Research Paper

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From Global to Local: Downscaling TiVA Indicators for Morocco Using an Inter-regional Input-Output Model

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The debate on global value chains (GVCs) has emphasized countries' contributions to value-added creation. From an intercountry perspective, a new body of research is adding to this debate by studying how subnational regions contribute to the indicators in specific countries. Proper assessment of economic contributions is essential for designing incentive policies. This paper analyzes the role played by the main trading partners of Moroccan regions in local value chains. We use input-output (IO) analysis to decompose regional value-added in Morocco, based on different sources of domestic and foreign final demand, taking into account the differences in regional economic structures and the nature of systematic interdependence associated with the structure of inter-regional linkages in Morocco. For each final demand originating from and into one of the Moroccan regions, we estimate measures of trade in value-added (TiVA). The output decomposition of final demand into domestic and foreign demand, where the latter is broken down into the final demand from each trading partner, serves as the methodological anchor for the study. We use the inter-regional input-output table for Morocco with 2019 data. The measures of trade in value-added reveal different inter-regional and international trade integration hierarchies, with implications for regional inequality in the country. We try to answer two main questions. First, how do domestic absorption and foreign exports affect value-added generation in Moroccan regions? Second, what is the regional value-added content incorporated in the components of final demand by geographical source?

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RESEARCH PAPER

From Global to Local: Downscaling TiVA Indicators for Morocco Using an Inter-regional Input-Output Model[1]

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1. This paper is based on the thesis submitted by Elhoussaine Wahyana for the master's degree in Economic Analysis at Public Policy at the Mohammed VI Polytechnic University, Faculty of Governance, Social and Economics Sciences. The work has been supervised by Eduardo A. Haddad.

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1. INTRODUCTION

The role trade flows play in economic development has always been a topic of research interest. While substantial developments have been taking place in international economics, less attention has been paid to the relationship between trade and local development. Such an approach expands on the development economics literature that emerged between the 1960s and 1970s, which focused on the effects of alternative trade regimes (Venables, 2001). Trade can be an important engine for rapid economic growth (Todaro, 1999) and wealth creation. The trade and growth relationship is a familiar topic of discussion in the development literature. The most frequently raised issue is what effect trade has on economic growth, and whether trade is an active 'element' of growth (Venables, 2001; Haddad *et al*, 2002). The nature and structure of the export sector, the distribution of its profits, and the sector's linkages with the rest of the economy are among the main factors explaining the contribution of trade to development (Haddad *et al*, 2002).

In the context of the increasing development of global value chains (GVC), which is viewed as one of the critical developments in twenty-first century international trade (Baldwin, 2012; Xiao *et al*, 2020), simple trade statistics are unsuitable for measuring the integration level within a country and its participation in international trade. Looking directly at gross exports may affect how a country prioritizes policies and partners in trade agreement negotiations, and may bias the impact analysis of demand shocks. A more appropriate measurement should consider the trade in value-added (TiVA) generated by the country's production and by different locations (i.e. regions) within the country. In addition, in relation to regional trade policies, it would be more interesting to map the contribution of trade flows to value-added creation by region or groups of regions (the same analysis can be done at the sector level).

With the development of new data on inter-regional flows, it becomes possible to understand trade flows using the same factors that determine the locations of various economic activities (Isard and Peck, 1954). Munroe *et al* (2007) considered the domestic trade flows between regions inside a country as an important economic lever and carrier of a considerable economic impact. Inter-regional trade can stimulate income transfers through production linkages that benefit central and peripheral regions. The research literature on economic geography and trade theory provides insights into how trade can create highly unequal spatial structures internationally and within countries (Venables, 2019). Perobelli *et al* (2010) and Pacheco *et al* (2023) studied the structural interdependence between Colombian departments and showed a spatial concentration of a center-periphery pattern that emerges from the influence of the capital city, Bogotá, on other regional economies because of its backward linkages. However, trade may adjust to inequalities within and between countries in certain circumstances.

The interaction between domestic and international trade is little understood because of the scarcity of domestic trade data for most countries. The degree of openness to international trade may change the nature of domestic market integration (Keller *et al*, 2012). This dual pattern of trade (international and domestic trade) is commonly overlooked in the research literature. Our purpose in studying Moroccan trade in value-added in this paper is to elucidate such a dual pattern in the country. Several recent studies have been carried out to measure value-added embedded in foreign and domestic exports. Haddad and Araujo (2020) studied the dual trade pattern of domestic value-added from services incorporated in goods exports in different countries in Latin America. Pacheco *et al* (2023) measured trade in value-added (TiVA) embodied

in Colombian departments' exports, taking into account different inter-regional and international trade integration hierarchies. Like Haddad and Araujo (2020), Wahyana *et al* (2021) studied the domestic value-added from services incorporated in goods exports from Moroccan regions.

In response to this growing interest in traded value-added and its geographical distribution, numerous efforts have been made to track value-added in trade using input-output (IO) tables[5]. Inter-regional input-output (IIO) tables are the primary information system in some of these studies, as they allow measuring and tracing of the traded value-added by country and by industry within countries.

Timmer *et al* (2013, 2014, 2015) and Los *et al* (2015b) focused on the value-added incorporated in the production of final goods separately from domestic or foreign demand. Nonetheless, the domestic focus was on single-region national economies. One of the first commonly applied approaches allows the tracking of value-added origin in the final demand using the Leontief model (Johnson and Noguera, 2012). As a result of IO decomposition, the value-added generated by a given country, a part of the country, and a sector from foreign final demand[6] is identified as *"exports of value-added"* or *"traded value-added in exports"*. This decomposition approach does not differ from the foundations of input-output analysis since it is computed by multiplying the Leontief inverse matrix by a final demand vector. The results give insights about traded value-added with the world (at the country level), traded value-added with a given partner (bilateral trade level), and the region or the industry origin of value-added in the exporting economy (regional and sectoral level) (Miroudot and Ye, 2017).

Haddad (2019b) decomposed the final demand components vector of Brazil's input-output table to measure services value-added embedded in exports to partner countries. The author suggested decomposing the final demand vector into domestic and foreign demand to emphasize the sources of traded value-added and its destinations. Similarly, Wang *et al* (2020) explored the contribution of domestic and foreign demand to China's value-added by business activity. Their study proposed a decomposition of the final demand vector into domestic and foreign final demand to quantify their importance to China's value-added by business activity, expressing how much domestic value-added is induced by domestic and foreign final demand.

Following on from these works, we are interested in providing a decomposition of value-added in Morocco's domestic and foreign final demand, leaving aside the decomposition of traded value-added in intermediate consumption domestic trade flows, unlike Koopman *et al* (2014), Los and Timmer (2018), and Miroudot and Ye (2020). We decompose the final demand into domestic absorption and foreign final demand (exports). We add to the current literature a decomposition of foreign final demand into destinations of Moroccan exports (by trading partner), measuring the value-added generated by the country's inter-regional trade (between its regions) and its foreign trade.

Thus, our main goal is to provide, for Morocco, a common reinterpretation of the input-output model in terms of the relationship between gross output, final demand, and value-added

[5] See for example Hummels *et al*, 2001; Johnson and Noguera, 2012, 2017; Timmer *et al*, 2014; Johnson, 2014; Koopman *et al*, 2012, 2014; Wang *et al*, 2013, 2018, 2020; Los *et al*, 2016; Miroudot and Ye, 2017, 2020; Duan *et al*, 2018; Brumm *et al*, 2019; Ito *et al*, 2020; Haddad and Araujo, 2020; Pacheco *et al*, 2023; Wahyana *et al*, 2021; and Patunru *et al*, 2021.
[6] Foreign final demand or external sources of final demand are all the types of demand originating outside the country.

generation by the main trading partners of Morocco's regions. We estimate the value-added embodied in Moroccan inter-regional trade taking into account the regional and sectoral flows in the domestic absorption components. Our second goal is to understand the potential gains from Moroccan participation in international trade through the generation of value-added embedded in foreign exports by foreign trading countries.

Methodologically, our estimation procedure is similar to that used by Johnson and Noguera (2012), Haddad (2019b), and Wang *et al* (2020), and to a certain extent to that applied by Wahyana *et al* (2021) and Pacheco *et al* (2021). In particular, we use the most recent Moroccan inter-regional input-output (IIO) table using 2019 data developed by Haddad *et al* (2021). The fundamental working assumption of our decomposition approach is that the economic structure of Moroccan exports in 2018 remains unaltered. We use data from the OECD database to decompose the foreign exports vector of the country IIO table. This estimation decomposes final demand into its impacts on gross output and value-added. We compute the value-added incorporated in domestic and foreign trade using the value-added to gross output vector derived from the IIO 2019 table.

Section 2 presents some characteristics of the Moroccan economy, considering the sectoral structure of exports, their main destinations, and the regional economic structure of the country. Section 3 describes the methodology we use to measure value-added in inter-regional and foreign trade in Morocco. In section 4, we present the data used in the research. Section 5 discusses our results and analyzes the sources and destinations of traded value-added. Finally, section 6 provides concluding remarks.

2. ECONOMIC STRUCTURE

2.1. Structure of Exports

This section describes the characteristics of Moroccan exports in order to understand their nature and participation in global value chains (GVCs). Looking at the structure of trading partners, France consumes 16% of total Moroccan exports, followed by Spain at 15.6%, China at 8.2%, the United States at 7.2%, and Italy at 5.2% (Table 1). The exports to these five countries alone represent more than half of Morocco's export value.

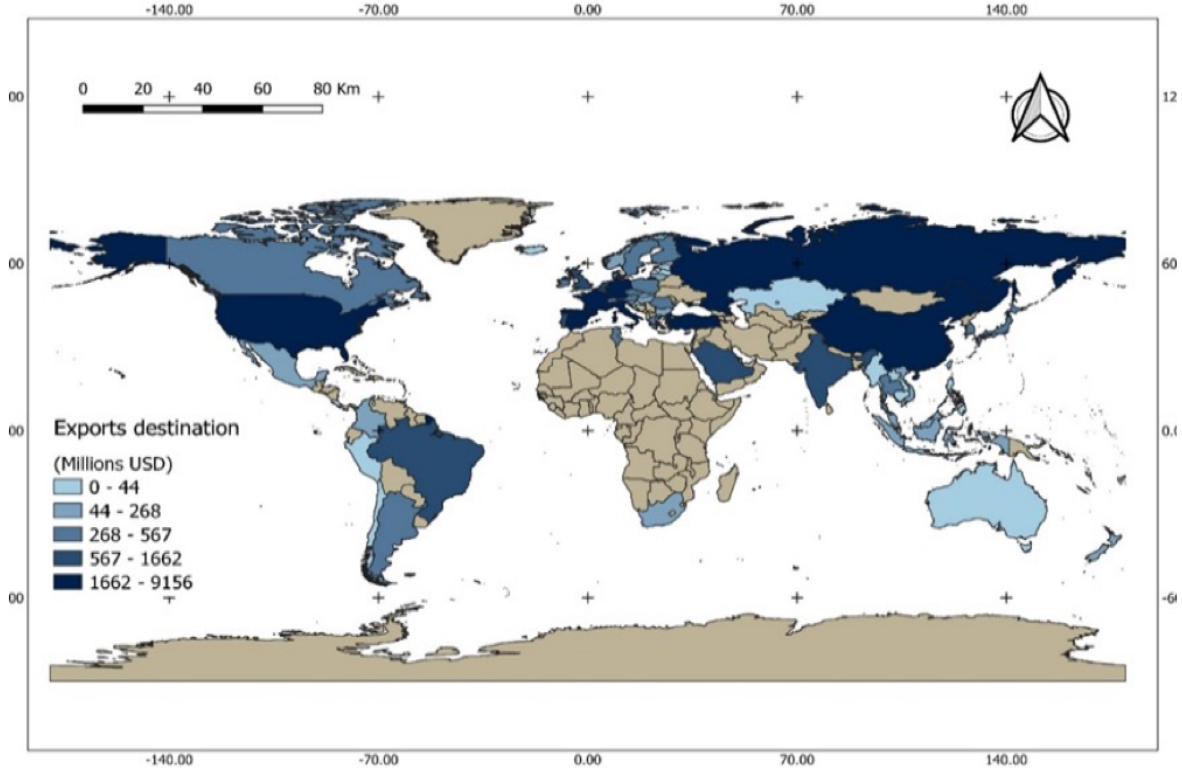
Table 1: Destinations of Moroccan Exports, 2018

Country	Exports (USD, Millions)	Share
France	9 155,3	16,0%
Spain	8 927,9	15,6%
China	4 720,4	8,2%
United States	4 116,0	7,2%
Italy	2 997,9	5,2%
Germany	2 442,6	4,3%
Turkey	2 340,6	4,1%
Russia	1 661,8	2,9%
United Kingdom	1 381,5	2,4%
Portugal	1 364,8	2,4%
Rest of the World (ROW)	18 165,6	31,7%
Total	**57 274,4**	**100,0%**

Source: Authors' calculations based on OECD, TiVA Indicators.

Figure 1 maps the relative importance of trade partners for Moroccan exports. Europe is the primary destination for Moroccan exports, particularly France, Spain, Italy, Germany, Russia, the United Kingdom, and Portugal.

Figure 1: Destinations of Moroccan Exports, 2018



Source: Authors' calculations, based on OECD TiVA Indicators.

Asia comes in second place as an important destination for Moroccan exports, mainly to China, Turkey, and India. The emergence of Asia on the map of Moroccan trade partners arises essentially from the trade agreements concluded (Turkey in 2006, China and India in 2016). Meanwhile, the United States is the primary destination on the American continent.

In sector terms, Moroccan exports are dominated mainly by the Metallurgical and electrical industry (D04) with 23.7%, Transport (I01) with 10.6%, Real estate (K00) with 10.6%, Chemical industry (D03) with 10.3%, and Agriculture (A00) 9.8% (Table. 2). Together, these five sectors represent 65% of Moroccan exports. Table 2 shows the top 20 sectoral export destinations, representing almost 41% of total Moroccan exports. It reveals an export concentration in a few destinations, mainly France and Spain, and sectors, primarily the Metallurgical and electrical industry, and Oil refining and other energy products (according to OECD). This concentration may cause external dependence and vulnerability for the Moroccan economy.

Table 2: Top Exporting Sectors and Top 20 Sectoral Flows by Destination

IIOM-MOR 2019				TiVA Indicators 2018		
	Sector	Millions DHS	Share	Sector	Destination	Share
A00	Agriculture	43 537,6	9,80%	Metallurgical and electrical industry	Spain	5,20%
B05	Fishing	4 831,7	1,10%	Metallurgical and electrical industry	France	5,10%
C00	Mining industry	20 087,5	4,50%	Metallurgical and electrical industry	China	3,40%
D01	Food industry and tobacco	33 429,9	7,50%	Oil refining and other energy products	Spain	2,90%
D02	Textile and leather industry	41 324,4	9,30%	Transport	France	2,60%
D03	Chemical industry	45 805,9	10,30%	Metallurgical and electrical industry	Germany	2,20%
D04	Metallurgical and electrical industry	104 965,2	23,70%	Trade	Spain	2,10%
D05	Other manufacturing	17 803,1	4,00%	Trade	France	2,10%
D06	Oil refining	36,4	0,00%	Metallurgical and electrical industry	Italy	1,90%
E00	Electricity and water	5 089,2	1,10%	Other non-financial services	France	1,60%
F45	Construction	1 072,1	0,20%	Metallurgical and electrical industry	Turkey	1,50%
G00	Trade	14 641,5	3,30%	Textile and leather industry	China	1,50%
H55	Hotels and restaurants	1 322,5	0,30%	Oil refining and other energy products	USA	1,40%
I01	Transport	47 209,9	10,60%	Chemical industry	Spain	1,40%
I02	Post and telecommunications	2 976,1	0,70%	Oil refining and other energy products	Russia	1,00%
J00	Financial activities and insurance	8 196,1	1,80%	Chemical industry	France	1,00%
K00	Real estate	47 034,9	10,60%	Trade	USA	1,00%
L75	Public administration	3 154,9	0,70%	Metallurgical and electrical industry	USA	1,00%
MNO	Education, health and social action	261,4	0,10%	Transport	Spain	1,00%
OP0	Other non-financial services	906,8	0,20%	Transport	USA	0,90%
	Total	**443 687,2**	**100,00%**	**Total**		**40,80%**

Source: Authors' calculations, based on OECD TiVA Indicators.

2.2. Geography of Economic Activity

To understand the nature and the structure of Moroccan inter-regional and international trade, it is first essential to study the geography of the economic activities within the country. Table 3 reveals essential information on gross domestic product (GDP) and the regional distribution of the population. It shows Grand Casablanca-Settat as the country's prime economic and most-populous region. The region has roughly 21% of the population and generates 29% of the national GDP. The two biggest urban agglomerations, Grand Casablanca-Settat (R6) and Rabat-Salé-Kénitra (R4), have higher productivity levels, which is presented in higher GDP shares (45%) than population shares (34%). In a more disaggregated spatial context, the localization of industrial and free zones outside the Grand Casablanca-Settat region shows the core of the Moroccan economy covering six of the twelve regions, namely Tanger-Tétouan-Al Hoceima (R1), Fès-Meknès (R3), Rabat-Salé-Kénitra (R4), Béni Mellal-Khénifra (R5), Grand Casablanca-Settat (R6), and Marrakech-Safi (R7). These regions together generate 81% of GDP.

Table 3: Basic Socioeconomic Indicators for Morocco, 2019

		GRP * (In Millions DHS)		Population (In Millions)		GRP Per Capita	
Region		2019	Share %	2020 **	Share %	GRP Per Capita (2019)	Share %
R1	Tanger-Tetouan-Al Hoceima	109 125,4	**10,70%**	3,814	**10,60%**	28 612,89	1,01
R2	Oriental	53 522,4	**5,30%**	2,453	**6,80%**	21 817,13	0,77
R3	Fès-Meknès	95 137,7	**9,30%**	4,406	**12,30%**	21 593,43	0,763
R4	Rabat-Salé-Kénitra	165 611,8	**16,30%**	4,868	**13,50%**	34 022,30	1,202
R5	Béni Mellal-Khénifra	67 964,4	**6,70%**	2,613	**7,30%**	26 008,74	0,919
R6	Grand Casablanca-Settat	292 367,1	**28,70%**	7,408	**20,60%**	39 465,27	1,394
R7	Marrakech-Safi	96 900,4	**9,50%**	4,774	**13,30%**	20 295,77	0,717
R8	Drâa-Tafilalet	27 045,3	**2,70%**	1,694	**4,70%**	15 967,37	0,564
R9	Souss-Massa	74 959,5	**7,40%**	2,896	**8,10%**	25 882,44	0,914
R10	Guelmim-Oued Noun	12 018,4	**1,20%**	0,446	**1,20%**	26 933,51	0,951
R11	Laayoune-Sakia El Hamra	15 376,4	**1,50%**	0,4	**1,10%**	38 398,58	1,356
R12	Dakhla-Oued Eddahab	7 993,1	**0,80%**	0,179	**0,50%**	44 754,40	1,581
MOROCCO		1 018 022,0	**100,00%**	35,952	**100,00%**	28 316,41	1,000

* GRP is the Gross Regional Product (IIOM-MOR).

* *Forecasts In Millions, HCP report

Source: Based on IIOM-MOR and High Commission of Planning (HCP).

In gross output terms, the 2019 input-output system of Morocco (IIOM-MOR) shows that five of the six economically largest regions, which are relatively more integrated, produce the bulk of goods and services flows: Grand Casablanca-Settat (R6), Rabat-Salé-Kénitra (R4), Tanger-Tétouan-Al Hoceima (R1), Marrakech-Safi (R7), and Fès-Meknès (R3). They were responsible for 74.2% of the Moroccan total output volume in 2019. The remaining regions are characterized by relatively weak integration between them, with a strong dependence on internal production chains and internal final demand. Grand Casablanca-Settat is the primary internal trade partner of the Moroccan regions.

In regional output terms, Grand Casablanca-Settat dominates national production, with a share of 31% in total output, followed by Rabat-Salé-Kénitra (12.8%), Tanger-Tétouan-Al Hoceima (11.9%), Marrakech-Safi (9.9%), and Fès-Meknès (8.8%). The analysis of regional output gives crucial information about the spatial concentration of specific activities: Food industry (D01) in Grand Casablanca-Settat, Rabat-Salé-Kénitra, Fès-Meknès, and Marrakech-Safi (85.5% of total sectoral output); Public administration (L75) in Rabat-Salé-Kénitra, Grand Casablanca-Settat, Fès-Meknès, and Tanger-Tétouan-Al Hoceima (57.1%); Agriculture (A00) in Béni Mellal Khénifra, Rabat-Salé-Kénitra, Fès-Meknès, and Marrakech-Safi (54.3%); Construction (F45) in Grand Casablanca-Settat, Rabat-Salé-Kénitra, Tanger-Tétouan-Al Hoceima, and Marrakech-Safi (60.8%); and Trade (G00) in Grand Casablanca-Settat, Rabat-Salé-Kénitra, Fès-Meknès, and Marrakech-Safi (59.8%). Meanwhile, some regions play important roles in some specific sectors, such as Tourism (H55) services in Souss Massa and Marrakech (together 62.3%). Generally, service activities are more concentrated in the two main urban agglomerations, i.e. Casablanca and Rabat (21.3% and 16.5% on average, respectively).

The analysis of sectoral production shows the dominance of the Food industry and tobacco (D01), Public administration (L75), Agriculture (A00), Construction (F45), and Trade (G00), representing more than 50% of 2019 total domestic-oriented output. It reveals the sectoral concentration of regional output and the importance of some sectoral activities in relatively specialized regions. Broadly, Agriculture (A00), the Food industry (D01), and Public Administration (L75) dominate the sectoral specialization of the majority of Moroccan regions. Specifically, Public administration (L75) dominates the economic activities in Guelmim-Oued

Noun (R10) (18.9% of total regional output), Laayoune-Sakia El Hamra (R11) (10.9%), and Rabat-Salé-Kénitra (R4) (12.8%), and Construction (F45) dominates in Laayoune-Sakia El Hamra (R11) (11.9%), Oriental (R2) (12.6%), and Marrakech-Safi (R7) (10.2%).

3. EMPIRICAL STRATEGY

3.1. Methodology

Our methodology follows the approach initiated by Johnson and Noguera (2012) to prevent double-counting observed in standard trade national accounts. This approach provides a summary trade table combining the input-output (IO) table and bilateral trade data for several countries to track the source country of the 'value-added in exports'. In this respect, Koopman *et al* (2014) proposed a framework for the decomposition of a country's gross exports into 'domestic value-added', 'foreign value-added', and double-counted terms.

Analyzing the geographical structure of trade flows helps identify feedback effects and inter-regional and international trade integration architecture (Sonis *et al*, 2002). Following Sonis *et al* (2002), we add to the inter-regional input-output (IIO) analysis the geographical mapping of domestic value-added (DVA) embedded in external sources of final demand within the country, covering the domestic and foreign trading partners of each domestic region. Regional data is decomposed to consider the multiplier structure and the corresponding structures of gross exports, final demand, and value-added.

For the specification of our simulation model, we start from a standard inter-regional input-output (IIO) model with N industries (labeled *i or j*), R regions (labeled r or s), and *C+1* final demand components (C domestic users and one foreign user)[7] in each region. For industry *i,* output in region r (x_i^r) is defined by the ($NR\ x\ 1$) vector $\mathbf{x}$ of gross output.

The commodity flows from industry i in region r to industry j in region s (z_{ij}^{rs}) are represented in a ($NR\ x\ NR$) matrix $\mathbf{Z}$ with the interindustry and inter-regional intermediate demand. $\mathbf{A}$ is defined to be the inter-regional matrix of technical coefficients, in which $\mathbf{A} = \mathbf{Z}(\hat{\mathbf{x}})^{-1}$. Thus,

$$\mathbf{x} = \mathbf{Z} + \mathbf{F}\boldsymbol{i} = \mathbf{A}\mathbf{x} + \mathbf{F}\boldsymbol{i} \tag{1}$$

Where $\mathbf{F}$ is the matrix of final demand with ($NR\ x\ C + 1$) dimensions, $\boldsymbol{i}$ represents a column vector of one's with the appropriate dimension. $\mathbf{A}$ considers the input coefficients, a_{ij}^{rs}, defined as the amount of i from r required per unit of j in s, for i, j =1,...., N and r, s =1,...., R. Then, the inter-regional input-output model can be expressed by:

$$\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{F}\boldsymbol{i} = \mathbf{B}\mathbf{F}\boldsymbol{i} \tag{2}$$

Where $\mathbf{I}$ is the identity matrix, and $\mathbf{B} = (\mathbf{I} - \mathbf{A})^{-1}$ is the Leontief inverse matrix.

[7] The C domestic absorption components of final demand are investment, household, government, and NPISH.

Let us consider the two equation systems above (1) and (2) in an inter-regional context, with R different regions, so that:

$$\boldsymbol{x} = \begin{bmatrix} \mathbf{x}_i^r \\ \mathbf{x}_j^r \\ \vdots \\ \mathbf{x}_i^s \\ \mathbf{x}_j^s \end{bmatrix}; \boldsymbol{A} = \begin{bmatrix} \mathbf{A}_{ii}^{rr} & \mathbf{A}_{ij}^{rr} & \cdots & \mathbf{A}_{ii}^{rs} & \mathbf{A}_{ij}^{rs} \\ \mathbf{A}_{ji}^{rr} & \mathbf{A}_{jj}^{rr} & \cdots & \mathbf{A}_{ji}^{rs} & \mathbf{A}_{jj}^{rs} \\ \vdots & & \ddots & \vdots & \\ \mathbf{A}_{ii}^{sr} & \mathbf{A}_{ij}^{sr} & \cdots & \mathbf{A}_{ii}^{ss} & \mathbf{A}_{ij}^{ss} \\ \mathbf{A}_{ji}^{sr} & \mathbf{A}_{jj}^{sr} & \cdots & \mathbf{A}_{ji}^{ss} & \mathbf{A}_{jj}^{ss} \end{bmatrix}; \boldsymbol{B} = \begin{bmatrix} \mathbf{B}_{ii}^{rr} & \mathbf{B}_{ij}^{rr} & \cdots & \mathbf{B}_{ii}^{rs} & \mathbf{B}_{ij}^{rs} \\ \mathbf{B}_{ji}^{rr} & \mathbf{B}_{jj}^{rr} & \cdots & \mathbf{B}_{ji}^{rs} & \mathbf{B}_{jj}^{rs} \\ \vdots & & \ddots & \vdots & \\ \mathbf{B}_{ii}^{sr} & \mathbf{B}_{ij}^{sr} & \cdots & \mathbf{B}_{ii}^{ss} & \mathbf{B}_{ij}^{ss} \\ \mathbf{B}_{ji}^{sr} & \mathbf{B}_{jj}^{sr} & \cdots & \mathbf{B}_{ji}^{ss} & \mathbf{B}_{jj}^{ss} \end{bmatrix}; \tag{3}$$

$$\text{and } \boldsymbol{F} = \begin{bmatrix} \mathbf{f}_i^{r,1} & \mathbf{f}_i^{r,2} & \cdots & \mathbf{f}_i^{r,C} & \mathbf{f}_i^{r,exp} \\ \mathbf{f}_j^{r,1} & \mathbf{f}_j^{r,2} & \cdots & \mathbf{f}_j^{r,C} & \mathbf{f}_j^{r,exp} \\ \vdots & & \ddots & \vdots & \\ \mathbf{f}_i^{s,1} & \mathbf{f}_i^{s,2} & \cdots & \mathbf{f}_i^{s,C} & \mathbf{f}_i^{s,exp} \\ \mathbf{f}_j^{s,1} & \mathbf{f}_j^{s,2} & \cdots & \mathbf{f}_j^{s,C} & \mathbf{f}_j^{s,exp} \end{bmatrix}$$

We may consider the foreign exports vector as a specific final demand matrix, where the foreign demand related to sector *i* in region *r* ($\mathbf{f_i^{r,exp}}$) may be disaggregated across *K* different foreign destinations. Thus, the final demand matrix (**F**) is obtained from the IIOM-MOR 2019, and decomposed into *C* components of domestic demand and *K* components of foreign demand. The latter is decomposed into source countries of final demand, using the OECD's estimates for Moroccan sectoral gross exports by destination country.

We define **W** (*NR x K*) as the foreign exports coefficients matrix, where w_i^{rk} is defined as the share of sector *i*'s exports from region *r* to country *k, for k=1,..... K,* calculated from its total foreign exports. We assume these coefficients have the same distribution across regional sectors (for the 20 sectors, in the 12 regions).

$$\boldsymbol{W} = \begin{bmatrix} \mathbf{w}_i^{rk1} & \mathbf{w}_i^{rk2} & \cdots & \mathbf{w}_i^{rk..} & \mathbf{w}_i^{rkn} \\ \mathbf{w}_j^{rk1} & \mathbf{w}_j^{rk2} & \cdots & \mathbf{w}_j^{rk..} & \mathbf{w}_j^{rkn} \\ \vdots & & \ddots & \vdots & \\ \mathbf{w}_i^{sk1} & \mathbf{w}_i^{sk2} & \cdots & \mathbf{w}_i^{sk..} & \mathbf{w}_i^{skn} \\ \mathbf{w}_j^{sk1} & \mathbf{w}_j^{sk2} & \cdots & \mathbf{w}_j^{sk..} & \mathbf{w}_j^{skn} \end{bmatrix}; \textit{ and } \boldsymbol{L} = \begin{bmatrix} \mathbf{l}_i^{rk1} & \mathbf{l}_i^{rk2} & \cdots & \mathbf{l}_i^{rk..} & \mathbf{l}_i^{rkn} \\ \mathbf{l}_j^{rk1} & \mathbf{l}_j^{rk2} & \cdots & \mathbf{l}_j^{rk..} & \mathbf{l}_j^{rkn} \\ \vdots & & \ddots & \vdots & \\ \mathbf{l}_i^{sk1} & \mathbf{l}_i^{sk2} & \cdots & \mathbf{l}_i^{sk..} & \mathbf{l}_i^{skn} \\ \mathbf{l}_j^{sk1} & \mathbf{l}_j^{sk2} & \cdots & \mathbf{l}_j^{sk..} & \mathbf{l}_j^{skn} \end{bmatrix}; \tag{4}$$

Then, we consider **L** the detailed foreign exports matrix. Where $\boldsymbol{l_i^{rk}}$ are exports of sector ***i*** in region ***r*** to country ***k.***

$$\mathbf{L} = \mathbf{EXP} * \mathbf{W} \tag{5}$$

Later, we compute $\boldsymbol{X^R}$ the gross output by the sources of final demand—domestic and foreign (regions and foreign exports). And $\boldsymbol{X^K}$ is gross output for exports by destination (by trading partners).

$$\boldsymbol{X^R} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{F} = \mathbf{BF} \tag{6}$$

$$\boldsymbol{X^K} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{L} = \mathbf{BL} \tag{7}$$

The two equations system (6) and (7) above can be written as follows:

$$\boldsymbol{X^R} = \begin{bmatrix} \mathbf{x}_i^r \\ \mathbf{x}_j^r \\ \vdots \\ \mathbf{x}_i^s \\ \mathbf{x}_j^s \end{bmatrix} = \begin{bmatrix} \mathbf{B}_{ii}^{rr} & \mathbf{B}_{ij}^{rr} & & \mathbf{B}_{ii}^{rs} & \mathbf{B}_{ij}^{rs} \\ \mathbf{B}_{ji}^{rr} & \mathbf{B}_{jj}^{rr} & \cdots & \mathbf{B}_{ji}^{rs} & \mathbf{B}_{jj}^{rs} \\ \vdots & & \ddots & \vdots & \\ \mathbf{B}_{ii}^{sr} & \mathbf{B}_{ij}^{sr} & & \mathbf{B}_{ii}^{ss} & \mathbf{B}_{ij}^{ss} \\ \mathbf{B}_{ji}^{sr} & \mathbf{B}_{jj}^{sr} & \cdots & \mathbf{B}_{ji}^{ss} & \mathbf{B}_{jj}^{ss} \end{bmatrix} * \begin{bmatrix} \mathbf{f}_i^{r\bullet} & \mathbf{f}_i^{r,\exp} \\ \mathbf{f}_j^{r\bullet} & \mathbf{f}_j^{r,\exp} \\ \vdots & \vdots \\ \mathbf{f}_i^{s\bullet} & \mathbf{f}_i^{s,\exp} \\ \mathbf{f}_j^{r\bullet} & \mathbf{f}_j^{s,\exp} \end{bmatrix} \tag{8}$$

$$\boldsymbol{X^K} = \begin{bmatrix} \mathbf{x}_i^{rk} \\ \mathbf{x}_j^{rk} \\ \vdots \\ \mathbf{x}_i^{sk} \\ \mathbf{x}_j^{sk} \end{bmatrix} = \begin{bmatrix} \mathbf{B}_{ii}^{rr} & \mathbf{B}_{ij}^{rr} & & \mathbf{B}_{ii}^{rs} & \mathbf{B}_{ij}^{rs} \\ \mathbf{B}_{ji}^{rr} & \mathbf{B}_{jj}^{rr} & \cdots & \mathbf{B}_{ji}^{rs} & \mathbf{B}_{jj}^{rs} \\ \vdots & & \ddots & \vdots & \\ \mathbf{B}_{ii}^{sr} & \mathbf{B}_{ij}^{sr} & & \mathbf{B}_{ii}^{ss} & \mathbf{B}_{ij}^{ss} \\ \mathbf{B}_{ji}^{sr} & \mathbf{B}_{jj}^{sr} & \cdots & \mathbf{B}_{ji}^{ss} & \mathbf{B}_{jj}^{ss} \end{bmatrix} * \begin{bmatrix} \mathbf{l}_i^{rk1} & \mathbf{l}_i^{rk2} & & \mathbf{l}_i^{rk..} & \mathbf{l}_i^{rkn} \\ \mathbf{l}_j^{rk1} & \mathbf{l}_j^{rk2} & \cdots & \mathbf{l}_j^{rk..} & \mathbf{l}_j^{rkn} \\ \vdots & & \ddots & \vdots & \\ \mathbf{l}_i^{sk1} & \mathbf{l}_i^{sk2} & & \mathbf{l}_i^{sk..} & \mathbf{l}_i^{skn} \\ \mathbf{l}_j^{sk1} & \mathbf{l}_j^{sk2} & \cdots & \mathbf{l}_j^{sk..} & \mathbf{l}_j^{skn} \end{bmatrix} \tag{9}$$

These calculations allow us to use the matrices to provide the monetary values of final demand expenditures from domestic regions in Morocco and foreign sources (trading partner countries). Let $\mathbf{V}$ be the value-added embodied in trade (inter-regional and international). Then, $\boldsymbol{V^R}$ corresponds to the value-added generated by regional and foreign trade (aggregated foreign final demand). And $\boldsymbol{V^K}$ is the value-added generated from foreign exports by the destination (trading partner). Finally, $\widehat{\mathbf{va}}$ is a diagonal matrix containing information on value-added to gross output ratios from the IIO table.

$$\boldsymbol{V^R} = \widehat{\mathbf{va}}\mathbf{X}^{\boldsymbol{R}} \tag{10}$$

$$\boldsymbol{V^K} = \widehat{\mathbf{va}}\mathbf{X}^{\boldsymbol{K}} \tag{11}$$

Value-added is decomposed to disaggregate the sectoral value-added created by trading partner countries within the country's regions. Thus, the two latter systems can algebraically be written as follows:

$$\boldsymbol{V^R} = \begin{bmatrix} \mathbf{v}_i^{rr} & \mathbf{v}_i^{rs} & & \boldsymbol{v}_i^{r,\exp} \\ \mathbf{v}_j^{rr} & \mathbf{v}_j^{rs} & \cdots & \mathbf{v}_j^{r,\exp} \\ \vdots & & \ddots & \vdots \\ \mathbf{v}_i^{sr} & \mathbf{v}_i^{ss} & & \mathbf{v}_i^{s,\exp} \\ \mathbf{v}_j^{sr} & \mathbf{v}_j^{ss} & \cdots & \mathbf{v}_j^{s,\exp} \end{bmatrix} \qquad \boldsymbol{V^K} = \begin{bmatrix} \mathbf{v}_i^{rk1} & \mathbf{v}_i^{rk2} & & \mathbf{v}_i^{rk..} & \mathbf{v}_i^{rkn} \\ \mathbf{v}_j^{rk1} & \mathbf{v}_j^{rk2} & \cdots & \mathbf{v}_j^{rk..} & \mathbf{v}_j^{rkn} \\ \vdots & & \ddots & \vdots & \\ \mathbf{v}_i^{sk1} & \mathbf{v}_i^{sk2} & & \mathbf{v}_i^{sk..} & \mathbf{v}_i^{skn} \\ \mathbf{v}_j^{sk1} & \mathbf{v}_j^{sk2} & \cdots & \mathbf{v}_j^{sk..} & \mathbf{v}_j^{skn} \end{bmatrix} \tag{12}$$

Where $\mathbf{v}_i^{rs}$ in $\boldsymbol{V^R}$matrix is defined as the value-added generated from the exports of sector $\boldsymbol{i}$ in region $\boldsymbol{r}$ to region $\boldsymbol{s}$. While $\mathbf{v}_j^{rk2}$ in $\boldsymbol{V^K}$ matrix means the traded value-added from sector $\boldsymbol{j}$ in the region $\boldsymbol{r}$'s exports to country $\boldsymbol{k2}$.

Using (12), we can thus estimate the contribution of final demand from different origins to regional and sectoral production and value-added generation. Thus, it is clear from (8) and (9) that regional and sectoral production depends, among other factors, on inter-regional demand—depending on the degree of inter-regional integration—and the demand from outside the country and depending on the country's international competitiveness.

3.2. Data

The methodology described in the previous section is based on the use of an inter-regional input-output system for Morocco (IIOS-MOR), linked to final demand and value-added generation. The IIOS-MOR was developed with the collaboration of three government and private research institutions. The IIO table was part of a technical cooperation initiative involving researchers from the Regional and Urban Economics Laboratory of São Paulo's University (NEREUS), Brazil, the Policy Center for the New South (PCNS), and the Department of Economic Studies and Financial Forecasting (DESFF), under the Ministry of Economy and Finance, both in Morocco. A fully specified inter-regional input-output database was estimated for 2019, covering 20 sectors in 12 Moroccan regions (IIOS-MOR). The IIOS database contains only one vector of foreign exports. We have decomposed the vector of foreign exports into 66 foreign destinations, including a vector for the rest of the world, specifying all remaining countries of the world, using the Trade in Value-Added (TiVA) indicators database[8].

The TiVA indicators database 2021 version contains a selection of indicators that track the origins of value-added in gross exports, imports, and final demand for the period 1995-2018. The inter-country input-output (ICIO) TiVA indicators database covers 66 economies, as well as region aggregates, for 45 sectors based on the International Standard Industrial Classification (ISIC) of all Economic Activities, revision 4, released by the Statistics Division of the United Nations[9] (OECD, 2021)[10].

Table 4: Databases

	IIO table	TiVA tables
Regions	12	National
Sectors	20	45 sectors aggregated in 20 sectors
Partners	Aggregated in foreign exports vector	66 economies
Year	2019	2018 (most recent year)

Source: Authors.

The OECD data details Morocco's gross exports by country of destination. The geographical unit of the data is the Moroccan national economy as the origin of exports. The indicator of gross exports aggregates exports of intermediate goods and services and exports of final demand. We harmonize the 45 national sectors responsible for gross exports available in the OECD's database with the Moroccan IIO table, taking into account national sectors aggregated in 20 sectors in 12 regions as presented in Table 4 (see Appendix 1). We also harmonize the gross foreign exports data to 20 exporting sectors and 66 trading partners. Then we compute the share of each trading partner in sectoral foreign exports, which we use to estimate value-added generation.

[8] https://www.oecd.org/sti/ind/measuring-trade-in-value-added.htm.
[9] This ICIO TiVA indicators was last updated in November 2021.
[10] OECD (2021), OECD Inter-Country Input-Output Database, http://oe.cd/icio.

4. RESULTS

4.1. Analysis of Trade Structure

This section presents and discusses the results after decomposing the final demand matrix of Morocco into domestic and foreign final demand. At the national level, our results show that trade between regions accounts for 78% of the total value-added embodied in Moroccan exports to final users. The remaining 22% is generated by international trade (Table 5). Nationally, inter-regional linkages generate more than three-quarters of the total value-added generated by trade. The four metropolitan regions, i.e. Grand Casablanca-Settat, Rabat-Salé-Kénitra, Marrakech-Safi, and Fès-Meknès, create 62% of value-added embodied in inter-regional trade and over 49% of total value-added. The Grand Casablanca-Settat region alone accounts for 19% and 24%, respectively, because of its strategic position as the economic and financial capital of the country.

Table 5: Value-added Embodied in Moroccan Exports

Source	Value-Added (DHS million)	Share in Total VA (%)	Share in National VA (%)
Interregional trade	**784 512,89**	**78.10%**	**100.00%**
Tanger-Tetouan-Al Hoceima	77 606,06	7.7%	10%
Oriental	50 316,25	5.0%	6%
Fès-Meknès	81 609,14	8.1%	10%
Rabat-Salé-Kénitra	125 753,80	12.5%	16%
Béni Mellal-Khénifra	46 973,03	4.7%	6%
Grand Casablanca-Settat	186 233,81	19.0%	24%
Marrakech-Safi	91 951,15	9.2%	12%
Drâa-Tafilalet	27 185,54	2.7%	3%
Souss-Massa	68 159,50	6.8%	9%
Guelmim-Oued Noun	11 037,97	1.1%	1%
Laayoune-Sakia El Hamra	12 890,70	1.3%	2%
Dakhla-Oued Eddahab	4 795,95	0.5%	1%
Exports	**220 408,57**	**21.9%**	**100.00%**
France	33 879,64	3.4%	15%
Spain	27 479,67	2.7%	12%
United States	19 479,58	1.9%	9%
China	15 110,43	1.5%	7%
Italy	9 179,32	0.9%	4%
India	8 182,68	1.0%	4%
Russian Federation	7 970,09	0.8%	4%
Turkey	6 206,51	0.6%	3%
Rest of the World	92 920,64	9.2%	42.20%
Total	**1 004 921,47**	**100.0%**	

Source: Authors' calculations.

At the sectoral level, four main sectors account for 48% of national inter-regional trade, i.e. Agriculture (A00), Public administration services (L75), Real estate (K00), and Education and Health (MN0), with shares of 13%, 13%, 11%, and 11% respectively (Table 6). Grand Casablanca-

Settat (R6) follows globally the same national structure with the dominance of the Construction sector (F45) over the Education and Health sector (MN0).

Meanwhile, the foreign exports' value-added is mainly generated by K00 (Real estate) 19%, D04 (Mechanical, metallurgical, and electrical industry) 14%, I01 (Transport) 13%, and A00 (Agriculture) 12%, representing 59% of their total value-added. The main four trading partners with the highest contributions to value-added are France, Spain, the United States, and China, with 15%, 12%, 9%, and 7%, respectively, of foreign exports' value-added (Table 6). Although the gross export volume to China is higher than to the United States, as shown in Table 1, the United States makes a more critical contribution to the Moroccan economy than China through traded value-added embodied. The same applies in the cases of Turkey and Russia.

In terms of the value-added contribution of foreign and domestic trade in every Moroccan region, Figure 2 reveals their relative importance to the national economy. On the one hand, trade flows with foreign partners create 38% of Dakhla-Oued Eddahab's value-added, and over 62% domestically. While on the other hand, nearly all of the Guelmim-Oued Noun's value-added (92%) is created by inter-regional trade flows.

From a sectoral perspective, Figure 3 reveals the importance of sectors in value-added generation based on their foreign and domestic trade. The Textile and leather sector (D02) generates 75% of its value-added from foreign exports and 25% domestically. Meanwhile, the Education, health, and social action sector (MN0), Construction (F45), Public administration services (L75), and Hotels and restaurants (H55) make all their value-added from domestic sales.

Table 6: Decomposition of Sectoral Value Added Based on All Sources of Final (Domestic & Foreign) Demand: Morocco, 2019 (in DHS million)

			Interregional Trade	Share %	Main Trading Regions				Foreign Exports	Share %	Main Trading Partners				Total	Share %
					R3	R4	R6	R7			France	Spain	United States	China		
Sectoral Value added	Agriculture	A00	99,265	13%	11,616	16,107	25,634	10,742	27,431	12.4%	2,609	2,045	2,154	2,115	126,696	13%
	Fishing	B05	7,576	1%	891	1,085	1,869	848	3,780	1.7%	164	371	72	96	11,356	1%
	Mining industry	C00	8,619	1%	1,058	1,295	1,617	1,109	14,771	6.7%	988	961	1,717	988	23,389	2%
	Food industry and tobacco	D01	46,818	6%	5,547	6,712	11,212	5,470	9,531	4.3%	730	1,036	864	442	56,349	6%
	Textile and leather industry	D02	4,585	1%	545	647	1,143	509	13,683	6.2%	740	2,305	126	3,977	18,267	2%
	Chemical industry	D03	8,290	1%	1,034	1,313	1,879	869	16,854	7.6%	2,751	1,966	927	2,632	25,143	3%
	Metallurgical and electrical industry	D04	12,103	2%	1,116	2,225	3,322	1,230	30,295	13.7%	578	8,828	4,417	117	42,398	4%
	Other manufacturing	D05	19,515	2%	2,035	2,734	4,748	2,551	6,139	2.8%	665	1,076	331	498	25,654	3%
	Oil refining	D06	7	0%	1	1	2	1	2	0.0%	0	0	0	0	9	0%
	Electricity and water	E00	27,668	4%	2,689	4,291	8,444	2,527	3,598	1.6%	282	592	270	245	31,265	3%
	Construction	F45	61,116	8%	4,942	14,601	19,622	3,363	454	0.2%	42	97	38	21	61,570	6%
	Trade	G00	80,461	10%	9,954	11,492	17,252	8,062	9,523	4.3%	1,415	1,291	875	502	89,983	9%
	Hotels and restaurants	H55	29,553	4%	3,661	4,442	6,700	3,176	893	0.4%	155	115	81	51	30,446	3%
	Transport	I01	17,961	2%	1,708	3,535	4,704	1,370	29,569	13.4%	5,202	2,119	2,525	1,592	47,530	5%
	Post and telecommunications	I02	19,170	2%	1,633	4,092	5,682	1,284	2,376	1.1%	943	243	184	46	21,546	2%
	Financial activities and insurance	J00	45,475	6%	5,733	7,182	12,054	5,096	6,108	2.8%	1,142	706	707	265	51,584	5%
	Real estate	K00	89,136	11%	9,585	14,672	21,580	9,668	41,890	19.0%	14,817	2,778	3,743	1,412	131,025	13%
	Public administration	L75	105,140	13%	9,882	25,526	24,223	6,817	2,613	1.2%	519	819	362	46	107,753	11%
	Education, health and social action	MNO	87,642	11%	10,756	15,181	17,322	8,526	225	0.1%	35	22	25	12	87,867	9%
	Other non-financial services	OP0	14,415	2%	1,632	2,426	3,761	2,023	674	0.3%	103	110	62	53	15,089	2%
	MOROCCO		784,513	78%	86,019	139,561	192,769	75,240	220,409	21.9%	33,880	27,480	19,480	15,110	1,004,921	100%

Figure 2: Value-added Embodied in Exports, by Type of Trade: Moroccan Regions

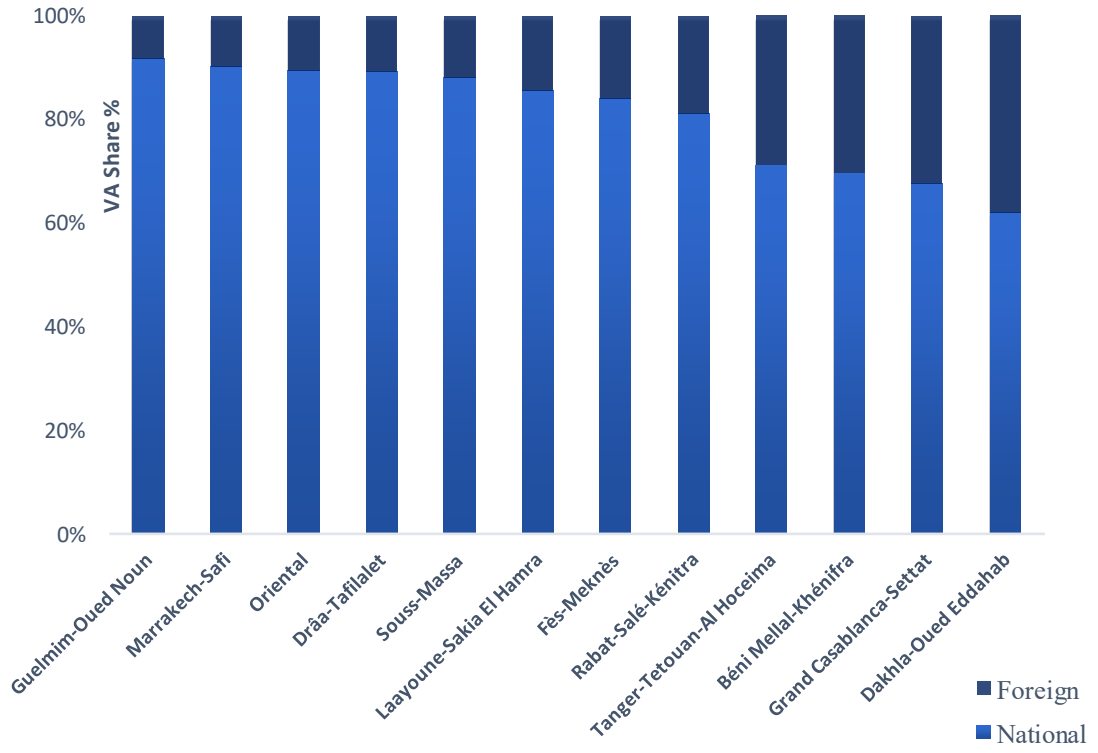
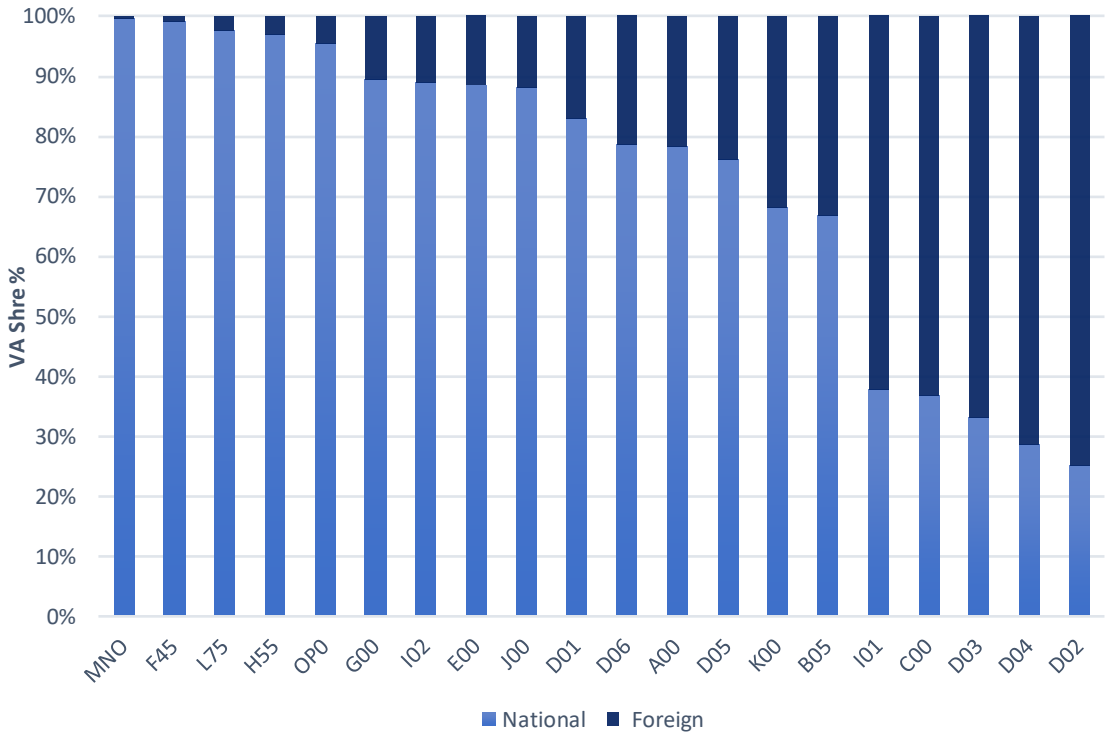


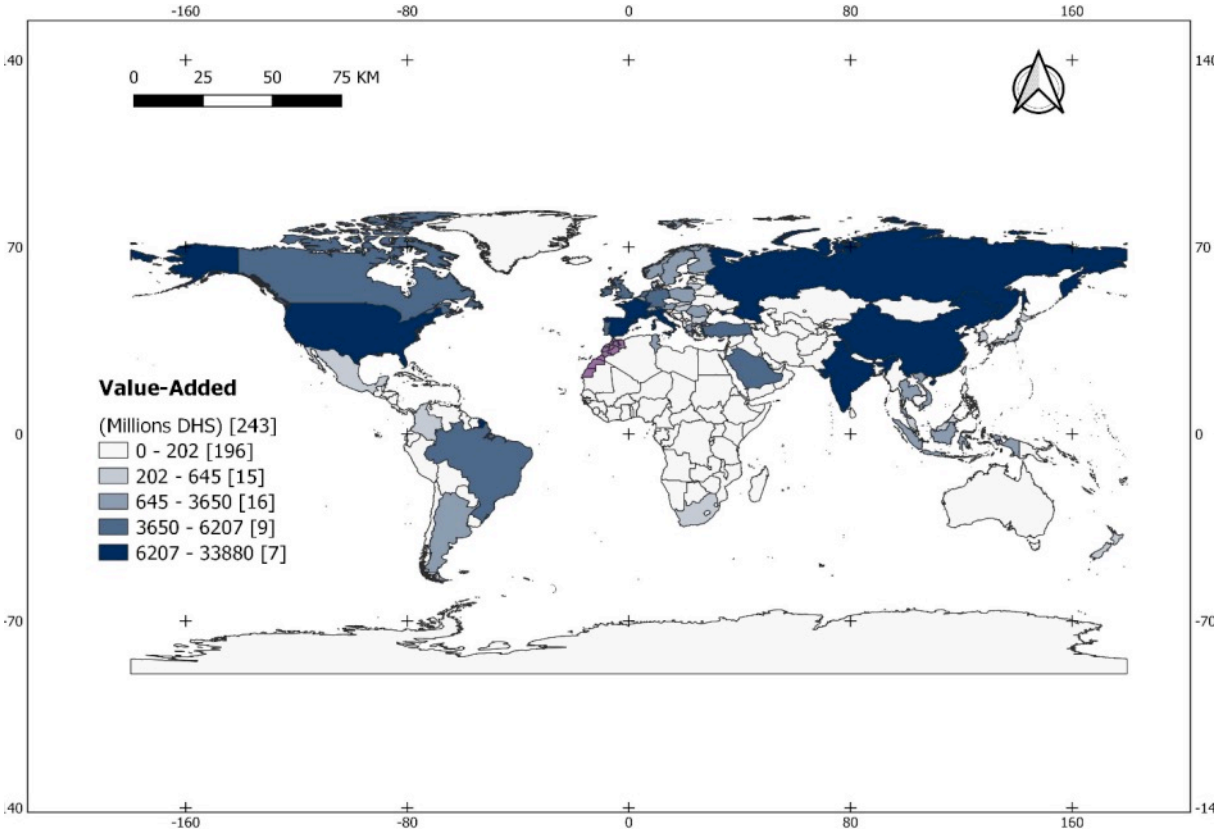
Figure 3: Value-added Embodied in Exports, by Type of Trade: Moroccan Sectors



For visualization purposes, Figure 4 shows the top 65 value-added destinations of foreign exports. Europe, North America, and North Asia concentrate the bulk of value-added. France, Spain, the United States, China, Italy, and India account for 51% of total foreign value-added exports.

However, although India is the eleventh gross export destination, it came out as the sixth generator of foreign export value-added, ahead of certain major trading partners like Germany, Turkey, and Russia (Table 1).

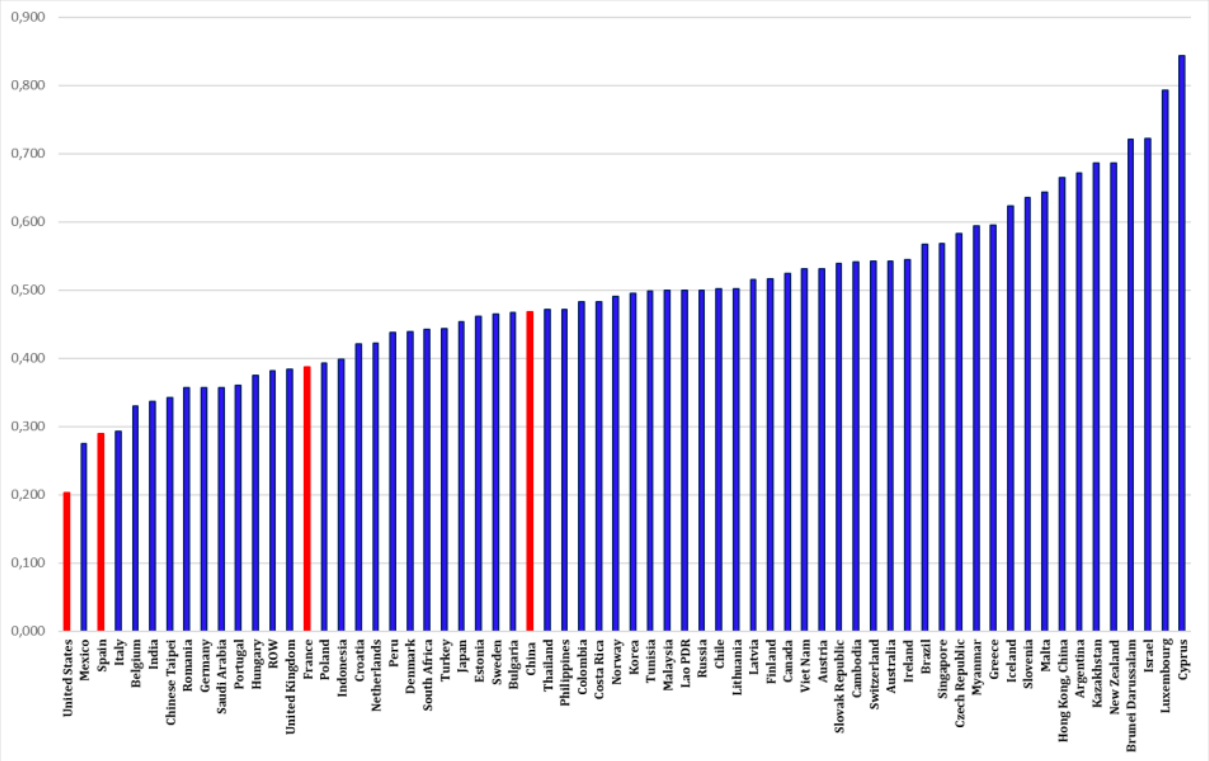
Figure 4: Value-added Incorporated in Foreign Exports from Moroccan Regions (Millions DHS)



Source: Authors' calculations.

We study the sectoral composition of Moroccan exports. Figure 5 presents the specialization of sectoral Moroccan exports by foreign destination. The smaller the coefficient for a given country, the more similar the sectoral structure of Moroccan exports to it, compared to the sectoral structure of Moroccan total foreign exports. For instance, Moroccan exports to the United States and Mexico have a similar sectoral composition to total exports, whereas the sectoral composition of exports to Cyprus and Luxemburg is pretty different. Of the main trading partners of Morocco, the United States and Spain have the most similar export sectoral composition to that of total exports. However, France has a higher specialization coefficient than the first two partner countries, and China has an average coefficient, meaning that the sectoral composition of Moroccan exports to China has a more different composition from that of total exports.

Figure 5: Specialization of Sectoral Moroccan Exports by Foreign Destination

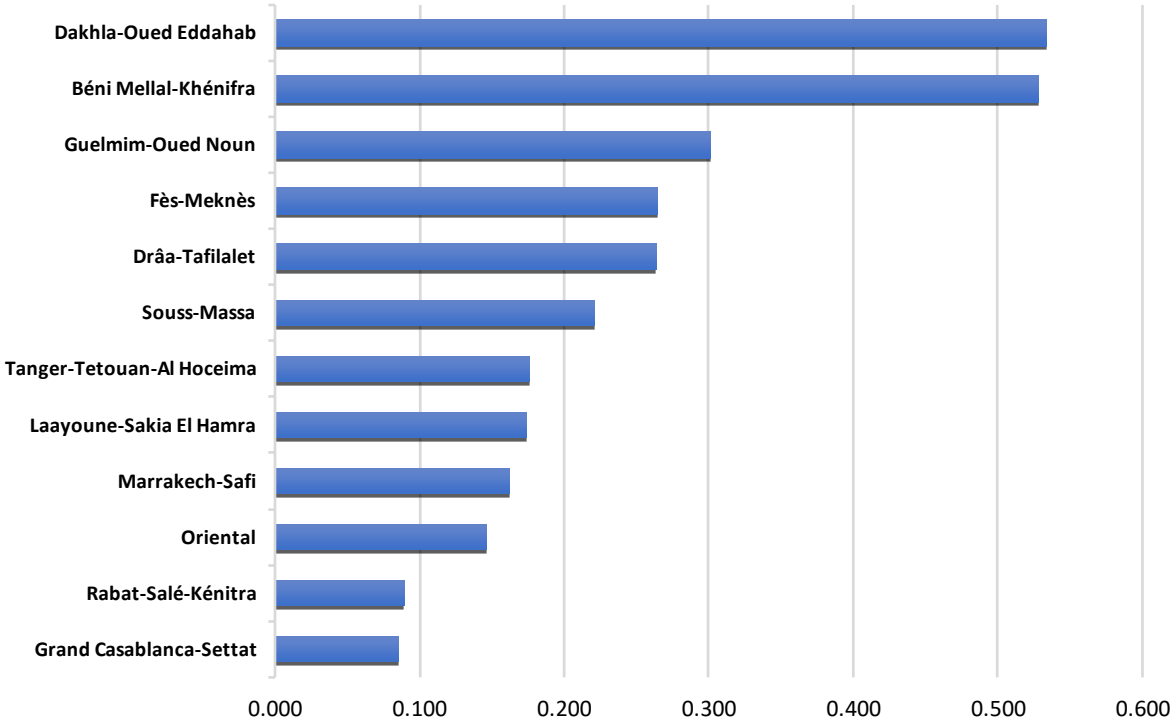


Source: Authors' calculations.

We also study destination specialization by region. Figure 6 shows the relative importance of foreign trade partners for a given region compared to the relative importance of foreign trade partners for Morocco. The smaller the coefficient, the more closely the structure of the trading partners of the given region are to the national structure of Moroccan export destinations.

The relative importance of foreign trade partners for Grand Casablanca-Settat and Rabat-Salé-Kénitra is quite similar to the relative importance of foreign trade partners in the Moroccan economy. Analyzing our results, one can easily observe that the regions Dakhla-Oued Eddahab and Béni Mellal-Khénifra have different relative importance of foreign trade partners from that of Morocco. In other words, the weights of exports from these regions to each country are very different from the weights of national exports.

Figure 6: Relative Importance of Foreign Trade Partners for Moroccan Regions



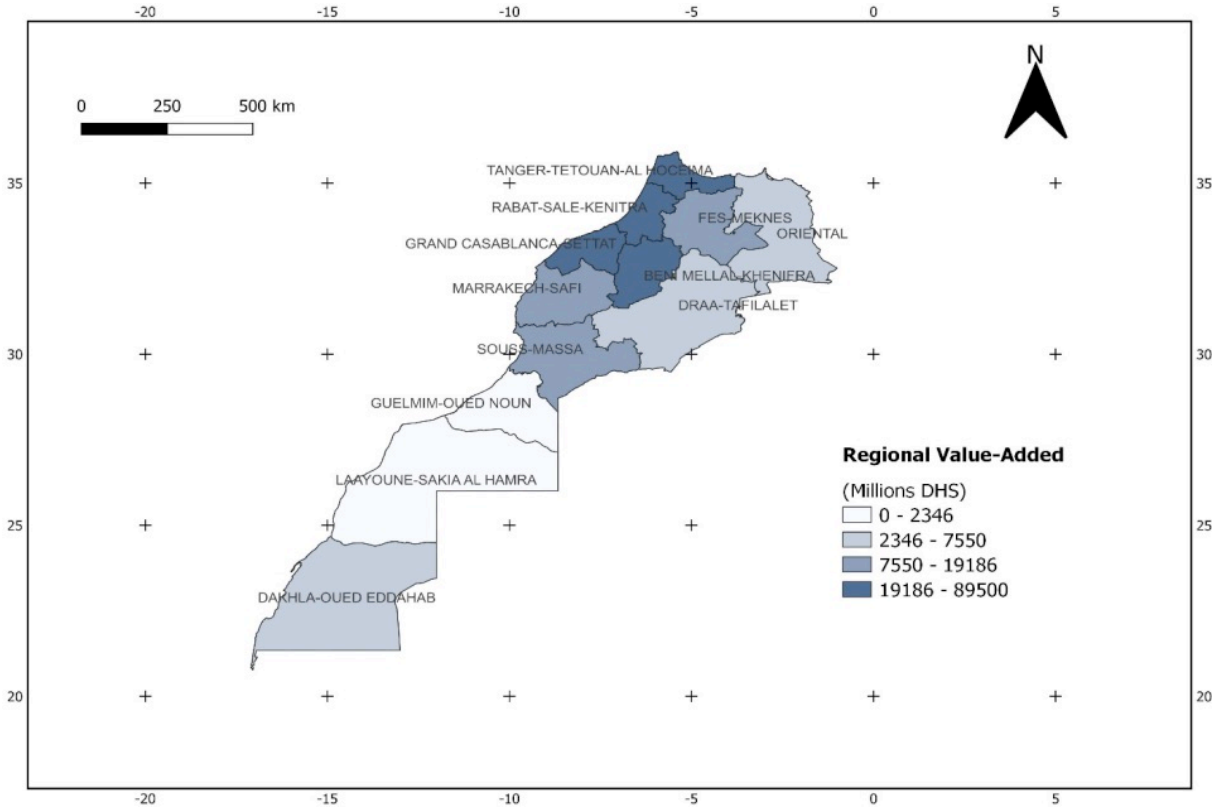
Source: Authors' calculations.

In terms of regional traded value-added, the highest value-added flows generated from foreign exports are from Grand Casablanca-Settat, Tanger-Tétouan-Al Hoceima, Rabat-Salé-Kénitra, and Béni Mellal-Khénifra, the three regions with the largest participation in gross exports (Figure 7).

Figure 8 visualizes the regional spatial pattern of domestic exports' value-added. The darker the color, the more the region is responsible for creating a high level of value-added from its transactions with the reference region. It shows the dependent regions and their degree of dependence on the external final demand originating from outside in value-added generation.

Grand Casablanca-Settat, Rabat-Salé-Kénitra, Marrakech-Safi, and Souss-Massa generate the greatest amount of value-added from national trade. The main sources of national final demand for Grand Casablanca-Settat, for instance, are Rabat-Salé-Kénitra, Marrakech-Safi, Tanger-Tétouan-Al Hoceima, and Fès-Meknès.

Figure 7: Value-added Embodied in Foreign Exports from Moroccan Regions (Millions DHS)



Source: Authors' calculations.

As for the most important flows, Table 7 presents the main trade flows of value-added incorporated in domestic and foreign exports from the main regions. The regions with the highest value-added flows embodied in domestic exports (inside the country) are Grand Casablanca, Rabat-Salé-Kénitra, Marrakech-Safi, and Souss-Massa. The two first regions generate a common benefit of nearly 30 billion DHS. The major trade flows go from Grand Casablanca-Settat, and Rabat-Salé-Kénitra to France, from Grand Casablanca-Settat, and Tanger-Tétouan-Al Hoceima to Spain, and finally from Béni Mellal-Khénifra to the United States.

Figure 8: Regional Value-added Generated by External Sources of Final Demand: Most Dependent Regions

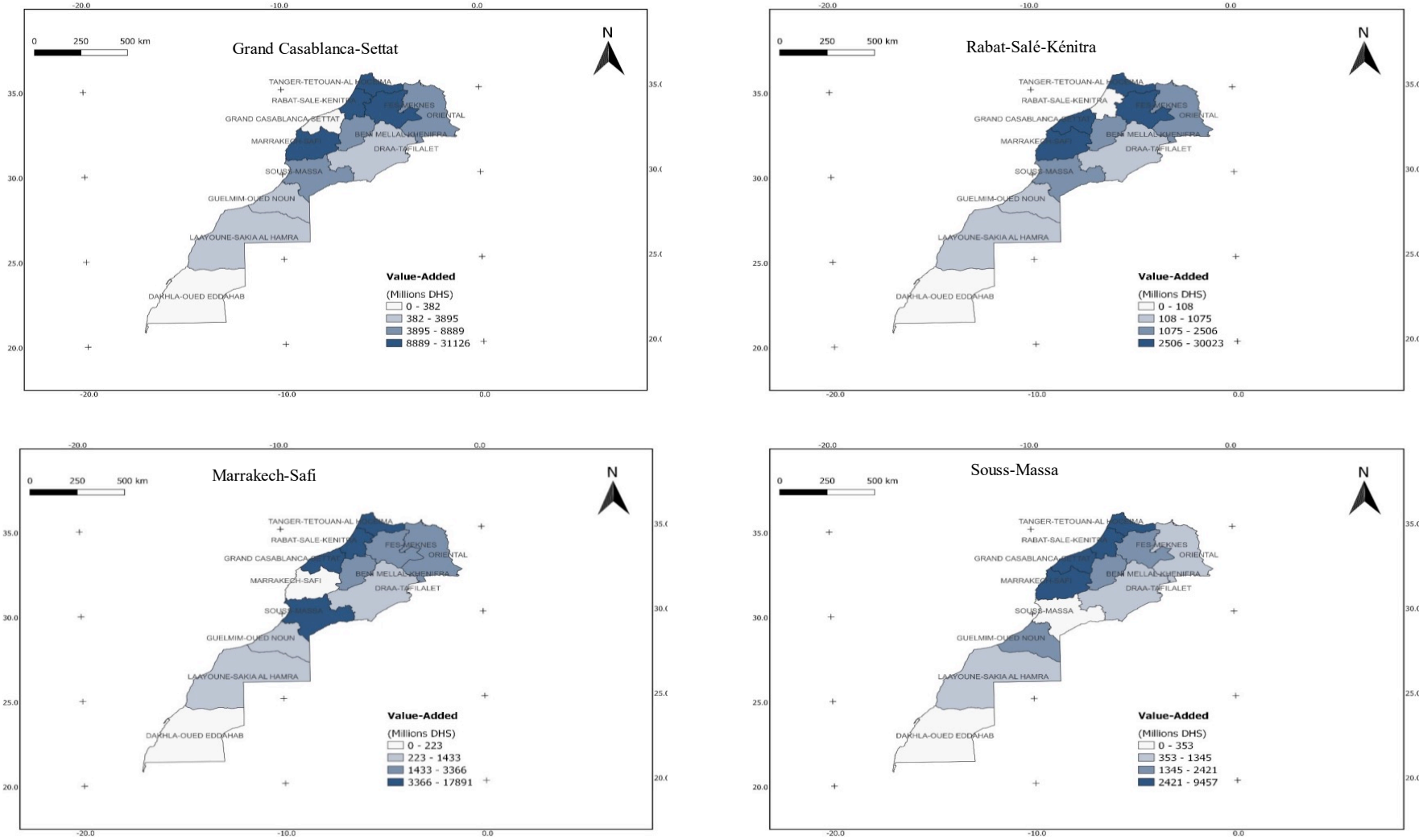


Table 7: Main Trade Flows Based on Value-Added Embodied in Domestic and Foreign Exports from Moroccan Regions

Domestic exports			Foreign exports		
Location	Partner	VA (Millions DHS)	Location	Partner	VA (Millions DHS)
Grand Casablanca-Settat	*Rabat-Salé-Kénitra*	*31 126,3*	*Grand Casablanca-Settat*	*France*	18 669,6
Rabat-Salé-Kénitra	*Grand Casablanca-Settat*	*30 022,5*	*Grand Casablanca-Settat*	*Spain*	11 124,2
Marrakech-Safi	*Grand Casablanca-Settat*	*17 890,9*	*Tanger-Tetouan-Al Hoceima*	*Spain*	6 242,8
Grand Casablanca-Settat	*Marrakech-Safi*	*11 069,6*	*Rabat-Salé-Kénitra*	*France*	5 646,6
Souss-Massa	*Grand Casablanca-Settat*	*9 457,2*	*Béni Mellal-Khénifra*	*USA*	2 123,8

Source: Authors' calculations.

For better visualization and understanding, Table 8 presents the overall value-added shares of the regions and the main international partners—France, Spain, the United States, and China—in the trade structure of the Moroccan regions. The column 'ROW' aggregates the contribution of the rest of the world.

At the national level, on average, the Grand Casablanca-Settat region makes the biggest contribution to value-added generation in other regions (21%), followed by Rabat-Salé-Kénitra (11%), and Fès-Meknès (7%). At the international level, France and Spain contribute together up to 9% to national value-added creation, while the rest of the world participates in up to one quarter (25%).

The intersection of row R6 (Grand Casablanca-Settat) with column R4 (Rabat-Salé-Kénitra) shows the contribution of R4 to the value-added generation in R6 (estimated value of 18%). The latter two regions—R6 and R4—account for the largest shares of value-added created in other regions (cells in dark blue). Regions depending more on foreign final demand for the stimulation of their economic activities are Dakhla-Oued Eddahab (R12) 78%, Tanger-Tétouan-Al Hoceima (R1) 63%, and Grand Casablanca-Settat (R6) 52%.

Table 8: Regional Total Traded Value-Added in Trade flows (domestic and foreign): Morocco 2019

			Origin of Final Demand by Partner															
Regional Value-Added			***R1***	***R2***	***R3***	***R4***	***R5***	***R6***	***R7***	***R8***	***R9***	***R10***	***R11***	***R12***	***France***	***Spain***	***USA***	***China***	***ROW***
Location	**Tanger-Tetouan-Al Hoceima**	**R1**		2%	4%	11%	1%	14%	2%	1%	1%	0%	0%	0%	4%	12%	6%	5%	35%
	Oriental	**R2**	10%		17%	13%	2%	20%	3%	3%	2%	0%	1%	0%	4%	4%	2%	2%	17%
	Fès-Meknès	**R3**	8%	8%		17%	2%	20%	3%	3%	2%	0%	0%	0%	4%	3%	3%	4%	24%
	Rabat-Salé-Kénitra	**R4**	7%	2%	6%		2%	38%	4%	1%	2%	0%	0%	0%	7%	5%	3%	2%	19%
	Béni Mellal-Khénifra	**R5**	5%	2%	5%	8%		20%	6%	2%	3%	0%	0%	0%	4%	3%	5%	3%	33%
	Grand Casablanca-Settat	**R6**	6%	3%	6%	18%	4%		6%	2%	3%	0%	0%	0%	11%	6%	5%	3%	27%
	Marrakech-Safi	**R7**	7%	3%	6%	13%	6%	34%		2%	7%	1%	1%	0%	2%	2%	2%	1%	12%
	Drâa-Tafilalet	**R8**	7%	7%	12%	14%	5%	20%	5%		4%	1%	1%	0%	3%	2%	2%	2%	16%
	Souss-Massa	**R9**	7%	3%	6%	10%	4%	25%	13%	3%		3%	2%	1%	3%	2%	2%	1%	15%
	Guelmim-Oued Noun	**R10**	5%	3%	5%	8%	3%	18%	7%	2%	17%		6%	1%	3%	2%	2%	1%	17%
	Laayoune-Sakia El Hamra	**R11**	6%	4%	6%	7%	3%	15%	6%	3%	6%	5%		3%	5%	3%	3%	2%	22%
	Dakhla-Oued Eddahab	**R12**	2%	2%	2%	2%	1%	5%	2%	1%	2%	1%	3%		4%	7%	1%	2%	63%
	Average		6%	4%	7%	11%	3%	21%	5%	2%	4%	1%	1%	1%	5%	4%	3%	2%	25%

Source: Authors' calculations.

Table 9: Sectoral Total Traded Value-Added in Trade Flows (Domestic and Foreign): Morocco 2019

		Origin of Final Demand																
		R1	***R2***	***R3***	***R4***	***R5***	***R6***	***R7***	***R8***	***R9***	***R10***	***R11***	***R12***	***France***	***Spain***	***USA***	***China***	***ROW***
Sectoral Value-Added	***A00***	9%	5%	9%	13%	4%	20%	9%	2%	5%	1%	1%	0%	2%	2%	2%	2%	15%
	B05	7%	5%	8%	10%	4%	17%	8%	2%	5%	1%	1%	1%	1%	3%	1%	1%	27%
	C00	4%	2%	5%	6%	2%	7%	5%	2%	4%	1%	1%	0%	4%	4%	7%	4%	43%
	D01	9%	6%	10%	12%	5%	20%	10%	3%	7%	1%	1%	1%	1%	2%	2%	1%	12%
	D02	3%	2%	3%	4%	1%	6%	3%	1%	2%	0%	0%	0%	4%	13%	1%	22%	36%
	D03	4%	3%	4%	5%	2%	8%	4%	1%	2%	1%	1%	0%	11%	8%	4%	11%	34%
	D04	3%	2%	3%	5%	1%	8%	3%	1%	2%	0%	1%	0%	1%	21%	10%	0%	39%
	D05	8%	6%	8%	11%	4%	19%	10%	3%	6%	1%	1%	0%	3%	4%	1%	2%	14%
	D06	9%	6%	10%	11%	5%	17%	10%	3%	6%	1%	1%	0%	3%	3%	2%	2%	13%
	E00	11%	8%	9%	14%	5%	27%	8%	2%	3%	1%	1%	1%	1%	2%	1%	1%	7%
	F45	10%	7%	8%	24%	3%	32%	6%	4%	2%	1%	2%	1%	0%	0%	0%	0%	0%
	G00	15%	4%	11%	13%	4%	19%	9%	3%	8%	1%	1%	1%	2%	1%	1%	1%	6%
	H55	14%	7%	12%	15%	6%	22%	10%	4%	6%	1%	1%	0%	1%	0%	0%	0%	2%
	I01	4%	3%	4%	7%	2%	10%	3%	2%	2%	0%	0%	0%	11%	5%	5%	3%	38%
	I02	9%	6%	8%	19%	3%	26%	6%	4%	6%	1%	1%	1%	4%	1%	1%	0%	5%
	J00	9%	6%	11%	14%	4%	23%	10%	2%	7%	1%	1%	0%	2%	1%	1%	1%	6%
	K00	8%	4%	7%	11%	4%	17%	7%	3%	4%	1%	1%	0%	11%	2%	3%	1%	15%
	L75	8%	7%	9%	24%	5%	23%	6%	2%	7%	3%	3%	1%	1%	1%	0%	0%	1%
	MNO	10%	7%	12%	17%	6%	20%	10%	4%	9%	2%	2%	1%	0%	0%	0%	0%	0%
	OP0	11%	4%	11%	16%	4%	25%	13%	3%	6%	1%	1%	0%	1%	1%	0%	0%	2%
Average		8%	5%	8%	12%	4%	18%	7%	3%	5%	1%	1%	1%	3%	4%	2%	3%	16%

Source: Authors' calculations.

To complete our study, we analyze and visualize the total traded value-added in trade flows—domestic and foreign—at the sectoral level. Table 9 indicates the shares of the aggregate value-added of the regions and the four main international partners in the sectoral trade structure of Moroccan regions.

Globally, the Real estate (K00) sector is the crucial sector in terms of trade value-added generation of up to 13% of total value-added in 2019, followed by Agriculture (A00) with 12.6%, and Public Administration (L75) at 11% (Table 6). On the one hand, domestically, Public administration (L75), Agriculture (A00), and Real estate (K00) are the major sectors, generating the value-added embedded in trade accounting for 37.4% of total domestic traded value-added. On the other hand, internationally, it is Real estate (K00), the Mechanical and electrical industry (D04), and Transport (I01) that produce about 46% of total value-added incorporated in foreign trade. Looking in more detail, 44% of traded value-added generated by France belongs to the Real estate, renting, and services to enterprises sector (K00), 15% to Transport (I01), and 8% to the Chemical industry (D03). Meanwhile, for Morocco's second main partner, Spain, 32% of value-added incorporated in its imports from Morocco comes from the Mechanical and electrical industry (D04), 10% from the Real estate, renting, and services to enterprises (K00), and 8.4% by Textile and leather (D02) (complete table in Appendix 2).

The intersection of the Construction (F45) row with the Grand Casablanca-Settat (R6) column in Table 9, shows the contribution of (R6) to value-added generation in (F45). This indicates that the region creates 32% of the sector's value-added. The Grand Casablanca-Settat region is the primary generator of traded value-added in sectors where activities are essentially domestically oriented, except (L75), which is more concentrated in Rabat-Salé-Kénitra (R4). The latter two regions—R6 and R4—concentrate the highest shares of sectoral value-added (cells in dark blue).

The sectors most stimulated by foreign final demand are Mining (C00) by the United States at 7.3%, Textile and leather (D02) by China at 22% and Spain at 13%, the Chemical industry (D03) by France and China at 11% each, the Mechanical and electrical industry (D04) by Spain at 21% and the United States at 10%, and Transport (I01) by France at 11%. The results of our study give rich insights into the most important trade partners of Moroccan regions by value-added. Table 10 sets out the five most important national and international trading partners. The main trade partners of the Moroccan regions are the internal destinations. France is the principal foreign trading partner of the five regions examined.

Table 10: Most Important Trade Partners, by Value-Added Contribution

	Domestic exports			Foreign exports		
Location	Partner	Value-Added (Millions DHS)	Share %	Partner	Value-Added (Millions DHS)	Share %
Grand Casablanca-Settat	*Rabat-Salé-Kénitra*	31 126,3	18%	*France*	18 669,6	11%
	Marrakech-Safi	11 069,6	6%	*Spain*	11 124,2	7%
	Tanger-Tetouan-Al Hoceima	9 802,8	6%	*United States*	7 912,1	5%
	Fès-Meknès	9 802,3	6%	*China*	5 728,6	3%
	Béni Mellal-Khénifra	6 148,5	4%	*Italy*	4 057,6	2%
Rabat-Salé-Kénitra	*Grand Casablanca-Settat*	30 022,5	38%	*France*	5 646,6	7%
	Tanger-Tetouan-Al Hoceima	5 347,6	7%	*Spain*	3 972,0	5%
	Fès-Meknès	5 031,6	6%	*United States*	2 704,6	4%
	Marrakech-Safi	2 767,1	4%	*China*	1 731,0	2%
	Oriental	1 721,1	2%	*India*	1 367,3	2%
Marrakech-Safi	*Grand Casablanca-Settat*	17 890,9	34%	*France*	1 218,9	2%
	Rabat-Salé-Kénitra	6 806,8	13%	*Spain*	1 029,9	2%
	Souss-Massa	3 821,1	7%	*United States*	818.6	2%
	Tanger-Tetouan-Al Hoceima	3 396,4	7%	*China*	776.7	2%
	Béni Mellal-Khénifra	3 273,6	6%	*India*	412.5	1%
Tanger-Tetouan-Al Hocein	*Grand Casablanca-Settat*	6 737,1	14%	*Spain*	6 242,8	13%
	Rabat-Salé-Kénitra	5 342,1	11%	*United States*	3 005,9	6%
	Fès-Meknès	2 219,0	4%	*China*	2 522,1	5%
	Oriental	1 086,5	2%	*France*	2 207,2	4%
	Marrakech-Safi	968.6	2%	*Italy*	2 100,4	4%
Béni Mellal-Khénifra	*Grand Casablanca-Settat*	8 389,5	20%	*United States*	2 123,8	5%
	Rabat-Salé-Kénitra	3 551,1	8%	*Russia*	1 787,5	4%
	Marrakech-Safi	2 409,7	6%	*France*	1 594,9	4%
	Fès-Meknès	2 083,1	5%	*China*	1 456,3	3%
	Tanger-Tetouan-Al Hoceima	1 982,4	5%	*Spain*	1 324,4	3%

Source: Authors' calculations.

For Grand Casablanca-Settat, Rabat-Salé-Kénitra, and Marrakech-Safi, France is the most important foreign partner. Out of Morocco's 12 regions, France is the leading foreign trade partner for nine, while Spain came in second place in seven regions. The three exceptional regions are Tanger-Tétouan-Al Hoceima, Béni Mellal-Khénifra, and Dakhla-Oued Eddahab, for which Spain, the United States, and the Netherlands are the major trade partners, respectively, in terms of value-added generation in 2019.

Nationally, Grand Casablanca-Settat is the most valuable and strategic partner for all 12 regions of the country. The region dominates local trade and plays the role of fulcrum for the economy at this level. France is the second most important destination for Grand Casablanca-Settat and Rabat-Salé-Kénitra in terms of value-added incorporated in trade, directly after their important domestic partner (Grand Casablanca-Settat).

Our results reveal the dominance of local demand-driven economies over foreign demand-oriented economies. Grand Casablanca-Settat region is the main trading partner of all internal regions, whereas the foreign partners come in second place only in the prominent metropolitan regions, i.e. Grand Casablanca-Settat, Rabat-Salé-Kénitra, and Tanger-Tétouan-Al Hoceima. Consequently, any change affecting the economic structure in Grand Casablanca-Settat is more important than an external shock for all the Moroccan regions.

Overall, our results show also that the main foreign trade partners for the urban regions are France and Spain, while less urbanized regions have distinct partners (the United States, Netherlands, China, etc.). Although the structure of the Moroccan regions' trade partners seems slightly diversified, Grand Casablanca-Settat is always the main commercial region in the country (Table 11). The trade partners importing more sophisticated manufactured products, including France, Spain, and the United States, trade more with industrialized regions, especially Grand Casablanca-Settat, Tanger-Tétouan-Al Hoceima, and Rabat-Salé-Kénitra. Meanwhile, others, including Canada and Argentina, are interested in importing natural resource-intensive products (from the Fès-Meknès region, for instance).

Table 11: Value-Added Embodied in Moroccan Foreign Exports by Region, by a Foreign Partner

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	TOTAL
Austria	10%	2%	4%	10%	12%	49%	7%	1%	4%	0%	1%	0%	100%
Belgium	16%	3%	5%	16%	3%	38%	6%	2%	8%	1%	2%	3%	100%
Canada	5%	6%	28%	10%	18%	21%	4%	4%	3%	0%	1%	1%	100%
Denmark	11%	4%	7%	12%	7%	39%	8%	2%	7%	1%	1%	0%	100%
France	7%	3%	5%	17%	5%	55%	4%	1%	3%	0%	1%	1%	100%
Germany	11%	3%	4%	13%	7%	47%	6%	1%	5%	1%	1%	1%	100%
Ireland	12%	2%	4%	18%	2%	42%	6%	2%	8%	1%	2%	1%	100%
Israel	10%	2%	4%	20%	1%	47%	5%	2%	8%	1%	1%	1%	100%
Italy	23%	2%	4%	13%	5%	44%	4%	1%	3%	0%	1%	0%	100%
Japan	9%	4%	3%	15%	4%	54%	5%	1%	4%	0%	1%	0%	100%
South Korea	24%	3%	7%	14%	3%	39%	5%	1%	4%	0%	1%	0%	100%
Netherlands	14%	3%	6%	12%	3%	27%	5%	2%	10%	2%	3%	15%	100%
New Zealand	9%	3%	4%	12%	2%	32%	4%	1%	11%	2%	3%	16%	100%
Portugal	23%	2%	6%	11%	7%	41%	4%	1%	2%	0%	1%	2%	100%
Spain	23%	3%	5%	15%	5%	41%	4%	1%	3%	0%	1%	1%	100%
Sweden	13%	2%	4%	13%	10%	44%	6%	2%	5%	1%	2%	0%	100%
Switzerland	10%	3%	4%	26%	2%	39%	5%	2%	7%	1%	1%	1%	100%
Turkey	19%	3%	7%	13%	6%	44%	4%	1%	2%	0%	1%	0%	100%
United Kingdom	20%	2%	4%	16%	3%	42%	4%	1%	6%	1%	1%	1%	100%
United States	15%	3%	6%	14%	11%	41%	4%	2%	4%	0%	1%	0%	100%
Argentina	8%	6%	22%	8%	13%	19%	5%	3%	8%	1%	1%	5%	100%
Brazil	13%	5%	14%	11%	9%	27%	6%	2%	10%	1%	2%	1%	100%
Bulgaria	13%	5%	12%	12%	7%	30%	6%	2%	10%	1%	2%	1%	100%
China	17%	2%	10%	12%	10%	38%	5%	2%	3%	0%	1%	1%	100%
Croatia	7%	2%	3%	13%	4%	66%	2%	1%	2%	0%	1%	0%	100%
Cyprus	12%	3%	4%	20%	1%	39%	6%	2%	9%	1%	2%	1%	100%
India	18%	2%	6%	17%	3%	38%	5%	2%	7%	1%	1%	1%	100%
Hong Kong, China	10%	3%	4%	19%	2%	46%	5%	2%	7%	1%	1%	1%	100%
Philippines	12%	3%	5%	18%	3%	43%	5%	2%	8%	1%	1%	1%	100%
Russia	20%	2%	6%	8%	22%	31%	5%	2%	2%	0%	1%	1%	100%
Saudi Arabia	22%	2%	3%	13%	5%	46%	4%	1%	3%	0%	1%	0%	100%
Singapore	6%	2%	2%	17%	4%	57%	5%	1%	4%	0%	1%	0%	100%
Viet Nam	9%	4%	20%	9%	12%	28%	3%	3%	4%	1%	1%	7%	100%
ROW	7%	3%	12%	9%	25%	30%	6%	3%	4%	0%	1%	1%	100%

Source: Authors' calculations. Note: The complete table for the 65 trading partners is in Appendix 3.

4.2. Structural Interdependence Among Moroccan Regions

This section of our study focuses on the concentration and structural dependence of certain regions on other regions, in terms of value-added creation. We computed the value-added shares incorporated in trade among the regions, with Grand Casablanca-Settat excluded. Table 12 presents the five highest traded value-added shares in inter-regional trade. It is evident that Rabat-Salé-Kénitra, Marrakech-Safi, Souss-Massa, Oriental, and Fès-Meknès depend significantly more on trade with Grand Casablanca-Settat.

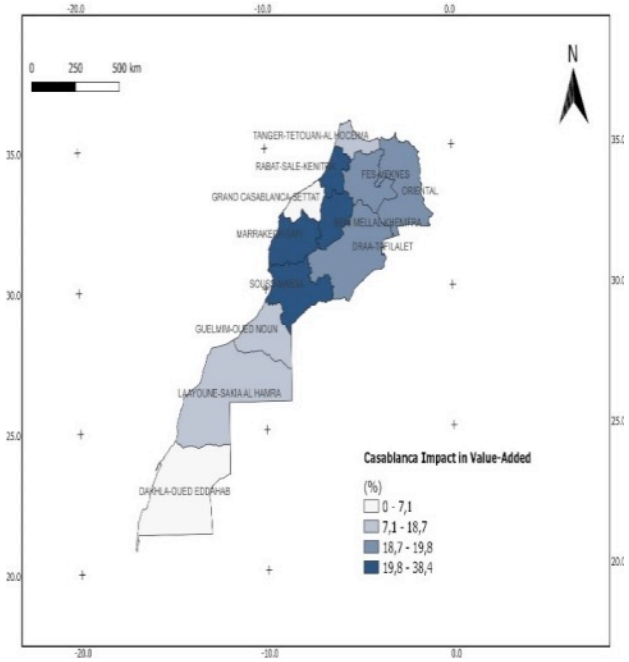
Table 12: Highest Shares of Value-Added in Inter-regional Trade with Grand Casablanca-Settat

Location	Partner	Value-Added (Millions DHS)	Share %
Rabat-Salé-Kénitra	Grand Casablanca-Settat	30 023	38%
Marrakech-Safi	Grand Casablanca-Settat	17 891	34%
Souss-Massa	Grand Casablanca-Settat	9 457	25%
Oriental	Grand Casablanca-Settat	3 999	20%
Fès-Meknès	Grand Casablanca-Settat	7 991	20%

Source: Authors' calculations.

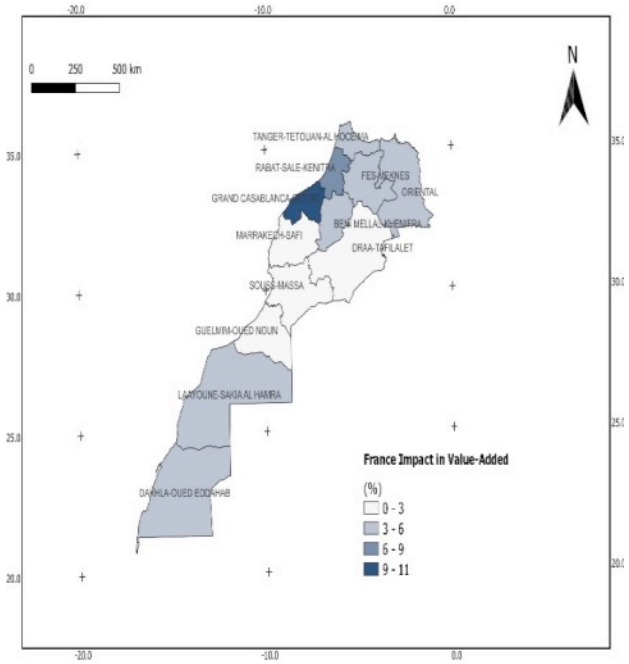
It is noticeable from Tables 12 and 8 that Grand Casablanca-Settat is the principal strategic trading partner for all the domestic regions, because of its critical role in inter-regional traded value-added. Figure 9 provides a spatial visualization of the importance of Grand Casablanca-Settat for the rest of the country in terms of value-added generation.

Figure 9: Casablanca-Settat Shares of VA



Source: Authors' calculations.

Figure 10: France Shares of VA

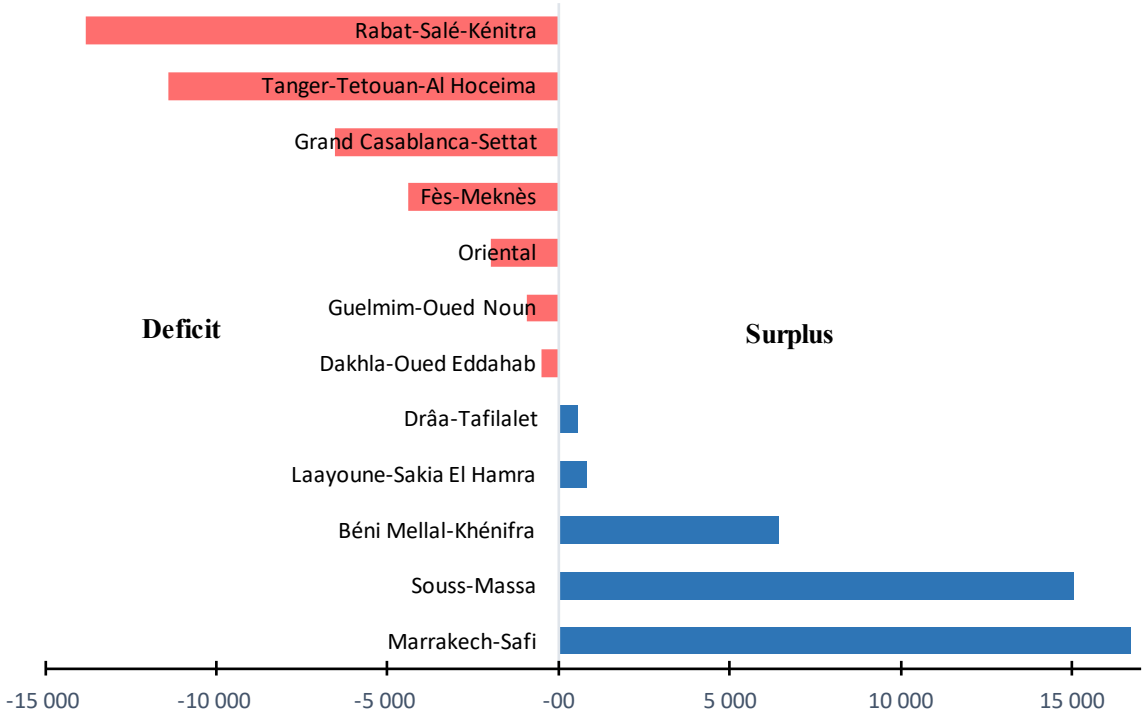


Source: Authors' calculations.

Grand Casablanca-Settat has a strategic position for the Moroccan economy since a higher proportion of domestic regions' value-added comes from trading with it. This is the result of the strong industrial agglomerations that have made the region into the country's economic capital and financial hub. Based on the same analysis for international trade, Figure 10 shows a geographical visualization of France's importance in terms of traded value-added for the Moroccan regions. Grand Casablanca-Settat depends more on trade with France to generate more value-added.

Figure 11 shows the trade balance of value-added between the Moroccan regions. The regions with positive net transfers of value-added in inter-regional trade (the ones with a surplus with other national regions) are located in the zones of immediate influence of the country's major urban agglomerations (mainly Grand Casablanca-Settat and Rabat-Salé-Kénitra), and regions that specialize in natural resource-intensive activities (except Marrakech-Safi), specifically: Souss-Massa, Béni Mellal-Khénifra, Laayoune-Sakia El Hamra, and Draa-Tafilalet.

Figure 11: Net Traded Value-Added Balance in Inter-regional Trade (Millions DHS)



Source: Authors' calculations.

All three main metropolitan regions, namely Grand Casablanca-Settat, Rabat-Salé-Kénitra, and Tanger-Tétouan-Al Hoceima, are in a deficit situation in traded value-added balance terms. The previous analysis of structural interdependence between Moroccan regions reveals the strong dependence of all regions on Grand Casablanca-Settat. However, Figure 11 shows that the region's net dependence on inter-regional trade benefits certain regions (with surplus net balance) more than it benefits the main region itself. In addition, our methodological approach enabled us to compute the net balance of traded value-added of inter-regional and international trade.

As a result, we show that in addition to Grand Casablanca-Settat, other regions can significantly influence the activities of other regional economies through the supply chain, particularly Marrakech-Safi, Souss-Massa, and Béni Mellal-Khénifra. These results confirm the findings of Pacheco *et al* (2021) from a similar analysis of Colombian departments. The authors showed the degree of importance of Bogotá DC's department for the other departments of the country. Therefore, besides the central department mentioned, some other Colombian departments showed strong potential to have considerable influence on the other departments through traded value-added.

5. CONCLUDING REMARKS

We have presented a detailed analysis of Moroccan trade at regional level that provides a deeper understanding of the functioning of different regional economic systems. The trade-in-value-added analysis reveals the existence of different hierarchies in both inter-regional and international trade systems, which may have negative implications in terms of regional inequality. Understanding these different trade-related hierarchies of inter-regional interactions and international transactions is undoubtedly important as a basis for better implementation of development policies. Therefore, this analysis offers crucial insights into the growing debate about regional inequality in a developing country.

The significant weight of inter-regional trade for the Moroccan economy should be taken into account in the first plan. Indeed, the weight differentiation among regions results from a high activity concentration in urban and metropolitan areas. Mitigation policies should consider inter-regional interactions to understand better how regional economies are interdependent and how they are affected by international and national final demands.

Trade can be an important driver for rapid economic growth and wealth creation. While interests are more centered on the effects of international trade on real economic growth, there is already a consensus that trade can provide a significant stimulus to economic growth. Our study shows the vital locomotive role played by Grand Casablanca-Settat as the economy stimulator, with its high contribution to the value-added generation in other regions and Moroccan foreign trade. Thus, it is evident that the impacts of inter-regional trade related to the Grand Casablanca-Settat economy differ from those of other regional economies.

These results support the findings of Haddad *et al* (2002) in their study on the interdependence of Brazilian states, and Pacheco *et al* (2021) in their analysis of trade between Colombian departments. The two studies concluded that in smaller economies, the performance of more developed regions (i.e. Grand Casablanca-Settat) plays a critical role in the development of the economy as a whole.

Some Moroccan regions (especially Dakhla-Oued Eddahab and Tanger-Tétouan-Al Hoceima) specialize in activities more oriented towards foreign exports, making their economic growth and development dependent on their ability to compete in international export markets, in addition to their domestic markets. Other regions benefit unexpectedly more from inter-regional trade in terms of net trade balance, which significantly influence the activities of other regional economies through the supply chain (i.e. Marrakech-Safi, Souss-Massa, and Béni Mellal-Khénifra).

Public policies should place more emphasis on the importance of specific large-scale sectors in terms of economic growth stimulation (mainly the Real estate industry and the Agriculture sector). From a trade perspective, reducing spatial transaction costs may be one way in which geographically peripheral economies can access national and international markets more efficiently, both in terms of production and consumption—thus acting on regional inequalities (McCann, 2007). Nevertheless, although the economy may benefit from these reductions, the relative distribution will not necessarily benefit peripheral regions unless they can derive significant economies of scale from the change process.

In this respect, public policies should favor more solid domestic production linkages, generate more efficient integration of producers and consumers, and, thus, maximize the effects of the different trade policy strategies (Haddad *et al*, 2002). In addition to strengthening the feedback mechanisms, the competitiveness of Moroccan products and the regional activities destined for international markets would also increase.

It is worth mentioning that the assumption of the unalterableness of the economic structure of Moroccan exports, which we used to decompose the foreign exports vector of the country IIO table, is a strong assumption. This allows us to decompose final demand, gross output, and value-added. This assumption and simplification can probably lead to bias in the estimation of Moroccan traded value-added originating from foreign final demand.

Furthermore, with information on sectoral greenhouse gas emissions, the integrated economic analysis of regional supply chains that we have discussed can be expanded and enriched. It is possible to add another layer of complexity to the system of value-added generation, as trade-offs may appear between economic growth and environmental preservation. Proper assessment of accountability of economic and environmental contributions would be helpful in designing important mitigation policies.

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Appendix 1: Sector Aggregation

TiVA 2021 - Industries			20 industries aggregation in IIO national table		
N.	**Code**	**Industry description**	**Code**	**Industry description**	**Industry description**
1	D01T02	Agriculture, hunting, forestry	**A00**	Agriculture, forêt et services annexes	Agriculture, forestry, hunting, and related services
2	D03	Fishing and aquaculture	**B05**	Pêche, aquaculture	Fishing, aquaculture
3	D05T06	Mining and quarrying, energy-producing products	**C00**	Industrie d'extraction	Mining industry
4	D07T08	Mining and quarrying, non-energy producing products			
5	D09	Mining support service activities			
6	D10T12	Food products, beverages, and tobacco	**D01**	Industries alimentaires et tabac	Food industry and tobacco
7	D13T15	Textiles, textile products, leather, and footwear	**D02**	Industries du textile et du cuir	Textile and leather industry
8	D16	Wood and products of wood and cork	**D05**	Autres industries manufac. hors raffinage pétrole	Other manufacturing, excluding petroleum refining
9	D17T18	Paper products and printing			
10	D19	Coke and refined petroleum products	**D06**	Raffinage de pétrole et autres produits d'énergie	Oil refining and other energy products
11	D20	Chemical and chemical products	**D03**	Industrie chimique et parachimique	Chemical and para-chemical industry
12	D21	Pharmaceuticals, medicinal chemical, and botanical products			
13	D22	Rubber and plastics products	**D05**	Autres industries manufac. hors raffinage pétrole	Other manufacturing, excluding petroleum refining
14	D23	Other non-metallic mineral products	**D04**	Industrie mécanique, métallurgique et électrique	Mechanical, metallurgical and electrical industry
15	D24	Basic metals			
16	D25	Fabricated metal products			
17	D26	Computer, electronic and optical equipment			
18	D27	Electrical equipment			
19	D28	Machinery and equipment, nec			
20	D29	Motor vehicles, trailers, and semi-trailers			

21	D30	Other transport equipment			
22	D31T33	Manufacturing nec; repair and installation of machinery and equipment	**D05**	Autres industries manuf.. hors raffinage pétrole	Other manufacturing, excluding petroleum refining
23	D35	Electricity, gas, steam, and air conditioning supply	**E00**	Electricité et Eau	Electricity and water
24	D36T39	Water supply; sewerage, waste management, and remediation activities			
25	D41T43	Construction	**F45**	Bâtiment et travaux publics	Construction
26	D45T47	Wholesale and retail trade; repair of motor vehicles	**G00**	Commerce	Trade
27	D49	Land transport and transport via pipelines	**I01**	Transports	Transport
28	D50	Water transport			
29	D51	Air transport			
30	D52	Warehousing and support activities for transportation			
31	D53	Postal and courier activities	**I02**	Postes et télécommunications	Post and telecommunications
32	D55T56	Accommodation and food service activities	**H55**	Hôtels et restaurants	Hotels and restaurants
33	D58T60	Publishing, audiovisual, and broadcasting activities	**I02**	Postes et télécommunications	Post and telecommunications
34	D61	Telecommunications			
35	D62T63	IT and other information services			
36	D64T66	Financial and insurance activities	**J00**	Activités financières et assurances	Financial activities and insurance
37	D68	Real estate activities	**K00**	Immobilier, location et serv. rendus entreprises	Real estate, renting, and services to enterprises
38	D69T75	Professional, scientific and technical activities	**OP0**	Autres services non financiers	Other non-financial services
39	D77T82	Administrative and support services	**L75**	Administration publique et sécurité sociale	General public administration and social security
40	D84	Public administration and defense; compulsory social security			
41	D85	Education	**MNO**	Education, santé et action sociale	Education, health and social action
42	D86T88	Human health and social work activities			
43	D90T93	Arts, entertainment, and recreation	**OP0**	Autres services non financiers	Other non-financial services
44	D94T96	Other service activities			

45	D97T98	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use			

Source: Authors.

Appendix 2: *Value Added Embodied in Moroccan Foreign Exports by Sector, 2019 (%)*

	A00	B05	C00	D01	D02	D03	D04	D05	D06	E00	F45	G00	H55	I01	I02	J00	K00	L75	MNO	OP0	TOTAL
Australia	14,5%	0,9%	1,4%	14,1%	0,7%	1,9%	0,6%	2,2%	0,0%	0,8%	0,4%	4,6%	0,4%	14,0%	1,6%	4,0%	37,2%	0,3%	0,2%	0,3%	100,0%
Austria	10,5%	0,6%	11,6%	7,9%	4,9%	33,1%	2,2%	4,5%	0,0%	2,0%	0,3%	3,4%	0,3%	2,5%	0,5%	1,8%	12,9%	0,7%	0,1%	0,3%	100,0%
Belgium	6,7%	3,0%	1,7%	5,5%	2,9%	3,5%	10,7%	4,1%	0,0%	1,4%	0,3%	6,9%	0,5%	35,2%	0,5%	3,7%	12,1%	0,9%	0,1%	0,3%	100,0%
Canada	55,0%	1,2%	1,2%	3,5%	0,2%	2,3%	4,5%	0,8%	0,0%	1,0%	0,2%	3,4%	0,3%	10,6%	1,0%	1,6%	10,0%	2,6%	0,3%	0,1%	100,0%
Chile	50,8%	0,4%	4,5%	4,3%	0,8%	7,3%	1,8%	4,8%	0,0%	1,3%	0,2%	3,4%	0,4%	4,6%	0,3%	1,5%	11,6%	1,7%	0,2%	0,2%	100,0%
Colombia	26,1%	1,3%	8,4%	21,8%	0,2%	1,5%	22,7%	3,3%	0,0%	1,6%	0,2%	3,3%	0,3%	2,1%	0,8%	1,8%	3,2%	1,0%	0,1%	0,3%	100,0%
Costa Rica	41,5%	0,4%	1,7%	4,4%	0,0%	4,5%	1,2%	0,9%	0,0%	0,8%	0,1%	2,7%	0,3%	10,6%	2,2%	2,1%	26,1%	0,2%	0,2%	0,2%	100,0%
Czech Republic	7,8%	0,4%	11,3%	5,2%	5,1%	31,6%	1,0%	11,2%	0,0%	2,6%	0,3%	5,2%	0,7%	3,8%	0,5%	1,9%	8,2%	2,5%	0,1%	0,4%	100,0%
Denmark	13,7%	0,5%	4,2%	6,7%	1,2%	11,4%	1,1%	7,6%	0,0%	1,6%	0,4%	6,9%	6,1%	21,6%	0,8%	2,3%	13,3%	0,4%	0,1%	0,3%	100,0%
Estonia	6,6%	0,4%	7,7%	5,9%	0,8%	21,5%	8,8%	1,3%	0,0%	4,5%	0,2%	5,5%	0,4%	28,2%	0,7%	1,6%	5,3%	0,4%	0,1%	0,2%	100,0%
Finland	2,7%	0,1%	10,6%	0,4%	0,1%	28,5%	32,0%	2,0%	0,0%	2,2%	0,2%	3,2%	0,4%	5,1%	0,3%	2,3%	8,6%	0,8%	0,0%	0,4%	100,0%
France	7,7%	0,5%	2,9%	2,2%	2,2%	8,1%	1,7%	2,0%	0,0%	0,8%	0,1%	4,2%	0,5%	15,4%	2,8%	3,4%	43,7%	1,5%	0,1%	0,3%	100,0%
Germany	7,9%	1,3%	5,8%	5,0%	4,4%	15,8%	2,5%	8,0%	0,0%	2,1%	0,2%	5,5%	0,5%	15,2%	0,4%	2,7%	21,9%	0,4%	0,1%	0,5%	100,0%
Greece	3,1%	7,4%	2,6%	0,7%	0,5%	3,1%	56,3%	2,7%	0,0%	2,1%	0,3%	3,8%	1,1%	2,3%	0,7%	3,1%	9,2%	0,5%	0,0%	0,4%	100,0%
Hungary	6,4%	0,2%	3,3%	3,3%	14,4%	8,4%	2,5%	6,8%	0,0%	16,2%	0,2%	3,9%	0,3%	10,7%	0,3%	2,0%	20,4%	0,3%	0,0%	0,4%	100,0%
Iceland	2,4%	0,2%	0,4%	2,5%	2,0%	0,9%	0,2%	0,4%	0,0%	0,5%	0,1%	5,1%	0,3%	35,1%	1,1%	2,8%	45,5%	0,3%	0,1%	0,2%	100,0%
Ireland	4,0%	0,2%	1,1%	3,2%	0,4%	2,5%	1,5%	1,8%	0,0%	0,8%	0,1%	7,3%	0,2%	49,3%	0,3%	2,7%	24,0%	0,4%	0,1%	0,2%	100,0%
Israel	0,4%	0,0%	0,5%	0,2%	0,1%	1,0%	0,4%	0,4%	0,0%	0,6%	0,1%	7,2%	0,3%	52,5%	0,5%	3,3%	32,1%	0,3%	0,1%	0,1%	100,0%
Italy	4,6%	0,3%	4,5%	2,3%	12,6%	10,6%	29,2%	3,8%	0,0%	2,0%	0,3%	4,5%	0,4%	8,2%	0,9%	2,9%	11,9%	0,6%	0,1%	0,4%	100,0%
Japan	2,1%	0,1%	3,9%	0,7%	4,1%	10,6%	1,9%	5,2%	0,0%	1,2%	0,1%	7,0%	0,9%	20,5%	2,1%	5,5%	33,3%	0,3%	0,1%	0,4%	100,0%
South Korea	2,3%	0,1%	2,5%	0,7%	32,3%	5,8%	6,7%	11,4%	0,0%	2,0%	0,2%	5,1%	0,9%	14,9%	0,8%	2,6%	10,7%	0,4%	0,1%	0,5%	100,0%
Latvia	10,8%	0,3%	2,2%	4,2%	0,9%	6,2%	0,1%	0,5%	0,0%	0,6%	0,1%	1,8%	0,3%	5,0%	5,5%	3,3%	57,8%	0,2%	0,1%	0,2%	100,0%
Lithuania	3,3%	0,2%	4,2%	2,6%	2,5%	7,0%	49,7%	7,5%	0,0%	2,5%	0,4%	4,1%	0,6%	1,7%	0,4%	3,0%	9,6%	0,4%	0,0%	0,4%	100,0%
Luxembourg	0,5%	0,0%	0,4%	0,2%	0,1%	0,6%	0,2%	2,5%	0,0%	0,7%	0,2%	7,5%	0,4%	51,8%	0,5%	24,8%	9,0%	0,4%	0,1%	0,2%	100,0%
Mexico	18,2%	0,8%	3,8%	12,7%	0,8%	9,5%	16,0%	5,4%	0,0%	1,6%	0,2%	4,9%	0,4%	5,0%	1,8%	2,5%	15,7%	0,4%	0,1%	0,3%	100,0%
Netherlands	13,3%	19,2%	1,3%	10,1%	0,7%	2,1%	9,0%	2,3%	0,0%	1,3%	0,2%	5,7%	0,4%	24,1%	0,5%	1,9%	6,5%	1,1%	0,1%	0,2%	100,0%
New Zealand	19,3%	21,6%	0,6%	20,8%	0,6%	1,6%	0,3%	0,7%	0,0%	0,7%	0,1%	2,7%	0,2%	4,2%	1,0%	2,0%	22,7%	0,6%	0,1%	0,2%	100,0%
Norway	1,0%	45,0%	2,4%	0,8%	0,1%	1,9%	19,6%	1,3%	0,0%	1,1%	0,2%	4,1%	0,4%	10,6%	0,6%	3,0%	7,4%	0,2%	0,0%	0,2%	100,0%
Poland	6,1%	0,3%	4,6%	4,7%	2,8%	11,2%	2,6%	4,1%	0,0%	1,3%	0,3%	5,6%	0,3%	25,3%	0,3%	2,2%	27,7%	0,3%	0,1%	0,2%	100,0%
Portugal	7,2%	2,9%	5,5%	2,1%	20,7%	14,0%	24,8%	3,7%	0,0%	2,9%	0,2%	3,6%	0,4%	2,1%	0,7%	2,3%	5,8%	0,6%	0,1%	0,4%	100,0%
Slovak Republic	3,4%	0,1%	2,9%	0,9%	31,1%	7,9%	1,8%	5,0%	0,0%	14,2%	0,3%	3,0%	0,3%	2,8%	0,9%	2,1%	22,0%	0,7%	0,0%	0,4%	100,0%
Slovenia	2,5%	0,1%	8,0%	0,4%	3,0%	22,9%	0,3%	3,0%	0,0%	1,6%	0,3%	7,3%	0,3%	40,8%	0,6%	1,9%	6,3%	0,4%	0,1%	0,2%	100,0%
Spain	7,4%	1,3%	3,5%	3,8%	8,4%	7,2%	32,1%	3,9%	0,0%	2,2%	0,4%	4,7%	0,4%	7,7%	0,9%	2,6%	10,1%	3,0%	0,1%	0,4%	100,0%
Sweden	4,4%	0,1%	9,0%	0,9%	0,1%	25,3%	11,4%	1,5%	0,0%	1,7%	0,2%	5,7%	0,3%	29,7%	0,3%	1,9%	6,3%	0,9%	0,1%	0,2%	100,0%
Switzerland	5,3%	0,3%	1,2%	5,2%	0,5%	3,0%	0,5%	3,4%	0,0%	0,9%	0,2%	7,0%	0,6%	33,7%	1,9%	6,3%	18,6%	10,8%	0,1%	0,2%	100,0%
Turkey	7,0%	0,3%	5,4%	4,0%	30,9%	13,5%	5,0%	4,0%	0,0%	2,1%	0,3%	3,4%	0,5%	1,5%	1,1%	2,3%	17,3%	1,1%	0,1%	0,4%	100,0%
United Kingdom	3,3%	0,4%	2,0%	2,3%	1,5%	3,3%	26,3%	2,2%	0,0%	1,5%	0,2%	6,2%	0,6%	30,1%	1,0%	4,8%	13,3%	0,5%	0,2%	0,3%	100,0%
United States	11,1%	0,4%	8,8%	4,4%	0,6%	4,8%	22,7%	1,7%	0,0%	1,4%	0,2%	4,5%	0,4%	13,0%	0,9%	3,6%	19,2%	1,9%	0,1%	0,3%	100,0%
Argentina	52,5%	6,7%	0,6%	17,4%	0,5%	1,3%	1,5%	0,7%	0,0%	0,9%	0,1%	3,1%	0,3%	4,5%	0,7%	1,2%	7,2%	0,3%	0,2%	0,1%	100,0%
Brazil	41,5%	2,0%	1,6%	25,1%	0,3%	3,8%	6,0%	1,2%	0,0%	1,1%	0,2%	2,9%	0,3%	1,9%	0,3%	1,5%	8,9%	1,0%	0,2%	0,2%	100,0%
Brunei Darussalam	0,5%	0,0%	2,4%	0,1%	0,1%	1,1%	77,0%	2,4%	0,0%	2,4%	0,3%	3,0%	0,4%	0,5%	0,3%	3,4%	5,2%	0,4%	0,0%	0,4%	100,0%
Bulgaria	31,4%	1,2%	1,9%	20,0%	3,3%	4,4%	1,0%	3,2%	0,0%	1,4%	0,3%	4,4%	0,3%	14,2%	0,8%	1,6%	9,8%	0,4%	0,2%	0,2%	100,0%
Cambodia	1,8%	0,1%	3,5%	0,8%	17,7%	10,1%	1,2%	0,8%	0,0%	1,0%	0,1%	2,1%	0,3%	7,5%	2,1%	2,6%	47,8%	0,2%	0,0%	0,2%	100,0%
China	14,0%	0,6%	6,5%	2,9%	26,3%	17,4%	0,8%	3,3%	0,0%	1,6%	0,1%	3,3%	0,3%	10,5%	0,3%	1,8%	9,3%	0,3%	0,1%	0,4%	100,0%
Croatia	3,8%	0,2%	3,4%	2,2%	6,4%	8,6%	4,2%	0,8%	0,0%	21,0%	0,3%	2,0%	0,2%	5,2%	4,5%	2,3%	33,2%	1,4%	0,1%	0,2%	100,0%
Cyprus	0,4%	0,0%	0,2%	0,2%	0,0%	0,2%	0,2%	0,4%	0,0%	0,7%	0,1%	9,3%	1,1%	64,0%	2,1%	12,2%	8,0%	0,4%	0,1%	0,3%	100,0%
India	5,5%	0,2%	1,3%	1,9%	7,3%	2,5%	11,3%	2,3%	0,0%	1,2%	0,2%	6,7%	0,3%	42,1%	0,5%	2,3%	13,8%	0,4%	0,1%	0,2%	100,0%
Indonesia	25,4%	2,1%	1,8%	6,1%	14,7%	4,8%	3,4%	2,2%	0,0%	1,1%	0,1%	2,3%	0,3%	4,6%	0,7%	2,2%	27,5%	0,3%	0,1%	0,3%	100,0%
Hong Kong, China	0,5%	0,0%	1,1%	0,2%	0,5%	2,7%	0,2%	0,4%	0,0%	0,7%	0,1%	8,5%	0,8%	50,2%	0,9%	11,8%	20,6%	0,4%	0,1%	0,2%	100,0%
Kazakhstan	1,1%	0,0%	55,1%	0,3%	0,3%	2,6%	0,5%	0,8%	0,0%	1,1%	0,4%	5,0%	0,4%	6,6%	0,8%	1,8%	22,6%	0,2%	0,0%	0,3%	100,0%
Lao	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Malaysia	13,1%	0,8%	1,6%	13,3%	1,1%	3,8%	1,2%	3,2%	0,0%	1,0%	0,1%	4,2%	0,2%	18,3%	1,5%	3,2%	32,3%	0,7%	0,1%	0,2%	100,0%
Malta	1,3%	0,1%	1,3%	1,1%	0,0%	3,4%	0,2%	0,4%	0,0%	0,6%	0,1%	4,9%	1,3%	33,2%	8,2%	6,7%	35,7%	0,3%	0,1%	1,3%	100,0%
Myanmar	25,4%	0,2%	5,9%	1,2%	26,5%	17,2%	0,3%	1,2%	0,0%	1,5%	0,1%	3,3%	0,2%	11,4%	0,2%	1,4%	3,2%	0,3%	0,1%	0,3%	100,0%
Peru	31,0%	0,6%	1,7%	8,9%	1,8%	3,2%	2,2%	0,9%	0,0%	0,9%	0,1%	3,5%	0,7%	13,1%	2,5%	2,1%	26,5%	0,3%	0,1%	0,2%	100,0%
Philippines	4,5%	0,2%	2,1%	3,1%	3,2%	3,9%	1,0%	0,9%	0,0%	0,8%	0,1%	7,5%	0,5%	44,0%	1,4%	2,8%	23,0%	0,4%	0,1%	0,6%	100,0%
Romania	10,2%	0,6%	3,7%	10,3%	4,5%	9,9%	6,3%	2,2%	0,0%	5,7%	0,1%	5,4%	0,3%	7,3%	3,1%	2,3%	27,4%	0,3%	0,1%	0,2%	100,0%
Russia	12,0%	1,0%	20,1%	2,0%	0,2%	1,9%	39,9%	4,1%	0,0%	2,0%	0,3%	3,7%	0,3%	1,5%	0,4%	2,4%	7,4%	0,3%	0,1%	0,4%	100,0%
Saudi Arabia	2,6%	0,1%	4,2%	0,4%	0,2%	8,8%	35,2%	5,7%	0,0%	1,9%	0,2%	5,1%	0,4%	16,1%	1,2%	2,8%	14,3%	0,4%	0,1%	0,3%	100,0%
Singapore	1,6%	0,1%	4,2%	0,8%	0,1%	12,1%	0,5%	1,2%	0,0%	0,8%	0,2%	5,4%	2,2%	22,4%	0,9%	7,1%	38,6%	1,4%	0,1%	0,3%	100,0%
South Africa	3,4%	0,1%	36,0%	1,3%	0,8%	5,8%	3,1%	2,3%	0,0%	13,1%	0,2%	3,5%	0,3%	10,0%	1,0%	2,1%	16,4%	0,2%	0,1%	0,2%	100,0%
Chinese Taipei	1,4%	0,1%	2,9%	0,5%	7,8%	5,3%	27,4%	6,0%	0,0%	1,9%	0,4%	6,0%	1,3%	24,0%	0,4%	3,9%	9,9%	0,4%	0,1%	0,5%	100,0%
Thailand	5,6%	0,3%	1,7%	4,7%	6,8%	4,7%	0,9%	1,5%	0,0%	0,7%	0,1%	2,2%	0,3%	6,9%	1,9%	3,0%	58,3%	0,2%	0,1%	0,2%	100,0%
Tunisia	40,3%	2,5%	4,9%	12,1%	3,3%	12,5%	0,8%	2,9%	0,0%	1,3%	0,2%	2,7%	0,2%	5,3%	0,8%	1,3%	8,1%	0,4%	0,2%	0,2%	100,0%
Viet Nam	37,6%	9,3%	1,6%	5,0%	15,9%	4,5%	0,2%	1,1%	0,0%	1,0%	0,1%	1,9%	0,3%	1,2%	0,8%	1,6%	17,3%	0,2%	0,2%	0,2%	100,0%
ROW	26,1%	1,0%	19,8%	6,6%	2,0%	3,4%	5,6%	1,8%	0,0%	1,7%	0,1%	2,8%	0,3%	5,8%	0,8%	2,1%	19,5%	0,3%	0,1%	0,2%	100,0%

Source: Authors' calculations.

Appendix 3: *Value Added Embodied in Moroccan Foreign Exports by Regions, 2019 (%)*

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	TOTAL
Australia	9,3%	3,5%	4,6%	15,9%	2,8%	48,1%	4,6%	1,4%	7,6%	0,5%	1,2%	0,4%	100,0%
Austria	10,0%	2,3%	3,7%	9,6%	12,0%	48,7%	6,9%	0,9%	4,0%	0,3%	1,4%	0,2%	100,0%
Belgium	16,3%	2,8%	4,8%	15,9%	2,7%	37,5%	5,5%	1,8%	7,8%	0,9%	1,5%	2,6%	100,0%
Canada	5,3%	5,6%	27,5%	9,6%	17,5%	20,7%	4,3%	4,3%	3,4%	0,3%	0,6%	0,8%	100,0%
Chile	5,1%	5,4%	24,9%	8,1%	18,9%	24,4%	5,3%	3,8%	3,1%	0,2%	0,6%	0,1%	100,0%
Colombia	20,0%	3,6%	7,7%	11,0%	11,2%	27,6%	6,1%	1,6%	9,0%	0,5%	1,4%	0,3%	100,0%
Costa Rica	4,4%	4,4%	20,4%	10,3%	13,5%	35,0%	4,0%	3,3%	3,6%	0,3%	0,6%	0,2%	100,0%
Czech Republic	10,8%	3,1%	3,5%	10,8%	11,5%	46,0%	7,9%	0,9%	3,8%	0,3%	1,3%	0,1%	100,0%
Denmark	11,2%	4,1%	7,3%	12,2%	6,7%	38,5%	8,4%	2,2%	7,1%	0,5%	1,3%	0,4%	100,0%
Estonia	13,6%	2,1%	3,5%	12,2%	7,9%	43,5%	6,5%	1,5%	6,6%	0,6%	1,6%	0,4%	100,0%
Finland	18,1%	1,1%	1,7%	10,0%	10,5%	50,3%	5,0%	0,6%	1,5%	0,1%	0,9%	0,1%	100,0%
France	6,5%	2,6%	4,6%	16,7%	4,7%	55,1%	3,6%	1,2%	3,4%	0,4%	0,8%	0,5%	100,0%
Germany	11,2%	2,9%	4,3%	12,9%	6,7%	47,0%	6,1%	1,2%	5,0%	0,5%	1,2%	1,0%	100,0%
Greece	27,6%	1,6%	2,5%	11,0%	3,4%	41,6%	2,4%	0,5%	2,1%	0,7%	0,8%	5,8%	100,0%
Hungary	13,2%	2,1%	5,2%	12,0%	4,5%	53,1%	4,4%	0,9%	3,5%	0,3%	0,8%	0,2%	100,0%
Iceland	8,6%	1,6%	3,1%	19,2%	0,9%	53,3%	3,8%	1,4%	6,0%	0,6%	1,0%	0,4%	100,0%
Ireland	11,9%	2,2%	4,4%	18,4%	1,9%	42,4%	5,5%	2,0%	8,3%	0,8%	1,5%	0,6%	100,0%
Israel	10,3%	1,7%	3,5%	19,8%	1,0%	46,7%	4,8%	2,0%	7,6%	0,8%	1,3%	0,6%	100,0%
Italy	22,9%	2,4%	4,3%	12,6%	5,1%	44,2%	3,9%	0,8%	2,7%	0,2%	0,7%	0,2%	100,0%
Japan	9,1%	3,5%	2,9%	15,2%	4,2%	53,8%	4,7%	1,0%	3,8%	0,4%	1,0%	0,3%	100,0%
South Korea	23,9%	2,5%	6,8%	14,3%	2,9%	38,8%	5,3%	0,8%	3,6%	0,3%	0,8%	0,2%	100,0%
Latvia	3,5%	2,4%	4,8%	15,7%	4,5%	62,2%	2,5%	0,9%	2,6%	0,3%	0,6%	0,1%	100,0%
Lithuania	27,8%	1,9%	2,3%	11,4%	4,5%	44,9%	3,9%	0,5%	2,3%	0,2%	0,5%	0,1%	100,0%
Luxembourg	10,7%	2,0%	3,6%	19,2%	0,9%	46,1%	5,1%	2,0%	7,6%	0,8%	1,3%	0,6%	100,0%
Mexico	15,6%	4,0%	6,4%	11,5%	6,4%	41,4%	5,4%	1,2%	6,2%	0,4%	1,1%	0,3%	100,0%
Netherlands	13,5%	2,8%	5,8%	12,4%	3,3%	26,5%	4,9%	1,6%	9,5%	2,2%	2,5%	15,1%	100,0%
New Zealand	9,4%	2,7%	4,4%	11,9%	2,0%	32,3%	4,3%	1,0%	10,7%	2,3%	2,6%	16,4%	100,0%
Norway	11,8%	1,0%	1,3%	7,4%	2,5%	23,3%	2,1%	0,6%	6,8%	4,1%	3,5%	35,6%	100,0%
Poland	10,8%	2,4%	3,8%	15,1%	5,2%	47,7%	5,5%	1,5%	5,8%	0,5%	1,2%	0,4%	100,0%
Portugal	23,3%	2,3%	6,3%	10,8%	6,8%	40,5%	3,9%	0,7%	2,1%	0,4%	0,8%	2,2%	100,0%
Slovak Republic	17,0%	2,1%	6,0%	12,8%	3,6%	52,9%	3,0%	0,5%	1,4%	0,1%	0,5%	0,1%	100,0%
Slovenia	11,6%	2,4%	3,9%	13,6%	8,2%	42,0%	7,1%	1,9%	6,4%	0,6%	1,7%	0,5%	100,0%
Spain	22,7%	2,6%	4,8%	14,5%	4,8%	40,5%	3,7%	0,9%	3,3%	0,3%	0,7%	1,0%	100,0%
Sweden	13,1%	1,8%	3,7%	12,5%	9,6%	43,9%	6,4%	1,6%	5,0%	0,5%	1,5%	0,4%	100,0%
Switzerland	10,0%	2,9%	3,6%	26,4%	1,9%	39,1%	5,1%	1,5%	7,1%	0,6%	1,3%	0,5%	100,0%
Turkey	19,4%	2,6%	6,7%	13,2%	6,2%	43,7%	4,1%	0,7%	2,4%	0,2%	0,7%	0,1%	100,0%
United Kingdom	20,0%	2,3%	3,6%	15,5%	2,7%	42,4%	4,3%	1,4%	5,6%	0,5%	1,0%	0,6%	100,0%
United States	15,4%	2,5%	5,6%	13,9%	10,9%	40,6%	4,2%	1,5%	3,9%	0,3%	0,8%	0,3%	100,0%
Argentina	8,3%	5,6%	22,0%	7,9%	13,0%	19,3%	5,2%	3,4%	8,2%	0,9%	1,4%	4,7%	100,0%
Brazil	13,1%	4,8%	14,2%	10,9%	8,8%	26,9%	6,0%	2,3%	10,1%	0,6%	1,5%	0,8%	100,0%
Brunei Darussalam	36,0%	0,9%	1,3%	11,7%	2,7%	44,6%	1,7%	0,2%	0,8%	0,0%	0,1%	0,0%	100,0%
Bulgaria	13,2%	4,5%	11,8%	12,1%	7,1%	29,9%	6,4%	2,3%	10,0%	0,7%	1,5%	0,5%	100,0%
Cambodia	10,7%	1,2%	3,5%	16,2%	3,6%	59,1%	2,6%	0,5%	1,7%	0,2%	0,6%	0,1%	100,0%
China	16,7%	2,4%	10,3%	11,5%	9,6%	37,9%	5,1%	1,5%	3,2%	0,3%	1,0%	0,5%	100,0%
Croatia	7,2%	1,8%	2,5%	12,8%	4,1%	65,7%	2,4%	0,6%	1,8%	0,2%	0,6%	0,1%	100,0%
Cyprus	12,4%	2,8%	4,3%	19,5%	0,8%	39,3%	5,9%	2,4%	9,2%	0,9%	1,6%	0,8%	100,0%
India	17,7%	2,3%	6,1%	16,7%	2,8%	38,0%	5,0%	1,9%	7,0%	0,7%	1,2%	0,6%	100,0%
Indonesia	11,8%	3,1%	13,5%	12,2%	8,2%	39,6%	3,6%	1,9%	3,6%	0,4%	0,7%	1,4%	100,0%
Hong Kong, China	10,2%	2,8%	3,6%	18,7%	1,5%	46,3%	5,0%	2,0%	7,3%	0,7%	1,4%	0,6%	100,0%
Kazakhstan	1,8%	2,0%	1,0%	6,3%	52,4%	24,1%	7,3%	2,4%	1,2%	0,1%	1,2%	0,1%	100,0%
Lao	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Malaysia	10,7%	2,8%	4,4%	16,3%	2,7%	46,5%	5,1%	1,3%	8,0%	0,6%	1,3%	0,4%	100,0%
Malta	7,1%	2,7%	2,6%	18,3%	1,6%	54,7%	4,0%	1,4%	5,4%	0,6%	1,1%	0,4%	100,0%
Myanmar	15,2%	3,2%	16,5%	9,7%	13,0%	31,3%	4,9%	2,3%	2,6%	0,2%	0,8%	0,1%	100,0%
Peru	7,9%	4,1%	14,3%	12,3%	9,3%	37,9%	4,5%	2,5%	5,6%	0,4%	0,9%	0,3%	100,0%
Philippines	11,8%	2,8%	4,7%	17,7%	3,0%	42,6%	5,2%	1,9%	7,6%	0,7%	1,4%	0,6%	100,0%
Romania	11,4%	4,1%	3,5%	12,9%	4,3%	51,7%	4,3%	0,8%	5,3%	0,4%	1,1%	0,2%	100,0%
Russia	20,4%	2,2%	6,3%	8,2%	22,4%	31,0%	4,5%	1,6%	1,7%	0,2%	0,6%	0,7%	100,0%
Saudi Arabia	21,6%	2,0%	2,8%	13,0%	4,8%	46,1%	4,3%	0,9%	3,2%	0,3%	0,7%	0,2%	100,0%
Singapore	6,2%	2,2%	2,2%	17,1%	4,4%	56,6%	4,7%	1,2%	4,0%	0,4%	1,0%	0,3%	100,0%
South Africa	4,9%	1,3%	2,2%	7,3%	35,0%	37,6%	6,3%	1,8%	2,2%	0,2%	1,1%	0,1%	100,0%
Chinese Taipei	22,8%	2,2%	3,7%	14,4%	3,2%	41,6%	4,9%	1,3%	4,4%	0,4%	0,9%	0,3%	100,0%
Thailand	7,2%	1,6%	3,0%	17,1%	2,3%	61,6%	2,7%	0,6%	3,1%	0,2%	0,6%	0,2%	100,0%
Tunisia	8,7%	4,3%	17,7%	8,3%	14,3%	28,4%	6,0%	2,9%	6,1%	0,5%	1,2%	1,6%	100,0%
Viet Nam	9,3%	3,9%	19,8%	8,7%	12,0%	27,8%	3,4%	2,6%	3,5%	0,9%	1,0%	7,1%	100,0%
ROW	7,4%	3,0%	12,1%	8,8%	25,3%	29,7%	5,5%	2,6%	3,8%	0,3%	0,9%	0,6%	100,0%

Source: Authors' calculations.

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