^1 l^{13} a^{32} x^2 \end{aligned}$$

The first line formally results from the fact that $\mathbf{M}^{-1}\mathbf{M} = \mathbf{I}$ for any non-singular square matrix $\mathbf{M}$. Thus multiplying row i of $\mathbf{M}^{-1}$ with row j from $\mathbf{M}$ with $i \neq j$ gives zero.[2] The second line uses the fact that country 2's gross output minus domestic intermediate inputs, i.e. $(1 - a^{22})x^2$, equals demand for intermediates from other countries and final demand from other countries, i.e. $\big(a^{21}x^1 + a^{23}x^3 + f^{21} + f^{22} + f^{23}\big)$, and the third line collect terms. Rewriting the term in the first line as

$$v^1 l^{12} x^2 = v^1 l^{11} a^{12} x^2 + v^1 l^{12} a^{22} x^2 + v^1 l^{13} a^{32} x^2$$

shows that production of gross output in country 2, x^2, needs intermediate inputs from the other countries, $a^{p2}x^2$, which are also directly and indirectly sourced from country 1 captured by l^{1p}. This equals gross output in country 1 produced due to intermediates demand of country 2 in all countries. By the property of inverse matrices this equals, $l^{12}x^2$, i.e. gross output to be produced in country 1 for output production in country 2.[3] This decomposition therefore uses the fact that gross output produced in country 1 due to direct intermediates demand from country 2, i.e. $l^{11}a^{12}x^2$, equals total gross output produced due to output in country 2, i.e. $l^{12}x^2$, minus the gross output to be produced via intermediates demand from the direct partner, i.e. $l^{12}a^{22}x^2$, and third countries, $l^{13}a^{32}x^2$. For later use it is noted that

$$v^1 l^{12} \big(a^{21} x^1 + a^{23} x^3 + f^{21} + f^{22} + f^{23} \big) > v^1 l^{13} a^{32} x^2$$

as $v^1 l^{11} a^{12} x^2 > 0$ by definition. Inserting the expression for $v^1 l^{11} a^{12} x^2$ back into equation (8) and some simple manipulations allows to decompose bilateral gross exports of country 1 to 2 into its value added components:

$$\begin{aligned} e^{12} = &\underbrace{v^1 l^{11} f^{12} + v^1 l^{12} f^{22} + v^1 l^{13} f^{32}}_{\text{VAX}^{12}} + \underbrace{v^1 l^{12} f^{21} + v^1 l^{12} a^{21} x^1}_{\text{DVAiM}^{12}=\text{FVAiX}^{21(1)}} + \\ &\underbrace{v^2 l^{21} f^{12} + v^2 l^{21} a^{12} x^2}_{\text{FVAiX}^{12(2)}} + \underbrace{v^3 l^{31} f^{12} + v^3 l^{31} a^{12} x^2}_{\text{FVAiX}^{12(3)}} + \\ &\underbrace{(v^1 l^{12} f^{23} + v^1 l^{12} a^{23} x^3)}_{\text{FVAiX}^{23(1)}} - \underbrace{(v^1 l^{13} f^{32} + v^1 l^{13} a^{32} x^2)}_{\text{FVAiX}^{32(1)}} \end{aligned} \tag{9}$$

[2] Technical details are presented in the Appendix Section A.2. This in fact results from the derivation of the inverse matrix as the inverse of the determinant times the adjoint matrix.

[3] This should not be confused with the derivation of multiplier effects in regional models which rest on calculating the domestic Leontief inverse.

Gross exports of country 1 to 3 can be expressed analogously.[4] Thus a country's gross exports can be decomposed into its value added contents broken down into several components: The first three terms, VAX^{12} comprise value added exports according to equation (4), which are further decomposed into three components: The value added directly absorbed in the partner country, i.e. $v^1 l^{11} f^{12}$, is referred to as the 'domestic value added in direct final goods exports'. The second term, $v^1 l^{12} f^{22}$, captures value added shipped to country 2 in intermediates which are then after further reprocessing consumed in country 2, which is referred to as 'domestic value added absorbed by the direct partner'. The third term, $v^1 l^{13} f^{32}$, is value added which is embodied in intermediates shipped from 1 to 3 and then after further processing sent to country 2 in form of final goods referred to as 'domestic value added indirectly absorbed by the direct partner'. One should be aware that the route in the bilateral consideration here is from country 1 to 3 and then to country 2. When summing up over all trading partners this component becomes $v^1 l^{13} f^{32} + v^1 l^{12} f^{23}$ which Koopman et al. (2011) refers to as 'indirect value added exports to third countries'.

The second term in the first line of equation (9), captures domestic value added imported by country 1 from country 2 either in form of final goods or in form of intermediates. These are goods produced in country 2 by already using some intermediates from country 1; therefore exports of 1 to 2 contain value added which flows back to itself. These are referred to as 're-imports of domestic value added' or 'returned domestic value added' and denoted by DVAiM^{12} corresponding to equation (7) when considering the bilateral case. In the bilateral consideration this can also be interpreted as country 1's value added embodied in country 2's exports to country 1 denoted by $\text{FVAiX}^{21(1)}$, therefore $\text{DVAiM}^{12} = \text{FVAiX}^{21(1)}$.

The second line captures the foreign content of country 1's exports to country 2 which stem from country 2 itself and other countries like country 3. It should be noted already here that value added content of country 1 exports to 2, i.e. $\text{FVAiX}^{12(2)}$ will again pop up as country 2 re-imports of value added from country 1 when considering gross export flows from 2 to 1 (see discussion below).

In the bilateral decomposition two further terms appear in the last line of equation (9) which need to be discussed. Country 3 imports from country 2 either final goods or intermediates which embody value added from country 1. These were shipped in form of intermediates to country 2 which are taken into account by $\text{FVAiX}^{23(1)}$. Therefore, this is value added embodied in gross exports from country 1 to 2 which is not absorbed there but shipped further to third countries. This is domestic value added content in exports of 1 to 2 which is however not part of country 1's value added exports to country 2. The second term in this line, $\text{FVAiX}^{32(1)}$, results from exports of country 3 to 2 containing value added from country 1. However, as the appearance of l^{13} in these terms indicate, this results from intermediates flows of country 1 to 3 which are not part of gross exports, i.e. physical shipment, of country 1 to 2 which are considered in this bilateral decomposition. These should already be captured by the other components discussed before and capture 'virtual value added flows' in a sense as value added is embodied in consumption of country 2 which does not correspond to a physical flow of goods between

[4] For convenience this equation is shown in Appendix Section A.4. Using $e^{rs} = f^{rs} + a^{rs}x^s$ these equations can also be written in terms of gross export flows as

$$e^{12} = \underbrace{v^1 l^{11} f^{12} + v^1 l^{12} f^{22} + v^1 l^{13} f^{32}}_{\text{VAX}^{12}} + \underbrace{v^1 l^{12} e^{21}}_{\text{FVAiX}^{21(1)}} + \underbrace{v^2 l^{21} e^{12}}_{\text{FVAiX}^{12(2)}} + \underbrace{v^3 l^{31} e^{12}}_{\text{FVAiX}^{12(3)}} + \underbrace{(v^1 l^{12} e^{23})}_{\text{FVAiX}^{23(1)}} - \underbrace{(v^1 l^{13} e^{32})}_{\text{FVAiX}^{32(1)}}$$

these countries. In fact, mathematically the first term in this component, $v^1 l^{13} f^{32}$, cancels out with the respective term in country 1's value added exports to 2 via country 3, i.e. $v^1 l^{13} f^{32}$. This is clear as no direct flow of goods are involved in this relation, i.e. not counted in the gross flows e^{12}.[5] Similarly, for the second term $v^1 l^{13} a^{32} x^2$, which results from the property of inverse matrices, no direct flow of goods from 1 to 2 is involved. This term has to be subtracted as the value added absorbed in country 2 (via intermediates trade with 3) is already captured in the other parts of the decomposition. Exactly, these are the terms including the components $a^{21}x^1$, f^{21}, $a^{23}x^3$, f^{22}, and f^{23}. These terms are the returned domestic value added, $\text{DVAiX}^{12} = \text{FVAiX}^{21(1)}$, the value added from country 1 in exports from 2 to 3, $\text{FVAiX}^{23(1)}$, and $v^1 l^{12} f^{22}$, i.e. the 'domestic value added absorbed by the direct importer'. These are exactly the terms absorbed in country 2 as is the case for the latter, transferred back to country 1 or further shipped to other countries like 3. It is important to note that $\text{FVAiX}^{32(1)}$ makes only part of these flows and is therefore smaller in magnitude as seen from the inequality above. Stated differently, this is value added content of country 1's exports to 3 (in form of intermediates) which however is finally absorbed in country 2. This absorption is captured already in the value added exports and re-imported value added. Subtracting this term therefore assures accounting consistency at the country and world level.

2.4.2 Aggregation

When adding over trading partners, i.e. summing up equations (9) and the corresponding equation for exports to country 3 (see Appendix Section A.4), the latter two terms in these equations cancel out each other. This should be clear from the discussion above as, for example, value added embodied in intermediates exports of 1 to 2 but ending up in country 3, i.e. $\text{FVAiX}^{23(1)}$, is already taken into account in the respective components when considering the decomposition of gross exports to country 3, i.e. e^{13}. In fact, this is exactly the term which is subtracted for reasons discussed above. The same holds when considering gross exports of country 1 to 3. Thus country 1's total exports can be decomposed in value added terms as follows (see Appendix Section A.4 for details)

$$
\begin{aligned}
e^{12} + e^{13} \quad = \quad & \underbrace{v^1 l^{11} f^{12} + v^1 l^{12} f^{22} + v^1 l^{13} f^{32}}_{\text{VAX}^{12}} + \underbrace{v^1 l^{12} f^{21} + v^1 l^{12} a^{21} x^1}_{\text{DVAiM}^{12}=\text{FVAiX}^{21(1)}} + \\
& \underbrace{v^1 l^{11} f^{13} + v^1 l^{13} f^{33} + v^1 l^{12} f^{23}}_{\text{VAX}^{13}} + \underbrace{v^1 l^{13} f^{31} + v^1 l^{13} a^{31} x^1}_{\text{DVAiM}^{13}=\text{FVAiX}^{31(1)}} + \\
& \underbrace{v^2 l^{21} f^{12} + v^2 l^{21} a^{12} x^2}_{\text{FVAiX}^{12(2)}} + \underbrace{v^3 l^{31} f^{12} + v^3 l^{31} a^{12} x^2}_{\text{FVAiX}^{12(3)}} + \\
& \underbrace{v^3 l^{31} f^{13} + v^3 l^{31} a^{13} x^3}_{\text{FVAiX}^{13(3)}} + \underbrace{v^2 l^{21} f^{13} + v^2 l^{21} a^{13} x^3}_{\text{FVAiX}^{13(2)}}
\end{aligned} \tag{10}
$$

which is the decomposition of a country's total exports as derived in Koopman et al. (2011).

This is also equivalent to equation (6) showing that a country's exports in gross terms can be decomposed in its domestic and foreign value added components. Note, that the domestic value added content of exports equals the value added exports plus the value added returning home. This makes sense as value added created in 1, independently of whether absorbed at home or abroad, is part of this country's

[5] This term was added and subtracted in derivation of equation (9) to satisfy the definition of value added exports.

GDP. The foreign part of a country's exports is however part of the other country's GDP. From a trade statistics perspective, the foreign part is clearly double-counted. But also the value added returning back home is, as this forms part of country 1's domestic value added in exports, but also part of another country's foreign value added in exports, is double counted. If more then three countries are considered the additional terms cancels out and an analogous expression for C countries is derived.[6]

2.4.3 Bilateral and aggregate net trade in gross and value added terms

The results in the previous sections can also be used to gain deeper insights into the relationship between net trade in gross and value added terms. As shown in Appendix Section A.4, when summing up country 1's bilateral trade balances over all trading partners, one arrives at the results at the aggregate level where net trade in value added equals net trade in gross terms as discussed above,

$$\mathrm{NX}^1 = \sum_p \mathrm{NX}^{1p} = \sum_p \mathrm{NVAX}^{1p} = \mathrm{NVAX}^1$$

This can also be seen when calculating the trade balance for country 1 by first calculating its total value added exports, i.e. the sum over bilateral value added exports, and subtracting total value added imports, i.e. the sum over bilateral value added imports,

$$\mathrm{NVAX}^1 = \sum_p \mathrm{VAX}^{1p} - \sum_r \mathrm{VAX}^{r1} = \mathrm{NX}^1$$

which equals country 1's value added exports minus its value added imports. All terms which appear twice and therefore are 'double counted' from a trade perspective cancel out. Further, as the procedure started from a full decomposition of value added exports and imports (which sum to gross exports and imports) this also equals net trade in gross terms.[7]

From a bilateral perspective, an innocent way of calculating net trade in value added therefore is

$$\mathrm{NVAX}^{1p} = \mathrm{VAX}^{1p} - \mathrm{VAX}^{p1} \neq \mathrm{NX}^{1p}$$

as all terms which cancel out when aggregating over trading partners are disregarded. This definition of bilateral net value added trade further satisfies that $\mathrm{NVAX}^{12} = -\mathrm{NVAX}^{21}$, adds up to a country's total net exports and is therefore consistent with national accounts. The latter can be seen by just summing up over the bilateral trading partners, $\mathrm{NVAX}^1 = \sum_p \mathrm{VAX}^{1p} - \sum_r \mathrm{VAX}^{r1} = \mathrm{NX}^1$ which is equivalent to the equations just discussed.

3 Selected empirical decomposition results

In this section stylised facts using the WIOD database are presented. This database integrates National Accounts data, supply and use and input-output tables and socio-economic accounts for a large range of countries over the period 1995-2011. From these data a time-series of world-input-output tables (WIOT) are derived which allows studying value added flows across countries in detail. For a documentation

[6] Appendix Section A.3 shows the general equation for decomposing country r's exports to country p with with any number of other countries considered.

[7] These results can easily be generalized to C countries in which case again all terms appearing twice cancel out.

see Timmer (2012) and Dietzenbacher et al. (2013).[8] In the following subsection some indicators and decomposition results at the aggregate level are reported. The results from a cross-country perspective are in line with the existing literature and therefore only a short overview is presented, however also providing the developments over time. This is followed by results focusing on the bilateral value added trade decomposition between US, China and the EU-27 which adds to the the existing literature.

3.1 Aggregate level

Table 1 presents the results from the equations reported in Section 2. Generally, the magnitudes are in line with the results presented in other papers (particularly in Koopman et al., 2011), thus it is not necessary to go into a detailed discussion of results from a cross-country perspective but highlight some trends over time.[9] The first column in Table 1 reports the value added exports in percent of total exports for all countries included in the WIOD database in 2007. This indicator is referred to as VAX ratio by Johnson and Noguera (2012) and discussed there in detail. For the world as a whole this ratio is 71.1% but ranges widely across countries between slightly above 50% (and even lower in Luxembourg with only 38.7%) to larger values of more than 80% and even 92.2% for Russia. Larger and more resource-abundant countries tend to have higher VAX ratios. In these countries more of the intermediates and raw materials are home-produced or contain a larger domestic share of value added. This can also be interpreted that these countries are less vertically integrated in the global economy. This indicator is further split according to equation (9). The major part of value added exports is in form of intermediates directly absorbed by the partner which comprises 38.4% at the world level as compared to 24.2% embodied of direct final goods exports and 8.5% which are sent further to third countries. Again there is a rather large variation across countries with again resource-rich countries like Russia, Australia and Brazil tend to have larger shares of the second and third component. The reason is that these countries export more intermediates (e.g. raw materials, etc.) which are processed and consumed in the partner countries or after some processing sent further to third countries. As shown above, the remaining part of gross exports are double counted from a trade perspective. Therefore about 29% of trade flows are double counted in overall world trade flows. That means, that according to his measure about one third of trade flows reported are counted at least twice. For the individual countries this varies according to the differences in the VAX ratios.

The next two columns report the returned value added in form of final goods or intermediates. These shares are relatively low in general and together comprise about 3% at the world level though are much lower for many countries. The US and Germany show the largest share of these returned value added with about 8 and 3.5% respectively. This part, though double counted from a trade perspective, is not double counted from the GDP perspective as it is actually value added (or income) created domestically. For these countries therefore also the difference with respect to 'double counting in trade' as compared to 'double counting in GDP' is largest.

The returned value added together with the value added exports sum up to a country's domestic value

[8] Data are available from www.wiod.org.

[9] Computational issues are outlined in Appendix Section A.5. The decompositions as suggested in Koopman et al. (2011) and Koopman et al. (2014) can be calculated in a cheap way by applying both concepts discussed above. Particularly, it is shown that the property of inverse matrices needs not to be implemented in the calculations, though this property provides useful insights from an analytical perspective.

Table 1 - Decomposition results (in % of gross exports), 2007

	Value added exports				Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
AUS	84.1	14.2	58.7	11.3	15.9	0.3	0.4	84.8	15.2	2.5	12.7	15.2
AUT	66.0	22.4	33.7	9.9	34.0	0.2	0.4	66.7	33.3	12.3	21.0	33.3
BEL	55.9	18.5	29.2	8.2	44.1	0.2	0.5	56.6	43.4	15.1	28.2	43.4
BGR	55.4	18.2	29.8	7.4	44.6	0.0	0.1	55.5	44.5	13.7	30.7	44.5
BRA	87.8	26.4	49.3	12.1	12.2	0.1	0.2	88.1	11.9	3.9	8.0	11.9
CAN	75.5	22.3	47.5	5.7	24.5	0.5	0.7	76.7	23.3	9.8	13.5	23.3
CHN	73.1	35.6	30.1	7.4	26.9	0.4	1.8	75.3	24.7	11.7	12.9	24.7
CYP	71.6	28.0	36.7	6.9	28.4	0.0	0.0	71.7	28.3	10.8	17.5	28.3
CZE	53.5	19.5	24.9	9.1	46.5	0.1	0.4	54.1	45.9	18.1	27.9	45.9
DEU	69.8	29.0	32.5	8.3	30.2	1.3	2.2	73.3	26.7	10.8	15.9	26.7
DNK	62.6	24.5	30.3	7.7	37.4	0.3	0.5	63.3	36.7	13.6	23.1	36.7
ESP	69.5	29.0	31.6	8.9	30.5	0.5	0.8	70.8	29.2	12.7	16.5	29.2
EST	61.7	18.6	34.8	8.3	38.3	0.0	0.1	61.9	38.1	11.7	26.4	38.1
FIN	67.0	18.1	38.7	10.2	33.0	0.1	0.2	67.4	32.6	9.6	23.0	32.6
FRA	71.6	30.8	31.9	8.9	28.4	0.8	1.0	73.3	26.7	11.8	14.9	26.7
GBR	79.8	24.9	44.5	10.4	20.2	1.0	1.1	81.9	18.1	7.0	11.2	18.1
GRC	71.5	21.1	42.7	7.7	28.5	0.1	0.1	71.7	28.3	8.4	20.0	28.3
HUN	51.5	19.4	24.1	8.0	48.5	0.1	0.2	51.8	48.2	19.8	28.4	48.2
IDN	83.7	17.0	55.3	11.4	16.3	0.1	0.3	84.0	16.0	4.3	11.7	16.0
IND	78.4	31.7	38.6	8.1	21.6	0.1	0.4	78.9	21.1	10.1	11.0	21.1
IRL	59.2	20.9	32.5	5.8	40.8	0.1	0.1	59.4	40.6	16.4	24.2	40.6
ITA	73.6	33.2	31.4	9.0	26.4	0.5	0.8	74.9	25.1	10.9	14.2	25.1
JPN	82.9	29.7	42.1	11.2	17.1	0.6	1.1	84.6	15.4	5.0	10.4	15.4
KOR	64.9	21.2	34.0	9.7	35.1	0.2	0.6	65.7	34.3	9.5	24.9	34.3
LTU	67.8	22.9	37.0	7.9	32.2	0.1	0.1	68.0	32.0	10.0	22.0	32.0
LUX	38.7	8.5	25.4	4.7	61.3	0.0	0.1	38.7	61.3	13.0	48.2	61.3
LVA	69.3	20.6	40.3	8.4	30.7	0.1	0.2	69.6	30.4	8.1	22.3	30.4
MEX	69.6	22.2	40.8	6.6	30.4	0.3	0.6	70.5	29.5	13.5	16.0	29.5
MLT	54.5	16.6	30.7	7.2	45.5	0.0	0.0	54.5	45.5	13.7	31.8	45.5
NLD	63.9	23.3	31.8	8.9	36.1	0.4	0.7	65.0	35.0	13.6	21.5	35.0
POL	66.6	25.7	30.5	10.5	33.4	0.2	0.4	67.2	32.8	12.6	20.2	32.8
PRT	68.2	26.2	33.5	8.5	31.8	0.2	0.2	68.6	31.4	12.5	18.9	31.4
ROU	72.1	24.1	37.8	10.2	27.9	0.1	0.2	72.4	27.6	9.0	18.5	27.6
RUS	92.2	9.2	65.1	17.9	7.8	0.4	0.4	93.1	6.9	0.8	6.2	6.9
SVK	52.1	18.9	23.8	9.4	47.9	0.1	0.3	52.5	47.5	20.0	27.5	47.5
SVN	57.7	22.9	26.4	8.5	42.3	0.0	0.1	57.8	42.2	17.9	24.3	42.2
SWE	67.5	23.2	35.3	9.0	32.5	0.2	0.4	68.1	31.9	12.1	19.7	31.9
TUR	70.2	36.1	26.2	7.9	29.8	0.1	0.3	70.6	29.4	13.3	16.1	29.4
TWN	53.6	12.4	30.1	11.1	46.4	0.1	0.5	54.2	45.8	9.3	36.4	45.8
USA	78.8	25.4	45.5	7.9	21.2	3.9	4.1	86.7	13.3	4.8	8.5	13.3
ZROW	65.7	15.3	43.7	6.8	34.3	1.8	4.5	72.0	28.0	9.2	18.7	28.0
WORLD	71.1	24.2	38.4	8.5	28.9	1.1	1.9	74.1	25.9	9.6	16.2	25.9

Source: WIOD database; author's calculations

Table 2 - Decomposition results (in % of gross exports)

	Value added exports				Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
						World						
1995	82.6	30.9	47.4	4.3	17.4	1.5	1.9	85.9	14.1	5.8	8.3	14.1
2000	78.6	28.7	44.6	5.3	21.4	1.9	2.2	82.7	17.3	7.2	10.1	17.3
2007	75.0	24.9	44.3	5.9	25.0	1.5	2.8	79.3	20.7	7.4	13.3	20.7
2009	78.2	27.0	45.6	5.6	21.8	1.3	2.3	81.8	18.2	6.9	11.3	18.2
2011	77.0	25.1	46.1	5.8	23.0	1.2	2.3	80.5	19.5	7.1	12.4	19.5
						USA						
1995	82.7	28.3	50.5	3.9	17.3	4.1	3.6	90.4	9.6	3.6	6.0	9.6
2000	78.5	28.5	45.6	4.4	21.5	6.0	4.8	89.4	10.6	4.0	6.7	10.6
2007	78.9	25.4	47.9	5.6	21.1	3.8	4.0	86.7	13.3	4.8	8.5	13.3
2009	82.6	26.7	50.4	5.5	17.4	3.0	3.0	88.6	11.4	4.2	7.2	11.4
2011	79.3	25.2	48.7	5.4	20.7	2.7	3.1	85.1	14.9	5.4	9.5	14.9
						EU-27						
1995	88.4	39.3	45.4	3.7	11.6	1.4	2.3	92.0	8.0	3.5	4.5	8.0
2000	84.5	34.9	44.5	5.2	15.5	1.7	2.8	89.0	11.0	4.5	6.5	11.0
2007	81.2	32.1	44.0	5.1	18.8	2.1	3.6	86.9	13.1	5.0	8.1	13.1
2009	83.5	34.0	45.0	4.5	16.5	1.7	2.7	87.9	12.1	4.9	7.2	12.1
2011	81.2	31.3	45.5	4.3	18.8	1.5	2.6	85.3	14.7	5.7	9.0	14.7
						China						
1995	83.6	45.6	32.1	5.9	16.4	0.1	0.4	84.2	15.8	9.0	6.9	15.8
2000	81.7	39.5	34.1	8.1	18.3	0.2	0.8	82.7	17.3	8.7	8.6	17.3
2007	73.1	35.6	30.1	7.4	26.9	0.4	1.8	75.3	24.7	11.7	12.9	24.7
2009	78.4	39.5	31.4	7.5	21.6	0.6	1.8	80.7	19.3	9.4	9.8	19.3
2011	75.5	35.7	32.4	7.4	24.5	0.6	2.2	78.2	21.8	9.8	12.0	21.8

Source: WIOD database; author's calculations

added in exports which makes up 74.1% in world exports. Differences across countries mainly stem from the differences in the value added export ratios as already discussed above. Finally, the remaining part of gross exports is the share of foreign value added embodied in a country's exports. This indicator, which is also interpreted as a measure of vertical specialisation, is well known from the literature. For total exports this equals 25.9% at the world level again with larger differences across countries corresponding to the differences in the VAX ratios. As mentioned above, larger and more resource-abundant countries (like Russia and Brazil) tend to be less vertically integrated and therefore this measure is smaller for these countries.

As these indicators are widely explored in the literature particularly in their cross-country dimension no further detailed discussion is included here. Instead, in Table 2 results for the world and some selected countries and selected years are presented only.[10] At the world level, value added exports as a share of total exports in gross terms have fallen from 82.6% in 1995 to 77% in 2011 implying that the share of double counting in trade statistics was rising from 17.4% to 23%. This tendency is in line with the assertion of an ongoing international integration of production. This decrease is most significant in the final goods component which decreased by almost 6 percentage points (from 30.9% in 1995 to 25.1% in 2011) as compared to the intermediates component which decreased by only 1.3 percentage points

[10]Results for individual countries over period 1995-2011 are provided in the Appendix Tables B.1 to B.17.

(from 47.4 to 46.1%). The indirect value added exports slightly increased from 4.3 to 5.8% again in line with the expectations as due to increased international integration of production more value added is sent further to third countries. Thus, within value added exports the share of intermediates and indirect trade has increased which point towards the increasing importance of assembly trade as no longer final goods are shipped directly to the partner countries but more and more so intermediates which are further processed.

Similar tendencies are found for the other countries. These have been been particularly strong for the EU-27 and China for which value added exports relative to exports decreased from 88.4% to 81.2% and 83.6 to 75.5%, respectively. The US shows a much lower decrease from 82.7 to 79.3%. Again most of this dynamics was driven by the falling share of the final goods component. The indirect component was increasing for all three countries and is larger for China. Again this is in line with the assertion of China becoming an important country for assembly, i.e. intermediates shipped to China which are assembled to a final product there with the typical example being the iPod (see Linden et al., 2009). The double-counted component was therefore increasing in all cases and particularly strong for the EU-27 and China. For the latter country it makes a share of about 25% whereas for the US and EU-27 this is about 20%. The shares of the foreign value added in a country's exports mirrors the value added exports shares as discussed above. Finally, in the crisis the share of value added exports in total exports increased in all countries reflecting the trade slump which mostly occurred in the high-tech industries (like electronics and automobile) and investment goods sectors (like machinery). These hikes therefore reflect more a composition of trade effect rather than a break in the trends regarding the internationalisation of production (see Bems et al., 2011).

3.2 Bilateral decompositions

This leads to considering the bilateral relations from a value added trade perspective. Results are reported for three the major economies both in absolute values in Table 3 and in percent of total exports in gross terms in Table 4.[11]

The value of US exports to China in 2011, for example, has been 175 bn US-$ in gross terms compared to almost 150 bn US-$ (or 85.4% of gross exports) in value added terms to China. Of these, 31 bn US-$ (17.7% as a share of gross exports) are directly absorbed in China in form of final consumption, 108.5 bn US-$ (61.9%) are indirectly absorbed and 10.2 bn US-$ is US value added embodied in intermediates sent to third countries first and then absorbed in China in form of final products. Almost 11 bn US-$ or about 6% of total exports to China are re-imported from China in value added terms. US exports in gross terms also embody value added from other countries of which 3.6 bn US-$ (2 %) are from the bilateral partner (China) and 20.6 bn US-$ (11.7%) are from all other countries. From the Chinese perspective, the value added exports over exports ratio is at 83.8% in 2011. However, 40.6% are value added in final goods exports whereas 35.3% in intermediates which is markedly different from the pattern with respect to US exports to China. Further note that the Chinese value added content of US export to China of 3.6 bn US-$ equals the the Chinese re-imports of value added from the US.

[11] See again Appendix Section A.5 for computational details.

Table 3 - Decomposition results for bilateral trade (in bn US-$)

	Total gross exports	Value added exports				Returned domestic VA	Foreign VA in exports		Multilateral VA exports	
		Total	Final goods	Inter-mediates	Indirect		from partner	from others	to 3rd countries via partner	via 3rd countries to partner
					Decomposition of USA bilateral exports to China					
1995	14.1	14.4	3.9	9.0	1.4	0.9	0.0	1.5	2.3	-5.0
2000	19.3	22.1	6.3	13.1	2.6	1.5	0.1	2.4	3.6	-10.4
2007	83.7	71.3	13.7	51.5	6.2	9.5	1.5	10.8	29.6	-39.1
2009	102.9	93.9	19.6	66.6	7.8	7.6	1.8	10.3	24.4	-34.9
2011	175.3	149.7	31.1	108.5	10.2	10.9	3.6	20.6	39.8	-49.2
					Decomposition of China bilateral exports to USA					
1995	41.7	36.9	24.3	9.9	2.7	0.0	0.9	6.5	2.0	-4.6
2000	74.5	68.8	39.8	21.5	7.5	0.1	1.5	12.5	4.4	-12.8
2007	300.8	245.7	132.1	88.9	24.6	1.5	9.5	69.3	20.2	-45.4
2009	290.6	252.0	136.4	92.3	23.3	1.8	7.6	51.7	18.5	-40.9
2011	412.8	345.9	167.5	145.8	32.6	3.6	10.9	83.8	31.0	-62.3
					Decomposition of EU-27 bilateral exports to USA					
1995	215.8	210.0	78.8	115.0	16.2	4.5	4.4	11.7	17.2	-31.9
2000	322.1	312.8	123.5	160.2	29.1	6.5	8.9	26.0	22.8	-55.0
2007	459.3	457.8	173.5	233.1	51.1	9.9	10.0	52.2	37.2	-107.8
2009	379.8	371.3	137.9	197.3	36.1	8.1	8.5	37.5	28.2	-73.9
2011	504.7	461.6	166.1	255.4	40.1	12.2	13.0	64.0	42.2	-88.4
					Decomposition of USA bilateral exports to EU-27					
1995	171.6	161.6	46.9	105.4	9.3	4.4	4.5	10.5	15.9	-25.2
2000	222.3	204.5	64.6	125.9	14.0	8.9	6.5	16.5	23.2	-37.2
2007	347.6	320.6	92.0	201.4	27.2	10.0	9.9	31.2	48.2	-72.3
2009	336.5	301.0	86.9	192.8	21.3	8.5	8.1	25.9	45.1	-52.2
2011	478.2	392.3	108.7	261.4	22.3	13.0	12.2	47.5	70.8	-57.7
					Decomposition of EU-27 bilateral exports to China					
1995	29.7	28.1	13.7	13.2	1.3	1.0	0.1	2.3	3.5	-5.3
2000	43.4	40.0	14.9	22.8	2.3	1.8	0.3	4.7	6.5	-9.9
2007	181.6	152.4	44.1	100.1	8.2	14.0	2.9	19.1	50.0	-56.7
2009	196.8	178.6	66.3	103.0	9.3	9.3	3.6	19.8	33.5	-48.0
2011	324.9	279.4	94.1	173.2	12.2	15.1	7.8	38.9	56.4	-72.7
					Decomposition of China bilateral exports to EU-27					
1995	37.9	32.4	17.7	13.2	1.6	0.1	1.0	4.9	2.8	-3.3
2000	59.9	51.2	24.1	23.4	3.6	0.3	1.8	8.8	5.9	-8.0
2007	292.9	226.9	105.3	104.9	16.8	2.9	14.0	58.3	30.5	-39.6
2009	293.0	238.5	117.7	105.1	15.7	3.6	9.3	45.7	29.3	-33.3
2011	446.0	341.3	155.9	163.5	21.9	7.8	15.1	79.8	53.7	-51.8

Source: WIOD database; author's calculations

In the bilateral decompositions one also get results concerning the magnitudes of VA exports to 3rd countries via the direct trading partner (see last but one column in Tables 3 and 4). According to these calculations, 39.8 bn US-$ or 22.7% is US value added embodied in US gross exports to China which is further absorbed in third countries. This can be compared to the 31 bn US-$, i.e. 7.5% in terms of gross exports, which is Chinese value added exports of products shipped to the US and further absorbed in 3rd countries. This indicates that the US plays a major role of sending intermediates to China which are further processed there and finally are absorbed in other countries. The last columns in Tables 3 and 4

Table 4 - Decomposition results for bilateral trade (in % of gross exports)

		Value added exports			Returned	Foreign VA in exports		Multilateral VA exports	
		Final	Inter-		domestic	from	from	to 3rd countries	via 3rd countries
	Total	goods	mediates	Indirect	VA	partner	others	via partner	to partner
					Decomposition of USA bilateral exports to China				
1995	102.0	27.9	64.1	10.0	6.2	0.3	10.9	16.2	-35.6
2000	114.4	32.9	67.9	13.7	7.9	0.6	12.3	18.6	-53.8
2007	85.2	16.3	61.5	7.4	11.4	1.8	12.9	35.3	-46.7
2009	91.2	19.0	64.7	7.6	7.3	1.7	10.0	23.7	-33.9
2011	85.4	17.7	61.9	5.8	6.2	2.0	11.7	22.7	-28.1
					Decomposition of China bilateral exports to USA				
1995	88.5	58.4	23.8	6.4	0.1	2.1	15.5	4.7	-10.9
2000	92.3	53.4	28.9	10.1	0.2	2.1	16.8	5.9	-17.2
2007	81.7	43.9	29.6	8.2	0.5	3.2	23.0	6.7	-15.1
2009	86.7	46.9	31.8	8.0	0.6	2.6	17.8	6.4	-14.1
2011	83.8	40.6	35.3	7.9	0.9	2.6	20.3	7.5	-15.1
					Decomposition of EU-27 bilateral exports to USA				
1995	97.3	36.5	53.3	7.5	2.1	2.0	5.4	8.0	-14.8
2000	97.1	38.3	49.7	9.0	2.0	2.8	8.1	7.1	-17.1
2007	99.7	37.8	50.8	11.1	2.2	2.2	11.4	8.1	-23.5
2009	97.8	36.3	51.9	9.5	2.1	2.2	9.9	7.4	-19.5
2011	91.5	32.9	50.6	7.9	2.4	2.6	12.7	8.4	-17.5
					Decomposition of USA bilateral exports to EU-27				
1995	94.1	27.3	61.4	5.4	2.6	2.6	6.1	9.2	-14.7
2000	92.0	29.1	56.6	6.3	4.0	2.9	7.4	10.4	-16.7
2007	92.2	26.5	57.9	7.8	2.9	2.8	9.0	13.9	-20.8
2009	89.5	25.8	57.3	6.3	2.5	2.4	7.7	13.4	-15.5
2011	82.0	22.7	54.7	4.7	2.7	2.6	9.9	14.8	-12.1
					Decomposition of EU-27 bilateral exports to China				
1995	94.6	46.0	44.2	4.4	3.4	0.3	7.8	11.8	-18.0
2000	92.1	34.3	52.5	5.4	4.3	0.6	10.7	15.1	-22.8
2007	83.9	24.3	55.1	4.5	7.7	1.6	10.5	27.5	-31.2
2009	90.8	33.7	52.4	4.7	4.7	1.8	10.0	17.0	-24.4
2011	86.0	29.0	53.3	3.7	4.7	2.4	12.0	17.3	-22.4
					Decomposition of China bilateral exports to EU-27				
1995	85.6	46.6	34.8	4.3	0.2	2.7	12.9	7.3	-8.8
2000	85.5	40.2	39.2	6.1	0.5	3.1	14.6	9.8	-13.4
2007	77.5	35.9	35.8	5.7	1.0	4.8	19.9	10.4	-13.5
2009	81.4	40.2	35.9	5.3	1.2	3.2	15.6	10.0	-11.4
2011	76.5	35.0	36.7	4.9	1.7	3.4	17.9	12.0	-11.6

Source: WIOD database; author's calculations

indicate that almost 50 bn US-$ (28.1%) of US value added is arriving in China via third countries and 62.3 bn US-$ (15.1%) of Chinese value added is absorbed in the US via third countries.

For a comparison across countries and over time it is more useful considering results in Table 4 only. A few interesting patterns emerge from this. First, in the bilateral considerations the value added exports to export ratio can be larger than 100% as in the case of the US in 1995 and 2000. The reason for this are that the US exports value added to third countries which are then transferred and absorbed in China. This is captured as value added exports of US to China but are not captured when considering

the bilateral exports in gross terms. Second, the value added exports to export ratios have fallen in all cases over time with again a different pattern emerging during the global crisis. Third, the share of value added exports directly absorbed in form of final goods is generally lower when considering US exports to China (17.7 % in 2001) as compared to Chinese exports to the US (40.6% in 2011) as already outlined above. The difference is less significant when considering EU-27 and China where the corresponding numbers in 2011 are 29% and 35%, respectively. The opposite patterns holds when looking at value added absorbed via intermediates. In 2011, 61.9% of US total gross exports to China have been absorbed in China whereas only 35.3% of Chinese exports to US has been absorbed in the US this way. Again the differences are less pronounced when considering EU-27 bilateral trade with China. Fourth, the value added absorbed in China via third countries has becoming smaller over time both for US and EU-27 exports to China. This trend goes in the opposite direction when considering China value added exports to the US and EU-27 though this is not very pronounced. These numbers are lower in general when considering EU-27 bilateral trade flows. Fifth, the share of returned domestic value added is significantly higher for US bilateral exports to China as compared to other bilateral flows. These shares are also relatively high when looking at EU-27 exports to China, though significantly lower as compared to the US. These numbers are particularly low when looking at Chinese bilateral exports to the US and the EU-27. Finally, sixth, the share of value added which is sent to the direct partner but then shipped further is particularly large when considering US and EU-27 exports to China where in 2011 this makes up 22.7% and 17.3% of gross exports, respectively. This indicates the role of China as a kind of hub to other countries via assembly trade.

4 Bilateral net value added trade positions

Having discussed the decomposition of bilateral gross exports flows into its value added components in this section results concerning net trade positions in value added terms are presented with an emphasis on the decomposition of bilateral net trade.

4.1 Bilateral net trade of major economies

At the aggregate level a country's net trade in gross terms equals net trade in value added terms as already discussed above as this reflects a country's gross savings positions. However, at the bilateral level this does not hold true and a useful measure is the the differences of the bilateral value added exports of two countries as argued in Section 2. Table 5 presents the net trade figures in value added terms, i.e. value added exports minus value added imports, together with net trade in gross terms for selected years and the three major economies.[12] The US trade deficit with China in value added terms is much lower as compared to the trade deficit in gross terms supporting the view that China acts as an assembler of final products using components from other parts of the world, and particularly from the US. For example, the trade deficit in 2007 amounted to 217 bn US-$ in gross terms whereas in value added terms it was

[12]Detailed figures of bilateral trade for US and China with all other countries are reported in Appendix Tables B.18 to B.19. The figures for the individual EU-27 countries with these two countries are the values with opposite signs. Further results are available upon request.

Table 5 Bilateral net trade in value added and gross terms in bn US-$, 2005

	Trade in value added					Gross trade				
Partner	1995	2000	2007	2009	2011	1995	2000	2007	2009	2011
					USA					
CHN	-22.5	-46.8	-174.4	-158.1	-196.2	-27.6	-55.3	-217.1	-187.7	-237.5
EU-27	-48.6	-109.4	-142.8	-74.9	-79.7	-44.2	-99.7	-111.7	-43.3	-26.5
Other	0.0	-177.3	-313.3	-144.7	-282.1	0.8	-178.5	-301.7	-146.7	-293.9
Total	-71.0	-333.5	-630.5	-377.7	-557.9	-71.0	-333.5	-630.5	-377.7	-557.9
					EU-27					
CHN	-4.3	-11.1	-74.5	-59.9	-61.9	-8.1	-16.4	-111.3	-96.3	-121.1
USA	48.4	108.3	137.2	70.2	69.3	44.2	99.7	111.7	43.3	26.5
Other	174.4	23.7	239.3	311.3	359.6	182.4	37.5	301.6	374.6	461.6
Total	218.5	120.9	302.0	321.6	367.0	218.5	120.9	302.0	321.6	367.0
					China					
EU-27	4.3	11.1	74.5	59.9	61.2	8.1	16.4	111.3	96.3	121.1
USA	22.5	46.8	174.4	158.1	196.2	27.6	55.3	217.1	187.7	237.5
Other	-1.0	-13.1	119.5	66.3	37.3	-9.9	-26.9	40.0	0.4	-63.9
Total	25.8	44.8	368.4	284.3	294.7	25.8	44.8	368.4	284.3	294.7

Source: WIOD database; author's calculations

with 174 bn US-$ much smaller by about 20%. However this is not uniform over time as the difference tended to become larger over time but after the crisis was reduced to about 17% in 2011. With respect to the EU-27 and the other economies the US is running however a larger deficit in value added terms as compared to gross figures. Therefore, when summing up over all trading partners this results in total US trade deficit which is equal in both cases as already extensively discussed in Section 2.

Looking at the EU-27 next the first observation is that with respect to US one finds the same figures with opposite signs, thus the EU-27 is running a trade surplus against the US which in value added terms is larger as compared to gross figures. With respect to China the EU-27 is running a trade deficit which - similar to the US - is larger in value added terms with an even larger difference when expressed in percentage terms (though rather volatile over time). The EU-27 is further running a trade surplus with the other countries which in value added terms tends to be smaller.

Finally, the Chinese surpluses with EU-27 and the US have already been discussed above. With respect to the remaining countries it is interesting to note that China is running a trade deficit in gross terms, which however in value added terms one observes still a trade surplus (e.g. in 2011).

4.2 Decomposition of bilateral net trade

The framework outlined above allows one to decompose bilateral net trade flows in value added terms in line with equation. Specifically, Table 6 reports the following numbers which corresponds to subtracting

Table 6 - Decomposition of bilateral net trade (in bn US-$)

	Total gross exports	Value added exports				Returned domestic VA	Foreign VA in exports		Multilateral VA exports	
		Total	Final goods	Inter-mediates	Indirect		from partner	from others	to 3rd countries via partner	via 3rd countries to partner
USA bilateral net exports to China										
1995	-27.6	-22.5	-20.4	-0.9	-1.3	0.8	-0.8	-4.9	0.3	-0.5
2000	-55.3	-46.8	-33.4	-8.5	-4.9	1.4	-1.4	-10.1	-0.8	2.5
2007	-217.1	-174.4	-118.5	-37.4	-18.5	8.0	-8.0	-58.5	9.4	6.4
2009	-187.7	-158.1	-116.9	-25.7	-15.5	5.8	-5.8	-41.4	5.9	6.0
2011	-237.5	-196.2	-136.4	-37.4	-22.4	7.3	-7.3	-63.2	8.8	13.1
EU-27 bilateral net exports to USA										
1995	44.2	48.4	31.9	9.6	6.9	0.1	-0.1	1.2	1.3	-6.7
2000	99.7	108.3	58.9	34.3	15.1	-2.4	2.4	9.6	-0.4	-17.8
2007	111.7	137.2	81.5	31.7	23.9	-0.2	0.2	21.0	-11.0	-35.4
2009	43.3	70.2	51.0	4.4	14.8	-0.4	0.4	11.6	-16.8	-21.7
2011	26.5	69.3	57.4	-5.9	17.8	-0.8	0.8	16.6	-28.6	-30.8
EU-27 bilateral net exports to China										
1995	-8.1	-4.3	-4.0	-0.0	-0.3	0.9	-0.9	-2.5	0.7	-2.0
2000	-16.4	-11.1	-9.2	-0.7	-1.3	1.6	-1.6	-4.1	0.7	-1.9
2007	-111.3	-74.5	-61.2	-4.7	-8.6	11.2	-11.2	-39.2	19.6	-17.1
2009	-96.3	-59.9	-51.4	-2.1	-6.4	5.7	-5.7	-26.0	4.3	-14.7
2011	-121.1	-61.9	-61.9	9.7	-9.7	7.3	-7.3	-41.0	2.7	-20.9

Source: WIOD database; author's calculations

the bilateral decomposition results as reported in Table 3.

$$
\begin{aligned}
\mathrm{NX}^{12} = e^{12} - e^{21} \quad = \quad & (v^1 l^{11} f^{12} - v^2 l^{22} f^{21}) + (v^1 l^{12} f^{22} - v^2 l^{21} f^{11}) + (v^1 l^{13} f^{32} - v^2 l^{23} f^{31}) + \\
& \Big[(v^1 l^{12} f^{21} + v^1 l^{12} a^{21} x^1) - (v^2 l^{21} f^{12} + v^2 l^{21} a^{12} x^2)\Big] + \\
& \Big[(v^2 l^{21} f^{12} + v^2 l^{21} a^{12} x^2) - (v^1 l^{12} f^{21} + v^1 l^{12} a^{21} x^1)\Big] + \\
& \Big[(v^3 l^{31} f^{12} + v^3 l^{31} a^{12} x^2) - (v^3 l^{32} f^{21} + v^3 l^{32} a^{21} x^1)\Big] + \\
& \Big[(v^1 l^{12} f^{23} + v^1 l^{12} a^{23} x^3) - (v^2 l^{21} f^{13} + v^2 l^{21} a^{13} x^3)\Big] + \\
& \Big[- (v^1 l^{13} f^{32} + v^1 l^{13} a^{32} x^2) + (v^2 l^{23} f^{31} + v^2 l^{23} a^{31} x^1]\Big)
\end{aligned}
$$

The first three terms (in line 1) correspond to net value added exports with respect to final goods, intermediates, and indirect trade. The second line is the difference between the returned value added whereas the third line reports the partner country's value added embodied in exports in net terms. It should be noted that these two lines exactly cancel out. The fourth line is the difference between value added contents from other countries in bilateral trade. Finally, the fifth line is value added exports of a country to other third countries via the direct partner whereas the sixth line provides information on net exports which are transferred to the partner via third countries.

Considering a specific example, the US was running a trade deficit with China in 2007 of 217 bn US-$ which in value added terms amounted to 174 bn US-$ as already shown above (see Table 5). This is composed of 118.5 bn US-$ net imports of value added embodied in final goods, 37.4 due to net imports in intermediates and the remaining 18.5 bn US-$ due to indirect trade flows. Therefore, though the most important component of the US deficit with China is in final goods trade it is noticeable that the US is

also running a deficit with respect to the intermediates component, though case-studies (e.g. for the iPod) might suggest differently. This has become more pronounced over time as e.g. in 1995 the intermediates part was almost balanced between the two countries. This can be compared to EU-27 net trade with China where net value added trade in final goods have even a larger share in total net trade in value added terms with the intermediates component being almost balanced and even being in surplus in 2011. With respect to EU-27 net trade to US also the final goods part is the most important one where the EU-27 is also running a surplus against the US, whereas the intermediates component is rather volatile over time. In this case also the net value added exported to US via third countries is quite important.

Finally, the balance of the foreign value added embodied in exports in net terms is also important and negative for the USA and the EU-27 when trading with China. This implies that the US and EU-27 imports from China embody more and more third country value added as Chinese imports from US and the EU-27 indicating that China is more and more using intermediates from other countries to produce its exports corresponding to the fact that China is more vertically integrated than the US or the EU-27 (as reported in Table 2).

5 Conclusions

Two concepts of measuring value added flows between countries have been considered and generalised in two dimensions. These two concepts are, first, the calculation of a country's domestic and foreign value added content of its exports in the spirit of Hummels et al. (2001) and measures of vertical specialisation, and second, the calculation of how much value added is created in one country due to consumption in other countries, i.e. the value added exports as discussed in Johnson and Noguera (2012). These two approaches are further generalised, first, by also considering value added imports from other countries which leads to a consideration of net trade positions in value added terms. Both concepts result in the same level of net exports for a country's total trade in value added terms which is also equal to a country's net trade in gross terms. This is in line with National Accounts as a country's net trade position reflects its overall savings position. Further, in this respect these results also justify to calculate a country's domestic value added content of its exports using total exports, i.e. including intermediates exports, rather than final goods exports only as in national accounts exports, either final goods or intermediates, are considered a category of final demand.

The most important contribution of the paper is to consider bilateral value added flows based on these concepts. First, for a country's total exports it does not carry over that bilateral net exports in gross and value added terms are equal. Particularly, the difference of net trade in gross versus value added terms can go in either direction, however sums up to a country's total net trade when aggregating over partner countries. This is shown in detail using the decomposition approach introduced in Koopman et al. (2011) which is applied at the level of bilateral trade flows with accounting for trade with third countries as well. This sheds some light on how the two concepts relate to each other, but - more importantly - that these bilateral decompositions are exact in the way that when summing up over partner countries one arrives at the overall measures. Particularly, it is shown that additional terms arising in the decomposition accounting for value added trade with third countries when considering bilateral trade in gross terms

exactly cancel out when aggregating over partner countries. This approach therefore indicates the role of double counting both in bilateral and aggregate trade. Using this approach, aggregation over all countries therefore results in the correct accounting that net value added trade at the world level is zero, i.e. the sum of value added exports must be equal the sum of value added imports. More generally, therefore it also holds that for a world input-output table world value added must equal the value of world final consumption. The analysis in this paper therefore shows how these accounting relations in bilateral and aggregate terms have to be considered and relate to National Accounts.

The paper then further presented selected empirical results with a focus on bilateral decompositions as outlined in the analytical part using the WIOD database. A more detailed analysis and explanation of emergence and structures of bilateral value added trade is however beyond the scope of this paper which focused on the methodological and accounting aspects. The analytical results when decomposing bilateral value added flows will prove important for a further deeper understanding of the emergence of global value chains both at the bilateral and country level. This is particularly important also for trade policy issues as discussed e.g. in Jara and Escaith (2012) and Baldwin (2012) which often has a focus on bilateral relations Bilateral trade restrictions might have impacts on third countries. The framework developed in this paper can be helpful in assessing these indirect impacts in a more accurate way. A further aspect for which the bilateral perspective can be important are issues concerning global re-balancing which also implies bilateral re-balancing. Further avenues of research are, for example, to use this approach for studying bilateral value added exports via third countries trade and the role of hubs some countries might play in this aspect which implies analysing in more depth such bilateral flows at the industry level along the lines discussed in this paper. This will allow further detailed insights e.g. on the role of assembly trade which is particularly important for some industries like the electronics industry as discussed in various case studies.

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A Technical appendix

A.1 Consistency with national accounts identities

In Section 2 it was argued that a countrys trade balance does not change when measured in value added terms, as income minus consumption of (domestic and foreign) nal goods, i.e. its savings, equals its net exports To see this and the role of imported intermediates play more clearly one can write GDP (for country 1) as the sum of final demand plus exports minus imports which are split into final and intermediates, i.e.

$$\begin{aligned}
\text{GDP}^1 &= \boldsymbol{\iota}' \left[\begin{pmatrix} \mathbf{f}^{11} \\ \mathbf{f}^{21} \\ \mathbf{f}^{31} \end{pmatrix} + \begin{pmatrix} \mathbf{e}^{12} + \mathbf{e}^{13} \\ -\mathbf{e}^{21} \\ -\mathbf{e}^{31} \end{pmatrix} \right] \\
&= \boldsymbol{\iota}' \begin{pmatrix} \mathbf{f}^{11} + \mathbf{e}^{12} + \mathbf{e}^{13} \\ \mathbf{f}^{21} - (\mathbf{f}^{21} + \mathbf{z}^{21}) \\ \mathbf{f}^{31} - (\mathbf{f}^{31} + \mathbf{z}^{31}) \end{pmatrix} \\
&= \boldsymbol{\iota}' \left\{ \begin{pmatrix} \mathbf{f}^{11} + \mathbf{f}^{12} + \mathbf{f}^{13} \\ \mathbf{0} \\ \mathbf{0} \end{pmatrix} + \begin{pmatrix} \mathbf{z}^{12} + \mathbf{z}^{13} \\ -\mathbf{z}^{21} \\ -\mathbf{z}^{31} \end{pmatrix} \right\}
\end{aligned}$$

A country's GDP equals domestic and foreign demand for its products including exported intermediates from which imported intermediates have to be subtracted. Note, that this corresponds to national input-output tables where imported intermediates are included in the intermediates block and thus do not count for value added, i.e. GDP, whereas the column for exports includes both intermediates and final goods exports. Here, it might be interesting to consider two special cases. Without intermediates trade, $\mathbf{z}^{rs} = \mathbf{0}$ for all $r \neq s$, the equation would become $\text{GDP}^1 = \boldsymbol{\iota}'(\mathbf{f}^{11} + \mathbf{f}^{12} + \mathbf{f}^{13})$, i.e. GDP of country 1 equals expenditures on (or demand for) its final goods (expenditures side). As a second special case consider a country which does not produce final goods but only intermediates, e.g. oil, without any other imported intermediates. Exports would consist of intermediates only and GDP would become $\text{GDP}^1 = \boldsymbol{\iota}'(\mathbf{z}^{12} + \mathbf{z}^{13})$. Finally, it is easy to see that when adding equation the above equation over all countries the intermediates part cancels out resulting in the fact that world GDP equals world consumption.

A.2 Property of inverse matrices

For the decomposition the property of inverse matrices was used which relies on the fact that for any square non-singular matrix it holds that $\mathbf{A}\mathbf{A}^{-1} = \mathbf{A}^{-1}\mathbf{A} = \mathbf{I}$. Denoting $\mathbf{B} = \mathbf{I} - \mathbf{A}$ and $\mathbf{L} = (\mathbf{I} - \mathbf{A})^{-1}$

$$\begin{aligned}
\mathbf{LB} &= \begin{pmatrix} l^{11} & l^{12} & l^{13} \\ l^{21} & l^{22} & l^{23} \\ l^{31} & l^{32} & l^{33} \end{pmatrix} \begin{pmatrix} 1 - a^{11} & -a^{12} & -a^{13} \\ -a^{21} & 1 - a^{22} & -a^{23} \\ -a^{31} & -a^{32} & 1 - a^{33} \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \\
&= \begin{pmatrix} l^{11}(1-a^{11}) - l^{12}a^{21} - l^{13}a^{31} & -l^{11}a^{12} + l^{12}(1-a^{22}) - l^{13}a^{32} & -l^{11}a^{13} - l^{13}a^{33} + l^{13}(1-a^{33}) \\ l^{21}(1-a^{11}) - l^{22}a^{21} - l^{23}a^{31} & -l^{21}a^{12} + l^{22}(1-a^{22}) - l^{23}a^{32} & -l^{21}a^{13} - l^{22}a^{23} + l^{23}(1-a^{33}) \\ l^{31}(1-a^{11}) - l^{32}a^{21} - l^{33}a^{31} & -l^{31}a^{12} + l^{32}(1-a^{22}) - l^{33}a^{32} & -l^{31}a^{13} - l^{32}a^{23} + l^{33}(1-a^{33}) \end{pmatrix}
\end{aligned}$$

For example, the entry in the first row and second entry in the latter matrix - which results from multiplying the first row in $\mathbf{L}$ with the second column in $\mathbf{B}$ - is

$$\begin{aligned} 0 &= -l^{11}a^{12} + l^{12}(1-a^{22}) - l^{13}a^{32} \\ l^{11}a^{12} &= l^{12}(1-a^{22}) - l^{13}a^{32} \end{aligned}$$

which is the term used in deriving equation (9) from (8).

A.3 Generalisation

In the bilateral trade of goods not only third country but also other countries are intervening in the way that exports of 1 to 2 also embody value added from these additional ones and part of value added is transferred to these countries via trade with country 2. The decomposition of the bilateral flows can be readily extended to these cases using similar algebra. The difference is that instead of considering rows and columns one has to consider country blocks when applying the property of inverse matrices. Then the results can be generalised to any number of countries and sectors. Using matrix notation the central equation for decomposing country r's exports to country p can be written as

$$\begin{aligned} e^{rp} = & \underbrace{\mathbf{v}^r\mathbf{L}^{rr}\mathbf{f}^{rp} + \mathbf{v}^r\mathbf{L}^{rp}\mathbf{f}^{pp} + \sum_{s\neq p;s\neq r}\mathbf{v}^r\mathbf{L}^{rs}\mathbf{f}^{sp}}_{\text{VAX}^{rp}} + \underbrace{\mathbf{v}^r\mathbf{L}^{rp}\mathbf{f}^{pr} + \mathbf{v}^r\mathbf{L}^{rp}\mathbf{A}^{pr}\mathbf{x}^r}_{\text{DVAiM}^{rp}=\text{FVAiX}^{pr(r)}} + \\ & \underbrace{\mathbf{v}^p\mathbf{L}^{pr}\mathbf{f}^{rp} + \mathbf{v}^p\mathbf{L}^{pr}\mathbf{A}^{rp}\mathbf{x}^p}_{\text{FVAiX}^{rp(p)}} + \underbrace{\sum_{r\neq p;s\neq p}\mathbf{v}^s\mathbf{L}^{sr}\mathbf{f}^{rp} + \mathbf{v}^s\mathbf{L}^{sr}\mathbf{A}^{rp}\mathbf{x}^p}_{\sum_s \text{FVAiX}^{rp(s)}} \\ & \underbrace{\sum_{s\neq p;s\neq r}\mathbf{v}^r\mathbf{L}^{rp}\mathbf{f}^{ps} + \mathbf{v}^r\mathbf{L}^{rp}\mathbf{A}^{ps}\mathbf{x}^s}_{\text{FVAiX}^{ps(r)}} - \underbrace{\sum_{s\neq p;s\neq r}\left(\mathbf{v}^r\mathbf{L}^{rs}\mathbf{f}^{sp} + \mathbf{v}^r\mathbf{L}^{rs}\mathbf{A}^{sp}\mathbf{x}^p\right)}_{\text{FVAiX}^{sp(r)}} \end{aligned}$$

where, in this case, $\mathbf{v}^c$ denotes the $1 \times N$ value added coefficients vector of country c, $\mathbf{x}^c$ is the $N \times 1$ vector of gross output of country c, $\mathbf{f}^{cb}$ denote the $N \times 1$ vector of final goods exports of c to b, and $\mathbf{A}^{cb}$ and $\mathbf{L}^{cb}$ denote the respective blocks of the global coefficients and Leontief matrix, respectively, which are of dimension $N \times N$. This equation can again be written in terms of gross trade flows by using $\mathbf{e}^{rb} = \mathbf{f}^{rb} + \mathbf{A}^{rb}\mathbf{x}^b$ which results in

$$\begin{aligned} e^{rp} = & \underbrace{\mathbf{v}^r\mathbf{L}\mathbf{f}^{rp} + \mathbf{v}^r\mathbf{L}\mathbf{f}^{pp} + \sum_{s\neq p;s\neq r}\mathbf{v}^r\mathbf{L}\mathbf{f}^{sp}}_{\text{VAX}^{rp}} + \underbrace{\mathbf{v}^r\mathbf{L}\mathbf{e}^{pr}}_{\text{FVAiX}^{pr(r)}} + \underbrace{\mathbf{v}^p\mathbf{L}\mathbf{e}^{rp}}_{\text{FVAiX}^{rp(p)}} + \underbrace{\sum_{r\neq p;s\neq p}\mathbf{v}^s\mathbf{L}\mathbf{e}^{rp}}_{\sum_s \text{FVAiX}^{rp(s)}} + \\ & \underbrace{\sum_{s\neq p;s\neq r}\mathbf{v}^r\mathbf{L}\mathbf{e}^{ps}}_{\text{FVAiX}^{ps(r)}} - \underbrace{\sum_{s\neq p;s\neq r}\mathbf{v}^r\mathbf{L}\mathbf{e}^{sp}}_{\text{FVAiX}^{sp(r)}} \end{aligned}$$

A.4 Aggregation

Gross exports of country 1 to 3 can - analogously to equation (9) - be expressed as

$$\begin{aligned} e^{13} &= \underbrace{v^1l^{11}f^{13}+v^1l^{13}f^{33}+v^1l^{12}f^{23}}_{\text{VAX}^{13}}+\underbrace{v^1l^{13}f^{31}+v^1l^{13}a^{31}x^1}_{\text{DVAiM}^{13}=\text{FVAiX}^{31(1)}}+ \\ &\underbrace{v^3l^{31}f^{13}+v^2l^{31}a^{13}x^3}_{\text{FVAiX}^{13(3)}}+\underbrace{v^2l^{21}f^{13}+v^2l^{21}a^{13}x^3}_{\text{FVAiX}^{13(2)}}+ \\ &\underbrace{(v^1l^{13}f^{32}+v^1l^{13}a^{32}x^2)}_{\text{FVAiX}^{32(1)}}-\underbrace{(v^1l^{12}f^{23}+v^1l^{12}a^{23}x^3)}_{\text{FVAiX}^{23(1)}} \end{aligned}$$

When adding gross exports of 1 to 2 and 3 it can easily be seen that the respective terms vanish leading to equation 10.

Analogous to (9), country 1's value added imports from 2 and 3 (i.e. the exports of 2 and 3 to 1) are respectively

$$\begin{aligned} e^{21} &= \underbrace{v^2l^{22}f^{21}+v^2l^{21}f^{11}+v^2l^{23}f^{31}}_{\text{VAX}^{21}}+\underbrace{v^2l^{21}f^{12}+v^2l^{21}a^{12}x^2}_{\text{DVAiM}^{21}=\text{FVAiX}^{12(2)}}+ \\ &\underbrace{v^1l^{12}f^{21}+v^1l^{12}a^{21}x^1}_{\text{FVAiX}^{21(1)}}+\underbrace{v^3l^{32}f^{21}+v^3l^{32}a^{21}x^1}_{\text{FVAiX}^{21(3)}}+ \\ &\underbrace{(v^2l^{21}f^{13}+v^2l^{21}a^{13}x^3)}_{\text{FVAiX}^{13(2)}}-\underbrace{(v^2l^{23}f^{31}+v^2l^{23}a^{31}x^1)}_{=\text{FVAiX}^{31(2)}} \end{aligned}$$

$$\begin{aligned} e^{31} &= \underbrace{v^3l^{33}f^{31}+v^3l^{31}f^{11}+v^3l^{31}f^{12}}_{\text{VAX}^{31}}+\underbrace{v^3l^{31}f^{13}+v^3l^{31}a^{13}x^3}_{\text{DVAiM}^{31}=\text{FVAiX}^{31(3)}}+ \\ &\underbrace{v^1l^{13}f^{31}+v^1l^{13}a^{31}x^1}_{\text{FVAiX}^{31(1)}}+\underbrace{v^2l^{23}f^{31}+v^2l^{23}a^{31}x^1}_{\text{FVAiX}^{32(2)}}+ \\ &\underbrace{(v^3l^{31}f^{12}+v^3l^{31}a^{12}x^2)}_{\text{FVAiX}^{12(3)}}-\underbrace{(v^3l^{32}f^{21}+v^3l^{32}a^{21}x^1)}_{\text{FVAiX}^{21(3)}} \end{aligned}$$

and total value added imports of country 1 are therefore

$$\begin{aligned} e^{21}+e^{31} &= \underbrace{v^2l^{22}f^{21}+v^2l^{21}f^{11}+v^2l^{23}f^{31}}_{\text{VAX}^{21}}+\underbrace{v^2l^{21}f^{12}+v^2l^{21}a^{12}x^2}_{\text{DVAiM}^{21}=\text{FVAiX}^{12(2)}}+ \\ &\underbrace{v^1l^{12}f^{21}+v^1l^{12}a^{21}x^1}_{\text{FVAiX}^{21(1)}=\text{DVAiM}^{12}}+\underbrace{(v^2l^{21}f^{13}+v^2l^{21}a^{13}x^3)}_{=\text{FVAiX}^{13(2)}}+ \\ &\underbrace{v^3l^{33}f^{31}+v^3l^{31}f^{11}+v^3l^{31}f^{12}}_{\text{VAX}^{31}}+\underbrace{v^3l^{31}f^{13}+v^3l^{31}a^{13}x^3}_{\text{DVAiM}^{31}=\text{FVAiX}^{13(3)}}+ \\ &\underbrace{v^1l^{13}f^{31}+v^1l^{13}a^{31}x^1}_{\text{FVAiX}^{31(1)}=\text{DVAiM}^{13}}+\underbrace{v^3l^{31}f^{12}+v^3l^{31}a^{12}x^2}_{=\text{FVAiX}^{12(3)}} \end{aligned}$$

which - by definition - also equals gross imports. Applying equations (9) and the decomposition of e^{21} for calculating bilateral net trade results in

$$\begin{aligned} \text{NX}^{12}=e^{12}-e^{21} &= \underbrace{(v^1l^{11}f^{12}+v^1l^{12}f^{22}+v^1l^{13}f^{32})}_{\text{VAX}^{12}}-\underbrace{(v^2l^{22}f^{21}+v^2l^{21}f^{11}+v^2l^{23}f^{31})}_{\text{VAX}^{21}}+ \\ &\underbrace{(v^1l^{12}f^{23}+v^1l^{12}a^{23}x^3)}_{\text{FVAiX}^{23(1)}}-\underbrace{(v^1l^{13}f^{32}+v^1l^{13}a^{32}x^2)}_{\text{FVAiX}^{32(1)}}- \\ &\underbrace{(v^2l^{21}f^{13}+v^2l^{21}a^{13}x^3)}_{\text{FVAiX}^{13(2)}}+\underbrace{(v^2l^{23}f^{31}+v^2l^{23}a^{31}x^1)}_{=\text{FVAiX}^{31(2)}}+ \\ &\underbrace{v^3l^{31}f^{12}+v^3l^{31}a^{12}x^2}_{\text{FVAiX}^{12(3)}}-\underbrace{v^3l^{32}f^{21}+v^3l^{32}a^{21}x^1}_{\text{FVAiX}^{21(3)}} \end{aligned}$$

Analogously, bilateral net trade between countries 1 and 3 would result in

$$\begin{aligned}
\mathrm{NX}^{13} = e^{13} - e^{31} \quad = \quad & \underbrace{(v^1 l^{11} f^{13} + v^1 l^{13} f^{33} + v^1 l^{12} f^{23})}_{\mathrm{VAX}^{13}} - \underbrace{(v^3 l^{33} f^{31} + v^3 l^{31} f^{11} + v^3 l^{32} f^{21})}_{\mathrm{VAX}^{31}} + \\
& \underbrace{(v^1 l^{13} f^{32} + v^1 l^{13} a^{32} x^2)}_{\mathrm{FVAiX}^{32(1)}} - \underbrace{(v^1 l^{12} f^{23} + v^1 l^{12} a^{23} x^3)}_{\mathrm{FVAiX}^{23(1)}} - \\
& \underbrace{(v^3 l^{31} f^{12} + v^3 l^{31} a^{12} x^2)}_{\mathrm{FVAiX}^{12(3)}} + \underbrace{(v^3 l^{32} f^{21} + v^3 l^{32} a^{21} x^1)}_{=\mathrm{FVAiX}^{21(3)}} + \\
& \underbrace{v^2 l^{21} f^{13} + v^2 l^{21} a^{13} x^3}_{\mathrm{FVAiX}^{13(2)}} - \underbrace{v^2 l^{23} f^{31} + v^2 l^{23} a^{31} x^1}_{\mathrm{FVAiX}^{31(2)}}
\end{aligned}$$

When summing up over partner countries, i.e. countries 2 and 3, lines 2 to 4 cancel out in the previous two equations.

A.5 Computational issues

A.5.1 Aggregate level calculations

This section finally shows that the decomposition results can be calculated using simple matrix algebra - without a need to program the properties of inverse matrices - applying formulas as used for calculating value added exports and domestic and foreign content of exports as outlined in Section 2. Value added exports of country 1 can be calculated by multiplying a value added coefficients vector including the positive coefficients for country 1 and zeros otherwise with the Leontief inverse and the final demand matrix split into three parts:

$$\mathrm{VAX}^1 = \mathbf{v}^1\mathbf{L}\left[\begin{pmatrix}\mathbf{0}+\mathbf{f}^{12}+\mathbf{f}^{13}\\ \mathbf{0}+\mathbf{0}+\mathbf{0}\\ \mathbf{0}+\mathbf{0}+\mathbf{0}\end{pmatrix} + \begin{pmatrix}\mathbf{0}+\mathbf{0}+\mathbf{0}\\ \mathbf{0}+\mathbf{f}^{22}+\mathbf{0}\\ \mathbf{0}+\mathbf{0}+\mathbf{f}^{33}\end{pmatrix} + \begin{pmatrix}\mathbf{0}+\mathbf{0}+\mathbf{0}\\ \mathbf{0}+\mathbf{0}+\mathbf{f}^{23}\\ \mathbf{0}+\mathbf{f}^{32}+\mathbf{0}\end{pmatrix}\right]$$

which provides the values for 'domestic value added in direct final goods exports', 'domestic value added absorbed by the direct importers' and 'indirect value added exports to third countries' following Koopman et al. (2011). Summing up the three final demand matrices results in equation (1).

Second, the 'returned domestic value added in final goods' and 'returned domestic value added in intermediate goods' can be calculated using the same coefficients vector times the Leontief times a matrix of country 1's imports split up by final and intermediate goods imports:

$$\mathrm{DVAiM}^1 = \mathbf{v}^1\mathbf{L}\left[\begin{pmatrix}\mathbf{0}\\ \mathbf{f}^{21}\\ \mathbf{f}^{31}\end{pmatrix} + \begin{pmatrix}\mathbf{0}\\ \mathbf{z}^{21}\\ \mathbf{z}^{31}\end{pmatrix}\right]$$

which corresponds to equation (7).

Finally, country 1's domestic and foreign value added content of exports - see the corresponding equation (6) - are

$$\mathrm{DVAiX}^1 = \mathbf{v}^1\mathbf{L}\left[\begin{pmatrix}\mathbf{f}^{12}+\mathbf{f}^{13}\\ \mathbf{0}\\ \mathbf{0}\end{pmatrix} + \begin{pmatrix}\mathbf{z}^{12}+\mathbf{z}^{13}\\ \mathbf{0}\\ \mathbf{0}\end{pmatrix}\right] \quad \text{and} \quad \mathrm{FVAiX}^1 = \mathbf{v}^{-1}\mathbf{L}\left[\begin{pmatrix}\mathbf{f}^{12}+\mathbf{f}^{13}\\ \mathbf{0}\\ \mathbf{0}\end{pmatrix} + \begin{pmatrix}\mathbf{z}^{12}+\mathbf{z}^{13}\\ \mathbf{0}\\ \mathbf{0}\end{pmatrix}\right]$$

A.5.2 Bilateral decomposition

Calculations for bilateral trade relations are slightly more complicated but also follow straightforwardly from the above considerations. These equations in the bilateral case would therefore become for value added exports of country 1 to 2

$$\mathrm{VAX}^{12} = \mathbf{v}^1\mathbf{L}\left[\begin{pmatrix}\mathbf{0}+\mathbf{f}^{12}+\mathbf{0}\\ \mathbf{0}+\mathbf{0}+\mathbf{0}\\ \mathbf{0}+\mathbf{0}+\mathbf{0}\end{pmatrix}+\begin{pmatrix}\mathbf{0}+\mathbf{0}+\mathbf{0}\\ \mathbf{0}+\mathbf{f}^{22}+\mathbf{0}\\ \mathbf{0}+\mathbf{0}+\mathbf{0}\end{pmatrix}+\begin{pmatrix}\mathbf{0}+\mathbf{0}+\mathbf{0}\\ \mathbf{0}+\mathbf{0}+\mathbf{0}\\ \mathbf{0}+\mathbf{f}^{32}+\mathbf{0}\end{pmatrix}\right]$$

It is important to note that in the third final demand matrix $\mathbf{f}^{32}$ is included compatible with derivation of equation (9). For actually calculating the value added exports of country 1 to 2 it is more appropriate to include $\mathbf{f}^{32}$ capturing imports of country 2 from 3 embodying value added from country 1.

In the other equations all parts not including bilateral (physical) shipments of goods from country 1 to 2 are excluded. The domestic value added in country 1's imports from 2 (the returned value added) is therefore calculated in the bilateral relation as

$$\mathrm{DVAiM}^{12} = \mathrm{FVAiX}^{21(1)} = \mathbf{v}^1\mathbf{L}\left[\begin{pmatrix}\mathbf{0}\\ \mathbf{f}^{21}\\ \mathbf{0}\end{pmatrix}+\begin{pmatrix}\mathbf{0}\\ \mathbf{z}^{21}\\ \mathbf{0}\end{pmatrix}\right]$$

And finally, country 1's domestic value added content of exports to 2 becomes

$$\mathrm{DVAiX}^{12} = \mathbf{v}^1\mathbf{L}\left[\begin{pmatrix}\mathbf{f}^{12}\\ \mathbf{0}\\ \mathbf{0}\end{pmatrix}+\begin{pmatrix}\mathbf{z}^{12}\\ \mathbf{0}\\ \mathbf{0}\end{pmatrix}\right]$$

The foreign content of exports of country 1 to country 2 by all partner countries is

$$\mathrm{FVAiX}^{12(2)} = \mathbf{v}^2\mathbf{L}\left[\begin{pmatrix}\mathbf{f}^{12}\\ \mathbf{0}\\ \mathbf{0}\end{pmatrix}+\begin{pmatrix}\mathbf{z}^{12}\\ \mathbf{0}\\ \mathbf{0}\end{pmatrix}\right] \quad \text{and} \quad \mathrm{FVAiX}^{12(3)} = \mathbf{v}^3\mathbf{L}\left[\begin{pmatrix}\mathbf{f}^{12}\\ \mathbf{0}\\ \mathbf{0}\end{pmatrix}+\begin{pmatrix}\mathbf{z}^{12}\\ \mathbf{0}\\ \mathbf{0}\end{pmatrix}\right]$$

The terms additionally appearing in the decomposition in equation (9) which are canceling out in the aggregation procedure are

$$\mathrm{FVAiX}^{23(1)} = \mathbf{v}^1\mathbf{L}\left[\begin{pmatrix}\mathbf{0}\\ \mathbf{f}^{23}\\ \mathbf{0}\end{pmatrix}+\begin{pmatrix}\mathbf{0}\\ \mathbf{z}^{23}\\ \mathbf{0}\end{pmatrix}\right] \quad \text{and} \quad \mathrm{FVAiX}^{32(1)} = \mathbf{v}^1\mathbf{L}\left[\begin{pmatrix}\mathbf{0}\\ \mathbf{0}\\ \mathbf{f}^{32}\end{pmatrix}+\begin{pmatrix}\mathbf{0}\\ \mathbf{0}\\ \mathbf{z}^{32}\end{pmatrix}\right]$$

This finally enables us to calculate the particular terms in the bilateral decomposition which can easily be extended to any number of countries. Summing up these bilateral equations result in the aggregate results.

B Appendix Tables

Table B.1 - Decomposition results (in % of gross exports), 1995

	Value added exports				Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
AUS	87.4	20.8	58.8	7.8	12.6	0.1	0.2	87.8	12.2	3.0	9.2	12.2
AUT	75.6	24.0	42.5	9.0	24.4	0.3	0.3	76.1	23.9	8.1	15.7	23.9
BEL	60.2	22.6	30.6	6.9	39.8	0.4	0.7	61.3	38.7	16.4	22.3	38.7
BGR	67.5	30.6	32.0	5.0	32.5	0.0	0.0	67.6	32.4	12.2	20.2	32.4
BRA	91.8	22.2	60.0	9.6	8.2	0.1	0.2	92.1	7.9	1.9	6.0	7.9
CAN	73.9	23.7	45.9	4.3	26.1	0.5	0.6	74.9	25.1	11.9	13.1	25.1
CHN	83.6	45.6	32.1	5.9	16.4	0.1	0.4	84.2	15.8	9.0	6.9	15.8
CYP	73.1	41.2	28.4	3.5	26.9	0.0	0.0	73.1	26.9	15.8	11.1	26.9
CZE	69.2	22.0	39.2	8.0	30.8	0.2	0.7	70.1	29.9	9.8	20.1	29.9
DEU	79.4	34.5	37.2	7.6	20.6	1.6	1.9	82.9	17.1	7.4	9.7	17.1
DNK	73.4	38.1	29.6	5.8	26.6	0.1	0.2	73.7	26.3	13.1	13.2	26.3
ESP	78.7	37.7	33.7	7.4	21.3	0.3	0.4	79.4	20.6	10.5	10.1	20.6
EST	62.0	23.8	31.5	6.7	38.0	0.0	0.1	62.1	37.9	15.5	22.4	37.9
FIN	76.2	22.5	45.3	8.5	23.8	0.1	0.2	76.6	23.4	8.4	15.0	23.4
FRA	78.7	33.6	37.4	7.7	21.3	0.8	1.0	80.5	19.5	8.6	10.9	19.5
GBR	79.1	30.7	40.7	7.7	20.9	0.7	0.9	80.7	19.3	8.4	10.9	19.3
GRC	80.8	35.5	39.1	6.2	19.2	0.1	0.1	80.9	19.1	7.7	11.4	19.1
HUN	71.1	27.6	36.5	7.0	28.9	0.0	0.1	71.2	28.8	10.9	17.9	28.8
IDN	84.3	23.8	53.5	7.0	15.7	0.1	0.2	84.6	15.4	5.5	9.9	15.4
IND	89.4	37.3	45.7	6.3	10.6	0.0	0.1	89.5	10.5	4.0	6.5	10.5
IRL	61.3	31.0	25.5	4.8	38.7	0.0	0.1	61.5	38.5	20.6	18.0	38.5
ITA	80.3	39.8	33.6	6.9	19.7	0.4	0.6	81.3	18.7	9.1	9.6	18.7
JPN	91.8	36.2	47.8	7.8	8.2	0.8	1.1	93.7	6.3	2.4	4.0	6.3
KOR	75.5	27.9	39.5	8.0	24.5	0.2	0.4	76.0	24.0	8.5	15.5	24.0
LTU	67.0	25.5	35.4	6.0	33.0	0.0	0.0	67.1	32.9	11.8	21.1	32.9
LUX	54.7	10.6	36.9	7.2	45.3	0.1	0.1	54.9	45.1	7.7	37.4	45.1
LVA	74.9	21.3	46.7	6.9	25.1	0.0	0.0	74.9	25.1	7.6	17.5	25.1
MEX	73.5	25.5	42.6	5.4	26.5	0.1	0.3	73.9	26.1	13.9	12.2	26.1
MLT	49.1	17.2	26.7	5.3	50.9	0.0	0.0	49.2	50.8	13.6	37.2	50.8
NLD	67.5	27.4	33.2	6.8	32.5	0.4	0.6	68.6	31.4	13.1	18.3	31.4
POL	82.6	33.5	40.1	8.9	17.4	0.1	0.1	82.8	17.2	6.9	10.3	17.2
PRT	72.2	35.0	31.1	6.1	27.8	0.1	0.1	72.4	27.6	14.6	13.0	27.6
ROU	76.6	28.3	40.8	7.6	23.4	0.0	0.0	76.7	23.3	8.2	15.1	23.3
RUS	91.8	13.9	66.6	11.3	8.2	0.4	0.4	92.6	7.4	1.2	6.2	7.4
SVK	67.7	17.8	41.4	8.5	32.3	0.2	0.5	68.5	31.5	8.2	23.3	31.5
SVN	66.1	29.9	29.9	6.3	33.9	0.0	0.0	66.1	33.9	16.0	17.9	33.9
SWE	73.7	27.1	38.4	8.3	26.3	0.2	0.4	74.3	25.7	10.6	15.0	25.7
TUR	86.0	50.1	29.5	6.4	14.0	0.0	0.1	86.2	13.8	7.9	6.0	13.8
TWN	66.6	29.4	31.2	6.0	33.4	0.1	0.2	67.0	33.0	13.8	19.3	33.0
USA	82.6	28.3	48.3	6.0	17.4	4.1	3.7	90.4	9.6	3.6	6.0	9.6
ZROW	73.0	21.9	45.3	5.7	27.0	1.2	2.3	76.4	23.6	9.2	14.4	23.6
WORLD	78.3	29.9	41.6	6.9	21.7	1.2	1.4	80.9	19.1	8.0	11.1	19.1

Source: WIOD database; author's calculations

Table B.2 - Decomposition results (in % of gross exports), 1996

	Value added exports				Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
AUS	87.4	20.1	59.6	7.6	12.6	0.1	0.2	87.7	12.3	2.9	9.4	12.3
AUT	74.4	23.7	41.9	8.9	25.6	0.3	0.3	75.0	25.0	8.6	16.4	25.0
BEL	60.0	22.8	30.2	7.0	40.0	0.3	0.7	61.0	39.0	16.3	22.6	39.0
BGR	66.6	29.0	32.6	5.0	33.4	0.0	0.0	66.6	33.4	12.0	21.4	33.4
BRA	91.4	21.5	60.2	9.8	8.6	0.1	0.2	91.7	8.3	2.0	6.3	8.3
CAN	74.1	24.1	45.7	4.3	25.9	0.5	0.6	75.2	24.8	11.8	13.1	24.8
CHN	85.0	46.5	32.3	6.2	15.0	0.1	0.5	85.6	14.4	8.0	6.3	14.4
CYP	70.7	37.8	29.5	3.4	29.3	0.0	0.0	70.7	29.3	16.5	12.8	29.3
CZE	71.0	23.8	39.4	7.9	29.0	0.2	0.5	71.8	28.2	10.0	18.2	28.2
DEU	79.3	34.0	37.4	7.8	20.7	1.5	1.8	82.6	17.4	7.5	9.9	17.4
DNK	73.5	37.5	29.9	6.1	26.5	0.1	0.2	73.8	26.2	13.0	13.2	26.2
ESP	78.8	37.0	34.2	7.6	21.2	0.3	0.4	79.6	20.4	9.9	10.6	20.4
EST	62.4	23.1	32.0	7.3	37.6	0.0	0.1	62.5	37.5	14.9	22.6	37.5
FIN	75.7	24.1	43.2	8.3	24.3	0.1	0.2	76.0	24.0	8.7	15.3	24.0
FRA	78.1	34.1	36.4	7.6	21.9	0.8	1.0	79.9	20.1	9.1	11.0	20.1
GBR	78.4	29.9	40.8	7.7	21.6	0.8	0.9	80.1	19.9	8.6	11.3	19.9
GRC	80.6	35.5	39.1	6.1	19.4	0.1	0.1	80.7	19.3	7.7	11.6	19.3
HUN	70.2	26.1	36.8	7.3	29.8	0.0	0.1	70.3	29.7	11.1	18.6	29.7
IDN	85.2	24.7	53.4	7.1	14.8	0.1	0.2	85.5	14.5	5.2	9.3	14.5
IND	89.4	38.4	44.0	7.1	10.6	0.0	0.1	89.6	10.4	4.2	6.2	10.4
IRL	61.2	30.4	26.0	4.8	38.8	0.1	0.1	61.4	38.6	20.4	18.2	38.6
ITA	82.1	40.3	34.7	7.2	17.9	0.4	0.6	83.1	16.9	8.1	8.8	16.9
JPN	90.8	35.3	47.7	7.8	9.2	0.8	1.0	92.6	7.4	2.7	4.7	7.4
KOR	74.3	27.9	38.5	7.9	25.7	0.2	0.4	74.8	25.2	8.9	16.3	25.2
LTU	66.7	27.3	33.7	5.7	33.3	0.0	0.0	66.7	33.3	12.9	20.4	33.3
LUX	52.6	9.9	35.9	6.8	47.4	0.0	0.1	52.7	47.3	8.1	39.1	47.3
LVA	73.0	21.7	44.8	6.5	27.0	0.0	0.0	73.1	26.9	8.8	18.2	26.9
MEX	73.0	26.9	41.1	5.0	27.0	0.1	0.4	73.5	26.5	14.8	11.8	26.5
MLT	52.4	19.3	27.8	5.3	47.6	0.0	0.0	52.4	47.6	16.6	31.0	47.6
NLD	67.2	27.1	33.2	7.0	32.8	0.4	0.6	68.2	31.8	13.3	18.5	31.8
POL	81.3	33.0	40.0	8.3	18.7	0.1	0.1	81.6	18.4	7.5	10.9	18.4
PRT	72.3	36.6	29.8	5.9	27.7	0.1	0.1	72.5	27.5	15.3	12.1	27.5
ROU	74.5	28.7	38.8	6.9	25.5	0.0	0.0	74.5	25.5	9.5	16.0	25.5
RUS	92.6	14.1	67.1	11.4	7.4	0.4	0.4	93.3	6.7	1.1	5.6	6.7
SVK	62.7	17.3	37.4	8.0	37.3	0.2	0.4	63.4	36.6	9.8	26.9	36.6
SVN	66.9	31.1	29.5	6.4	33.1	0.0	0.0	67.0	33.0	16.4	16.6	33.0
SWE	74.6	29.2	37.3	8.1	25.4	0.2	0.4	75.2	24.8	10.8	14.0	24.8
TUR	84.3	48.9	29.3	6.2	15.7	0.1	0.1	84.5	15.5	8.8	6.7	15.5
TWN	67.6	28.1	32.7	6.8	32.4	0.1	0.3	68.0	32.0	12.6	19.4	32.0
USA	82.4	28.3	48.0	6.0	17.6	4.3	3.8	90.5	9.5	3.6	5.9	9.5
ZROW	73.1	21.8	45.5	5.8	26.9	1.2	2.4	76.6	23.4	9.4	14.0	23.4
WORLD	78.2	29.7	41.6	6.9	21.8	1.2	1.4	80.7	19.3	8.1	11.1	19.3

Source: WIOD database; author's calculations

Table B.3 - Decomposition results (in % of gross exports), 1997

	Value added exports				Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
AUS	87.1	20.4	59.3	7.4	12.9	0.2	0.2	87.4	12.6	3.0	9.6	12.6
AUT	73.5	24.2	40.6	8.7	26.5	0.3	0.3	74.1	25.9	9.3	16.6	25.9
BEL	59.5	21.9	30.2	7.3	40.5	0.3	0.7	60.5	39.5	15.7	23.8	39.5
BGR	62.7	27.2	30.5	5.1	37.3	0.0	0.0	62.8	37.2	12.5	24.7	37.2
BRA	91.3	22.4	59.6	9.3	8.7	0.1	0.2	91.6	8.4	2.2	6.2	8.4
CAN	72.6	23.9	44.5	4.2	27.4	0.5	0.7	73.8	26.2	12.4	13.8	26.2
CHN	85.3	43.8	35.3	6.2	14.7	0.1	0.6	85.9	14.1	7.5	6.6	14.1
CYP	69.1	34.0	31.9	3.3	30.9	0.0	0.0	69.2	30.8	15.2	15.6	30.8
CZE	68.0	23.6	36.3	8.1	32.0	0.1	0.5	68.6	31.4	11.5	19.9	31.4
DEU	78.3	33.2	37.6	7.5	21.7	1.4	1.7	81.4	18.6	8.0	10.6	18.6
DNK	73.3	36.6	30.5	6.2	26.7	0.2	0.2	73.6	26.4	12.9	13.5	26.4
ESP	77.5	35.5	34.3	7.7	22.5	0.4	0.5	78.3	21.7	10.3	11.4	21.7
EST	59.8	21.0	31.4	7.3	40.2	0.0	0.1	59.9	40.1	15.5	24.7	40.1
FIN	75.0	23.3	43.2	8.4	25.0	0.1	0.2	75.3	24.7	8.7	16.0	24.7
FRA	77.4	33.5	36.2	7.6	22.6	0.7	0.9	79.1	20.9	9.5	11.5	20.9
GBR	79.4	30.2	41.5	7.7	20.6	0.9	1.0	81.3	18.7	8.0	10.7	18.7
GRC	77.3	30.8	40.7	5.8	22.7	0.1	0.1	77.4	22.6	8.1	14.4	22.6
HUN	65.0	25.3	32.5	7.2	35.0	0.0	0.1	65.2	34.8	14.6	20.2	34.8
IDN	84.2	24.8	52.2	7.2	15.8	0.1	0.3	84.5	15.5	5.3	10.2	15.5
IND	89.5	36.4	45.8	7.3	10.5	0.0	0.1	89.6	10.4	3.9	6.5	10.4
IRL	61.3	28.6	27.6	5.1	38.7	0.1	0.1	61.5	38.5	19.2	19.3	38.5
ITA	81.4	38.7	35.4	7.3	18.6	0.5	0.6	82.5	17.5	8.2	9.3	17.5
JPN	90.3	35.1	47.6	7.6	9.7	0.7	1.0	91.9	8.1	3.0	5.1	8.1
KOR	71.6	26.1	38.1	7.4	28.4	0.1	0.4	72.2	27.8	9.2	18.6	27.8
LTU	65.6	26.2	33.8	5.7	34.4	0.0	0.1	65.7	34.3	12.8	21.5	34.3
LUX	48.1	9.4	32.4	6.3	51.9	0.0	0.1	48.2	51.8	9.1	42.7	51.8
LVA	73.8	23.7	43.6	6.5	26.2	0.0	0.0	73.8	26.2	9.1	17.1	26.2
MEX	71.4	29.3	37.5	4.7	28.6	0.2	0.4	72.0	28.0	16.3	11.7	28.0
MLT	54.7	20.9	28.5	5.4	45.3	0.0	0.0	54.7	45.3	16.0	29.3	45.3
NLD	66.2	25.8	33.5	6.9	33.8	0.4	0.6	67.2	32.8	13.4	19.4	32.8
POL	81.0	33.2	39.1	8.7	19.0	0.1	0.2	81.3	18.7	7.8	10.9	18.7
PRT	71.9	35.4	30.4	6.1	28.1	0.1	0.1	72.1	27.9	15.2	12.7	27.9
ROU	74.0	28.2	38.9	7.0	26.0	0.0	0.0	74.1	25.9	10.3	15.6	25.9
RUS	92.2	14.2	66.2	11.9	7.8	0.4	0.5	93.1	6.9	1.1	5.7	6.9
SVK	62.2	18.8	35.1	8.3	37.8	0.2	0.4	62.8	37.2	11.7	25.6	37.2
SVN	66.1	30.4	29.3	6.5	33.9	0.0	0.0	66.2	33.8	16.9	16.9	33.8
SWE	73.2	27.5	37.9	7.7	26.8	0.2	0.3	73.7	26.3	11.2	15.1	26.3
TUR	82.5	48.1	28.2	6.1	17.5	0.1	0.1	82.7	17.3	9.7	7.6	17.3
TWN	66.6	25.7	34.1	6.8	33.4	0.1	0.3	67.0	33.0	12.3	20.7	33.0
USA	82.0	28.8	47.7	5.5	18.0	4.5	3.9	90.4	9.6	3.7	5.9	9.6
ZROW	75.6	20.1	49.4	6.2	24.4	1.0	2.4	79.1	20.9	8.2	12.8	20.9
WORLD	78.1	29.3	42.0	6.8	21.9	1.2	1.4	80.7	19.3	8.0	11.3	19.3

Source: WIOD database; author's calculations

Table B.4 - Decomposition results (in % of gross exports), 1998

		Value added exports			Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
AUS	86.9	22.1	56.3	8.5	13.1	0.2	0.3	87.4	12.6	3.3	9.4	12.6
AUT	72.9	24.3	39.2	9.4	27.1	0.3	0.3	73.5	26.5	9.5	17.0	26.5
BEL	60.0	22.8	29.6	7.6	40.0	0.3	0.7	61.1	38.9	16.2	22.8	38.9
BGR	67.9	28.6	33.3	6.0	32.1	0.0	0.0	68.0	32.0	11.4	20.6	32.0
BRA	91.0	25.3	56.0	9.7	9.0	0.1	0.2	91.3	8.7	2.7	6.0	8.7
CAN	71.5	25.0	42.4	4.1	28.5	0.5	0.6	72.6	27.4	13.3	14.1	27.4
CHN	86.4	44.2	35.3	7.0	13.6	0.2	0.5	87.2	12.8	6.9	6.0	12.8
CYP	71.6	35.4	32.5	3.8	28.4	0.0	0.0	71.6	28.4	13.8	14.5	28.4
CZE	67.1	23.8	34.6	8.6	32.9	0.2	0.4	67.7	32.3	12.6	19.7	32.3
DEU	77.6	34.3	35.4	7.8	22.4	1.6	1.9	81.0	19.0	8.5	10.5	19.0
DNK	72.7	36.5	29.7	6.5	27.3	0.1	0.2	73.0	27.0	13.2	13.8	27.0
ESP	76.7	37.0	31.9	7.8	23.3	0.4	0.5	77.5	22.5	11.5	11.0	22.5
EST	58.0	20.1	30.6	7.3	42.0	0.0	0.1	58.1	41.9	16.4	25.5	41.9
FIN	76.3	25.5	41.5	9.3	23.7	0.2	0.2	76.8	23.2	8.8	14.4	23.2
FRA	76.7	34.2	34.7	7.8	23.3	0.8	1.0	78.4	21.6	10.2	11.4	21.6
GBR	80.5	31.1	41.1	8.3	19.5	1.0	1.1	82.5	17.5	7.7	9.8	17.5
GRC	77.6	31.3	40.1	6.2	22.4	0.1	0.1	77.7	22.3	7.8	14.5	22.3
HUN	59.8	23.5	28.9	7.4	40.2	0.0	0.1	60.0	40.0	16.8	23.2	40.0
IDN	78.4	22.6	48.3	7.5	21.6	0.0	0.2	78.6	21.4	8.2	13.2	21.4
IND	88.5	37.1	43.7	7.7	11.5	0.0	0.1	88.6	11.4	4.5	6.9	11.4
IRL	60.4	25.9	28.9	5.7	39.6	0.1	0.1	60.6	39.4	19.1	20.3	39.4
ITA	81.1	39.8	33.6	7.8	18.9	0.5	0.6	82.3	17.7	8.6	9.1	17.7
JPN	91.1	39.6	43.1	8.4	8.9	0.6	0.8	92.5	7.5	3.1	4.4	7.5
KOR	71.5	27.5	36.3	7.7	28.5	0.1	0.3	71.9	28.1	9.9	18.3	28.1
LTU	66.7	27.2	33.8	5.8	33.3	0.0	0.1	66.8	33.2	12.5	20.6	33.2
LUX	45.8	9.4	30.1	6.3	54.2	0.0	0.1	45.9	54.1	9.9	44.2	54.1
LVA	71.2	21.3	43.4	6.5	28.8	0.0	0.1	71.3	28.7	9.6	19.1	28.7
MEX	70.0	30.2	35.2	4.7	30.0	0.2	0.4	70.6	29.4	17.5	12.0	29.4
MLT	52.9	17.6	29.5	5.8	47.1	0.0	0.0	52.9	47.1	12.5	34.6	47.1
NLD	67.0	26.5	33.1	7.3	33.0	0.4	0.6	67.9	32.1	13.5	18.6	32.1
POL	78.5	32.9	36.9	8.8	21.5	0.1	0.2	78.9	21.1	9.3	11.8	21.1
PRT	71.4	34.3	30.6	6.6	28.6	0.1	0.1	71.7	28.3	15.1	13.2	28.3
ROU	76.3	28.9	39.5	7.9	23.7	0.0	0.1	76.4	23.6	10.2	13.4	23.6
RUS	90.5	14.2	64.3	12.0	9.5	0.3	0.4	91.2	8.8	1.5	7.3	8.8
SVK	60.0	20.6	31.2	8.2	40.0	0.2	0.3	60.4	39.6	15.5	24.0	39.6
SVN	65.3	29.7	28.6	7.1	34.7	0.0	0.0	65.4	34.6	17.2	17.4	34.6
SWE	72.2	27.8	36.3	8.1	27.8	0.2	0.4	72.7	27.3	11.7	15.5	27.3
TUR	83.0	46.8	28.9	7.4	17.0	0.1	0.1	83.2	16.8	8.9	7.9	16.8
TWN	66.6	27.0	32.4	7.2	33.4	0.1	0.3	67.0	33.0	13.0	19.9	33.0
USA	81.8	29.6	46.1	6.0	18.2	5.1	4.2	91.0	9.0	3.5	5.5	9.0
ZROW	74.7	23.0	45.2	6.4	25.3	1.1	2.1	77.8	22.2	9.2	13.0	22.2
WORLD	77.6	30.6	39.7	7.3	22.4	1.3	1.4	80.3	19.7	8.6	11.2	19.7

Source: WIOD database; author's calculations

Table B.5 - Decomposition results (in % of gross exports), 1999

		Value added exports			Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
AUS	86.5	23.6	54.8	8.1	13.5	0.2	0.2	87.0	13.0	3.7	9.3	13.0
AUT	73.0	24.6	38.8	9.7	27.0	0.3	0.3	73.6	26.4	9.7	16.6	26.4
BEL	60.3	22.2	30.6	7.6	39.7	0.3	0.6	61.3	38.7	15.6	23.1	38.7
BGR	62.5	24.7	32.0	5.7	37.5	0.0	0.0	62.5	37.5	13.3	24.1	37.5
BRA	88.7	26.1	52.8	9.8	11.3	0.1	0.1	89.0	11.0	3.8	7.3	11.0
CAN	71.5	26.5	41.2	3.9	28.5	0.5	0.6	72.7	27.3	13.6	13.7	27.3
CHN	84.7	42.9	34.3	7.5	15.3	0.2	0.6	85.5	14.5	7.7	6.8	14.5
CYP	71.5	34.3	32.7	4.5	28.5	0.0	0.0	71.5	28.5	12.7	15.7	28.5
CZE	66.2	23.0	33.9	9.2	33.8	0.1	0.4	66.7	33.3	12.7	20.7	33.3
DEU	76.7	34.3	34.5	8.0	23.3	1.6	1.9	80.2	19.8	9.0	10.8	19.8
DNK	72.8	35.7	30.2	6.9	27.2	0.2	0.2	73.2	26.8	12.9	13.9	26.8
ESP	75.6	35.4	32.2	8.0	24.4	0.5	0.5	76.5	23.5	11.6	11.8	23.5
EST	58.5	20.0	31.0	7.5	41.5	0.0	0.1	58.6	41.4	16.3	25.1	41.4
FIN	76.4	22.8	43.6	9.9	23.6	0.2	0.2	76.7	23.3	7.9	15.3	23.3
FRA	76.9	33.9	34.7	8.3	23.1	0.8	1.0	78.7	21.3	9.8	11.5	21.3
GBR	80.6	29.6	42.4	8.6	19.4	1.0	1.1	82.7	17.3	7.3	10.0	17.3
GRC	75.1	27.4	41.4	6.4	24.9	0.1	0.1	75.2	24.8	7.8	16.9	24.8
HUN	57.3	23.4	26.4	7.4	42.7	0.1	0.1	57.4	42.6	19.6	23.0	42.6
IDN	83.1	24.2	50.7	8.3	16.9	0.0	0.2	83.3	16.7	6.4	10.3	16.7
IND	86.9	38.5	40.7	7.8	13.1	0.0	0.1	87.1	12.9	5.3	7.6	12.9
IRL	59.0	24.2	29.0	5.7	41.0	0.1	0.1	59.2	40.8	18.3	22.5	40.8
ITA	81.1	39.7	33.2	8.2	18.9	0.6	0.6	82.3	17.7	8.6	9.1	17.7
JPN	91.1	39.5	42.4	9.1	8.9	0.7	0.9	92.7	7.3	3.1	4.2	7.3
KOR	72.1	28.9	35.2	8.0	27.9	0.1	0.4	72.5	27.5	10.3	17.2	27.5
LTU	68.9	28.3	34.2	6.4	31.1	0.0	0.1	69.0	31.0	12.4	18.5	31.0
LUX	45.1	8.6	30.4	6.0	54.9	0.0	0.1	45.2	54.8	9.3	45.5	54.8
LVA	74.4	19.7	46.8	8.0	25.6	0.0	0.1	74.5	25.5	7.5	18.0	25.5
MEX	69.2	29.5	34.9	4.8	30.8	0.2	0.4	69.8	30.2	17.9	12.3	30.2
MLT	51.5	16.9	28.4	6.2	48.5	0.0	0.0	51.5	48.5	13.2	35.3	48.5
NLD	66.7	26.6	33.0	7.2	33.3	0.4	0.5	67.6	32.4	13.7	18.7	32.4
POL	78.5	32.4	36.6	9.5	21.5	0.1	0.2	78.8	21.2	9.1	12.1	21.2
PRT	71.7	33.9	31.0	6.9	28.3	0.1	0.1	72.0	28.0	14.5	13.4	28.0
ROU	76.3	29.4	39.0	7.9	23.7	0.0	0.0	76.4	23.6	10.7	12.9	23.6
RUS	89.2	14.3	62.6	12.3	10.8	0.2	0.2	89.6	10.4	1.9	8.5	10.4
SVK	60.9	21.6	30.6	8.7	39.1	0.1	0.3	61.3	38.7	15.4	23.3	38.7
SVN	65.9	30.3	28.1	7.6	34.1	0.0	0.0	66.0	34.0	17.1	16.9	34.0
SWE	71.5	27.2	36.0	8.3	28.5	0.2	0.3	72.1	27.9	12.2	15.8	27.9
TUR	82.6	47.2	28.0	7.4	17.4	0.1	0.1	82.7	17.3	9.5	7.7	17.3
TWN	67.0	27.2	32.2	7.6	33.0	0.2	0.3	67.4	32.6	12.9	19.7	32.6
USA	80.3	28.9	45.0	6.4	19.7	5.7	4.6	90.5	9.5	3.6	5.8	9.5
ZROW	73.2	22.2	44.7	6.3	26.8	1.0	2.3	76.5	23.5	9.7	13.8	23.5
WORLD	76.8	30.0	39.4	7.4	23.2	1.4	1.5	79.7	20.3	8.8	11.5	20.3

Source: WIOD database; author's calculations

Table B.6 - Decomposition results (in % of gross exports), 2000

		Value added exports			Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
AUS	86.3	20.0	57.3	9.0	13.7	0.2	0.2	86.7	13.3	3.3	10.0	13.3
AUT	71.2	23.6	37.4	10.2	28.8	0.3	0.3	71.8	28.2	10.2	18.0	28.2
BEL	57.6	20.6	29.3	7.6	42.4	0.3	0.6	58.5	41.5	16.3	25.2	41.5
BGR	63.4	24.7	32.2	6.6	36.6	0.0	0.0	63.5	36.5	11.4	25.1	36.5
BRA	87.7	27.5	49.7	10.5	12.3	0.1	0.2	88.0	12.0	4.4	7.6	12.0
CAN	71.9	25.4	42.3	4.2	28.1	0.5	0.7	73.0	27.0	13.2	13.8	27.0
CHN	81.7	39.5	34.1	8.1	18.3	0.2	0.8	82.7	17.3	8.7	8.6	17.3
CYP	67.7	30.4	32.5	4.8	32.3	0.0	0.0	67.7	32.3	13.0	19.3	32.3
CZE	61.2	21.1	31.2	8.9	38.8	0.1	0.3	61.6	38.4	14.8	23.6	38.4
DEU	74.3	32.1	33.9	8.3	25.7	1.6	1.9	77.8	22.2	9.6	12.6	22.2
DNK	69.5	30.7	31.4	7.4	30.5	0.2	0.4	70.0	30.0	12.9	17.0	30.0
ESP	71.8	32.8	31.0	8.0	28.2	0.4	0.6	72.8	27.2	13.1	14.1	27.2
EST	55.4	16.7	30.1	8.5	44.6	0.0	0.1	55.5	44.5	14.5	30.0	44.5
FIN	72.1	19.9	41.6	10.7	27.9	0.1	0.2	72.5	27.5	8.9	18.7	27.5
FRA	73.8	31.3	33.9	8.6	26.2	0.8	1.0	75.6	24.4	10.7	13.7	24.4
GBR	78.8	28.0	41.7	9.2	21.2	1.0	1.2	81.1	18.9	7.9	11.0	18.9
GRC	69.2	23.9	38.6	6.7	30.8	0.1	0.1	69.3	30.7	9.2	21.5	30.7
HUN	51.8	20.4	24.3	7.1	48.2	0.0	0.1	52.0	48.0	21.7	26.3	48.0
IDN	80.6	23.6	48.1	9.0	19.4	0.1	0.2	80.9	19.1	7.2	11.9	19.1
IND	85.2	36.9	39.9	8.4	14.8	0.0	0.2	85.4	14.6	5.7	8.9	14.6
IRL	55.0	21.3	28.2	5.5	45.0	0.1	0.2	55.2	44.8	19.6	25.2	44.8
ITA	78.0	37.4	32.0	8.5	22.0	0.6	0.6	79.2	20.8	9.8	11.1	20.8
JPN	89.5	37.0	42.5	10.1	10.5	0.9	1.1	91.5	8.5	3.4	5.1	8.5
KOR	69.7	28.8	32.3	8.5	30.3	0.1	0.4	70.2	29.8	11.2	18.6	29.8
LTU	66.0	27.4	32.1	6.5	34.0	0.0	0.0	66.1	33.9	13.4	20.5	33.9
LUX	41.5	8.3	27.6	5.7	58.5	0.0	0.1	41.7	58.3	10.3	48.0	58.3
LVA	73.8	20.5	45.1	8.1	26.2	0.0	0.0	73.8	26.2	8.0	18.2	26.2
MEX	68.9	28.2	35.4	5.3	31.1	0.2	0.5	69.6	30.4	18.1	12.3	30.4
MLT	47.4	14.7	26.1	6.7	52.6	0.0	0.0	47.4	52.6	13.0	39.6	52.6
NLD	64.6	25.4	31.7	7.5	35.4	0.3	0.6	65.5	34.5	14.3	20.2	34.5
POL	73.3	28.5	34.5	10.3	26.7	0.1	0.3	73.7	26.3	10.5	15.8	26.3
PRT	69.7	31.2	30.8	7.6	30.3	0.2	0.2	70.0	30.0	14.5	15.5	30.0
ROU	73.2	27.5	37.1	8.5	26.8	0.0	0.1	73.3	26.7	11.0	15.8	26.7
RUS	89.3	13.1	62.7	13.4	10.7	0.2	0.4	89.9	10.1	1.5	8.6	10.1
SVK	57.0	20.3	28.3	8.4	43.0	0.1	0.2	57.3	42.7	16.4	26.3	42.7
SVN	63.0	26.6	28.1	8.2	37.0	0.0	0.0	63.1	36.9	16.6	20.3	36.9
SWE	69.6	24.6	35.9	9.1	30.4	0.2	0.4	70.2	29.8	11.9	17.9	29.8
TUR	79.9	43.4	28.1	8.4	20.1	0.1	0.2	80.1	19.9	10.1	9.8	19.9
TWN	63.4	25.0	30.2	8.2	36.6	0.2	0.4	64.0	36.0	13.8	22.2	36.0
USA	78.3	28.5	43.2	6.7	21.7	6.0	5.0	89.4	10.6	4.0	6.6	10.6
ZROW	71.5	18.9	45.9	6.7	28.5	1.0	2.4	75.0	25.0	9.9	15.1	25.0
WORLD	74.7	27.8	39.1	7.8	25.3	1.4	1.7	77.8	22.2	9.3	12.9	22.2

Source: WIOD database; author's calculations

Table B.7 - Decomposition results (in % of gross exports), 2001

		Value added exports			Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
AUS	86.9	20.7	56.7	9.5	13.1	0.2	0.2	87.3	12.7	3.3	9.5	12.7
AUT	70.4	24.1	36.1	10.1	29.6	0.3	0.3	71.0	29.0	11.0	18.0	29.0
BEL	57.9	21.5	28.9	7.6	42.1	0.3	0.6	58.8	41.2	17.0	24.1	41.2
BGR	64.6	24.5	33.4	6.8	35.4	0.0	0.0	64.7	35.3	11.4	24.0	35.3
BRA	86.2	27.6	48.2	10.3	13.8	0.1	0.2	86.5	13.5	5.1	8.4	13.5
CAN	72.7	25.6	42.8	4.3	27.3	0.5	0.6	73.8	26.2	12.6	13.6	26.2
CHN	82.3	40.3	33.9	8.1	17.7	0.3	0.9	83.5	16.5	8.5	8.1	16.5
CYP	68.6	30.4	33.0	5.2	31.4	0.0	0.0	68.6	31.4	13.1	18.3	31.4
CZE	59.6	21.0	29.5	9.1	40.4	0.1	0.4	60.1	39.9	15.6	24.3	39.9
DEU	74.5	33.0	33.2	8.3	25.5	1.5	1.9	77.9	22.1	9.8	12.3	22.1
DNK	68.3	31.2	29.9	7.3	31.7	0.2	0.3	68.8	31.2	13.6	17.6	31.2
ESP	73.4	32.9	31.9	8.6	26.6	0.4	0.6	74.4	25.6	12.2	13.4	25.6
EST	52.4	16.3	27.9	8.2	47.6	0.0	0.1	52.5	47.5	15.4	32.2	47.5
FIN	74.4	20.5	42.9	11.0	25.6	0.1	0.2	74.8	25.2	7.9	17.3	25.2
FRA	74.3	32.7	32.9	8.7	25.7	0.8	1.0	76.1	23.9	10.9	13.0	23.9
GBR	79.3	27.3	42.3	9.7	20.7	1.1	1.2	81.6	18.4	7.4	11.0	18.4
GRC	67.3	24.4	36.1	6.8	32.7	0.1	0.1	67.5	32.5	9.7	22.8	32.5
HUN	53.7	20.9	25.3	7.5	46.3	0.0	0.1	53.9	46.1	20.1	26.1	46.1
IDN	79.2	23.3	46.9	9.1	20.8	0.1	0.2	79.5	20.5	7.6	12.9	20.5
IND	85.5	36.8	40.3	8.4	14.5	0.1	0.2	85.7	14.3	5.9	8.4	14.3
IRL	54.6	20.7	28.3	5.6	45.4	0.1	0.2	54.8	45.2	19.4	25.8	45.2
ITA	78.5	38.1	31.6	8.8	21.5	0.6	0.6	79.7	20.3	9.7	10.6	20.3
JPN	89.0	36.7	42.1	10.3	11.0	0.8	1.0	90.8	9.2	3.7	5.6	9.2
KOR	70.4	30.0	32.1	8.2	29.6	0.1	0.4	70.9	29.1	11.5	17.6	29.1
LTU	64.7	26.8	31.2	6.7	35.3	0.0	0.0	64.8	35.2	14.2	21.0	35.2
LUX	40.8	8.5	26.2	6.1	59.2	0.0	0.1	41.0	59.0	10.7	48.3	59.0
LVA	73.7	21.9	43.2	8.7	26.3	0.0	0.0	73.8	26.2	8.5	17.7	26.2
MEX	69.0	30.7	33.2	5.1	31.0	0.2	0.5	69.7	30.3	19.0	11.3	30.3
MLT	53.3	17.9	28.1	7.2	46.7	0.0	0.0	53.3	46.7	14.4	32.3	46.7
NLD	66.1	25.5	32.5	8.1	33.9	0.3	0.6	67.1	32.9	13.8	19.2	32.9
POL	74.2	28.8	34.6	10.8	25.8	0.1	0.3	74.6	25.4	10.1	15.3	25.4
PRT	70.2	31.4	30.7	8.0	29.8	0.2	0.2	70.5	29.5	14.3	15.2	29.5
ROU	71.5	27.9	35.1	8.4	28.5	0.0	0.1	71.6	28.4	12.5	15.9	28.4
RUS	89.6	11.6	64.3	13.7	10.4	0.2	0.4	90.2	9.8	1.4	8.4	9.8
SVK	53.9	19.4	26.5	8.1	46.1	0.1	0.2	54.2	45.8	19.1	26.6	45.8
SVN	62.9	27.6	27.0	8.3	37.1	0.0	0.0	63.0	37.0	17.4	19.6	37.0
SWE	69.7	24.5	36.1	9.1	30.3	0.2	0.3	70.2	29.8	12.0	17.8	29.8
TUR	78.0	42.0	27.6	8.4	22.0	0.1	0.1	78.2	21.8	10.8	11.0	21.8
TWN	65.2	26.9	29.9	8.5	34.8	0.2	0.4	65.8	34.2	13.5	20.8	34.2
USA	79.6	28.9	43.7	7.1	20.4	5.9	4.7	90.2	9.8	3.7	6.1	9.8
ZROW	71.7	20.5	44.5	6.7	28.3	1.1	2.4	75.3	24.7	10.0	14.8	24.7
WORLD	75.0	28.4	38.6	8.0	25.0	1.4	1.6	78.0	22.0	9.4	12.7	22.0

Source: WIOD database; author's calculations

Table B.8 - Decomposition results (in % of gross exports), 2002

		Value added exports			Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
AUS	86.9	21.1	56.2	9.6	13.1	0.2	0.2	87.3	12.7	3.3	9.4	12.7
AUT	71.1	25.3	35.8	10.0	28.9	0.2	0.3	71.7	28.3	11.2	17.1	28.3
BEL	59.9	22.4	29.9	7.6	40.1	0.2	0.5	60.7	39.3	16.4	22.9	39.3
BGR	66.1	24.8	34.2	7.1	33.9	0.0	0.0	66.2	33.8	12.1	21.7	33.8
BRA	86.8	29.4	47.2	10.2	13.2	0.1	0.1	87.0	13.0	5.0	8.0	13.0
CAN	73.7	26.3	43.1	4.3	26.3	0.5	0.6	74.7	25.3	12.3	13.0	25.3
CHN	80.8	39.5	33.3	7.9	19.2	0.4	1.0	82.1	17.9	9.2	8.7	17.9
CYP	70.5	33.3	32.1	5.0	29.5	0.0	0.0	70.5	29.5	12.6	16.9	29.5
CZE	60.2	21.9	28.7	9.6	39.8	0.1	0.4	60.7	39.3	15.7	23.7	39.3
DEU	75.8	33.8	33.8	8.2	24.2	1.5	1.8	79.2	20.8	9.4	11.4	20.8
DNK	70.1	32.3	30.3	7.5	29.9	0.2	0.3	70.6	29.4	13.1	16.3	29.4
ESP	74.5	34.3	31.8	8.5	25.5	0.4	0.6	75.5	24.5	11.9	12.5	24.5
EST	56.0	18.5	29.7	7.8	44.0	0.0	0.1	56.1	43.9	15.3	28.6	43.9
FIN	74.7	20.7	42.9	11.1	25.3	0.1	0.3	75.0	25.0	7.7	17.2	25.0
FRA	75.2	33.1	33.2	8.8	24.8	0.8	0.9	76.9	23.1	10.5	12.6	23.1
GBR	80.5	28.0	43.1	9.5	19.5	1.0	1.0	82.6	17.4	7.3	10.1	17.4
GRC	69.7	25.0	37.8	7.0	30.3	0.1	0.1	69.9	30.1	9.5	20.6	30.1
HUN	56.0	21.5	26.6	7.9	44.0	0.1	0.1	56.2	43.8	18.9	24.9	43.8
IDN	81.5	23.1	48.8	9.7	18.5	0.1	0.2	81.8	18.2	6.5	11.8	18.2
IND	84.9	35.2	41.0	8.7	15.1	0.1	0.2	85.2	14.8	6.3	8.4	14.8
IRL	58.1	23.9	28.9	5.3	41.9	0.0	0.1	58.3	41.7	19.4	22.3	41.7
ITA	79.3	38.9	31.6	8.8	20.7	0.6	0.6	80.6	19.4	9.4	10.0	19.4
JPN	89.1	37.4	41.4	10.3	10.9	0.8	0.9	90.8	9.2	3.7	5.5	9.2
KOR	71.3	30.9	31.8	8.6	28.7	0.2	0.4	71.8	28.2	11.3	16.9	28.2
LTU	66.0	25.8	32.6	7.5	34.0	0.0	0.1	66.1	33.9	13.5	20.4	33.9
LUX	41.9	9.8	26.7	5.4	58.1	0.0	0.1	42.0	58.0	13.0	45.0	58.0
LVA	73.9	22.6	42.6	8.7	26.1	0.0	0.0	74.0	26.0	8.6	17.4	26.0
MEX	69.4	30.4	34.0	5.0	30.6	0.2	0.4	70.0	30.0	18.5	11.5	30.0
MLT	55.4	19.6	28.3	7.5	44.6	0.0	0.0	55.4	44.6	14.6	30.0	44.6
NLD	67.7	26.9	32.6	8.1	32.3	0.4	0.6	68.6	31.4	13.3	18.1	31.4
POL	73.2	29.2	33.1	10.9	26.8	0.2	0.2	73.6	26.4	10.8	15.6	26.4
PRT	71.0	31.9	31.0	8.1	29.0	0.2	0.2	71.3	28.7	13.8	14.9	28.7
ROU	71.5	28.1	34.9	8.4	28.5	0.0	0.1	71.6	28.4	13.1	15.4	28.4
RUS	90.5	11.5	64.4	14.6	9.5	0.2	0.3	91.0	9.0	1.3	7.6	9.0
SVK	54.3	19.9	26.0	8.3	45.7	0.1	0.2	54.6	45.4	19.5	25.9	45.4
SVN	63.6	27.9	27.2	8.4	36.4	0.0	0.0	63.6	36.4	17.2	19.1	36.4
SWE	70.9	26.3	35.8	8.8	29.1	0.2	0.3	71.5	28.5	12.0	16.5	28.5
TUR	76.5	43.5	25.2	7.8	23.5	0.1	0.1	76.7	23.3	12.2	11.1	23.3
TWN	64.5	23.2	32.0	9.3	35.5	0.2	0.4	65.1	34.9	12.2	22.8	34.9
USA	80.2	28.5	44.4	7.3	19.8	5.8	4.5	90.6	9.4	3.6	5.9	9.4
ZROW	69.8	21.2	42.1	6.5	30.2	1.2	2.7	73.7	26.3	10.7	15.6	26.3
WORLD	75.3	28.9	38.3	8.0	24.7	1.4	1.6	78.2	21.8	9.4	12.4	21.8

Source: WIOD database; author's calculations

Table B.9 - Decomposition results (in % of gross exports), 2003

	Value added exports				Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
AUS	87.4	21.5	56.0	9.8	12.6	0.2	0.2	87.8	12.2	3.0	9.2	12.2
AUT	70.5	24.3	36.2	10.0	29.5	0.3	0.4	71.1	28.9	11.0	17.9	28.9
BEL	60.7	22.7	30.3	7.7	39.3	0.3	0.5	61.4	38.6	16.0	22.6	38.6
BGR	64.3	22.1	34.1	8.1	35.7	0.0	0.0	64.4	35.6	11.2	24.4	35.6
BRA	87.4	28.1	48.5	10.8	12.6	0.1	0.1	87.6	12.4	4.6	7.8	12.4
CAN	75.0	25.9	44.6	4.5	25.0	0.5	0.6	76.2	23.8	11.4	12.4	23.8
CHN	77.1	38.0	31.4	7.7	22.9	0.4	1.2	78.8	21.2	10.9	10.3	21.2
CYP	70.5	31.5	33.8	5.2	29.5	0.0	0.0	70.5	29.5	12.1	17.4	29.5
CZE	59.3	20.9	28.4	9.9	40.7	0.2	0.4	59.8	40.2	15.2	25.0	40.2
DEU	75.2	33.5	33.5	8.2	24.8	1.6	2.0	78.7	21.3	9.6	11.7	21.3
DNK	70.6	31.7	31.3	7.7	29.4	0.2	0.4	71.1	28.9	12.6	16.2	28.9
ESP	74.6	33.6	32.3	8.7	25.4	0.5	0.6	75.7	24.3	11.5	12.8	24.3
EST	57.4	18.0	31.6	7.8	42.6	0.0	0.1	57.5	42.5	15.4	27.1	42.5
FIN	74.9	21.8	42.3	10.9	25.1	0.1	0.2	75.3	24.7	7.7	17.0	24.7
FRA	75.6	33.4	33.4	8.8	24.4	0.8	1.0	77.4	22.6	10.3	12.3	22.6
GBR	80.6	28.1	43.0	9.6	19.4	1.0	1.0	82.6	17.4	7.4	10.1	17.4
GRC	73.4	24.5	41.3	7.6	26.6	0.1	0.1	73.5	26.5	8.0	18.5	26.5
HUN	55.8	20.7	26.4	8.7	44.2	0.1	0.2	56.1	43.9	18.0	26.0	43.9
IDN	82.9	21.0	51.3	10.5	17.1	0.1	0.2	83.1	16.9	5.3	11.6	16.9
IND	85.2	32.1	43.8	9.3	14.8	0.1	0.3	85.6	14.4	5.9	8.5	14.4
IRL	59.2	22.9	30.8	5.4	40.8	0.0	0.1	59.3	40.7	18.0	22.6	40.7
ITA	79.2	38.8	31.5	8.9	20.8	0.6	0.7	80.5	19.5	9.4	10.2	19.5
JPN	89.0	36.6	41.5	10.8	11.0	0.8	1.0	90.8	9.2	3.7	5.6	9.2
KOR	69.5	29.9	31.0	8.6	30.5	0.2	0.5	70.2	29.8	11.7	18.2	29.8
LTU	66.2	27.6	32.1	6.6	33.8	0.0	0.0	66.3	33.7	13.4	20.3	33.7
LUX	44.6	10.6	28.3	5.7	55.4	0.0	0.1	44.7	55.3	12.5	42.8	55.3
LVA	71.7	20.6	42.5	8.6	28.3	0.0	0.0	71.8	28.2	8.7	19.5	28.2
MEX	69.0	28.7	35.0	5.2	31.0	0.2	0.4	69.6	30.4	18.3	12.1	30.4
MLT	56.0	19.0	29.3	7.7	44.0	0.0	0.0	56.0	44.0	13.5	30.5	44.0
NLD	67.8	26.6	32.9	8.3	32.2	0.4	0.6	68.8	31.2	13.0	18.2	31.2
POL	70.8	27.9	31.9	11.0	29.2	0.2	0.3	71.3	28.7	11.4	17.3	28.7
PRT	70.8	31.3	31.5	8.1	29.2	0.2	0.2	71.2	28.8	13.5	15.3	28.8
ROU	70.7	27.3	34.9	8.5	29.3	0.0	0.1	70.8	29.2	13.0	16.2	29.2
RUS	89.8	11.2	64.0	14.6	10.2	0.2	0.4	90.3	9.7	1.4	8.3	9.7
SVK	53.0	20.6	24.0	8.4	47.0	0.1	0.2	53.3	46.7	21.6	25.1	46.7
SVN	64.0	26.5	28.8	8.7	36.0	0.0	0.1	64.1	35.9	15.9	20.0	35.9
SWE	71.3	26.9	35.5	9.0	28.7	0.2	0.4	71.9	28.1	11.7	16.4	28.1
TUR	75.7	43.2	24.8	7.7	24.3	0.1	0.2	75.9	24.1	12.5	11.5	24.1
TWN	61.7	20.6	31.3	9.9	38.3	0.2	0.4	62.4	37.6	11.6	26.0	37.6
USA	80.4	28.3	44.6	7.5	19.6	5.5	4.3	90.2	9.8	3.7	6.1	9.8
ZROW	68.7	19.7	42.5	6.5	31.3	1.2	3.0	72.9	27.1	10.6	16.5	27.1
WORLD	74.7	28.3	38.3	8.2	25.3	1.3	1.6	77.6	22.4	9.4	13.0	22.4

Source: WIOD database; author's calculations

Table B.10 - Decomposition results (in % of gross exports), 2004

	Value added exports				Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
AUS	86.5	19.6	57.0	9.9	13.5	0.2	0.3	87.0	13.0	3.1	9.9	13.0
AUT	68.4	23.4	35.2	9.9	31.6	0.3	0.4	69.1	30.9	11.8	19.1	30.9
BEL	59.5	21.5	30.1	7.9	40.5	0.3	0.6	60.3	39.7	15.8	23.9	39.7
BGR	61.5	21.8	32.0	7.7	38.5	0.0	0.0	61.6	38.4	12.5	25.8	38.4
BRA	86.9	27.7	48.4	10.7	13.1	0.1	0.2	87.1	12.9	4.7	8.2	12.9
CAN	74.2	24.2	45.6	4.4	25.8	0.5	0.6	75.4	24.6	11.3	13.4	24.6
CHN	72.8	33.9	31.3	7.6	27.2	0.4	1.5	74.7	25.3	12.0	13.4	25.3
CYP	73.6	32.2	35.4	6.0	26.4	0.0	0.0	73.6	26.4	11.5	14.9	26.4
CZE	57.1	19.9	27.6	9.7	42.9	0.2	0.4	57.6	42.4	15.6	26.8	42.4
DEU	73.8	31.5	33.9	8.4	26.2	1.5	2.1	77.4	22.6	9.7	12.9	22.6
DNK	70.1	29.7	32.5	7.9	29.9	0.2	0.4	70.7	29.3	12.3	17.1	29.3
ESP	73.3	32.4	32.2	8.7	26.7	0.5	0.7	74.4	25.6	11.9	13.7	25.6
EST	58.4	16.8	33.3	8.3	41.6	0.0	0.1	58.6	41.4	13.2	28.3	41.4
FIN	72.6	18.3	43.1	11.2	27.4	0.1	0.3	73.0	27.0	7.3	19.6	27.0
FRA	74.6	32.8	33.0	8.7	25.4	0.8	1.0	76.4	23.6	10.7	12.9	23.6
GBR	80.4	26.9	44.0	9.6	19.6	1.0	1.1	82.5	17.5	7.1	10.4	17.5
GRC	71.9	22.4	41.7	7.7	28.1	0.1	0.1	72.1	27.9	7.8	20.1	27.9
HUN	55.0	20.6	25.6	8.7	45.0	0.1	0.2	55.3	44.7	17.6	27.2	44.7
IDN	80.5	18.0	52.0	10.4	19.5	0.1	0.3	80.8	19.2	5.3	13.8	19.2
IND	82.0	31.4	41.8	8.7	18.0	0.1	0.3	82.4	17.6	7.9	9.7	17.6
IRL	58.0	21.9	30.6	5.5	42.0	0.1	0.2	58.3	41.7	17.6	24.1	41.7
ITA	78.0	36.2	32.6	9.2	22.0	0.6	0.7	79.3	20.7	9.4	11.3	20.7
JPN	87.8	33.1	43.6	11.0	12.2	0.9	1.1	89.7	10.3	3.7	6.6	10.3
KOR	67.8	26.2	32.6	8.9	32.2	0.2	0.5	68.5	31.5	10.8	20.7	31.5
LTU	66.8	25.5	34.0	7.4	33.2	0.1	0.1	67.0	33.0	11.7	21.3	33.0
LUX	40.9	9.7	26.0	5.3	59.1	0.0	0.1	41.0	59.0	12.9	46.1	59.0
LVA	69.5	20.2	40.9	8.5	30.5	0.1	0.1	69.7	30.3	9.3	21.0	30.3
MEX	67.7	24.3	37.7	5.6	32.3	0.2	0.5	68.4	31.6	15.2	16.3	31.6
MLT	54.7	18.1	29.4	7.2	45.3	0.0	0.0	54.7	45.3	14.7	30.6	45.3
NLD	66.5	25.0	32.9	8.6	33.5	0.4	0.6	67.5	32.5	13.0	19.5	32.5
POL	68.6	28.0	30.4	10.2	31.4	0.2	0.3	69.1	30.9	12.8	18.1	30.9
PRT	69.7	29.2	32.4	8.0	30.3	0.2	0.2	70.1	29.9	13.4	16.6	29.9
ROU	69.2	25.0	34.6	9.6	30.8	0.1	0.1	69.3	30.7	11.8	18.9	30.7
RUS	91.5	10.0	65.9	15.6	8.5	0.3	0.3	92.1	7.9	1.1	6.8	7.9
SVK	54.1	20.2	25.0	8.9	45.9	0.1	0.2	54.4	45.6	20.0	25.6	45.6
SVN	61.1	25.1	27.6	8.4	38.9	0.0	0.1	61.2	38.8	17.2	21.6	38.8
SWE	70.8	25.1	36.6	9.1	29.2	0.2	0.4	71.4	28.6	11.2	17.4	28.6
TUR	73.8	40.1	25.9	7.9	26.2	0.1	0.2	74.1	25.9	12.7	13.2	25.9
TWN	57.0	16.1	30.9	10.0	43.0	0.2	0.5	57.7	42.3	10.8	31.5	42.3
USA	78.9	26.5	44.9	7.5	21.1	4.9	4.7	88.4	11.6	4.2	7.4	11.6
ZROW	67.5	17.8	43.2	6.5	32.5	1.3	3.5	72.2	27.8	10.1	17.7	27.8
WORLD	73.2	26.2	38.8	8.3	26.8	1.2	1.7	76.1	23.9	9.4	14.4	23.9

Source: WIOD database; author's calculations

Table B.11 - Decomposition results (in % of gross exports), 2005

	Value added exports				Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
AUS	86.0	17.5	58.0	10.5	14.0	0.3	0.3	86.6	13.4	2.9	10.5	13.4
AUT	67.6	23.2	34.5	10.0	32.4	0.2	0.4	68.3	31.7	11.7	20.0	31.7
BEL	58.6	20.4	30.0	8.1	41.4	0.2	0.5	59.3	40.7	15.3	25.4	40.7
BGR	65.5	23.3	33.9	8.4	34.5	0.0	0.0	65.6	34.4	11.2	23.2	34.4
BRA	87.8	27.7	48.9	11.2	12.2	0.1	0.2	88.1	11.9	4.1	7.7	11.9
CAN	75.1	23.3	47.1	4.7	24.9	0.5	0.7	76.3	23.7	10.7	13.0	23.7
CHN	72.3	34.7	30.2	7.3	27.7	0.4	1.6	74.2	25.8	12.5	13.3	25.8
CYP	77.6	31.1	39.6	6.8	22.4	0.0	0.0	77.6	22.4	9.8	12.6	22.4
CZE	56.3	20.3	26.7	9.3	43.7	0.1	0.4	56.8	43.2	16.5	26.7	43.2
DEU	72.4	30.7	33.3	8.4	27.6	1.4	2.1	75.8	24.2	10.3	13.9	24.2
DNK	66.9	27.4	31.6	8.0	33.1	0.2	0.4	67.5	32.5	13.1	19.4	32.5
ESP	72.4	31.8	32.1	8.6	27.6	0.5	0.7	73.6	26.4	12.1	14.3	26.4
EST	60.1	18.1	34.0	8.0	39.9	0.0	0.1	60.3	39.7	12.7	27.0	39.7
FIN	69.2	18.9	40.0	10.3	30.8	0.1	0.3	69.6	30.4	9.1	21.3	30.4
FRA	73.5	32.0	32.8	8.6	26.5	0.8	1.0	75.2	24.8	11.2	13.6	24.8
GBR	80.2	26.6	43.8	9.9	19.8	1.0	1.1	82.3	17.7	7.1	10.6	17.7
GRC	73.6	21.5	43.4	8.7	26.4	0.1	0.1	73.8	26.2	7.3	18.9	26.2
HUN	54.5	20.5	25.1	8.9	45.5	0.1	0.2	54.8	45.2	17.7	27.5	45.2
IDN	80.8	17.5	52.6	10.7	19.2	0.1	0.3	81.2	18.8	5.4	13.4	18.8
IND	79.4	31.3	39.9	8.3	20.6	0.1	0.4	79.9	20.1	9.7	10.4	20.1
IRL	57.7	21.8	30.4	5.6	42.3	0.1	0.2	57.9	42.1	17.9	24.2	42.1
ITA	76.6	35.1	32.3	9.1	23.4	0.6	0.7	77.8	22.2	9.9	12.3	22.2
JPN	86.2	32.1	43.1	11.0	13.8	0.9	1.1	88.2	11.8	4.1	7.7	11.8
KOR	66.9	23.6	33.6	9.7	33.1	0.2	0.6	67.7	32.3	9.9	22.4	32.3
LTU	63.5	19.9	36.1	7.5	36.5	0.1	0.1	63.7	36.3	11.8	24.6	36.3
LUX	41.1	9.5	26.6	4.9	58.9	0.0	0.1	41.1	58.9	13.0	45.9	58.9
LVA	69.6	21.0	40.5	8.1	30.4	0.1	0.1	69.8	30.2	8.9	21.2	30.2
MEX	69.3	22.2	41.0	6.1	30.7	0.2	0.5	70.1	29.9	13.4	16.5	29.9
MLT	56.0	18.5	30.4	7.1	44.0	0.0	0.0	56.1	43.9	14.4	29.5	43.9
NLD	65.4	24.2	32.5	8.6	34.6	0.3	0.6	66.4	33.6	13.2	20.5	33.6
POL	69.3	28.2	30.7	10.4	30.7	0.2	0.3	69.8	30.2	12.3	17.9	30.2
PRT	68.9	28.6	32.1	8.2	31.1	0.2	0.2	69.3	30.7	13.2	17.5	30.7
ROU	70.3	25.3	35.7	9.3	29.7	0.1	0.1	70.4	29.6	10.7	18.8	29.6
RUS	91.8	9.5	65.4	16.9	8.2	0.3	0.4	92.5	7.5	1.0	6.5	7.5
SVK	53.9	19.3	25.4	9.3	46.1	0.1	0.2	54.3	45.7	18.1	27.7	45.7
SVN	59.6	24.6	26.6	8.4	40.4	0.0	0.1	59.7	40.3	17.9	22.4	40.3
SWE	69.4	24.6	35.8	9.0	30.6	0.2	0.4	69.9	30.1	11.7	18.4	30.1
TUR	74.0	40.7	25.8	7.6	26.0	0.1	0.2	74.3	25.7	12.5	13.2	25.7
TWN	55.8	14.5	30.6	10.7	44.2	0.2	0.5	56.5	43.5	10.1	33.5	43.5
USA	78.4	26.2	44.5	7.6	21.6	4.6	4.6	87.6	12.4	4.5	8.0	12.4
ZROW	67.3	16.3	44.4	6.6	32.7	1.4	3.8	72.5	27.5	9.6	17.9	27.5
WORLD	72.5	25.2	39.0	8.3	27.5	1.1	1.8	75.5	24.5	9.5	15.0	24.5

Source: WIOD database; author's calculations

Table B.12 - Decomposition results (in % of gross exports), 2006

	Value added exports				Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
AUS	87.4	20.1	59.6	7.6	12.6	0.1	0.2	87.7	12.3	2.9	9.4	12.3
AUT	74.4	23.7	41.9	8.9	25.6	0.3	0.3	75.0	25.0	8.6	16.4	25.0
BEL	60.0	22.8	30.2	7.0	40.0	0.3	0.7	61.0	39.0	16.3	22.6	39.0
BGR	66.6	29.0	32.6	5.0	33.4	0.0	0.0	66.6	33.4	12.0	21.4	33.4
BRA	91.4	21.5	60.2	9.8	8.6	0.1	0.2	91.7	8.3	2.0	6.3	8.3
CAN	74.1	24.1	45.7	4.3	25.9	0.5	0.6	75.2	24.8	11.8	13.1	24.8
CHN	85.0	46.5	32.3	6.2	15.0	0.1	0.5	85.6	14.4	8.0	6.3	14.4
CYP	70.7	37.8	29.5	3.4	29.3	0.0	0.0	70.7	29.3	16.5	12.8	29.3
CZE	71.0	23.8	39.4	7.9	29.0	0.2	0.5	71.8	28.2	10.0	18.2	28.2
DEU	79.3	34.0	37.4	7.8	20.7	1.5	1.8	82.6	17.4	7.5	9.9	17.4
DNK	73.5	37.5	29.9	6.1	26.5	0.1	0.2	73.8	26.2	13.0	13.2	26.2
ESP	78.8	37.0	34.2	7.6	21.2	0.3	0.4	79.6	20.4	9.9	10.6	20.4
EST	62.4	23.1	32.0	7.3	37.6	0.0	0.1	62.5	37.5	14.9	22.6	37.5
FIN	75.7	24.1	43.2	8.3	24.3	0.1	0.2	76.0	24.0	8.7	15.3	24.0
FRA	78.1	34.1	36.4	7.6	21.9	0.8	1.0	79.9	20.1	9.1	11.0	20.1
GBR	78.4	29.9	40.8	7.7	21.6	0.8	0.9	80.1	19.9	8.6	11.3	19.9
GRC	80.6	35.5	39.1	6.1	19.4	0.1	0.1	80.7	19.3	7.7	11.6	19.3
HUN	70.2	26.1	36.8	7.3	29.8	0.0	0.1	70.3	29.7	11.1	18.6	29.7
IDN	85.2	24.7	53.4	7.1	14.8	0.1	0.2	85.5	14.5	5.2	9.3	14.5
IND	89.4	38.4	44.0	7.1	10.6	0.0	0.1	89.6	10.4	4.2	6.2	10.4
IRL	61.2	30.4	26.0	4.8	38.8	0.1	0.1	61.4	38.6	20.4	18.2	38.6
ITA	82.1	40.3	34.7	7.2	17.9	0.4	0.6	83.1	16.9	8.1	8.8	16.9
JPN	90.8	35.3	47.7	7.8	9.2	0.8	1.0	92.6	7.4	2.7	4.7	7.4
KOR	74.3	27.9	38.5	7.9	25.7	0.2	0.4	74.8	25.2	8.9	16.3	25.2
LTU	66.7	27.3	33.7	5.7	33.3	0.0	0.0	66.7	33.3	12.9	20.4	33.3
LUX	52.6	9.9	35.9	6.8	47.4	0.0	0.1	52.7	47.3	8.1	39.1	47.3
LVA	73.0	21.7	44.8	6.5	27.0	0.0	0.0	73.1	26.9	8.8	18.2	26.9
MEX	73.0	26.9	41.1	5.0	27.0	0.1	0.4	73.5	26.5	14.8	11.8	26.5
MLT	52.4	19.3	27.8	5.3	47.6	0.0	0.0	52.4	47.6	16.6	31.0	47.6
NLD	67.2	27.1	33.2	7.0	32.8	0.4	0.6	68.2	31.8	13.3	18.5	31.8
POL	81.3	33.0	40.0	8.3	18.7	0.1	0.1	81.6	18.4	7.5	10.9	18.4
PRT	72.3	36.6	29.8	5.9	27.7	0.1	0.1	72.5	27.5	15.3	12.1	27.5
ROU	74.5	28.7	38.8	6.9	25.5	0.0	0.0	74.5	25.5	9.5	16.0	25.5
RUS	92.6	14.1	67.1	11.4	7.4	0.4	0.4	93.3	6.7	1.1	5.6	6.7
SVK	62.7	17.3	37.4	8.0	37.3	0.2	0.4	63.4	36.6	9.8	26.9	36.6
SVN	66.9	31.1	29.5	6.4	33.1	0.0	0.0	67.0	33.0	16.4	16.6	33.0
SWE	74.6	29.2	37.3	8.1	25.4	0.2	0.4	75.2	24.8	10.8	14.0	24.8
TUR	84.3	48.9	29.3	6.2	15.7	0.1	0.1	84.5	15.5	8.8	6.7	15.5
TWN	67.6	28.1	32.7	6.8	32.4	0.1	0.3	68.0	32.0	12.6	19.4	32.0
USA	82.4	28.3	48.0	6.0	17.6	4.3	3.8	90.5	9.5	3.6	5.9	9.5
ZROW	73.1	21.8	45.5	5.8	26.9	1.2	2.4	76.6	23.4	9.4	14.0	23.4
WORLD	78.2	29.7	41.6	6.9	21.8	1.2	1.4	80.7	19.3	8.1	11.1	19.3

Source: WIOD database; author's calculations

Table B.13 - Decomposition results (in % of gross exports), 2007

	Value added exports				Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
AUS	84.1	14.2	58.7	11.3	15.9	0.3	0.4	84.8	15.2	2.5	12.7	15.2
AUT	66.0	22.4	33.7	9.9	34.0	0.2	0.4	66.7	33.3	12.3	21.0	33.3
BEL	55.9	18.5	29.2	8.2	44.1	0.2	0.5	56.6	43.4	15.1	28.2	43.4
BGR	55.4	18.2	29.8	7.4	44.6	0.0	0.1	55.5	44.5	13.7	30.7	44.5
BRA	87.8	26.4	49.3	12.1	12.2	0.1	0.2	88.1	11.9	3.9	8.0	11.9
CAN	75.5	22.3	47.5	5.7	24.5	0.5	0.7	76.7	23.3	9.8	13.5	23.3
CHN	73.1	35.6	30.1	7.4	26.9	0.4	1.8	75.3	24.7	11.7	12.9	24.7
CYP	71.6	28.0	36.7	6.9	28.4	0.0	0.0	71.7	28.3	10.8	17.5	28.3
CZE	53.5	19.5	24.9	9.1	46.5	0.1	0.4	54.1	45.9	18.1	27.9	45.9
DEU	69.8	29.0	32.5	8.3	30.2	1.3	2.2	73.3	26.7	10.8	15.9	26.7
DNK	62.6	24.5	30.3	7.7	37.4	0.3	0.5	63.3	36.7	13.6	23.1	36.7
ESP	69.5	29.0	31.6	8.9	30.5	0.5	0.8	70.8	29.2	12.7	16.5	29.2
EST	61.7	18.6	34.8	8.3	38.3	0.0	0.1	61.9	38.1	11.7	26.4	38.1
FIN	67.0	18.1	38.7	10.2	33.0	0.1	0.2	67.4	32.6	9.6	23.0	32.6
FRA	71.6	30.8	31.9	8.9	28.4	0.8	1.0	73.3	26.7	11.8	14.9	26.7
GBR	79.8	24.9	44.5	10.4	20.2	1.0	1.1	81.9	18.1	7.0	11.2	18.1
GRC	71.5	21.1	42.7	7.7	28.5	0.1	0.1	71.7	28.3	8.4	20.0	28.3
HUN	51.5	19.4	24.1	8.0	48.5	0.1	0.2	51.8	48.2	19.8	28.4	48.2
IDN	83.7	17.0	55.3	11.4	16.3	0.1	0.3	84.0	16.0	4.3	11.7	16.0
IND	78.4	31.7	38.6	8.1	21.6	0.1	0.4	78.9	21.1	10.1	11.0	21.1
IRL	59.2	20.9	32.5	5.8	40.8	0.1	0.1	59.4	40.6	16.4	24.2	40.6
ITA	73.6	33.2	31.4	9.0	26.4	0.5	0.8	74.9	25.1	10.9	14.2	25.1
JPN	82.9	29.7	42.1	11.2	17.1	0.6	1.1	84.6	15.4	5.0	10.4	15.4
KOR	64.9	21.2	34.0	9.7	35.1	0.2	0.6	65.7	34.3	9.5	24.9	34.3
LTU	67.8	22.9	37.0	7.9	32.2	0.1	0.1	68.0	32.0	10.0	22.0	32.0
LUX	38.7	8.5	25.4	4.7	61.3	0.0	0.1	38.7	61.3	13.0	48.2	61.3
LVA	69.3	20.6	40.3	8.4	30.7	0.1	0.2	69.6	30.4	8.1	22.3	30.4
MEX	69.6	22.2	40.8	6.6	30.4	0.3	0.6	70.5	29.5	13.5	16.0	29.5
MLT	54.5	16.6	30.7	7.2	45.5	0.0	0.0	54.5	45.5	13.7	31.8	45.5
NLD	63.9	23.3	31.8	8.9	36.1	0.4	0.7	65.0	35.0	13.6	21.5	35.0
POL	66.6	25.7	30.5	10.5	33.4	0.2	0.4	67.2	32.8	12.6	20.2	32.8
PRT	68.2	26.2	33.5	8.5	31.8	0.2	0.2	68.6	31.4	12.5	18.9	31.4
ROU	72.1	24.1	37.8	10.2	27.9	0.1	0.2	72.4	27.6	9.0	18.5	27.6
RUS	92.2	9.2	65.1	17.9	7.8	0.4	0.4	93.1	6.9	0.8	6.2	6.9
SVK	52.1	18.9	23.8	9.4	47.9	0.1	0.3	52.5	47.5	20.0	27.5	47.5
SVN	57.7	22.9	26.4	8.5	42.3	0.0	0.1	57.8	42.2	17.9	24.3	42.2
SWE	67.5	23.2	35.3	9.0	32.5	0.2	0.4	68.1	31.9	12.1	19.7	31.9
TUR	70.2	36.1	26.2	7.9	29.8	0.1	0.3	70.6	29.4	13.3	16.1	29.4
TWN	53.6	12.4	30.1	11.1	46.4	0.1	0.5	54.2	45.8	9.3	36.4	45.8
USA	78.8	25.4	45.5	7.9	21.2	3.9	4.1	86.7	13.3	4.8	8.5	13.3
ZROW	65.7	15.3	43.7	6.8	34.3	1.8	4.5	72.0	28.0	9.2	18.7	28.0
WORLD	71.1	24.2	38.4	8.5	28.9	1.1	1.9	74.1	25.9	9.6	16.2	25.9

Source: WIOD database; author's calculations

Table B.14 - Decomposition results (in % of gross exports), 2008

	Value added exports				Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
AUS	83.5	12.3	59.5	11.7	16.5	0.3	0.4	84.2	15.8	2.3	13.5	15.8
AUT	65.3	21.8	33.7	9.9	34.7	0.2	0.4	65.9	34.1	12.1	22.0	34.1
BEL	53.1	17.1	28.0	8.0	46.9	0.3	0.6	53.9	46.1	15.9	30.3	46.1
BGR	56.0	18.2	30.5	7.2	44.0	0.0	0.1	56.1	43.9	13.6	30.3	43.9
BRA	86.5	23.0	51.1	12.4	13.5	0.2	0.3	87.0	13.0	3.9	9.1	13.0
CAN	76.2	19.1	50.7	6.4	23.8	0.6	0.7	77.5	22.5	8.5	14.0	22.5
CHN	75.0	35.9	31.3	7.8	25.0	0.4	1.8	77.2	22.8	10.6	12.2	22.8
CYP	69.7	25.9	36.3	7.4	30.3	0.0	0.0	69.7	30.3	10.3	19.9	30.3
CZE	53.9	19.7	25.1	9.1	46.1	0.1	0.4	54.5	45.5	17.9	27.7	45.5
DEU	69.0	28.8	32.0	8.2	31.0	1.3	2.1	72.4	27.6	11.2	16.3	27.6
DNK	60.6	23.6	29.3	7.6	39.4	0.2	0.4	61.2	38.8	14.2	24.6	38.8
ESP	69.5	28.8	32.3	8.4	30.5	0.4	0.7	70.7	29.3	12.4	16.9	29.3
EST	62.1	18.1	35.4	8.6	37.9	0.1	0.1	62.3	37.7	11.4	26.4	37.7
FIN	65.6	18.0	37.8	9.9	34.4	0.1	0.3	66.0	34.0	10.1	23.9	34.0
FRA	70.5	30.3	31.5	8.7	29.5	0.7	1.0	72.2	27.8	12.2	15.5	27.8
GBR	78.1	24.3	43.6	10.2	21.9	0.8	1.1	80.0	20.0	7.7	12.3	20.0
GRC	69.9	18.6	42.8	8.5	30.1	0.1	0.1	70.1	29.9	8.6	21.3	29.9
HUN	51.6	19.1	24.5	8.0	48.4	0.1	0.2	51.9	48.1	19.7	28.4	48.1
IDN	82.8	15.7	55.9	11.2	17.2	0.1	0.3	83.2	16.8	5.0	11.8	16.8
IND	77.6	31.9	37.6	8.1	22.4	0.1	0.4	78.1	21.9	10.4	11.5	21.9
IRL	57.7	19.9	31.9	5.9	42.3	0.1	0.2	57.9	42.1	16.6	25.4	42.1
ITA	73.2	34.0	30.6	8.7	26.8	0.5	0.7	74.4	25.6	11.4	14.2	25.6
JPN	80.2	28.0	41.5	10.6	19.8	0.6	1.1	81.8	18.2	5.7	12.5	18.2
KOR	57.5	19.3	30.1	8.2	42.5	0.1	0.5	58.2	41.8	11.4	30.4	41.8
LTU	60.0	19.1	33.7	7.3	40.0	0.1	0.1	60.2	39.8	11.2	28.6	39.8
LUX	38.2	7.9	25.2	5.2	61.8	0.0	0.1	38.3	61.7	10.9	50.7	61.7
LVA	70.8	22.6	39.6	8.6	29.2	0.1	0.2	71.1	28.9	8.6	20.3	28.9
MEX	70.3	22.1	41.3	6.8	29.7	0.3	0.6	71.2	28.8	13.3	15.5	28.8
MLT	56.2	17.5	31.9	6.8	43.8	0.0	0.0	56.2	43.8	13.0	30.8	43.8
NLD	61.7	21.4	31.3	9.1	38.3	0.4	0.8	62.9	37.1	14.2	22.8	37.1
POL	66.7	26.6	29.8	10.2	33.3	0.2	0.4	67.4	32.6	13.1	19.6	32.6
PRT	66.6	25.8	32.6	8.2	33.4	0.2	0.2	67.0	33.0	13.4	19.6	33.0
ROU	71.6	23.3	37.7	10.7	28.4	0.2	0.2	72.0	28.0	9.1	18.9	28.0
RUS	91.8	8.8	63.8	19.2	8.2	0.5	0.6	92.9	7.1	0.8	6.3	7.1
SVK	53.0	19.1	24.6	9.3	47.0	0.1	0.3	53.4	46.6	19.2	27.4	46.6
SVN	58.7	22.8	27.0	8.9	41.3	0.0	0.1	58.8	41.2	17.2	24.0	41.2
SWE	65.8	22.4	34.7	8.8	34.2	0.2	0.4	66.4	33.6	12.8	20.8	33.6
TUR	77.2	32.6	35.4	9.1	22.8	0.2	0.3	77.7	22.3	9.9	12.4	22.3
TWN	50.9	11.9	28.8	10.1	49.1	0.1	0.4	51.4	48.6	9.5	39.1	48.6
USA	78.0	25.0	44.9	8.1	22.0	3.2	3.7	84.9	15.1	5.4	9.7	15.1
ZROW	66.6	14.9	44.9	6.8	33.4	2.1	5.3	74.0	26.0	8.6	17.4	26.0
WORLD	70.5	23.3	38.7	8.6	29.5	1.1	2.1	73.7	26.3	9.6	16.7	26.3

Source: WIOD database; author's calculations

Table B.15 - Decomposition results (in % of gross exports), 2009

	Value added exports				Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
AUS	86.7	14.4	62.0	10.3	13.3	0.3	0.4	87.3	12.7	2.4	10.3	12.7
AUT	69.7	23.6	36.5	9.6	30.3	0.2	0.4	70.3	29.7	10.6	19.1	29.7
BEL	58.6	19.8	30.8	8.0	41.4	0.3	0.5	59.4	40.6	15.3	25.3	40.6
BGR	65.3	23.2	34.2	7.8	34.7	0.0	0.1	65.4	34.6	13.4	21.1	34.6
BRA	89.4	24.4	53.3	11.7	10.6	0.2	0.3	89.8	10.2	3.0	7.2	10.2
CAN	78.3	22.2	50.2	5.9	21.7	0.5	0.6	79.4	20.6	8.2	12.4	20.6
CHN	78.4	39.5	31.4	7.5	21.6	0.6	1.8	80.7	19.3	9.4	9.8	19.3
CYP	72.8	28.6	38.1	6.1	27.2	0.0	0.0	72.9	27.1	10.5	16.6	27.1
CZE	58.2	22.4	27.0	8.8	41.8	0.1	0.4	58.7	41.3	17.5	23.7	41.3
DEU	73.1	31.2	34.2	7.8	26.9	1.3	1.8	76.2	23.8	10.3	13.4	23.8
DNK	63.5	26.8	29.7	7.0	36.5	0.2	0.3	64.0	36.0	13.4	22.6	36.0
ESP	75.0	32.8	34.1	8.1	25.0	0.4	0.6	76.0	24.0	10.8	13.2	24.0
EST	66.6	21.1	37.0	8.5	33.4	0.0	0.1	66.8	33.2	11.2	22.0	33.2
FIN	69.5	19.6	40.5	9.4	30.5	0.1	0.2	69.9	30.1	9.5	20.6	30.1
FRA	74.1	31.9	34.1	8.2	25.9	0.7	0.9	75.7	24.3	10.9	13.5	24.3
GBR	79.6	25.4	44.7	9.5	20.4	0.7	0.9	81.3	18.7	7.5	11.2	18.7
GRC	75.6	24.1	43.7	7.8	24.4	0.1	0.1	75.8	24.2	7.4	16.8	24.2
HUN	56.4	21.2	27.1	8.0	43.6	0.1	0.2	56.6	43.4	18.2	25.2	43.4
IDN	86.0	16.9	58.4	10.6	14.0	0.1	0.3	86.4	13.6	4.4	9.2	13.6
IND	76.3	37.4	32.6	6.3	23.7	0.1	0.3	76.7	23.3	14.3	9.0	23.3
IRL	56.9	19.1	32.5	5.4	43.1	0.1	0.1	57.1	42.9	16.6	26.3	42.9
ITA	77.6	37.6	31.8	8.2	22.4	0.5	0.6	78.6	21.4	10.0	11.4	21.4
JPN	85.1	28.1	46.3	10.6	14.9	0.6	0.9	86.6	13.4	4.1	9.4	13.4
KOR	62.1	21.5	33.0	7.7	37.9	0.1	0.5	62.7	37.3	11.0	26.3	37.3
LTU	66.0	22.7	36.0	7.3	34.0	0.1	0.1	66.2	33.8	10.8	23.0	33.8
LUX	38.7	8.0	26.1	4.6	61.3	0.0	0.1	38.8	61.2	11.0	50.2	61.2
LVA	75.2	24.9	42.2	8.1	24.8	0.1	0.1	75.5	24.5	7.9	16.6	24.5
MEX	70.3	26.1	38.4	5.8	29.7	0.3	0.4	71.0	29.0	14.4	14.6	29.0
MLT	60.5	18.5	35.2	6.8	39.5	0.0	0.0	60.5	39.5	12.0	27.5	39.5
NLD	64.3	23.4	32.7	8.2	35.7	0.4	0.7	65.4	34.6	13.7	20.9	34.6
POL	70.5	29.7	30.9	10.0	29.5	0.2	0.3	71.1	28.9	12.3	16.6	28.9
PRT	72.1	28.2	35.7	8.2	27.9	0.2	0.2	72.5	27.5	11.4	16.1	27.5
ROU	75.6	26.3	39.4	9.9	24.4	0.1	0.2	75.9	24.1	9.0	15.1	24.1
RUS	93.9	9.5	67.8	16.5	6.1	0.4	0.4	94.7	5.3	0.7	4.6	5.3
SVK	57.8	22.3	26.2	9.3	42.2	0.1	0.3	58.2	41.8	18.4	23.4	41.8
SVN	63.5	26.8	28.3	8.4	36.5	0.0	0.1	63.6	36.4	17.0	19.4	36.4
SWE	68.8	22.4	38.0	8.4	31.2	0.2	0.3	69.3	30.7	11.3	19.4	30.7
TUR	81.6	35.1	37.6	9.0	18.4	0.2	0.2	82.0	18.0	8.4	9.6	18.0
TWN	57.1	13.1	33.6	10.3	42.9	0.1	0.4	57.6	42.4	8.3	34.1	42.4
USA	82.4	26.7	48.0	7.8	17.6	3.1	3.1	88.6	11.4	4.2	7.2	11.4
ZROW	70.0	18.9	44.6	6.5	30.0	1.8	4.2	75.9	24.1	8.9	15.2	24.1
WORLD	74.1	26.1	39.9	8.1	25.9	1.0	1.7	76.8	23.2	9.1	14.2	23.2

Source: WIOD database; author's calculations

Table B.16 - Decomposition results (in % of gross exports), 2010

		Value added exports			Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
AUS	87.0	12.3	63.2	11.5	13.0	0.3	0.4	87.7	12.3	2.0	10.3	12.3
AUT	67.2	22.3	35.4	9.5	32.8	0.2	0.3	67.8	32.2	11.1	21.1	32.2
BEL	56.1	18.1	30.2	7.8	43.9	0.2	0.5	56.8	43.2	15.0	28.2	43.2
BGR	65.2	23.6	34.1	7.5	34.8	0.0	0.1	65.3	34.7	13.1	21.6	34.7
BRA	88.9	23.1	53.6	12.3	11.1	0.2	0.3	89.5	10.5	2.9	7.6	10.5
CAN	78.5	21.7	50.5	6.3	21.5	0.5	0.7	79.8	20.2	7.7	12.5	20.2
CHN	75.9	36.6	31.8	7.5	24.1	0.6	2.0	78.6	21.4	9.9	11.5	21.4
CYP	72.8	29.6	37.8	5.5	27.2	0.0	0.0	72.9	27.1	10.5	16.7	27.1
CZE	54.3	19.9	26.0	8.4	45.7	0.1	0.4	54.9	45.1	18.4	26.7	45.1
DEU	70.8	29.8	33.2	7.8	29.2	1.2	1.9	73.9	26.1	11.1	15.0	26.1
DNK	63.9	25.7	31.1	7.1	36.1	0.2	0.4	64.5	35.5	13.4	22.1	35.5
ESP	71.8	30.2	33.5	8.1	28.2	0.4	0.6	72.7	27.3	11.6	15.7	27.3
EST	66.7	21.1	37.5	8.1	33.3	0.0	0.1	66.8	33.2	11.0	22.2	33.2
FIN	67.0	16.8	40.9	9.4	33.0	0.1	0.2	67.3	32.7	8.8	23.9	32.7
FRA	71.7	30.8	32.9	8.0	28.3	0.7	0.9	73.2	26.8	12.0	14.8	26.8
GBR	78.0	25.2	43.4	9.4	22.0	0.7	0.8	79.6	20.4	8.4	12.0	20.4
GRC	75.6	23.8	44.8	7.0	24.4	0.1	0.1	75.8	24.2	7.2	17.1	24.2
HUN	54.3	20.3	26.3	7.7	45.7	0.1	0.2	54.5	45.5	18.6	26.8	45.5
IDN	85.7	16.5	58.3	11.0	14.3	0.1	0.4	86.2	13.8	4.5	9.3	13.8
IND	78.0	34.7	35.9	7.3	22.0	0.2	0.4	78.5	21.5	12.0	9.6	21.5
IRL	56.1	18.4	33.0	4.8	43.9	0.0	0.1	56.3	43.7	16.3	27.4	43.7
ITA	73.4	35.0	30.3	8.1	26.6	0.4	0.6	74.5	25.5	11.5	14.0	25.5
JPN	83.4	30.6	41.7	11.2	16.6	0.6	0.8	84.9	15.1	4.7	10.4	15.1
KOR	61.6	20.2	33.1	8.4	38.4	0.2	0.5	62.3	37.7	10.5	27.2	37.7
LTU	66.0	25.5	33.8	6.7	34.0	0.1	0.1	66.2	33.8	11.5	22.3	33.8
LUX	38.7	8.1	25.6	5.0	61.3	0.0	0.1	38.8	61.2	11.0	50.2	61.2
LVA	75.2	29.2	38.5	7.5	24.8	0.1	0.1	75.4	24.6	8.7	15.9	24.6
MEX	68.7	23.8	38.9	6.0	31.3	0.3	0.6	69.7	30.3	14.2	16.1	30.3
MLT	60.4	17.5	36.3	6.5	39.6	0.0	0.0	60.4	39.6	11.7	28.0	39.6
NLD	61.3	21.6	31.5	8.2	38.7	0.4	0.7	62.4	37.6	14.4	23.3	37.6
POL	67.1	27.4	30.2	9.5	32.9	0.2	0.4	67.6	32.4	13.2	19.2	32.4
PRT	72.1	27.6	36.2	8.3	27.9	0.2	0.2	72.5	27.5	11.2	16.4	27.5
ROU	75.7	26.7	39.4	9.6	24.3	0.1	0.2	75.9	24.1	9.0	15.0	24.1
RUS	93.8	8.2	68.0	17.5	6.2	0.5	0.4	94.7	5.3	0.6	4.7	5.3
SVK	57.8	21.9	26.3	9.5	42.2	0.1	0.2	58.1	41.9	18.2	23.8	41.9
SVN	63.4	26.0	28.8	8.7	36.6	0.0	0.0	63.5	36.5	16.5	20.0	36.5
SWE	67.8	21.1	38.1	8.7	32.2	0.2	0.3	68.3	31.7	11.5	20.2	31.7
TUR	80.5	34.3	36.9	9.3	19.5	0.2	0.2	80.9	19.1	8.9	10.1	19.1
TWN	53.2	12.4	31.0	9.8	46.8	0.1	0.5	53.8	46.2	9.3	36.9	46.2
USA	80.2	25.7	46.4	8.0	19.8	3.0	3.4	86.5	13.5	4.9	8.5	13.5
ZROW	69.1	17.7	44.4	7.0	30.9	1.9	4.3	75.3	24.7	9.1	15.7	24.7
WORLD	72.7	24.8	39.5	8.3	27.3	1.0	1.8	75.5	24.5	9.3	15.2	24.5

Source: WIOD database; author's calculations

Table B.17 - Decomposition results (in % of gross exports), 2011

	Value added exports				Double	Returned Dom. VA		Domestic	Double	Foreign VA in exports		
		Final	Inter-		counting	Final	Inter-	VA in	counting	Final	Inter-	
	Total	goods	mediates	Indirect	(trade)	goods	mediates	exports	(GDP)	goods	mediates	Total
AUS	85.5	11.8	63.0	10.7	14.5	0.3	0.5	86.3	13.7	2.1	11.6	13.7
AUT	65.2	20.5	35.5	9.2	34.8	0.2	0.4	65.8	34.2	11.1	23.2	34.2
BEL	53.3	17.2	28.7	7.4	46.7	0.2	0.5	54.0	46.0	15.7	30.2	46.0
BGR	65.2	22.5	35.1	7.6	34.8	0.0	0.1	65.3	34.7	12.3	22.4	34.7
BRA	87.6	23.7	52.3	11.6	12.4	0.2	0.3	88.1	11.9	3.4	8.5	11.9
CAN	78.4	21.0	50.9	6.5	21.6	0.6	0.8	79.8	20.2	7.5	12.8	20.2
CHN	75.5	35.7	32.4	7.4	24.5	0.6	2.2	78.2	21.8	9.8	12.0	21.8
CYP	72.7	29.1	38.1	5.5	27.3	0.0	0.0	72.8	27.2	10.4	16.8	27.2
CZE	52.9	19.2	25.4	8.3	47.1	0.2	0.5	53.5	46.5	18.5	27.9	46.5
DEU	69.4	28.1	33.6	7.6	30.6	1.2	2.1	72.7	27.3	11.2	16.1	27.3
DNK	62.3	23.7	31.6	7.0	37.7	0.2	0.4	62.9	37.1	13.7	23.4	37.1
ESP	69.4	28.1	33.3	7.9	30.6	0.3	0.6	70.3	29.7	12.0	17.7	29.7
EST	66.6	20.4	38.2	8.0	33.4	0.0	0.1	66.7	33.3	10.7	22.6	33.3
FIN	65.2	15.0	41.1	9.1	34.8	0.1	0.2	65.5	34.5	8.7	25.7	34.5
FRA	69.9	29.1	32.8	8.0	30.1	0.7	0.9	71.5	28.5	12.3	16.2	28.5
GBR	76.8	24.0	43.2	9.5	23.2	0.8	0.8	78.4	21.6	8.4	13.2	21.6
GRC	75.6	23.7	45.2	6.7	24.4	0.1	0.1	75.7	24.3	7.3	17.0	24.3
HUN	53.8	19.8	26.2	7.7	46.2	0.1	0.2	54.0	46.0	18.4	27.6	46.0
IDN	84.8	15.4	59.0	10.4	15.2	0.1	0.5	85.4	14.6	4.5	10.2	14.6
IND	77.9	35.4	35.4	7.0	22.1	0.1	0.3	78.3	21.7	12.0	9.7	21.7
IRL	55.3	18.8	32.0	4.5	44.7	0.0	0.1	55.4	44.6	17.2	27.3	44.6
ITA	71.9	32.7	31.0	8.2	28.1	0.4	0.6	72.9	27.1	11.6	15.5	27.1
JPN	81.5	28.8	42.4	10.4	18.5	0.6	0.8	83.0	17.0	4.9	12.1	17.0
KOR	59.1	19.4	32.2	7.4	40.9	0.2	0.5	59.7	40.3	11.1	29.2	40.3
LTU	65.9	24.3	35.0	6.6	34.1	0.1	0.1	66.1	33.9	10.9	23.0	33.9
LUX	38.7	7.5	26.4	4.7	61.3	0.0	0.1	38.7	61.3	10.6	50.7	61.3
LVA	75.2	25.4	42.0	7.8	24.8	0.1	0.1	75.4	24.6	7.9	16.8	24.6
MEX	68.8	23.5	39.2	6.1	31.2	0.4	0.7	70.0	30.0	14.4	15.6	30.0
MLT	60.3	17.8	36.0	6.5	39.7	0.0	0.0	60.3	39.7	11.5	28.1	39.7
NLD	59.5	20.8	30.7	8.0	40.5	0.4	0.9	60.8	39.2	14.6	24.6	39.2
POL	65.1	26.0	29.9	9.3	34.9	0.2	0.4	65.7	34.3	13.6	20.7	34.3
PRT	71.7	27.0	36.3	8.4	28.3	0.2	0.2	72.1	27.9	11.3	16.6	27.9
ROU	75.8	26.4	39.6	9.8	24.2	0.1	0.2	76.1	23.9	8.9	15.0	23.9
RUS	92.8	8.1	68.3	16.4	7.2	0.5	0.5	93.8	6.2	0.6	5.6	6.2
SVK	57.6	21.1	26.7	9.8	42.4	0.1	0.2	58.0	42.0	17.7	24.3	42.0
SVN	63.4	24.5	30.1	8.8	36.6	0.0	0.0	63.5	36.5	15.5	21.1	36.5
SWE	67.6	20.6	38.5	8.5	32.4	0.2	0.4	68.1	31.9	11.3	20.6	31.9
TUR	77.3	32.0	36.1	9.1	22.7	0.3	0.2	77.8	22.2	9.7	12.5	22.2
TWN	52.2	11.9	31.3	9.0	47.8	0.1	0.4	52.7	47.3	9.3	38.0	47.3
USA	79.0	25.2	46.3	7.6	21.0	2.8	3.3	85.1	14.9	5.4	9.5	14.9
ZROW	73.0	17.6	47.8	7.6	27.0	1.8	4.2	79.0	21.0	7.6	13.4	21.0
WORLD	72.4	24.0	40.2	8.2	27.6	1.0	1.8	75.2	24.8	9.2	15.6	24.8

Source: WIOD database; author's calculations

Table B.18 China bilateral net trade in value added and gross terms in bn US-$

	Trade in value added					Gross trade				
Partner	1995	2000	2007	2009	2011	1995	2000	2007	2009	2011
AUS	0.3	-0.2	2.1	-6.1	-23.8	0.4	0.0	-2.4	-12.2	-39.2
AUT	0.1	0.1	1.1	-0.7	-1.4	0.2	0.2	1.8	-0.9	-1.3
BEL	-0.3	0.1	1.2	1.3	0.1	-0.4	0.2	3.4	2.7	2.2
BGR	-0.0	0.0	0.5	0.7	0.4	0.0	0.0	0.7	1.0	0.5
BRA	0.1	0.1	1.0	-2.5	1.2	0.2	0.1	0.5	-4.7	1.1
CAN	1.7	2.2	15.4	17.3	20.6	2.4	3.1	19.9	20.5	25.8
CHN										
CYP	0.1	0.1	0.3	0.2	0.3	0.1	0.1	0.4	0.2	0.3
CZE	0.1	0.2	1.8	1.9	2.8	0.1	0.3	6.4	7.5	13.7
DEU	1.5	1.3	2.8	-5.9	-7.3	2.6	2.3	7.8	-2.8	0.7
DNK	0.3	-0.1	0.6	0.6	-0.6	0.8	0.2	1.1	1.9	1.0
ESP	0.5	0.9	11.4	10.9	12.9	0.5	0.7	12.0	12.5	17.1
EST	0.0	0.0	0.4	0.1	0.2	0.0	0.1	0.6	0.3	0.6
FIN	-0.3	-0.8	0.0	-1.5	-3.3	-0.3	-1.1	1.1	-2.2	-6.1
FRA	-0.1	1.3	13.5	12.0	14.0	0.0	1.7	16.5	14.9	18.0
GBR	1.3	4.5	16.4	19.4	21.3	1.7	5.7	19.4	25.3	27.0
GRC	0.3	0.5	3.0	3.4	4.3	0.3	0.5	3.0	3.4	4.5
HUN	0.0	0.2	0.8	0.4	0.1	0.0	0.5	4.3	2.9	2.9
IDN	-0.5	-0.9	-0.2	3.0	2.4	-0.9	-0.7	0.3	6.3	7.9
IND	0.9	0.9	16.7	27.1	39.5	1.1	1.1	24.2	35.7	54.5
IRL	0.1	-0.0	1.4	1.9	2.4	0.3	0.3	5.0	5.4	8.3
ITA	-0.6	0.5	8.8	5.8	7.2	-0.7	0.2	10.2	7.3	11.2
JPN	0.9	-0.8	-1.5	-0.3	3.2	1.6	0.4	-9.6	1.2	3.5
KOR	-3.2	-3.9	-6.1	-14.2	-17.4	-6.1	-10.0	-24.4	-34.4	-45.6
LTU	0.0	0.0	0.2	0.2	0.3	0.0	0.0	0.3	0.3	0.5
LUX	-0.1	-0.1	-0.4	-0.4	-0.6	-0.1	-0.3	0.0	-0.3	-0.3
LVA	-0.0	0.0	0.2	0.1	0.1	-0.0	0.0	0.2	0.0	0.1
MEX	0.2	1.5	10.7	10.8	17.1	0.4	2.4	22.9	22.7	39.4
MLT	0.0	-0.0	-0.0	0.0	0.0	0.0	-0.0	-0.3	-0.1	-0.3
NLD	1.3	2.6	3.5	4.0	1.3	2.8	5.3	7.8	9.1	7.6
POL	0.1	0.5	5.1	5.3	7.4	0.2	0.7	8.5	8.8	13.5
PRT	-0.0	-0.0	-0.4	1.0	1.4	-0.1	-0.2	-1.4	0.8	1.2
ROU	-0.1	-0.0	1.6	1.2	1.5	-0.1	-0.1	1.7	1.4	1.8
RUS	-0.1	-1.5	9.1	7.2	7.4	-0.3	-1.7	10.8	11.0	10.0
SVK	0.0	0.1	0.7	0.8	0.8	0.1	0.1	1.4	1.3	1.5
SVN	0.0	0.0	0.2	0.4	0.4	0.0	0.1	0.2	0.7	0.9
SWE	-0.1	-0.8	-0.8	-3.8	-4.7	-0.1	-1.2	-0.7	-5.2	-5.6
TUR	0.2	0.8	8.0	10.7	23.6	0.4	0.9	10.5	12.4	26.6
TWN	-6.2	-10.3	-19.1	-21.6	-30.7	-12.8	-21.4	-65.8	-57.6	-88.1
USA	22.5	46.8	174.4	158.1	196.2	27.6	55.3	217.1	187.7	237.5
ZROW	5.0	-1.0	84.1	35.8	-5.7	3.8	-1.0	53.1	-0.4	-59.8

Source: WIOD database; author's calculations

Table B.19 US bilateral net trade in value added and gross terms in bn US-$

	Trade in value added					Gross trade				
Partner	1995	2000	2007	2009	2011	1995	2000	2007	2009	2011
AUS	3.7	0.1	0.6	2.8	7.0	5.9	2.6	6.1	7.9	18.8
AUT	-0.6	-2.2	-6.9	-3.3	-3.7	-0.5	-1.7	-8.1	-3.2	-3.7
BEL	-2.5	-3.3	-5.0	-3.9	-3.4	-1.5	-1.8	-3.1	-3.1	-0.6
BGR	-0.0	-0.1	0.0	0.2	-0.0	-0.1	-0.1	0.3	0.2	-0.1
BRA	1.8	-2.8	-11.1	0.0	1.9	2.2	-2.8	-8.5	2.8	7.0
CAN	-24.6	-59.5	-78.4	-36.2	-50.8	-30.4	-73.9	-100.1	-52.2	-66.4
CHN	-22.5	-46.8	-174.4	-158.1	-196.2	-27.6	-55.3	-217.1	-187.7	-237.5
CYP	0.2	0.2	0.3	0.3	0.4	0.2	0.2	0.2	0.3	0.4
CZE	-0.1	-0.2	-1.2	-0.2	0.1	-0.2	0.1	-0.5	0.3	1.1
DEU	-12.8	-24.5	-59.5	-35.5	-42.6	-11.9	-21.9	-52.5	-32.6	-40.3
DNK	-1.5	-3.1	-3.0	-2.1	-1.7	-1.8	-2.8	1.5	1.8	5.1
ESP	1.4	0.8	7.9	1.5	2.6	1.0	-0.8	5.5	-1.2	-1.4
EST	0.0	0.0	0.1	-0.0	-0.1	-0.0	-0.0	0.0	0.1	-0.0
FIN	-0.7	-2.5	-4.2	-1.9	-2.2	-0.0	-1.4	-4.1	-1.7	-2.3
FRA	-5.0	-13.7	-12.6	-3.4	-3.2	-3.7	-12.0	-11.4	-1.2	-0.5
GBR	-12.8	-28.6	-10.4	-11.3	-2.4	-14.6	-29.7	-5.0	-9.3	4.4
GRC	1.1	2.1	2.3	2.1	2.4	0.8	2.9	4.2	3.3	4.1
HUN	0.2	-0.7	-1.4	0.5	0.4	0.2	-1.4	-1.3	1.5	2.3
IDN	-2.3	-7.4	-6.9	-5.6	-6.5	-2.8	-7.6	-5.2	-5.0	-5.4
IND	-4.3	-13.1	-22.2	-22.8	-31.8	-5.4	-15.4	-29.4	-40.2	-51.6
IRL	0.1	-4.0	-7.0	-4.7	-10.5	2.7	-0.8	-1.0	3.4	-1.9
ITA	-9.4	-16.3	-23.3	-10.7	-13.2	-10.9	-18.8	-28.1	-13.9	-17.3
JPN	-42.7	-65.8	-63.4	-27.3	-42.7	-37.6	-54.4	-47.5	-14.8	-30.8
KOR	-3.0	-13.3	-13.5	-8.7	-9.4	-1.4	-10.2	-2.8	-2.1	-1.4
LTU	0.0	-0.0	0.0	-0.1	-0.1	0.0	-0.1	-0.1	-0.3	-0.3
LUX	-0.1	-0.2	-0.7	-0.2	0.7	0.1	0.3	2.8	3.0	12.7
LVA	-0.0	-0.0	0.1	0.0	0.0	-0.0	-0.0	0.1	0.1	0.1
MEX	-3.9	-4.0	-33.0	-26.3	-36.1	-4.3	-3.5	-54.8	-47.5	-60.2
MLT	0.0	-0.0	-0.0	-0.1	-0.1	-0.0	-0.2	-0.0	-0.2	-0.1
NLD	-2.7	-6.1	-5.9	0.3	0.6	-0.1	-2.9	2.5	9.7	13.5
POL	-0.3	0.2	-0.5	1.0	1.8	-0.3	0.3	0.7	2.3	3.7
PRT	-0.1	-0.3	-1.0	-0.3	0.1	-0.7	-1.1	-2.7	-1.2	-1.0
ROU	0.0	-0.1	0.1	0.3	0.3	0.0	-0.2	-0.2	0.3	0.2
RUS	0.1	-3.4	-14.7	-12.5	-28.2	0.4	-0.3	-4.1	-3.7	-17.0
SVK	0.1	-0.1	-0.8	-0.0	-0.1	0.1	-0.0	-1.4	-0.2	-0.3
SVN	-0.0	-0.1	-0.2	0.0	0.0	-0.1	-0.1	-0.3	0.1	0.2
SWE	-3.0	-6.6	-9.8	-3.4	-5.8	-2.7	-5.7	-9.6	-1.3	-4.4
TUR	0.1	-1.1	1.3	0.4	2.5	-0.4	-2.3	-0.9	-0.8	0.5
TWN	-11.3	-16.7	-18.4	-13.5	-18.5	-14.8	-22.1	-13.5	-8.7	-17.8
USA										
ZROW	86.6	9.6	-53.6	5.0	-69.5	89.4	11.3	-41.0	17.7	-69.6

Source: WIOD database; author's calculations