BRAINTRAINS

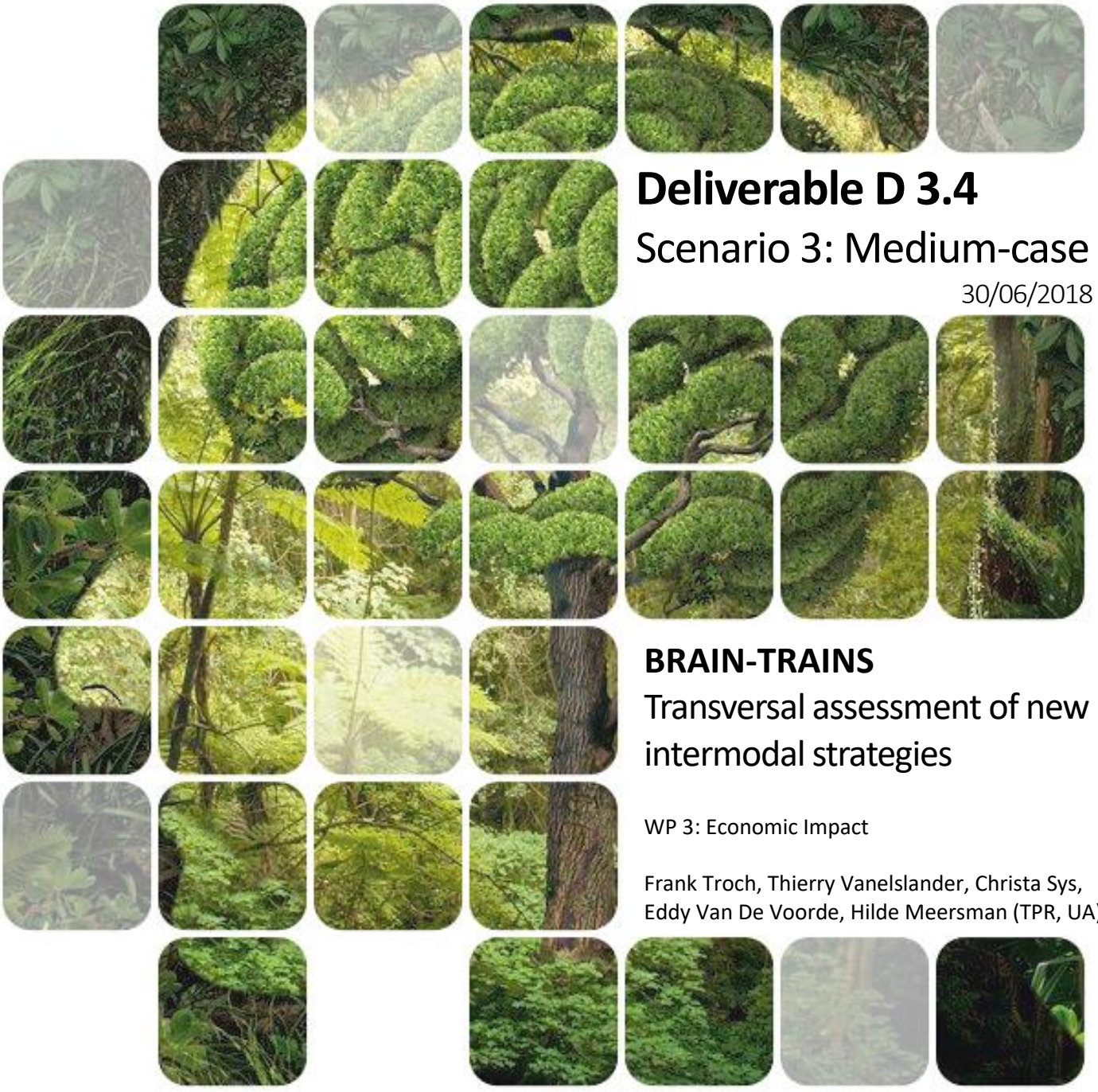
LIÈGE université 200

University of Antwerp

Belgian Science Policy Office

belspo

BELGIAN RESEARCH ACTION THROUGH INTERDISCIPLINARY NETWORKS



Deliverable D 3.4

Scenario 3: Medium-case

30/06/2018

BRAIN-TRAINS

Transversal assessment of new intermodal strategies

WP 3: Economic Impact

Frank Troch, Thierry Vanelslander, Christa Sys, Eddy Van De Voorde, Hilde Meersman (TPR, UA)

CONTENTS

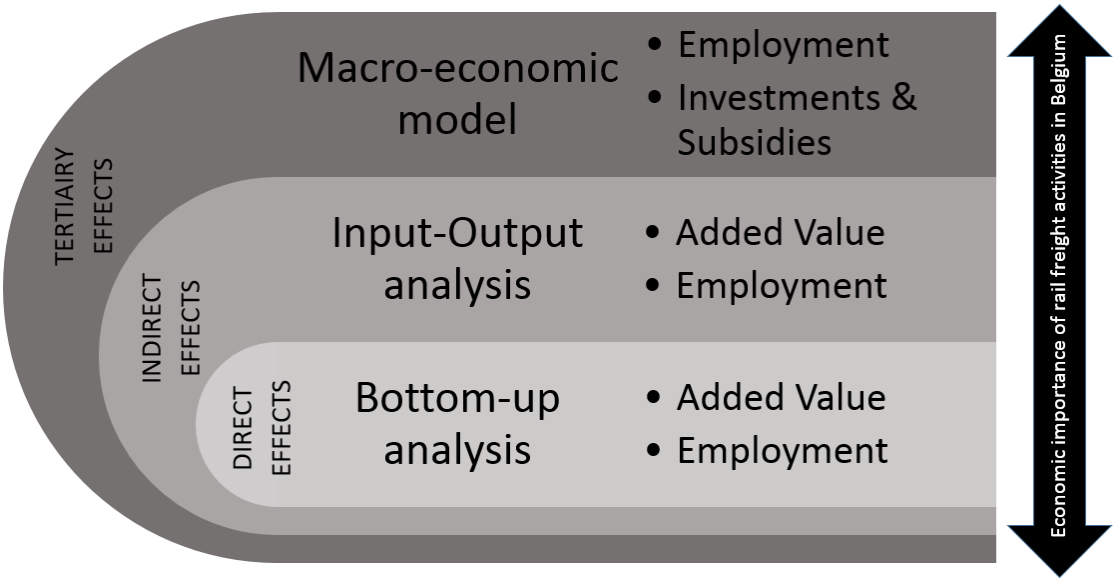
LIST OF FIGURES, TABLES AND GRAPHS

1. INTRODUCTION

The BRAIN-TRAINS project deals with rail freight development, its possible importance for business and governments, and how it can be made successful in a context of an increasing intermodality. The main goal of the project is to develop a blue print establishing the detailed criteria and conditions for developing an innovative intermodal network in and through Belgium, as part of the Trans-European Transport Network and related to different market, society and policy-making challenges. The project develops an operational framework in which effective intermodal transport can be successfully established in Belgium, with attention to beneficial participation and commitment of all different stakeholders. As such, this insight will help decision makers and policy makers understand complex managerial problems in the field of rail transport development, by translating them into a quantified approach. The output of this analysis can support the stakeholders in their decision process for future rail freight development.

The present deliverable, *'Scenario 3 - Medium-case',* is the third deliverable in a series of three within *Work Package 3 (WP 3): Economic impact of rail freight transport in Belgium*[1]. Figure 1 gives an overview of the framework that was developed for this work package and the way economic impact can be analysed on different levels. This economic impact of rail freight transport in Belgium, with rail transport also being part of the intermodal chain, can be assessed based on two major indicators: added value and employment. The objective of this WP is to quantify these economic indicators under different scenarios. Within previous research, it is found that both economic growth and transport growth share a strong mutual connection. Hence, this finding confirms the importance of understanding and measuring the relationship between rail freight transport and the national economy.

Figure 1: Framework for economic analysis of rail freight transport development in Belgium



Source: TROCH ET.AL. (2016)

Within Deliverable 1.1 – 1.3[1], a SWOT analysis was performed and multiple possible scenarios for rail freight transport development have been explored (Troch et. al., 2015; Vanelslander et. al., 2015). As stated in the scenario development in Deliverable 1.3, the goal of the scenario-based approach within this research project is to explore different plausible situations in which the development of rail transport in Belgium and its place within the intermodal transport chain can shift. As such, the obtained results from the application of scenarios are not meant to offer visionary insights into the future, neither are they attempting to forecast the exact events that the future of rail transport development might hold. The main purpose of the developed scenarios is to explore what the impact could be under a certain set of events, and to determine the relationship between certain macro-economic indicators and rail transport development in Belgium. The results in the current deliverable are analysed in the context of the medium-case scenario, where a moderate modal shift is taking place by 2030.

A methodological approach was set out in deliverable 3.1[1] (Troch, Vanelslander & Sys, 2016). From this methodological deliverable, the instruments that allow measuring the impact of rail freight transport on the Belgian economy are applied, with rail transport also being a part of the intermodal chain. ed to the observed multipliers. gives an overview of how this economic impact of rail freight transport in Belgium is analysed within the BRAIN-TRAINS project.

Deliverable 3.2[1] focussed on the input-output methodology used to calculate the indirect economic impact of an increase in final consumption of rail freight transportation, based on the best-case scenario (Troch, Vanelslander & Sys, 2017a). These indirect effects take into account the influence of intermediary supplies, causing a chain effect throughout the economy

Within deliverable 3.3[1] , the focus was put on the economic parameters 'employment' and 'added value' of rail freight operators, analysed from the company level and focusing on the direct economic impact (Troch, Vanelslander & Sys, 2017b). Indirect consequences due to spillover effects from intermediary purchases, which are not addressed within this deliverable.

The current deliverable 3.4 is an opportunity to extend previous studies within the Brain-Trains project to their next level. For the direct impact analysis, a comparative analysis is added on the level of rail freight transport in the European Union. Moreover a comparative analysis with direct effects of road transport and Inland Waterways (IWW) on the Belgian economy is investigated. For the indirect impact analysis, data of 2012 and 2015 have been taken into consideration, as 2012 is the first year after the transition period of the incumbent rail freight operator and 2015 being the most recent available year. Next, a sensitivity analysis has been performed to verify the results of deliverable 3.3. And finally, the indicator 'employment' was linked to the observed multipliers.

The further structure of this deliverable is linked to the following main components:

1) An extended research on the direct impact
2) An extended research on the indirect impact
3) Conclusions and recommendations

[1] The results of the scenario development, the methodology, the best-case analysis and the worst-case analysis can be consulted on https://www.brain-trains.com > project results > deliverables

Throughout the deliverable, a summary of previous results will be given in each section, followed by three extension studies on both the direct and indirect impact, involving both parameters 'added value' and 'employment'. Each section also incorporates the aforementioned medium-case scenario. The deliverable finishes with a short conclusion and some recommendations for further research in the last section.

2. DIRECT IMPACT

This section includes a synopsis of the previous results found from the direct impact analysis in deliverable 3.3. In addition, three extensions will be added within the current report. First, the case of seconded employees or assigned workforce will be discussed for the incumbent rail freight operator 'Lineas group' (formerly known as NMBS Logistics and B Logistics). This will be done in section 2.2. Second, a comparative analysis for the transport sector is presented in section 2.3, allowing to compare the previous results of the rail freight sector in Belgium to the road transport and the IWW sector in Belgium. The third extension compares rail freight transport on the European continent in section 2.4.

2.1. Synopsis of previous results

Troch, Vanelslander & Sys (2017b) developed a methodology to analyse three economic indicators based on 'added value' and 'employment' in deliverable 3.3[2]. The three economic indicators, (i) added value per Full Time Equivalent (FTE), (ii) added value per production unit and (iii) added value range, allow to discuss the direct economic impact of a rail freight operator on the Belgian economy (Vanstraelen, 2005). Data for this study was obtained from the statistical yearbooks and historical data for the period before the liberalization, and from the annual accounts and interviews within Lineas for the period after liberalization and privatization of the incumbent rail freight operator. With an average market share of 80% over the last years on the Belgian market, the results from this company case analysis are representative for the Belgian market.

The findings of Troch, Vanelslander & Sys (2017b), where four alternative calculations for added value are evaluated, show that during the transition period, the simplified top-down approach (Van Dijk, 2018) is similar to the extended top-down approach (NBB, 2007). The adapted top-down approach was similar to the bottom-up approach (Welten, 1996; Bloemen, 2017). After the transition period towards an independent organization, all four methods show similar results, making it indifferent which one of the four methods could be applied. As data collection is challenging, due to limited data being publicly available, and taking into account that the simplified top-down approach is the method requiring the least amount of data, this is the preferred method to apply on further analysis in this deliverable.

For the indicator 'added value', it is clear that the incumbent operator suffered from the liberalization of the Belgian rail freight market in 2007 and the financial and economic crisis in 2008-2009. All economic indicators dropped significantly. After the transition period in 2011-2012, a positive trend can be observed, and the economic parameter of added value per FTE in 2015 is even higher compared to the results before liberalization. Comparing the results of the incumbent operator to its main

[2] Details of the methodology development, the three indicators and the context of interpretation, can be found in deliverable 3.3 on the website: http://www.brain-trains.com

competitors, it can be observed that the latter succeeded in stealing away a limited volume, yet some very high added value generating flows from the incumbent operator. This is reflected by the higher economic indicators and the generation of a high amount of absolute added value with a limited market share. Nevertheless, the added value generation and economic indicators for both the incumbent operator as well as the main competitors show a positive trend, showing that both can grow next to each other and continue to have a rising direct impact on the Belgian economy.

In terms of employment, the main conclusion of the pre-liberalization period is the absence of joint-cost allocation. As freight activities were incorporated within the national rail services, employees working partially for freight services were not allocated to this freight cost centre, resulting in an underestimation of the real workforce, employment cost and added value generation. After a reorganization in 2004, the amount of personnel allocated to freight services increased drastically, resulting in a more realistic cost allocation. Post liberalization, the number of FTE dropped again, as the incumbent rail freight operator only gradually transferred human resources from the national rail operator and the infrastructure manager. In addition, many freight services from the national rail operator are still used by the newly formed and privatized organization. This will be discussed in the next section.

2.2. The case of seconded employees (assigned workforce)

In this section the case of seconded employees for Lineas is discussed for the post-liberalization period (2010 – 2015). Within deliverable 3.3, only the workforce on the direct payroll of the observed rail operator has been taken into account. Nevertheless, after liberalization, they continued to use employees on the direct payroll of the national rail operator for passenger services and the infrastructure manager. These employees however work full time for the rail freight operator, but are not on their direct payroll and are therefore included as a cost (input bought from other companies). It could be argued that these employees, although on the payroll of other companies and therefore taken into account in the added value generation of these suppliers, do generate added value for rail freight services and should therefore also be taken into account.

2.2.1. Data used

Data on the seconded employees was received from Lineas for the period 2010 – 2015, and can be verified with the annual accounts. Each annual account contains a 'social balance', stating an overview of all employees. This includes a table with interim employees and seconded employees, assigned to the observed organization (code 150). In addition, the cost of these employees is stated within the 'social balance' (code 152). As wages are one of the main components of added value, the cost of the seconded employees should be taken into account as an integral part of the added value of the observed company, when also taking into account the employees themselves.

2.2.2. Results

Looking at the employment in FTE,

Table 1 gives an overview of the employment in FTE for the period 2010-2015.

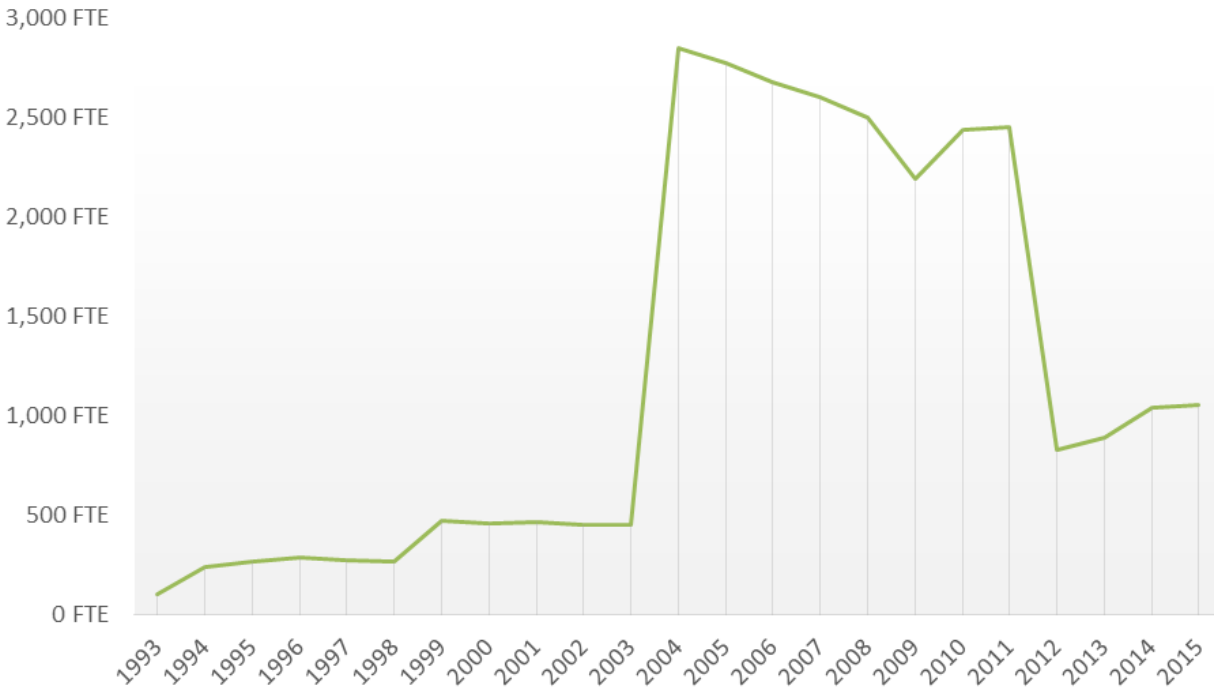
Table 1: Employment in FTE, including seconded employees (2010-2015)

	Total workforce	*Direct payroll*	*Seconded*
2010	**2,440 FTE**	*228 FTE*	*2,212 FTE*
2011	**2,451 FTE**	*344 FTE*	*2,107 FTE*
2012	**827 FTE**	*481 FTE*	*346 FTE*
2013	**887 FTE**	*505 FTE*	*382 FTE*
2014	**1,042 FTE**	*659 FTE*	*383 FTE*
2015	**1,053 FTE**	*680 FTE*	*373 FTE*

Source: own composition based on Troch et al. (2017b), B LOGISTICS (2011–2016), Inter Ferry Boats (2011–2016), Xpedys (2011–2016)

During the first two transition years, the incumbent rail freight operator used a high amount of seconded employees, resulting in a similar workforce compared to the pre-liberalization period when joint cost allocation was starting to be implemented. Graph 1 depicts the evolution of employment (in FTE), including the seconded employees covering the 1993-2015 period. Three evolutions are immediately apparent in this graph: the significant increase in 2004 (due to the reorganisation of cost centres, as discussed in deliverable 3.3), the stabilisation of the high amount of FTE over a longer period of time compared with the FTE analysis without seconded employees, and more importantly a remarkable decrease in number of seconded employees in 2012. This could be the result of one of the strategies of the organization to become an efficient and profitable organization. As of 2012, the number of seconded employees remains at a constant level; however, the employees on the direct payroll show an increasing trend, indicating the sustainable growth of the organization.

Graph 1: Employment evolution in FTE, including seconded employees (1993-2015)



Source: own composition based on Troch et al. (2017b), B LOGISTICS (2011–2016), Inter Ferry Boats (2011–2016), Xpedys (2011–2016)

Taking into account the cost of these seconded employees, the inclusive gross added value in factor costs can be estimated for the period 2010 – 2015. This is illustrated in

Graph 2. This graph shows changes in annual gross added value in terms of factor costs over a period of 10 years. Reflecting this to the graph on added value without seconded employees (deliverable 3.3), it can be concluded that the drop of added value shifted from 2011 to 2012, which can be explained due to the decrease in usage of seconded employees as of 2012. The addition of assigned employees only results in a time shift of the previously observed conclusions, but does not change the nature of these evolutions, so no difference in trend evolution is to be noticed. In addition, the same conclusions can be made for the methodology usage, as the simplified top-down approach is still following the extended approach, and the adapted top-down approach is still approximating the more detailed (but more difficult to calculate) bottom-up approach. As of 2013, all methods are showing similar results and have a positive upward trend, as it was found in the previous analysis.

Graph 2: Annual Gross Added Value in factor costs, including seconded employees (mio EUR, 2005-2015)

Source: own composition based on Troch et al. (2017b), B LOGISTICS (2011–2016), Inter Ferry Boats (2011–2016), Xpedys (2011–2016)

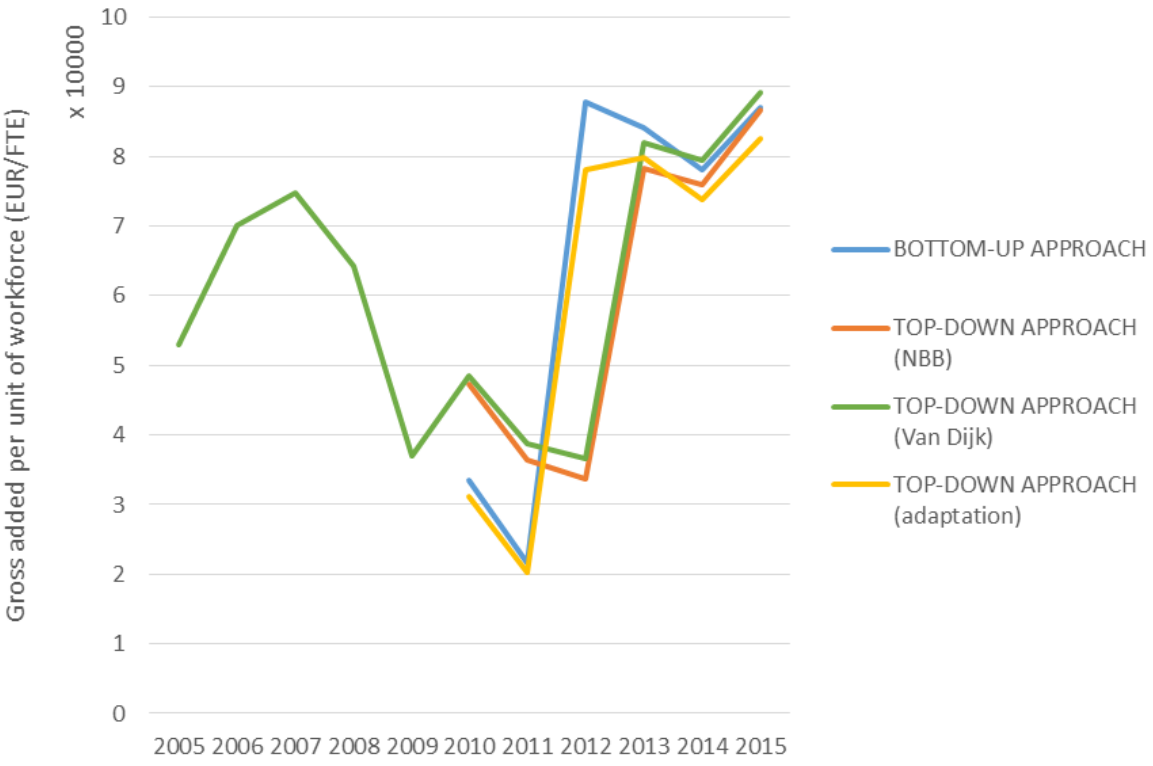
When using the added value and employment figures including the seconded employees, the three economic indicators can be recalculated and compared with the previous results.

Graph 3 shows the gross added value (in EUR factor prices) per unit of workforce (in FTE), including assigned workforce from other companies. Taking into account the allocated workforce to the rail freight operator, this economic indicator does not show any negative values anymore, but values are not reaching similar levels in 2015, as they are on average 10,000 EUR per FTE lower compared to the

study without seconded employees. This could be explained by the methodology, as in this extended study additional

employees are taken into account, but only their cost (wages) are increasing the added value. Remaining added value produced by these employees, due to production (profit generation), has already been taken into account within the previous study, resulting in a higher economic indicator. This is due to the calculation where generated added value, with the help of the seconded employees, was divided only by the FTE on the direct payroll. This argument justifies to equally study the effect of seconded employees on the direct economic effect or an organization. Although the indicator still decreases during the transition period from pre to post liberalization, the added value per FTE remains positive. Graph 3 also clearly confirms the previous observation that the added value per FTE is now higher compared to the results before liberalization, and a positive trend continues to increase the efficiency of the organization.

Graph 3: Employment economic indicator, including seconded employees (EUR/FTE, 2005-2015)



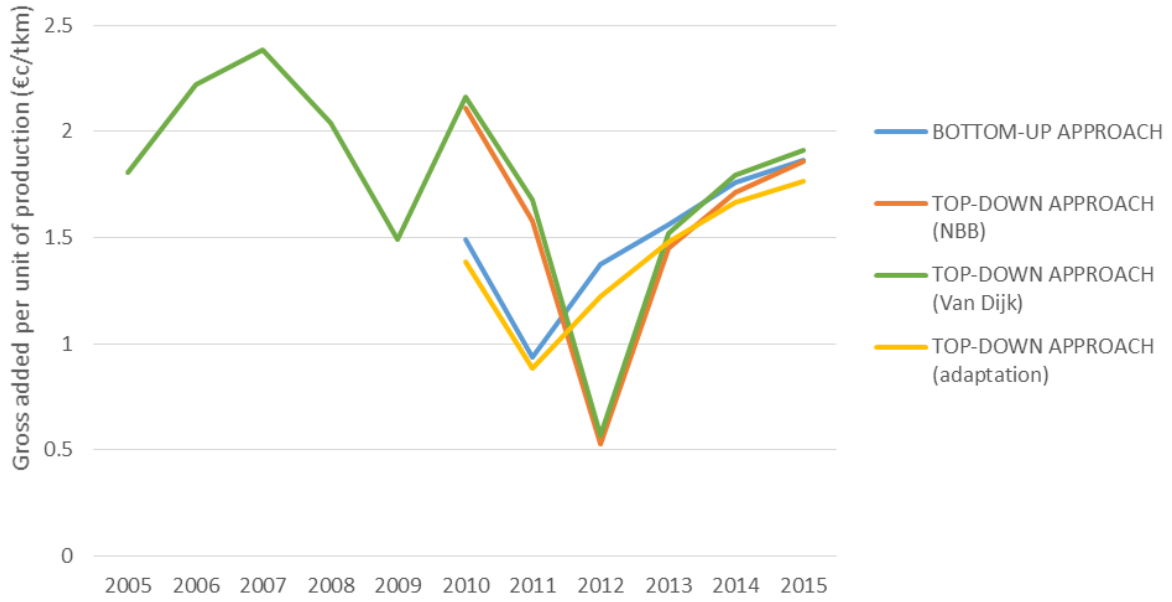
Source: own composition based on Troch et al. (2017b), B LOGISTICS (2011–2016), Inter Ferry Boats (2011–2016), Xpedys (2011–2016)

Graph 4 shows the second economic indicator, being the gross added value (in EUR factor prices) per production unit (€c/TKM), this time including assigned workforce from other companies.

is the visualisation of the third and final indicator, being the gross added value range (%) taking into account the cost of the appointed employees as added value. Similar conclusions can be drawn, as there are no more negative added value figures, and an increasing trend can be noticed for both indicators after the transition period. Peaks during the transition period also have been flattened due

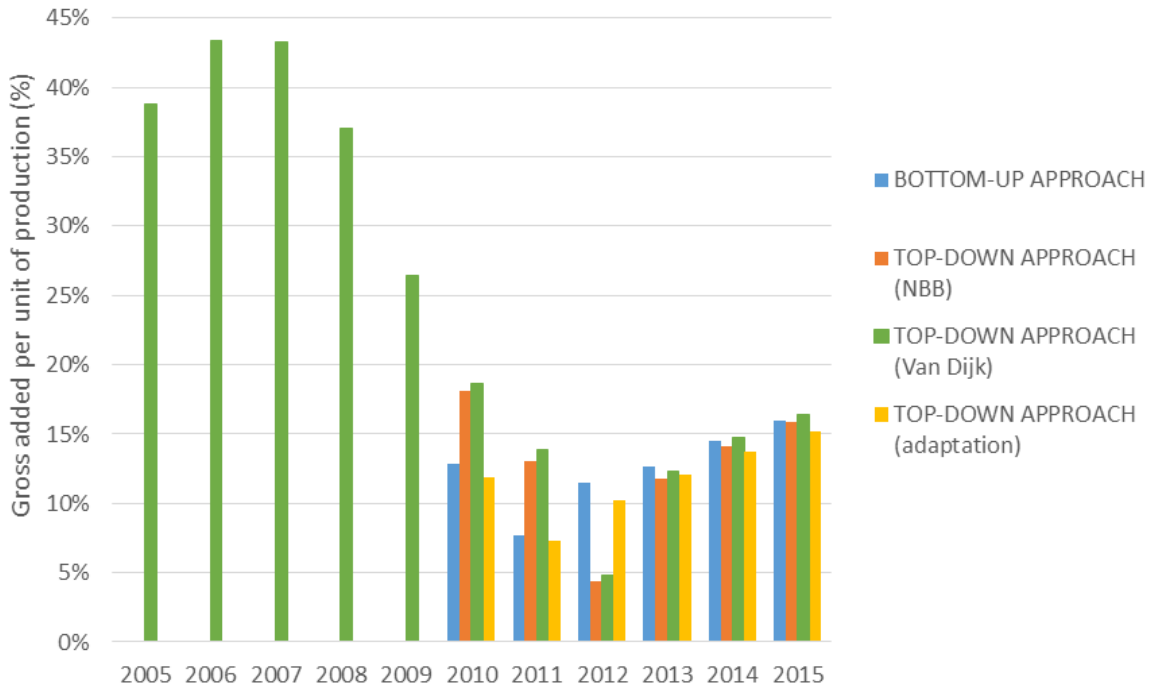
to the above argument that seconded employees generate additional added value outside of the wages. Added value productivity is at comparable levels as before the liberalization and the financial and economic crisis, indicating that the organization is ready for new strategies that should lead to

Graph 4: Production economic indicator, including seconded employees (EURcent/tkm, 2005-2015)



Source: own composition based on Troch et al. (2017b), B LOGISTICS (2011–2016), Inter Ferry Boats (2011–2016), Xpedys (2011–2016)

Graph 5: Gross Added Value Range, including seconded employees (%, 2005-2015)

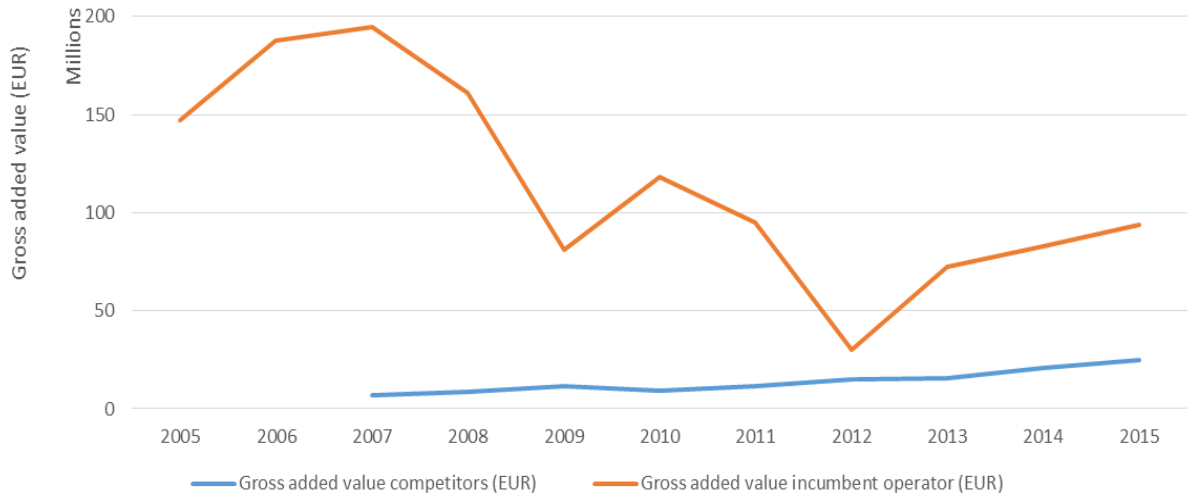


Source: own composition based on Troch et al. (2017b), B LOGISTICS (2011–2016), Inter Ferry Boats (2011–2016), Xpedys (2011–2016)

sustainable growth in the future. Vertical integration is higher compared to the analysis without seconded employees, but remains lower compared to the pre-liberalization period. This can be explained due to the absence of joint-cost allocation within this period, resulting in internal costs not being allocated to the rail freight services, resulting in a distortion of the added value figures and as such the creation of added value from generated revenue. The level of vertical integration of the observed rail freight operator after liberalization can be considered as normal levels for transport operators.

Graph 6 compares the recalculated gross added value in factor prices in EUR of the incumbent operator with the aggregated gross added value of the main competitors in Belgium. This graph again shows the upward trend of the total gross added value of the competition in Belgium. Although competitors hold a relatively small market share of the Belgian rail freight market (below 20%), they succeed in generating a considerably high amount of added value. This indicates that competitors are successful in overtaking high added value flows from the incumbent operator, a statement which is further established by the findings of **Error! Reference source not found.**.

Graph 6: Gross Added Value, including seconded employees - competition comparison (mio EUR, 2005-2015)

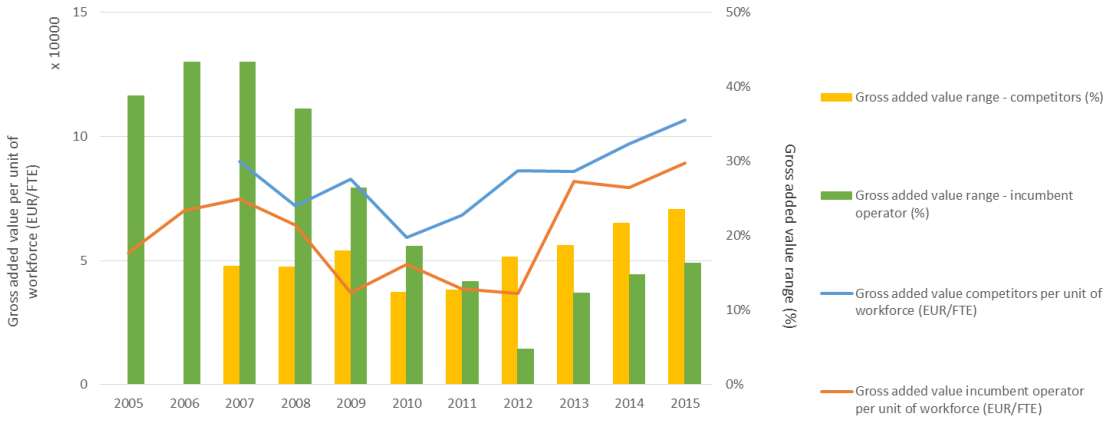


Source: own composition based on Troch et al. (2017b)

As can be observed from

Graph 7, the gross added value of competitors per unit of workforce and the level of vertical integration of competitors is noticeably higher compared to the figures of the incumbent operator, even when taking into account the seconded employees. Therefore, each additional EUR of revenue of the competitors is resulting in higher levels of added value and consequently has a bigger impact on the economy. Nevertheless, the total impact of the incumbent rail freight operator on the Belgian economy is higher, due to their high market share, and can as such not be ignored for further developments in the rail freight sector. In addition, it can also be concluded from the obtained results that for both the competitors and the incumbent rail freight operator, indicator values are steadily increasing, indicating a compatible growth and an increasing economic impact.

Graph 7: Gross added value per FTE and vertical integration, including seconded employees - competition comparison (mio EUR, 2005-2015)



Source: own composition based on Troch et al. (2017b)

2.3. Transport sector comparative analysis

The second extension of the direct impact analysis compares the main competitors of rail freight transport in Belgium, being road transport and IWW. To do this, the methodology of deliverable 3.3 is applied.

2.3.1. Data used

Data of road transport companies and IWW organizations has been collected from the annual accounts of companies established in Belgium. These are available through the National Bank of Belgium (Consult application). Road transport companies are selected based on their main NACE classification in sector 4941 'freight transport by road'; while Inland waterway companies are nominated based on their main NACE classification in sector 504 'freight transport by IWW'. The simplified approach to approximate the gross added value is adopted.

As the road transport sector and the IWW business are structurally different markets compared to the rail freight transport market, results should be interpreted in the correct context. In the road transport sector, competition is much more elaborated, with a mix of multiple bigger and smaller companies operating in the Belgian economy (Van Dijk, 2018). As this sector is still the dominant mode of inland transportation in Belgium, they generate a big part of the added value in the national economy. Therefore, it is important to look at the relative figures, identified by the economic indicators and more specifically the employment economic indicator, to show how this sector can be compared to the rail freight sector. It should also be taken into account that many road transport companies operating on the Belgian network, do not have an organization based on Belgian territory. These companies are left out of scope, as they do not contribute directly to the Belgian economy, which is the main set-up of this research. For IWW, barges are often operated by small family businesses, but represented by contractor organizations (Beelen, 2011; Sys et. al., 2017). As data of individual family organizations are not available, data of the inland waterway agents and bigger inland waterway operators are taken into account.

A total of 11.702 Belgian companies are identified with primary NACE classification '49410 – freight transport by road' with a total turnover of 7,819,098,000 EUR and a total employment of 53,880,000 FTE. This is considerably lower compared to the 136 companies linked to the rail freight sector in Belgium, with a total turnover of 1,203,299,000 EUR and a total direct employment of 1,364,000 FTE. A similar search for NACE classification '50400 – freight transport by IWW' results in 1,283 companies with a total direct employment of 1,668,000 FTE. Turnover is not publicly available, as companies are often too small and are not obliged to publish their turnover results. Nevertheless, the number of companies and the amount of direct employment, as well as the total turnover of rail and road make clear that road indeed remains the dominant mode of transportation in Belgium. It should be noted however that the NACE classification takes into account all organizations that have road, rail or IWW as one of their main activities. As such, a more detailed company analysis is required to compare results with the previous study.

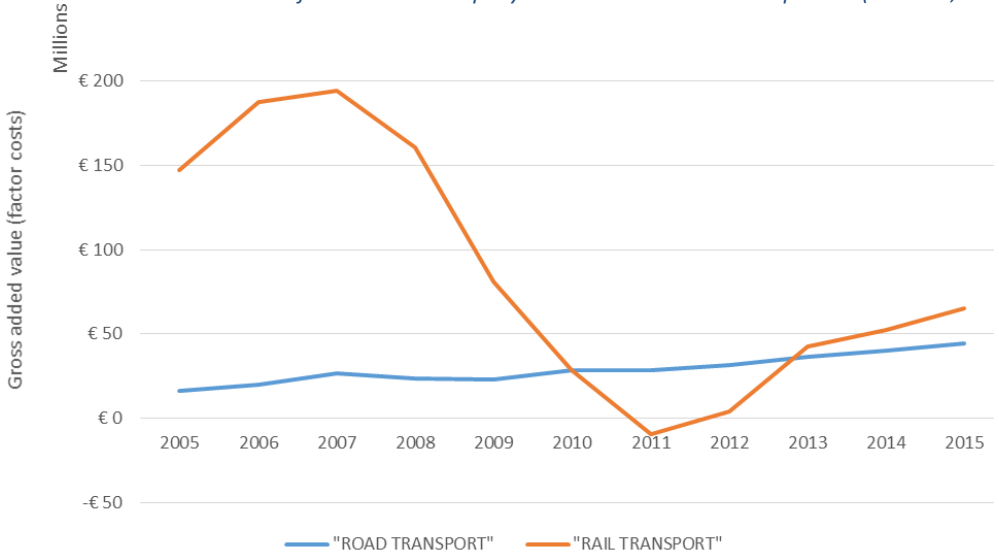
2.3.2. Results

For both the road transport sector and the IWW, a few company case analysis results will be discussed and compared with the company case analysis for the rail freight transport sector without seconded employees. Annual revenue of the incumbent rail freight operator varies between 550 and 650 million EUR, which is around 85% of total rail freight revenue in Belgium. In addition, the comparison will also include some results of freight forwarders operating in the field of intermodal transportation.

2.3.2.1. Road transport sector

One of the dominant road transport operators on the Belgian network is H. Essers NV. With an annual turnover of 364,998,930 EUR in 2015, and a total workforce of 537 FTE, they are very similar in terms of performance figures to the observed company 'Lineas' in the rail freight analysis. Graph 8 shows the added value of the incumbent rail freight operator, compared to the observed road transport organization. It can be seen that the observed road organization shows an increasing trend and is comparable to the levels of rail freight added value after the transition period following liberalization.

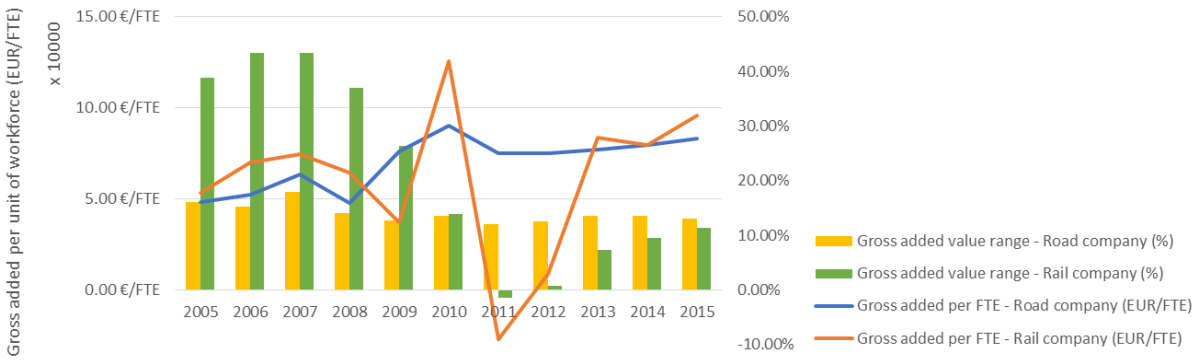
Graph 8: Annual Gross Added Value in factor costs - Company case "Road" vs. "Rail" comparison (mio EUR, 2005-2015)



Source: own composition based on Troch et al. (2017b) and H. Essers NV (2007-2016)

The same can be observed in Graph 9, where the gross added value per unit of workforce and the level of vertical integration of both the rail freight organization as well as the observed road transport organization are compared.

Graph 9: Employment indicator – Company case "Road" vs. "Rail" comparison (EUR/FTE, 2005-2015)



Source: own composition based on Troch et al. (2017b) and H. Essers NV (2007-2016)

Other road transport companies observed within the comparative analysis are DHL Road freight, Transport Joosen, JOST, Schenker and Van Moer Groep. These are major road transport companies operating in the Belgian economy with public data available in Belfirst (Van Dijk, 2018). Table 2 summarizes the figures of 2015 for these road companies. Comparing them to the observed rail freight organization, it can be noticed that the added value generated per FTE is lower for all road companies compared to the incumbent rail freight operator. The level of vertical integration, indicating how much the operations are owned by the observed company and as such the level in which revenue is transmitted into added value, is higher compared to the rail freight observation. This leads to the conclusion that road freight companies generate lower amounts of added value per employee, which means they need more labour capital to produce similar value compared to the rail sector, however they are less dependent on supplier inputs for their production process. In addition, it can also be stated that the added value creation apart from wages is lower in the road sector compared to the rail sector, resulting in the lower direct impact on the economy in the form of the economic indicator 'added value per FTE'.

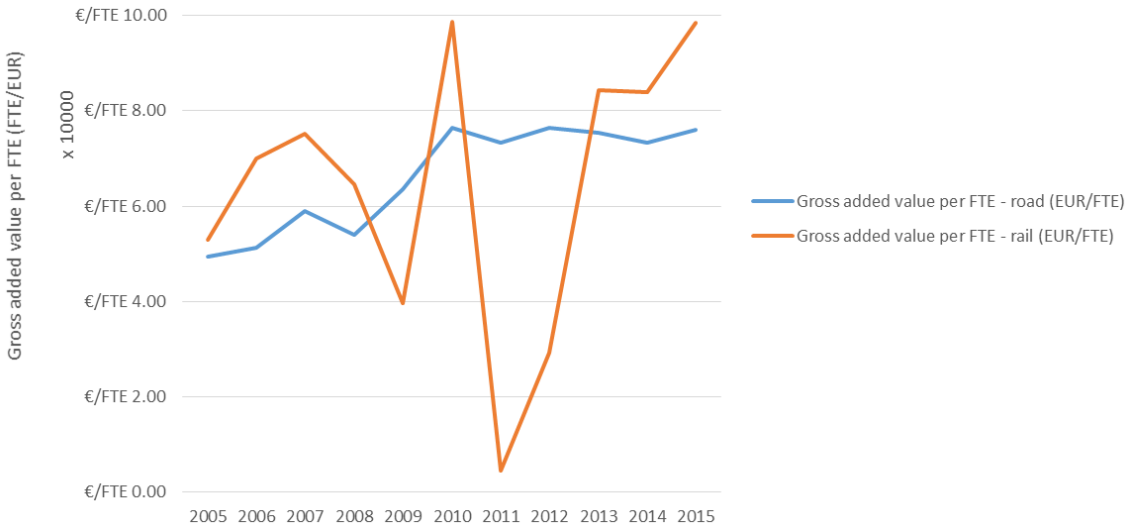
Table 2: Overview of road transport companies with the incumbent rail freight operator (2015)

- 2015 -	Revenue	FTE	gross added value	added value per FTE	added value range
Lineas	**€ 570,485,950**	**680 FTE**	**€ 65,121,735**	**€/FTE 95,767.26**	**11.42%**
H. Essers	€ 341,934,519	537 FTE	€ 44,574,762	**€/FTE 83,007.01**	**13.04%**
DHL Road freight	€ 135,005,388	199 FTE	€ 14,676,922	**€/FTE 73,753.38**	**10.87%**
T. Joosen	€ 24,364,466	124 FTE	€ 7,692,271	**€/FTE 62,034.44**	**31.57%**
JOST	€ 97,024,310	225 FTE	€ 19,399,084	**€/FTE 86,218.15**	**19.99%**
Schenker	€ 191,933,973	627 FTE	€ 42,162,437	**€/FTE 67,244.72**	**21.97%**
Van Moer	€ 33,231,123	113 FTE	€ 10,178,973	**€/FTE 90,079.41**	**30.63%**
TOTAL road selection	**€ 823,493,779**	**1825 FTE**	**€ 138,684,449**	**€/FTE 75,991.48**	**16.84%**
TOTAL rail selection	**€ 676,649,641**	**914 FTE**	**€ 90,062,183**	**€/FTE 98,536.31**	**13.31%**

Source: own composition based on Troch et al. (2017b), H. Essers NV (2007 – 2016), DHL Road freight (2007 – 2016), Transport Joosen (2007 – 2016), JOST (2007 – 2016), Schenker (2007 - 2016) and Van Moer Groep (2007 – 2016)

Comparing the added value per FTE of the selection of road freight transport companies with the total rail freight market analysis (incumbent operator + competitors) for the period 2005 – 2015 results in Graph 10. Making abstraction of the transition period 2010 - 2012 for the rail freight sector, it can be concluded that, based on the sample in this analysis, both rail and road transport have a similar direct effect on the economy, with an advantage for rail transport. Both sectors also show a growing trend over the past decade.

Graph 10: Employment indicator - Sector "Road" vs. "Rail" comparison (EUR/FTE, 2005-2015)



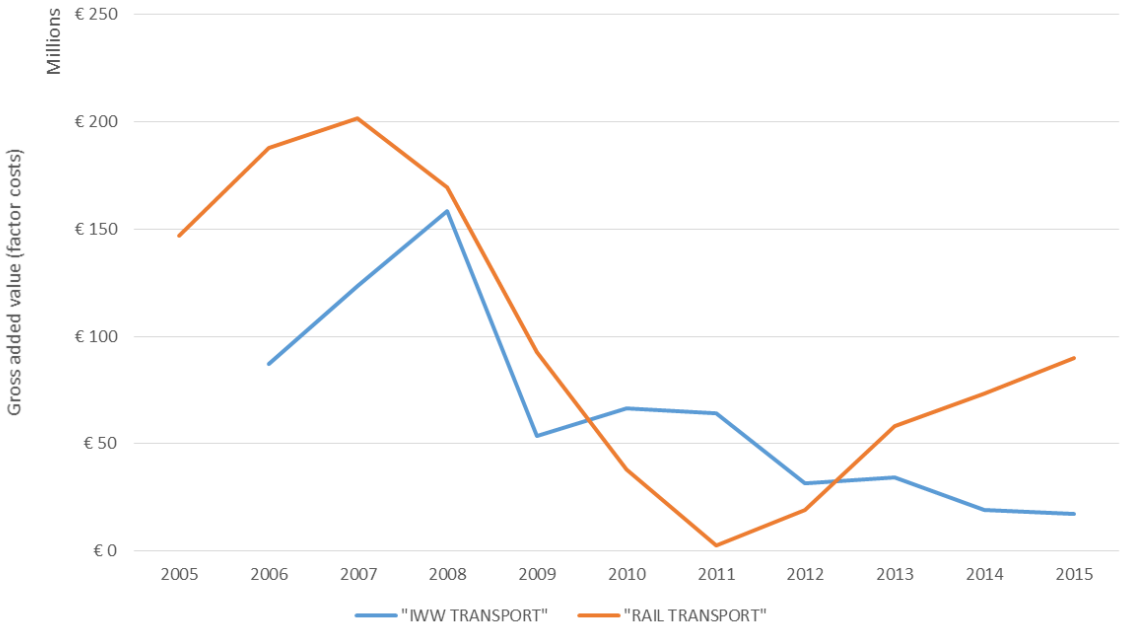
Source: own composition

2.3.2.2. IWW

Barges are often operated as small family businesses, due to which no or limited data is available in the annual accounts. Nevertheless, these barges are represented by an agent. However, total turnover of each agent is limited and most of the time smaller compared to the incumbent rail freight operator. Therefore, a number of barge operators and agents will be combined in order to be able to compare IWW with rail transport in Belgium. It should be remarked that, as road transport companies situated outside of Belgium but operating on Belgian roads are left out of scope, also barge operators seated in The Netherlands, but operating on Belgian inland waterways are equally left out of scope of this research. Based on the company details from the annual accounts, the following companies have been selected for this study: BCTN Meerhout, Cobelfret, De Grave Antverpia, Plouvier transport, Rederij Ringoot en zoon, SOMEF and SOMTRANS. Together, they achieve an average annual turnover of 196,418,321 EUR in 2015, and a total workforce of 201 FTE, which is still lower compared to the observed company 'Lineas' in the rail freight analysis, but allows already some more insight on the economic indicators' evolution in this sector.

Error! Reference source not found. shows the gross added value of the incumbent rail freight operator, compared to the observed organizations representing the sector of IWW. It can be seen that the observed IWW organizations show a downward trend since the financial and economic crisis, and did not see any structural recovery from this downturn so far.

Graph 11: Annual Gross Added Value in factor costs - Sector "IWW" vs. "Rail" comparison (mio EUR, 2005-2015)

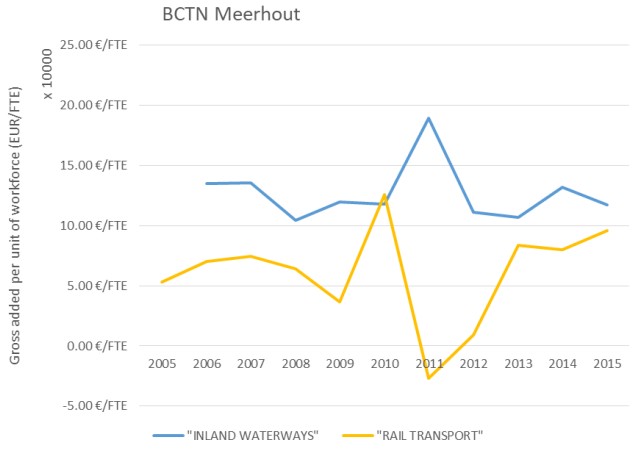


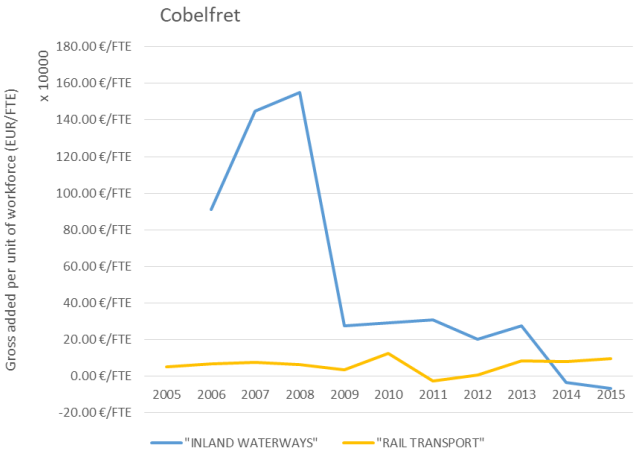
Source: own composition based on Troch et al. (2017b), BCTN Meerhout (2008 – 2016), Cobelfret (2008 – 2016), De Grave Antverpia (2008 – 2016), Plouvier Transport (2008 – 2016), Rederij Ringoot en zoon (2008 – 2016b), SOMEF (2008 – 2016), SOMTRANS (2008 - 2016)

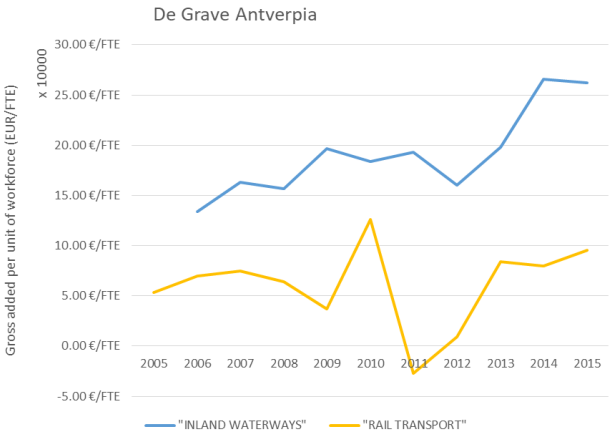
However, with only a quarter of the employment needed by the rail freight sector, half of the rail freight revenue can be generated and relative gross added value levels are remarkably high. Relating the added value with the employment figures results in the added value per FTE indicator for the selection of IWW companies. Due to the IWW companies being smaller in size compared to the observed rail freight organization, even when aggregated, the indicator is calculated on a company case base in order to observe different company trends, and to check if they are consistent and as such extensible to the IWW sector (Beelen, 2011; Sys et. al., 2017). Comparing the obtained company results for IWW with the rail freight analysis for the period 2005 – 2015 results in

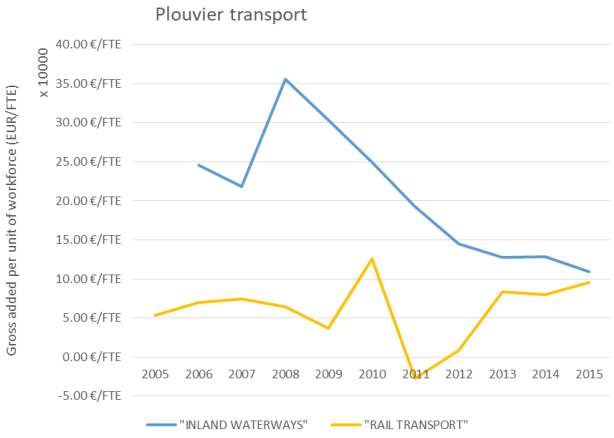
Graph 12. It can be concluded that in general, IWW has a higher direct impact on the Belgian economy in terms of added value creation per FTE. Nevertheless, companies that outperform the rail sector face a downward trend.

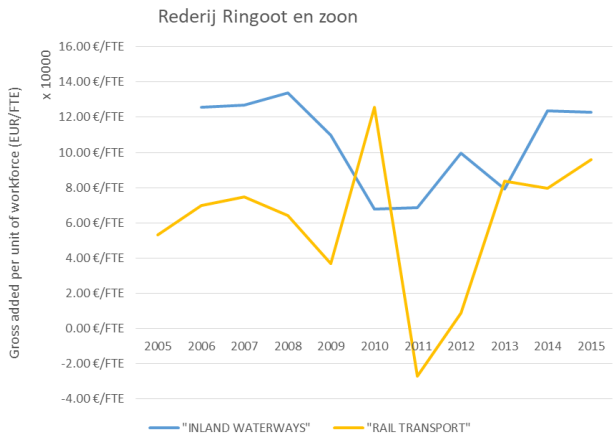
Graph 12: Employment indicator – Company case "Road" vs. "Rail" comparison (EUR/FTE, 2005-2015)

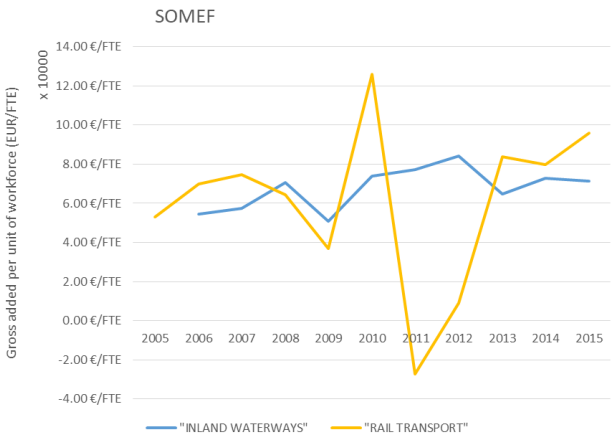


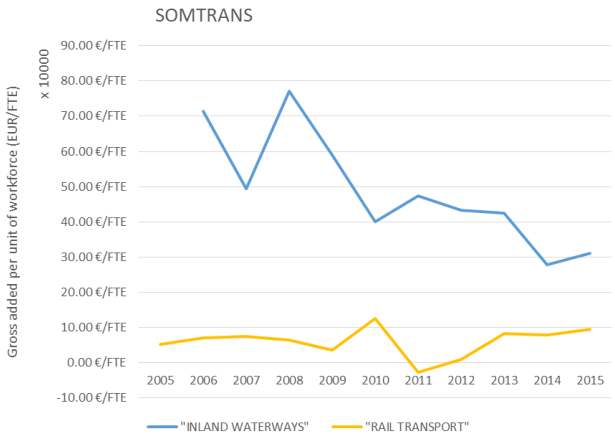












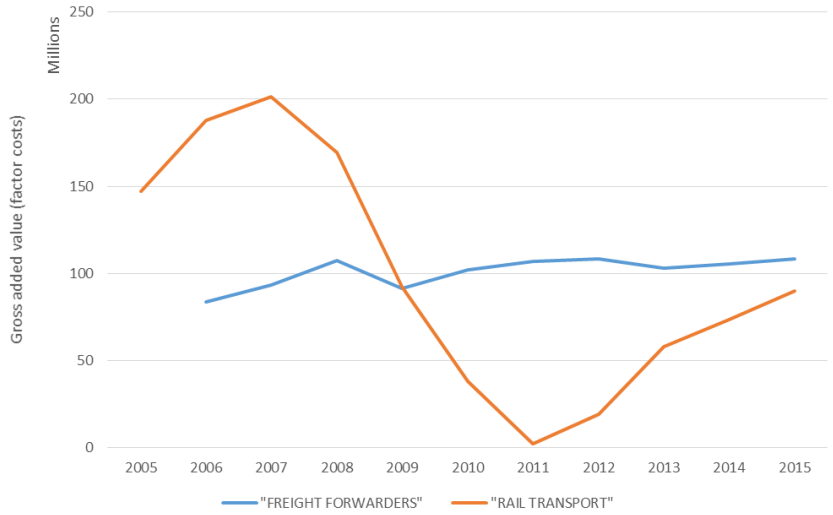
Source: own composition based on Troch et al. (2017b), BCTN Meerhout (2008 – 2016), Cobelfret (2008 – 2016), De Grave Antverpia (2008 – 2016), Plouvier Transport (2008 – 2016), Rederij Ringoot en zoon (2008 – 2016b), SOMEF (2008 – 2016), SOMTRANS (2008 - 2016)

2.3.2.3. Freight forwarders

As hinterland transport is often organized by freight forwarders, it is an interesting exercise to study the added value and employment parameters for such third party providers. For this deliverable, three freight forwarders active in Belgium have been selected: ArcelorMittal Logistics, DHL global forwarding and Kuehne+Nagel. Together, they perform an annual revenue of 918,251,695 EUR with an employment of 1,296 FTE. Previous analysis learns that this is a first indicator that freight forwarders use mainly labour capital to generate added value. The results are shown in Graph 13 and Graph 14.

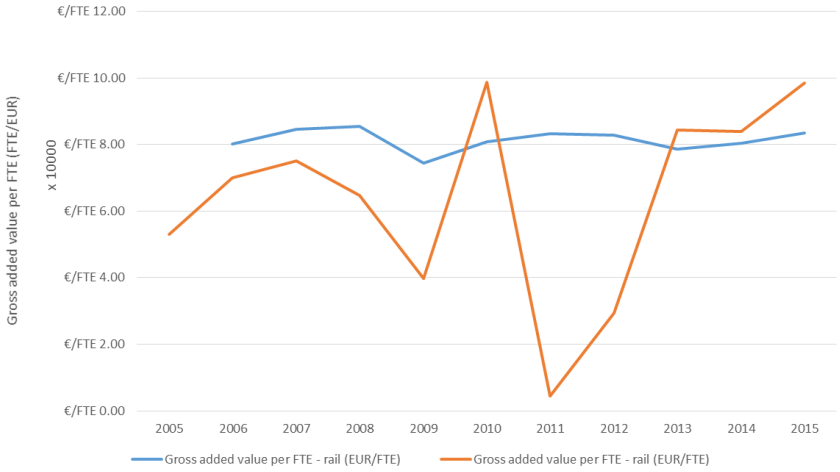
It can be noticed that freight forwarders remain stable in both added value generation as well as the creation of added value per employee during the financial and economic crisis. The gross added value shows a limited but noticeable growing trend, whereas the direct impact remains the same. Comparing the results with the observed rail sector, it is clear that the rail sector is starting to catch up with freight forwarders efficiency.

Graph 13: Annual Gross Added Value in factor costs - Sector "Freight Forwarders" vs. "Rail" comparison (mio EUR, 2005-2015)



Source: own composition based on Troch et al. (2017b), AML (2007 – 2016), DHL GF (2007 – 2016), K+N (2008 - 2017)

Graph 14: Employment indicator - Sector "Freight Forwarders" vs. "Rail" comparison (EUR/FTE, 2005-2015)



Source: own composition based on Troch et al. (2017b), AML (2007 – 2016), DHL GF (2007 – 2016), K+N (2008 - 2017)

2.4. European comparative analysis

In this section, the methodology of deliverable 3.3 is applied to rail freight operators in European countries as a third extension to the direct impact analysis.

2.4.1. Data used

The aim of this section is to make a comparison of the rail freight sector in Belgium to rail freight in European countries. As data is once again difficult to be found, the research will take into account a selection of rail freight operators active in the observed countries. Data is gathered from annual accounts and annual reports that can be found online via the Amadeus (2018) database.

Within the observed data, costs for goods and services (inputs) are often not shared at European level. Therefore the simplified top-bottom calculation, as described in the methodology in deliverable 3.3, cannot be used. As an alternative, the gross added value in factor costs is calculated by the bottom-up

technique, taking into account the available retribution values for the production factors: (i) profit/loss, (ii) cost of employees, (iii) depreciation, (iv) interest and (v) taxes. The results of the analysis will be discussed in the next section.

2.4.2. Results

For each country with available data, a short summary is made stating the observed rail freight operators active in that country, the total revenue they generate, the amount of employment they need and a graph on the indicator on added value per FTE. For six major (dominant) rail freight countries an additional graph with the total gross added value in factor costs is discussed as well. The obtained results will be compared to the outcome of the Belgian rail freight sector analysis, which generated a total revenue of 675 million euros in 2015 with a total employment of 914 FTE (Troch, Vanelslander & Sys, 2017b).

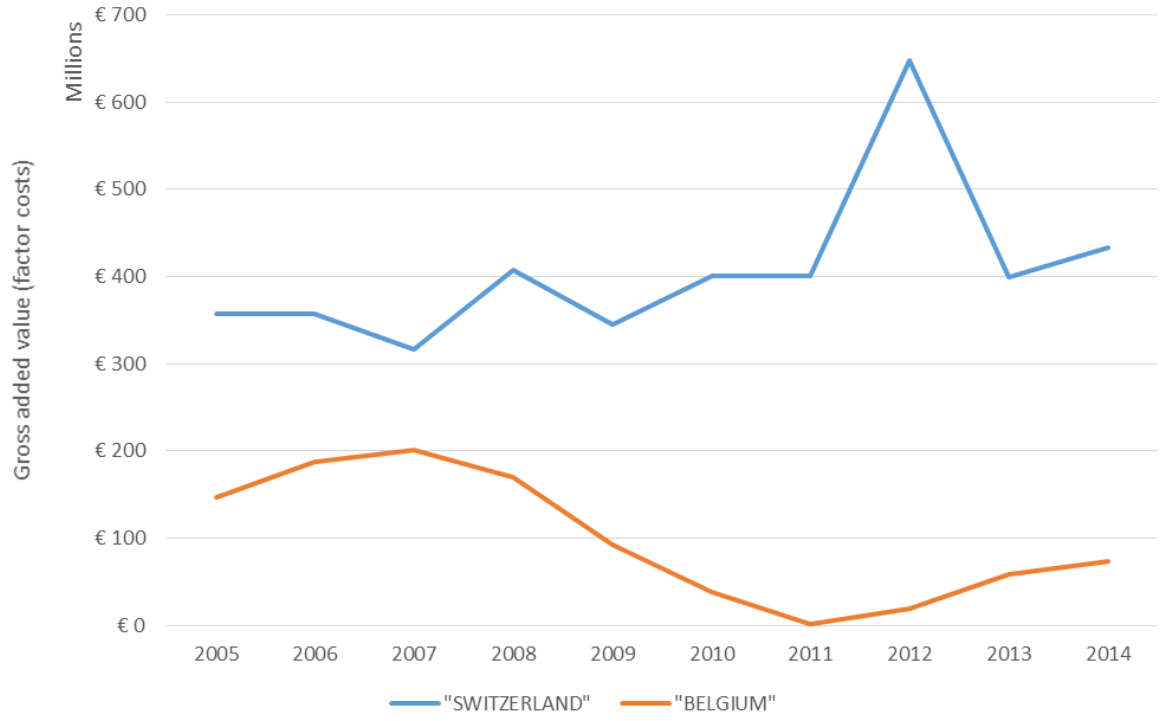
2.4.2.1. Switzerland

Data for three rail freight operators was found for Switzerland. This country is often seen as a success story in terms of rail freight transport development. The main rail freight operator is SBB Cargo. Two other observed rail freight operators are BLS Cargo and the more recently founded AARE Seeland Mobil. Data is only available until 2014.

Total revenue of the three operators starts at 639 million euros in 2005 and surpasses 900 million euros in 2014. Total employment, mainly provided by SBB Cargo, decreases from a total of 4,872 FTE in 2005 to 3,366 FTE in 2014.

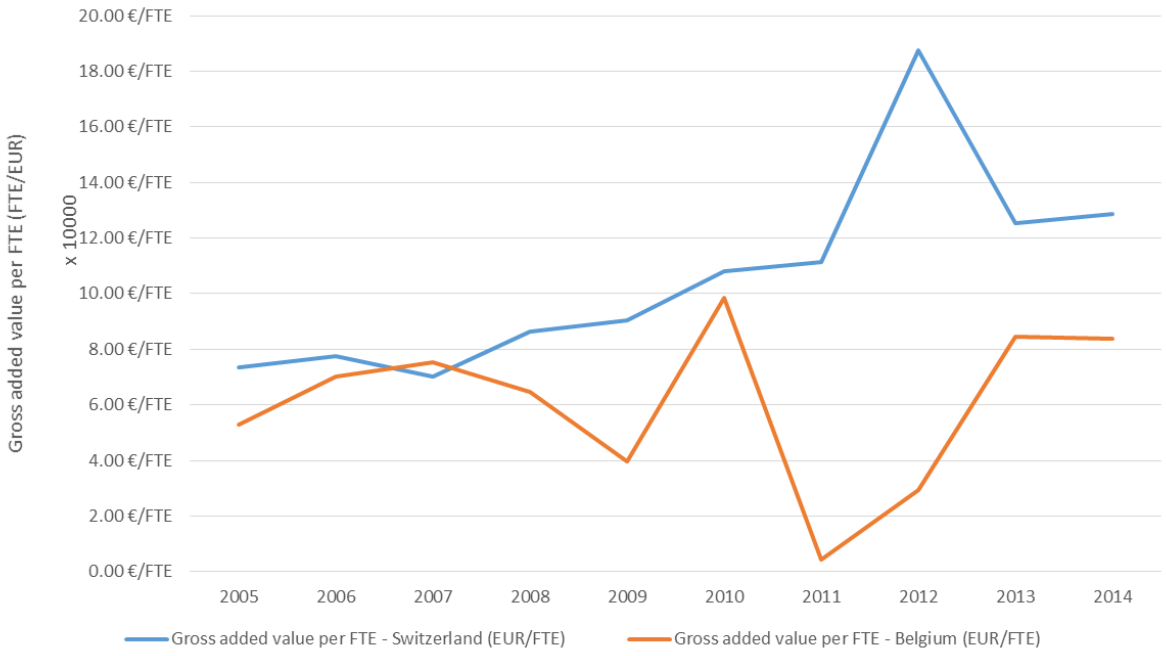
Graph 15 shows that the creation of gross added value in Switzerland by rail freight operators is significantly higher compared to the Belgian rail freight sector. This can be mainly explained due to the high level of workforce employed, contributing directly to the added value creation and as such resulting in a direct economic impact.

Graph 15: Gross Added Value - Belgium vs. Switzerland (mio EUR, 2005-2015)



Source: own omposition based on Amadeus (2018)

Graph 16: Employment indicator - Belgium vs. Switzerland (EUR/FTE, 2005-2015)



Source: own composition based on Amadeus (2018)

Graph 16 is the indicator gross added value per FTE. As employment of the observed rail freight operators in Switzerland is four times higher compared to Belgium, but generated revenue only is 1.5 tums higher, it could be expected that the economic indicator would be lower compared to Belgium. Nevertheless, graph 15 shows that the indicator shows a stable increasing trend and significantly surpasses the Belgian gross added value per FTE, due to the high added value creation of rail freight services in Switzerland. This is an indication that added value in the rail sector in this country is not only generated by employment (labor factor) but also by a profitable business.

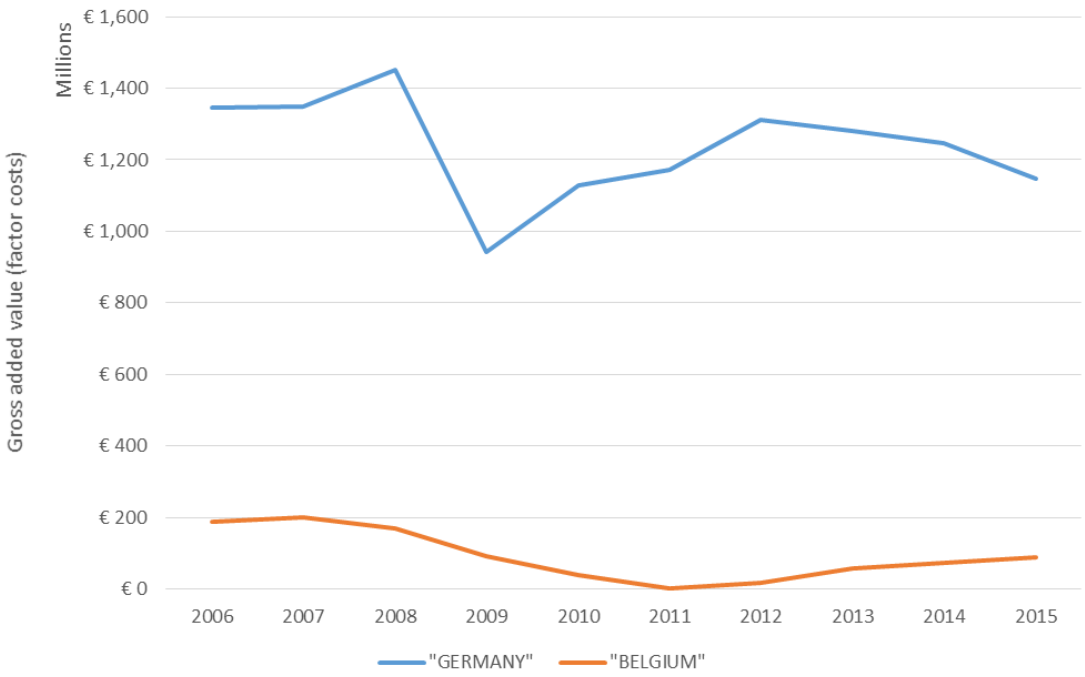
2.4.2.2. Germany

Data for six rail freight operators was found for Germany. This country is often seen as a dominant market for rail freight transport, mainly due to the activities of the main rail freight operator Deutsche Bahn. Unfortunately, due to organization structures, data of this main operator is not available. The observed six rail freight operators are Boxxpress, BLS Cargo, ITL, TW Logistik, SNCF Fret and Mitteldeutsche eisenbahn.

Total revenue of the six operators starts at 3.849 billion euros in 2006 and surpasses 4 billion euros in 2015. Total employment, mainly provided by BLS Cargo, decreases from a total of 20,995 FTE in 2006 to 18,953 FTE in 2015.

Graph 17 shows that the creation of gross added value in Germany by rail freight operators is significantly higher compared to the Belgian rail freight sector. This is no surprise, as the extent of operational activities of the observed rail freight operators is much larger. For a more competitive view, the economic indicator should be evaluated.

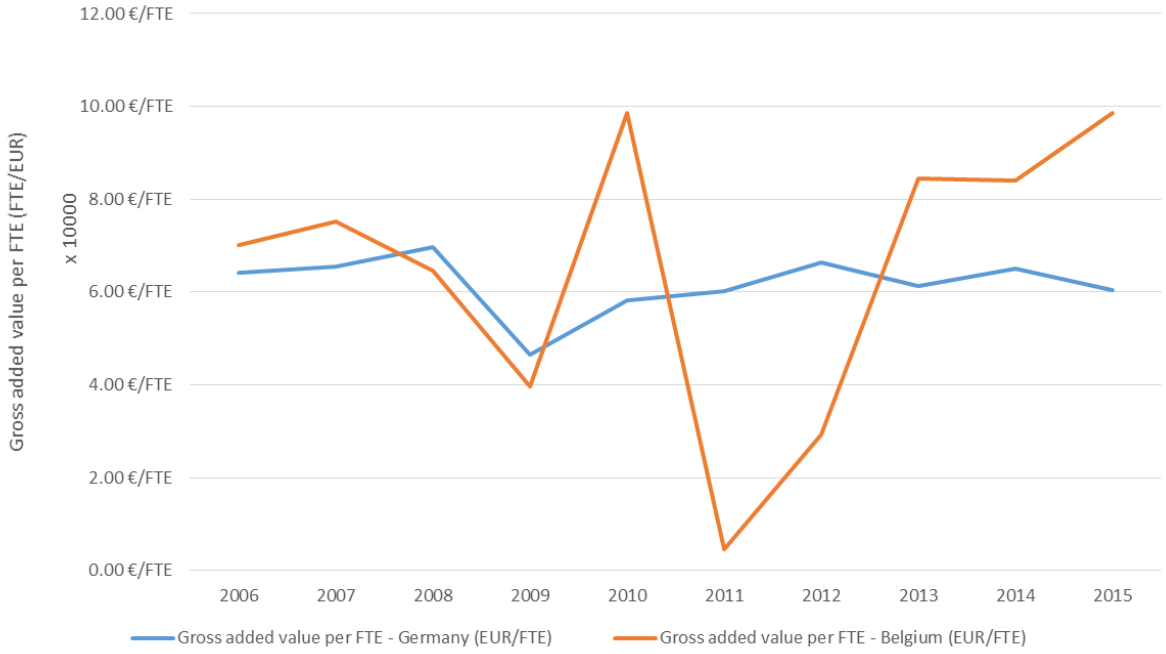
Graph 17: Gross Added Value - Belgium vs. Germany (mio EUR, 2006-2015)



Source: own composition based on Amadeus (2018)

Graph 18 is the indicator gross added value per FTE. Making abstraction from the transition period of the incumbent Belgian rail freight operator, it can be noticed that the direct impact generated by rail freight operators in terms of added value and employment are similar in both countries. Whereas Belgium features an increasing trend over the last years towards 100,000 EUR per FTE in 2015, Germany remains at a constant level of 60,000 EUR per FTE. It should be taken into account that the dominant market player, Deutsche Bahn, is not taken into account in this analysis.

Graph 18: Employment indicator - Belgium vs. Germany (EUR/FTE, 2006-2015)



Source: own composition based on Amadeus (2018)

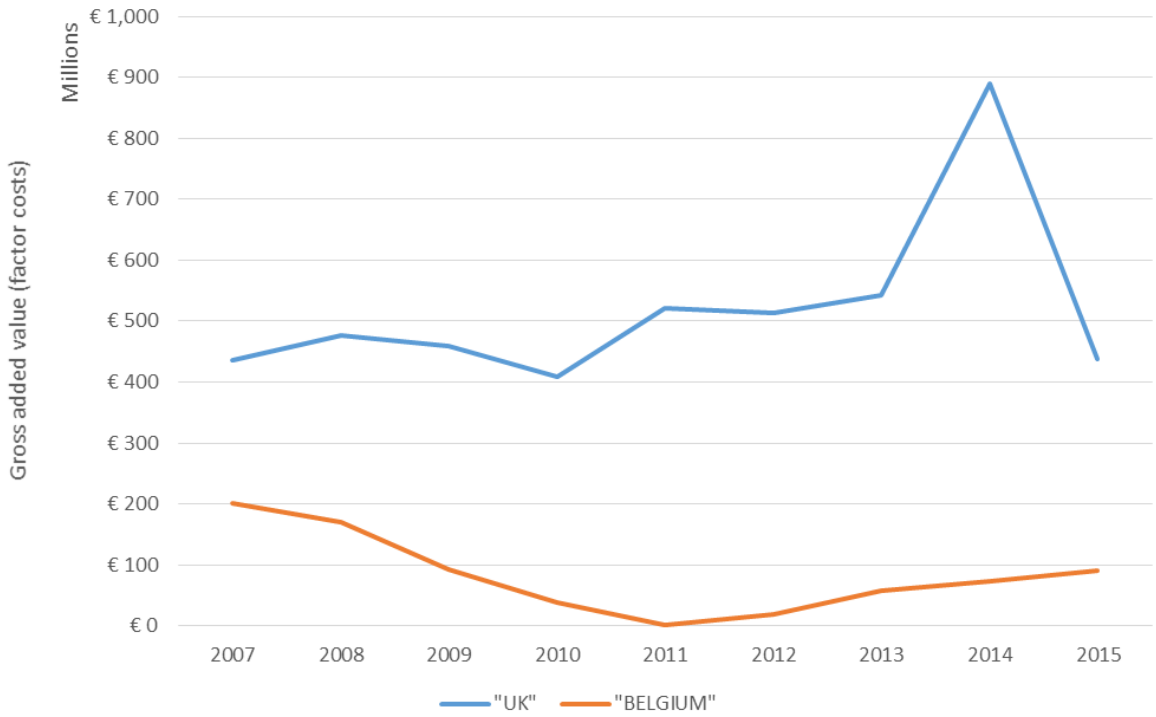
2.4.2.3. United Kingdom

Although the United Kingdom decided to leave the European Union, it is still interesting to take the rail freight sector into consideration as it was the first European country to liberalize the rail freight market. Data for six rail freight operators was found for the UK. Liberalization in this country has often been portrayed as a failure. It is an interesting question to see if this is reflected by the added value and employment parameters. The observed six rail freight operators are DB Cargo International UK, DB Cargo UK, Direct rail services, Freightliner, Freightliner (Heavy Haul) and GB railfreight.

Total revenue of the six operators starts at 913 million euros in 2007 and surpasses 1.1 billion euros in 2015. Total employment, mainly provided by DB Cargo UK and Freightliner, decreases from a total of 6,464 FTE in 2007 to 5,894 FTE in 2015.

Graph 19 shows that the creation of gross added value in the UK by rail freight operators is once again significantly higher compared to the Belgian rail freight sector due to the greater extension of the rail freight sector and the economy as such. Again, for a more competitive view, the economic indicator should be evaluated.

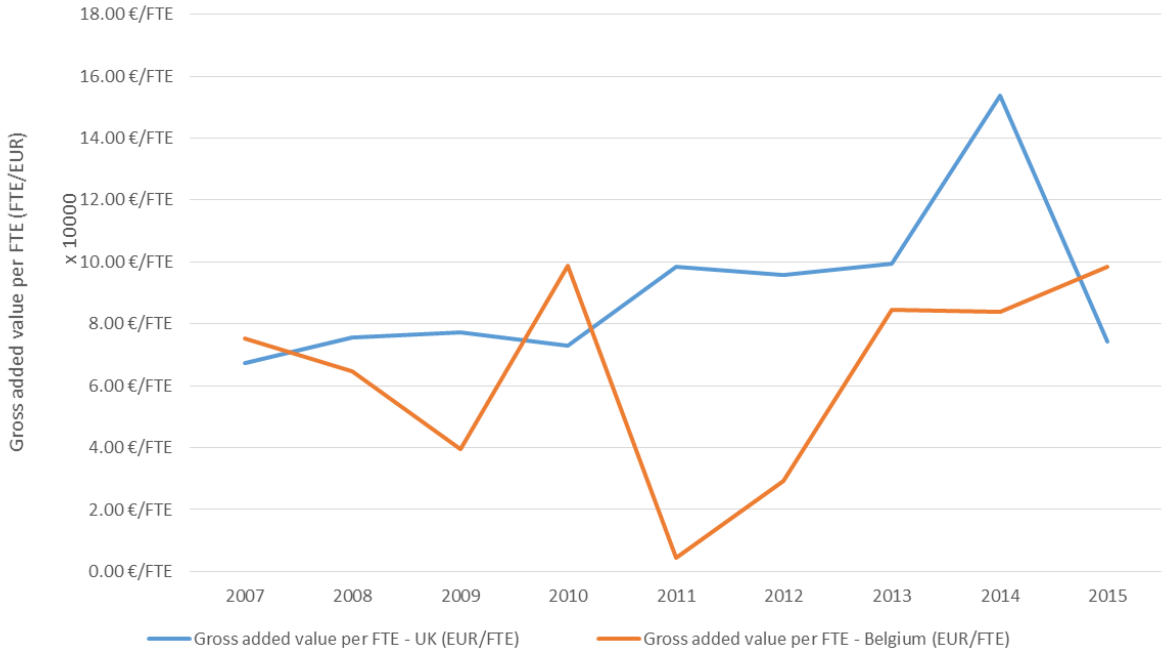
Graph 19: Gross Added Value - Belgium vs. UK (mio EUR, 2007-2015)



Source: own composition based on Amadeus (2018)

Graph 20 shows the indicator on gross added value per FTE. As it was the case with Germany, it can be noticed that the direct impact generated by rail freight operators in terms of added value and employment are similar in both countries, as they are leapfrogging several times.

Graph 20: Employment indicator - Belgium vs. UK (EUR/FTE, 2007-2015)



Source: own composition based on Amadeus (2018)

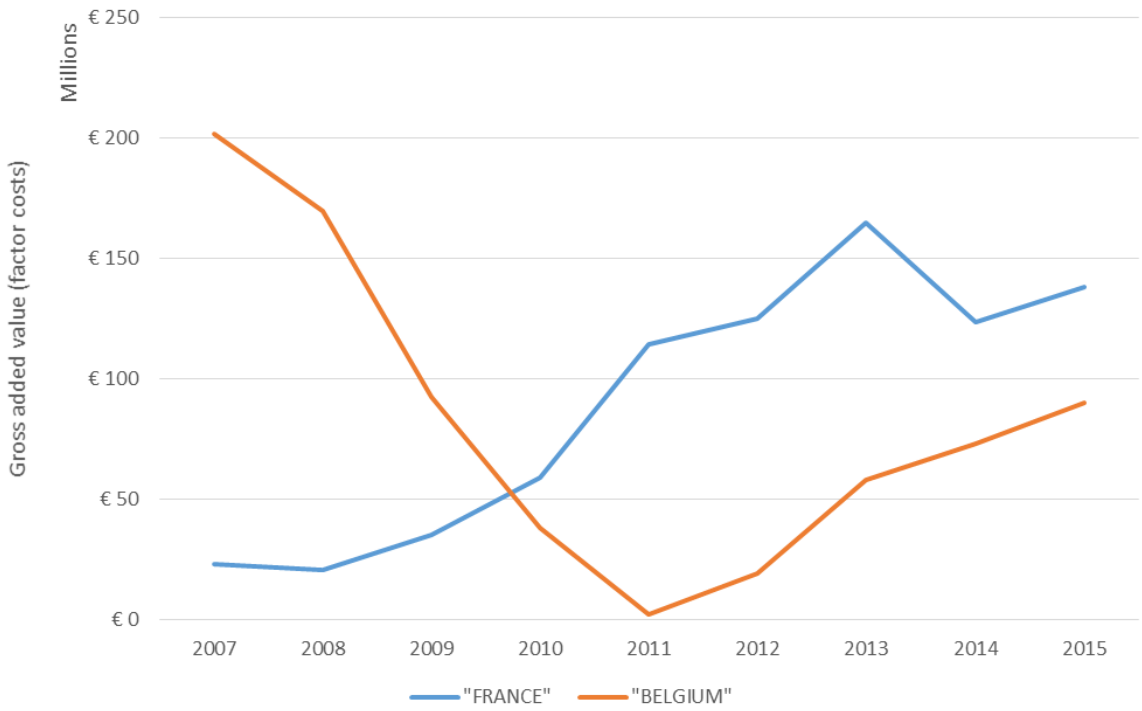
2.4.2.4. France

SNCF in France is often considered another major rail freight operator at European level. Looking at France, data for three rail freight operators was found. Unfortunately, data of SNCF Fret is unavailable in such a form that it could be used for this analysis. The observed three rail freight operators are Euro Cargo Rail, Europorte and VFLI.

Total revenue of the three operators starts at 68 million euros in 2007 and surpasses 315 million euros in 2015. Total employment, mainly provided by Euro Cargo Rail, rises from a total of 988 FTE in 2007 to 2,568 FTE in 2015.

Graph 21 shows that, although only a small part of the French rail freight market is taken into account, the creation of gross added value is higher compared to the Belgian rail freight sector. This can be explained due to the high amount of workforce needed by the French rail freight operator to reach a lower amount of revenue compared to the Belgian market.

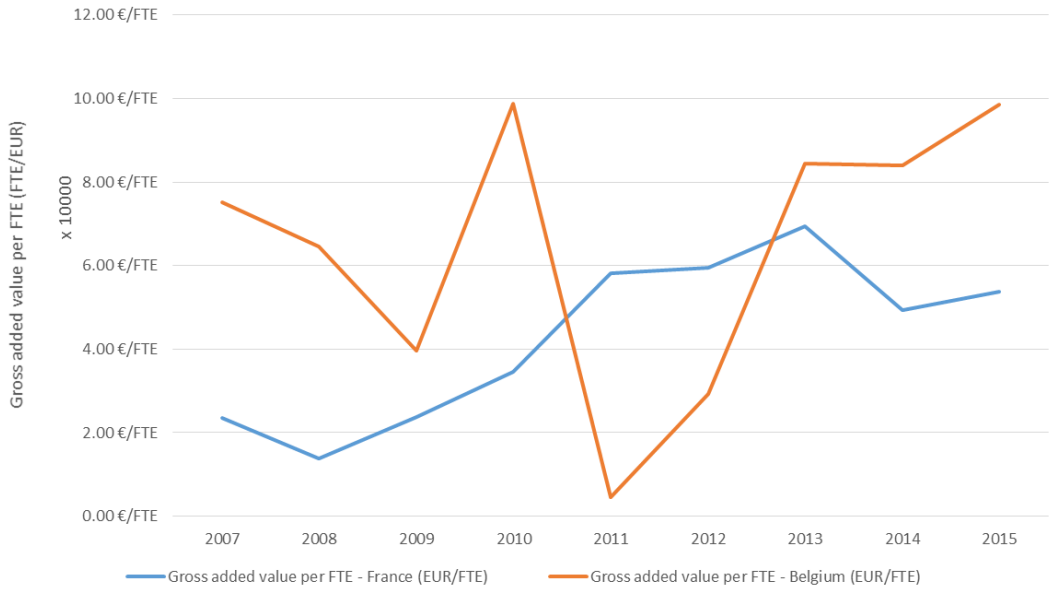
Graph 21: Gross Added Value - Belgium vs. France (mio EUR, 2007-2015)



Source: own composition based on Amadeus (2018)

Graph 22 shows the effects of such a high labor demanding situation on the relative indicator on gross added value per FT. Making abstraction from the transition period of the Belgian rail freight operator, it can be seen that the gross added value per FTE of the three smaller operators in France is significantly below the Belgian rail freight market, rising from 20,000 EUR per FTE in 2007 to 55,000 EUR per FTE in 2015. As indicated before, the indicator for the Belgian rail freight market rises from 75,000 EUR per FTE in 2007 to almost 100,000 EUR per FTE in 2015. It should be taken into account however that the three observed operators are not a good representation of the total rail freight market in France, dominated by SNCF.

Graph 22: Employment indiciator - Belgium vs. France (EUR/FTE, 2007-2015)

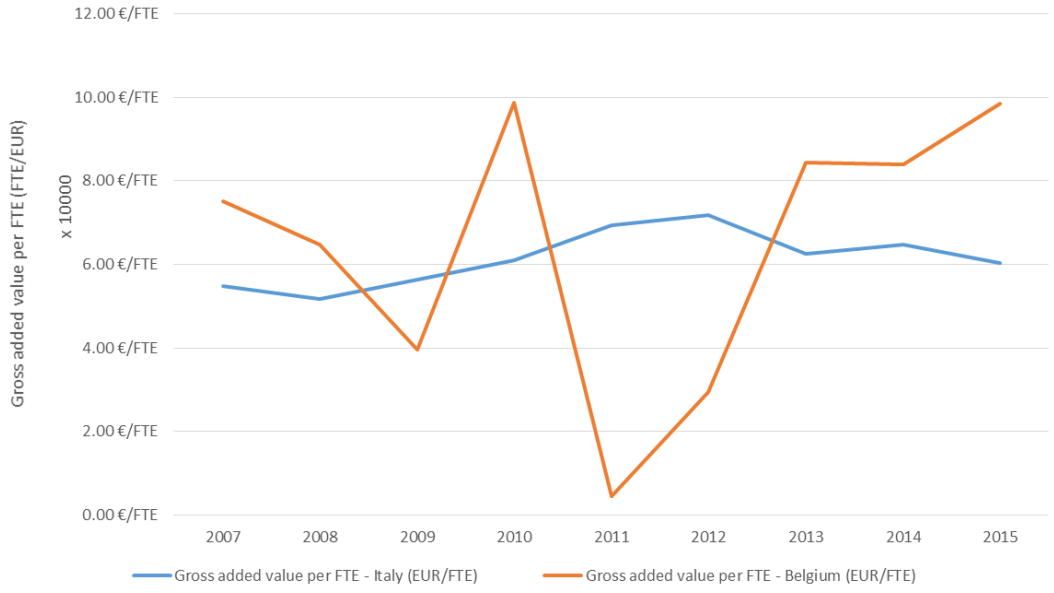


Source: own composition based on Amadeus (2018)

2.4.2.5. Italy

For Italy, only data of DB Cargo Italy has been found. As data of the main operator, Trenitalia Cargo, is not available for this research, there is no good representation of the Italian market. DB Cargo Italy generates a total revenue of only 43 million euros in 2015 with a total workforce of 295 FTE. Again it can be noticed that, compared to the company case analysis of Belgium, this is very labor-intensive. Graph 23 shows indeed that in general the added value per FTE is indeed lower compared to the Belgian rail freight market.

Graph 23: Employment indicator - Belgium vs. Italy (EUR/FTE, 2007-2015)



Source: own composition based on Amadeus (2018)

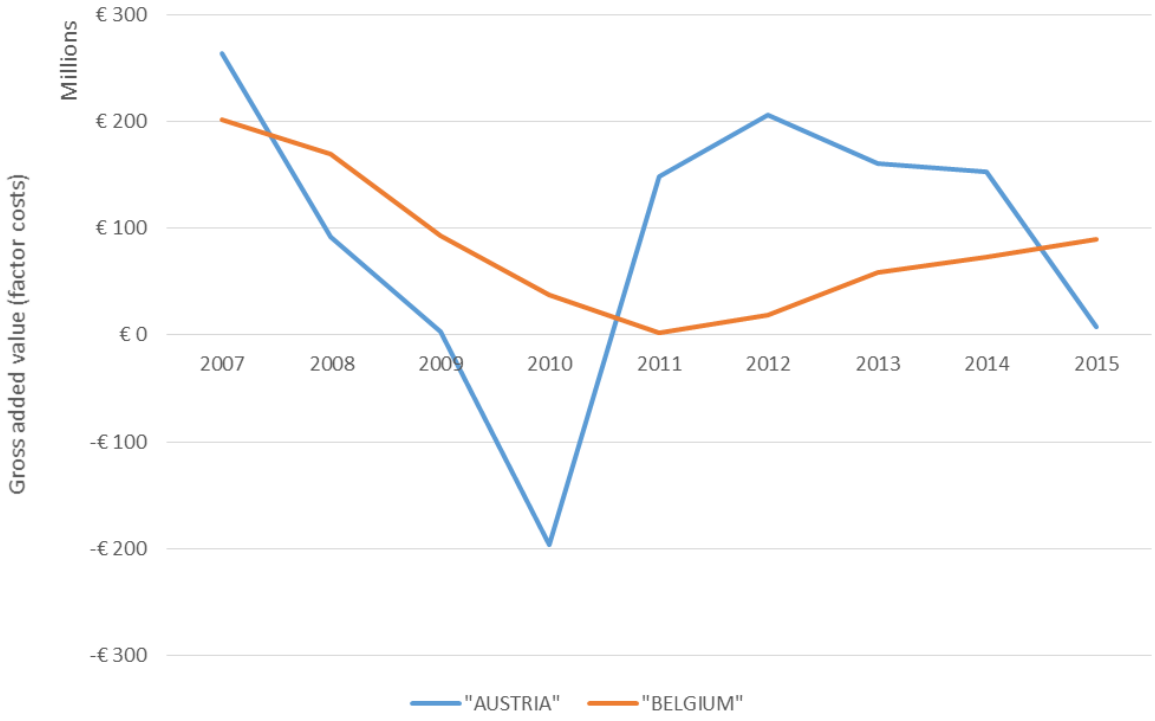
2.4.2.6. Austria

Another main player on the European market is based in Austria, Rail Cargo Austria. It was previously part of the ÖBB group but became independent in 2005 after liberalization. A second rail freight operator taken into account for the Austrian railway market is LTE, which was founded in 2009.

Total revenue of both operators starts at 1 billion euros in 2007 and remains at a constant level until 2015. Total employment, mainly provided by Rail Cargo Austria, lowers from a total of 2,450 FTE in 2007 to 1,955 FTE in 2015.

Due to the extent of economic activities taken into account for the Austrian railway market, it could be expected that added value figures would greatly surpass those of the Belgian market. Graph 24 shows however that the total gross added value created by the Austrian rail freight market has featured a significant downturn until 2010, surpassed again the Belgian one after rising significantly in 2011 to drop again in 2015.

Graph 24: Gross Added Value - Belgium vs. Austria (mio EUR, 2007-2015)



Source: own composition based on Amadeus (2018)

In order to compare the effects on the economy, the evolution of the economic indicator on added value per FTE is used.

value per FTE is used.

Graph 25 shows that the indicator of both countries is once again leapfrogging. Nevertheless, both are fluctuating around similar values, indicating they generate a comparable direct economic impact.

Graph 25: Employment indicator - Belgium vs. Austria (EUR/FTE, 2007-2015)

Source: own composition based on Amadeus (2018)

2.4.2.7. Other European countries

In this section, the remaining European countries for which data from Amadeus (2018) was observed will be discussed.

Although the freight activities of the incumbent rail operator in **The Netherlands** were acquired by Deutsche Bahn, data of three rail freight operators were observed: DB Cargo, ERS Railways and Voestalpine. They reached a total turnover of 311 million EUR in 2015. Unfortunately, no clean data on workforce has been made publicly available, due to which the added value and the economic indicator could not be calculated. Rough estimations however learn that the gross added value per FTE would vary between 70,000 and 100,000 EUR per FTE, which are again comparable levels to the company case analysis of Belgium.

*For **Spain**, two rail freight operators are taken into account, RENFE and Transportes Ferroviarios Especialos. They generate Especialos. They generate an average yearly revenue of 380 million EUR with a total workforce of 1,881 FTE in 2015.*

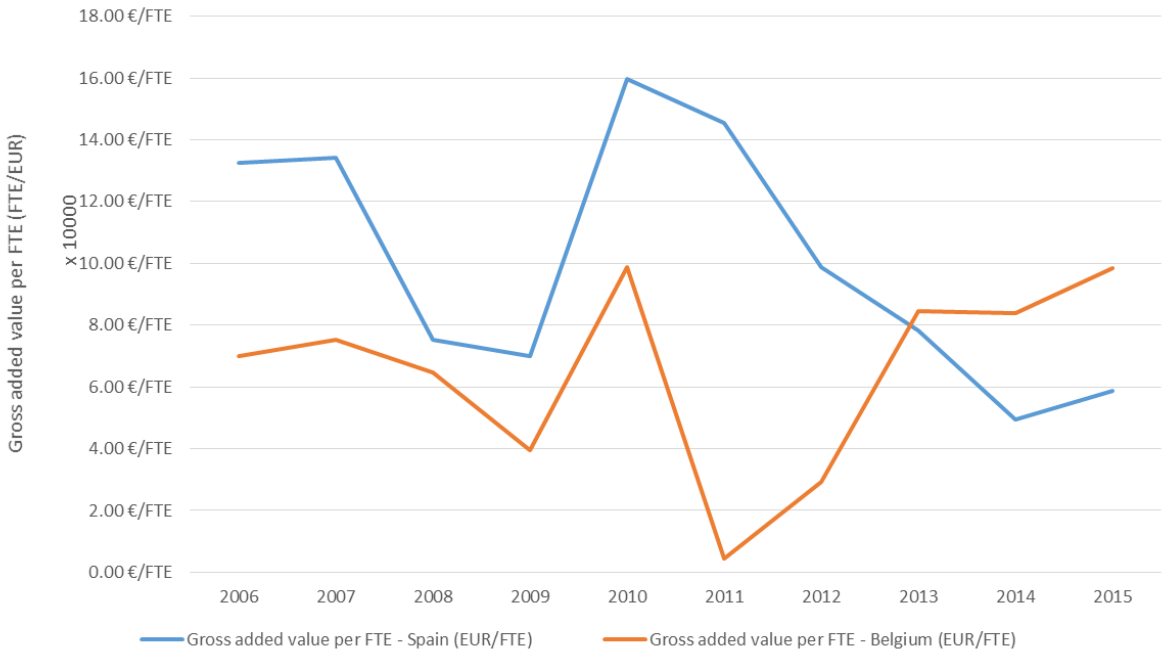
FTE in 2015.

Graph 26 shows that the gross added value per FTE has been decreasing for some years, dropping below the values of the Belgian rail freight market. Nevertheless, no exceptional higher or lower impact can be estimated from the Spanish rail freight market.

Four rail freight operators in the **Czech Republic** are taken into account: Advanced World Transport, CD Cargo, Metrans and Unipetrol, with a total turnover of 271 million EUR in 2015 and a total workforce of 2,200 FTE. The gross added value per FTE indicator in Graph 27 shows that the impact of

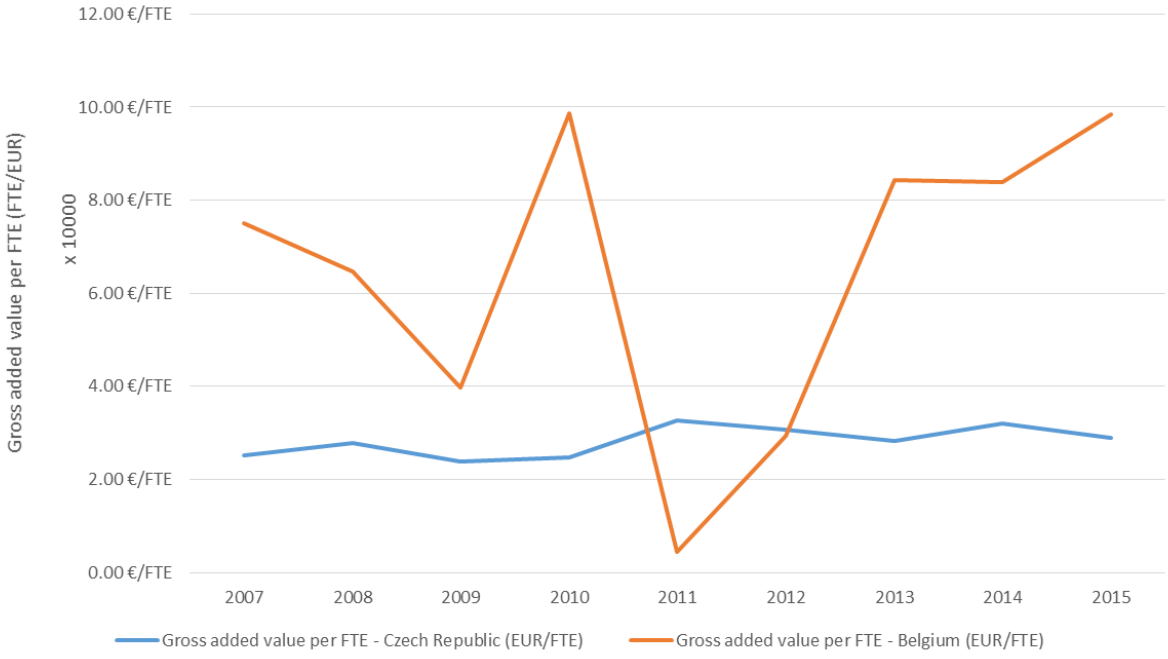
the observed Czech rail freight operators is significantly lower compared to the Belgian case, yet following a stable trend.

Graph 26: Employment indicator - Belgium vs. Spain (EUR/FTE, 2006-2015)



Source: own composition based on Amadeus (2018)

Graph 27: Employment indicator - Belgium vs. Czech Republic (EUR/FTE, 2007-2015)



Source: own composition based on Amadeus (2018)

Rail freight operations in **Hungary** are operated by two big European operators: DB Cargo and Rail Cargo. The two observed organizations have a total turnover of 2 billion EUR in 2014 and a total workforce of 7,146 FTE. The gross added value generation per FTE is fluctuating around 70,000 EUR per FTE.

Four rail freight operators from **Poland** are taken into account: DB cargo, Kolprem, Lotos and PKP. For another major polish player, CTL, no data was available. The four observed organizations have a total turnover of 310 million EUR in 2015 and a total workforce of 5,300 FTE. This labour intensity results again in a low gross added value per FTE, varying around 20,000 EUR per FTE.

Also in **Romania**, four rail freight operators are observed: Unicom, Grup Feroviarr Roman, CFR Marge and EP Rail. They obtain a considerable turnover of 463 million EUR in 2015 with a high total workforce 9,850 FTE. Therefore, gross added value per FTE is low, fluctuating around 10,000 EUR per FTE.

A similar story can be observed in Bulgaria, Slovakia, Estonia, Croatia, Portugal and Slovenia. Table 3 summarizes the figures for these countries.

Table 3: Economic indicators in Bulgaria, Slovakia, Estonia, Croatia, Portugal and Slovenia (2015)

	# operators observed	Revenu in 2015	Employment in 2015	Average Gross added value per FTE
Bulgaria	2	82 million EUR	3,599 FTE	6,000 EUR/FTE
Slovakia	2	385 million EUR	7,625 FTE	20,000 EUR/FTE
Estonia	1	62 million EUR	735 FTE	27,500 EUR/FTE
Croatia	1	81 million EUR	2,003 FTE	25,000 EUR/FTE
Portugal	2	70 million EUR	552 FTE	45,000 EUR/FTE
Slovenia	1	185 million EUR	1,269 FTE	40,000 EUR/FTE

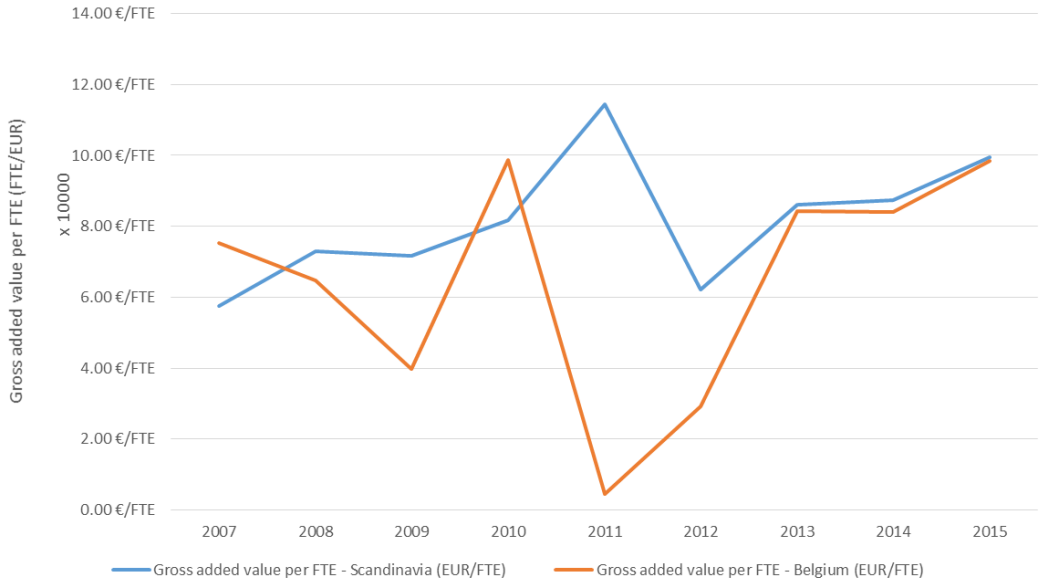
Source: own composition based on Amadeus (2018)

A different story can be observed in some Scandinavian countries. For **Norway**, one rail freight operator is taken into account, Cargonet, generating 114 million EUR of turnover in 2015 with 351 FTE. **Denmark** is represented by DB Cargo, generating 60 million EUR of revenue with 224 FTE. The largest Scandinavian country taken into account in terms of rail freight is **Sweden**, where three rail freight operators (Green Cargo, Hector rail and Scanfibre logistics) generated 1.3 million EUR of revenue in 2015 with a total workforce of 2,119 FTE. Comparing the combined added value per FTE for these Scandinavian countries with the Belgium case results in Graph 28 . It can be seen that similar results for the indicator can be observed.

As a conclusion to this section, it should be mentioned that the comparative analysis above is based on fragmented and partial data of rail freight operators in European countries. Therefore, it cannot be treated as a full benchmarking and comparison between countries should be done with caution. Nevertheless, some interesting conclusions are to be made out of the obtained data analysis, as the

economic indicator of rail freight transport is often similar for European countries where a significant part of the rail freight market could be captured in the exercise.

Graph 28: Employment indicator - Belgium vs. Scandinavia (EUR/FTE, 2007-2015)



Source: own composition based on Amadeus (2018)

3. INDIRECT IMPACT

After analysing the direct impact, this section will summarize the results found in deliverable 3.1 and 3.2 on the indirect impact analysis of rail freight transport in Belgium. Three extensions to this previous study will be discussed. First, the input-output analysis based on 2011 data of 'Lineas group' (entities taken into account were previously known as B Logistics, IFB and Xpedys) will be repeated for 2012 and 2015. Second, a sensitivity analysis will be performed using raw data for the observed years. And third, the results will be linked to the employment figures.

3.1. Synopsis of previous results

Troch, Vanelslander & Sys (2016, 2017a) developed a methodology to analyse the indirect effects of rail freight transport on the rest of the economy. As the creation of output requires some inputs from suppliers, who in their turn need inputs from other suppliers to create these, spill over effects are to be taken into account. To analyse these indirect effects, the input-output methodology was used. Data was collected directly from the incumbent rail freight operator, Lineas, representing the rail freight market in Belgium with a market share of 85%. Within deliverable 3.2, supplier and demand data have been substituted in the existing 2010 national input-output table of 64 sectors. This created an input-output table with 65 sectors, splitting sector 49 'land transport' into two new sub-categories: '49+52 rail freight transport' and '49' - other land transport'. The latter category contained all land transport for passengers and freight, such as road, pipes, busses, taxi, etc.

This analysis was performed with a set of assumptions and limitations. First, it was assumed that the rail freight market is not producing and selling any other products besides their core product towards the customers, and that inputs from suppliers correspond with their primary activity. Second, the financial activities of the rail freight market have not shifted significantly from 2010 to 2011, allowing to substitute 2011 data in the 2010 table. Third, final consumers and governmental parties are not buying rail freight transport and the sector is not receiving any subsidies. Fourth, the rail freight sector is not applying handling margins when selling their services. And finally, the incumbent operator is a good representation of the Belgian rail freight market.

The results of the analysis show that the rail freight market is a national oriented sector, with almost 70% of the required inputs bought from national suppliers. Translating the results from the input-output table into the Leontief multiplier, estimating the total increase for the national economy for each additional unit of output of final demand from the rail freight sector, it was shown that an approximated multiplier of 2.423 was achieved. This means that every EUR additional output (final demand) of rail freight transport, generates 2.423 EUR for the national economy. For the remaining land transport sector, the multiplier was found to be 1.642 EUR and for the IWW 1.570 EUR.

Given the list of assumptions and limitations, the interpretation of the results should be done carefully. In addition, as it was mentioned in the previous section, the incumbent rail freight operator was going through a transition period between 2010 and 2012. Added value and employment figures were very unstable and the organization was not profitable. As such, a high multiplier of indirect effects is not sustainable if the sector in itself needs to be supported to stay alive. Therefore, section 3.2 will apply the developed methodology to newly acquired data for 2012 and 2015. Section 3.3 will perform a sensitivity analysis, using raw data from the National Bank of Belgium (2018a) to simulate the use and demand tables for 2010, 2011, 2012 and 2015. As such, the evolution of the multiplier can be studied in the different analyses. Section 3.4 will link the analysis to the employment values.

3.2. Input-Output analysis for data 2012 and 2015

In this section, the input-output analysis with data of 2011 substituted in the original 2010 data will be repeated for obtained data of 2012 and 2015.

3.2.1. Data used

The analysis for 2012 and 2015 data is conducted in the same way as for the data of 2011. Data was directly required from the incumbent rail freight operator in Belgium. Customer data and supplier data from B Logistics, IFB and Xpedys was cleaned and treated as the 2011 data, and then substituted in the 2010 national use and demand tables in order to recalculate the input-output table with 65 sectors instead of 64 sectors. This allows comparing the evolution of the input-output values and the corresponding Leontief multiplier as the rail freight transport sector in Belgium evolved to a more sustainable and profitable sector in 2015, with a positive added value creation and a rising employment. The analysis is performed in Excel and Maple, and is available upon request.

3.2.2. Results

The evolution of the Leontief multipliers for 2012 and 2015 is shown in Table 4.

Table 4: Leontief multipliers 2011 - 2012 - 2015

National framework	Rail freight data (split)	49'	49 + 52 *(split)*	52'	50
2010	2011	**1.642**	**2.423**	**1.699**	**1.570**
	2012	**1.643**	**2.158**	**1.703**	**1.571**
	2015	**1.648**	**1.883**	**1.706**	**1.572**

Source: own composition based on Troch, Vanelslander & Sys (2017a), Lineas (2012) and Lineas (2015)

As it was already indicated in deliverable 3.3, the Leontief multiplier for rail freight (49 + 52) decreases over time due to the strategic changes within the incumbent operator to become more profitable. However, with an indirect economic impact of 1.883 EUR for each additional EUR of final demand output, the rail freight sector still surpasses the other hinterland options such as road and IWW. In terms of output, the metal industry (NACE 24) and the remaining land transport sector (NACE 49') remain the two most important sectors for the rail freight industry. Looking at the input, the same land transport sector (NACE 49'), the transport supporting activities (NACE 52') and the sector of legal and accounting activities (NACE 69/70) remain the most important suppliers of the rail freight sector.

3.3. Sensitivity analysis

This section will perform a sensitivity analysis for the years 2010 – 2011 – 2012 – 2014, based on raw data obtained from the National Bank of Belgium (2018a). By comparing the original method of substituting accounting data in previous year-models (e.g. Lineas data of 2012 into the processed national input-output table of 2010) with the usage of substituting accounting data in raw data but same-year models (e.g. Lineas data of 2012 into the raw national input-output table of 2012), the sensitivity of results and the previous assumption of trend stability can be observed.

3.3.1. Data used

Performing a similar analysis with 2012 and 2015 data in itself, as done in section 3.2, is not sufficient to show the validity of the approximation. Therefore, the use and demand table data, based on customer and supplier transactions, for 2010, 2011, 2012 and 2014 was collected from the NBB online statistics database (National Bank of Belgium, 2018a). The use of this data will be referred to as 'raw data' in the continuation of this deliverable, as no adaptations are made to obtain similar data compared to the national input-output table of 2010 published by the federal planning office (2016). As indicated in deliverable 3.2, every five years the federal planning office is manipulating the raw data to obtain a use table in basic prices, taking into account taxes, subsidies and handling margins. In addition, also import transactions are removed from this processed use table. As such, the usage of raw data results in an overestimation of the Leontief multiplier for all sectors. Nevertheless, the evolution of the parameters in this new context will be a hint of the sensitivity of the multipliers. It can help understand if the observed trends and the relative comparison between sectors still hold when different data is used, or how far the observed values in deliverable 3.2 and the previous section shift from reality.

3.3.2. Results

This section will summarize the results of the raw data analysis for the years 2010 – 2011 – 2012 – 2014. The raw data obtained from the National Bank of Belgium (2018a) is first used to recalculate the input-output table of the respective years. In a second step, the obtained accounting data from Lineas is substituted within these raw input-output tables, to split the rail freight sector from the land transport sector.

3.3.2.1. Raw data

In order to understand the effect of the usage of raw data, instead of the manipulated national data, the input-output table was recalculated for base year 2010 with the usage of the raw data from the National Bank of Belgium (2018a). Table 5 gives an overview of the Leontief multipliers for the observed transport sectors, as well as verification sector 24 (metal industry). No data for a split of the rail freight sector is used, as this is the base scenario. Therefore, the data is compared to the standard national input-output table results, as calculated and presented by the Federal Planning Office (2016). It can be concluded from the table that the usage of raw data indeed over-estimates the multiplier indicators, as import and handling margins are not excluded from the exercise. The land transport sector rises from 1.659 EUR per additional unit of final demand to 1.966 EUR.

The metal industry and the transport supporting activities show a similar increase. IWW rises a bit faster, from 1.630 to 2.100 EUR per additional unit of final demand, indicating that the inclusion of import and handling margins has a bigger impact on this sector.

Table 5: Leontief multipliers for 2010 - Original vs. Raw (EUR)

National framework	24	49	52	50
2010 original	**1.630**	**1.659**	**1.674**	**1.630**
2010 raw	**1.936**	**1.966**	**1.935**	**2.100**

Source: own composition based on Troch, Vanelslander & Sys (2017a) and National Bank of Belgium (2018a)

The same exercise can be done for the data of years 2011, 2012 and 2014. However, no original data is available for these is available for these years. As such, no comparison to the original data can be made as in Table 5. Instead, the evolution from the original 2010 data, towards the raw 2010 data and then the raw 2011-2012-2014 data, can give some interesting insight in how the raw data effects should be interpreted. It is indeed mentioned raw 2014 data and not raw 2015 data, although obtained company data is from 2015, as this is currently yet unavailable. The results are shown in

Table 6. The land transport sector (49) features an increase in 2011, has a similar impact in 2012 compared to 2010 and drops significantly by 2014. The same evolution path can be noticed for IWW. The sector of transport-supporting activities gradually rises to reach an impact multiplier of 2.006 in 2014. The comparison sector of minerals (24) remains stable until 2012, to drop as well by 2014. These evolutions will be important when analysing the Leontief multiplier paths in the next section, where data of the incumbent rail freight operator will be used to split the land transport sector again in two separate sectors: rail freight transport (49 + 52) and remaining land transport (49').

Table 6: Raw Leontief multipliers (EUR, 2010 – 2014)

National framework	24	49	52	50
2010 original	**1.630**	**1.659**	**1.674**	**1.630**
2010 raw	**1.936**	**1.966**	**1.935**	**2.100**
2011 raw	**1.938**	**2.007**	**1.947**	**2.281**
2012 raw	**1.940**	**1.964**	**1.943**	**2.182**
2014 raw	**1.893**	**1.867**	**2.006**	**2.000**

Source: own composition based on Troch, Vanelslander & Sys (2017a) and National Bank of Belgium (2018a)

3.3.2.2. 2011 sensitivity analysis

Using the data of the incumbent rail freight operator of 2011 to be substituted in the 2010 and 2011 raw data, allows obtaining the results shown in Table 7. The original Leontief multipliers (top rows of the table) can be compared with the Leontief multipliers when this data is used in a similar way as in deliverable 3.2 to create a new rail freight sector (49 + 52), Comparing the first row (original 2010 multipliers without split) with the fourth row (original 2010 multipliers with 2011 data split), it was already concluded that Leontief multipliers of sectors do not shift significantly and a multiplier of 2.423 EUR for each additional output of final rail freight demand is obtained.

Table 7: Leontief multipliers - original vs. raw (EUR, 2010 - 2011)

Rail data for split	Supply / Use data	24	49	49 + 52 *(split)*	52	50
-	**2010** (clean)	**1.630**	**1.659**		**1.674**	**1.630**
	2010 (raw)	**1.936**	**1.966**		**1.935**	**2.100**
	2011 (raw)	**1.938**	**2.007**		**1.947**	**2.281**
SPLIT B LOGISTICS **(2011)**	**2010** (clean)	**1.621**	**1.642**	**2.423**	**1.699**	**1.570**
	2010 (raw)	**1.937**	**1.946**	**2.742**	**1.938**	**2.101**
	2011 (raw)	**1.939**	**1.985**	**2.780**	**1.950**	**2.282**

Source: own composition based on Troch, Vanelslander & Sys (2017a) and National Bank of Belgium (2018a)

Going one step further, Table 5 shows the evolution for each observed sector when shifting from the original 2010 data to the raw 2010 data (first row to second row). Using the 2011 rail freight data, a similar exercise can be done for the split data (fourth row to fifth row in Table 7). As this usage of raw data implies an overestimation of the multiplier, it can be seen that also the multiplier of the rail freight sector increases from 2.423 to 2.742 EUR per additional output of final rail freight demand.

The most important exercise however is to evaluate the evolutions when the raw data of 2011 is used to substitute the 2011 data of the observed rail freight market in Belgium. When observing the raw 2011 data without split (third row), it can be seen that the land transport sector (49) increases significantly, indicating that the impact of the sector on the economy increased in 2011. The question remains however whether this increased impact could be contributed to the included rail freight activities, or to other land transport activities. This can be evaluated when taking into account the split

data in the last row of Table 7. For the rail freight sector (49 + 52), it can be noticed that the multiplier increases slightly from 2.742 to 2.780, indicating that indeed at least a part of the increased economic impact can be contributed to the activities of the rail freight sector and that the observed rail freight multiplier of 2.423 could be slightly higher when it would be compared with original 2011 data.

3.3.2.3. 2012 sensitivity analysis

Table 6 learned that Leontief multipliers of 2012 raw data fell back to similar results as in 2010, apart from IWW, increasing considerably. Table 8 gives an overview when this data is compared with a split based on the obtained customer and supplier data of 2012 from the incumbent rail freight operator, representing the Belgian rail freight market.

Table 8: Leontief multipliers - original vs. raw (EUR, 2010 - 2012)

Rail data for split	Supply / Use data	24	49	49 + 52 *(split)*	52	50
-	**2010** (clean)	**1.630**	**1.659**		**1.674**	**1.630**
	2010 (raw)	**1.936**	**1.966**		**1.935**	**2.100**
	2012 (raw)	**1.94**	**1.964**		**1.943**	**2.182**
SPLIT B LOGISTICS (2012)	**2010** (clean)	**1.62**	**1.643**	**2.158**	**1.703**	**1.571**
	2010 (raw)	**1.936**	**1.945**	**2.604**	**1.940**	**2.101**
	2012 (raw)	**1.941**	**1.945**	**2.545**	**1.947**	**2.183**

Source: own composition based on Troch, Vanelslander & Sys (2017a) and National Bank of Belgium (2018a)

When not taking into account the split of the rail freight sector, raw data show that the multipliers of minerals (24), land transport (49) and transport supporting activities (52) remain similar in 2012 compared to 2010. The sector of IWW features a significant increase in indirect economic impact. Evaluating the same evolutions when the split based on the obtained 2012 data is performed, the same trends can be observed. For the separated rail freight sector, a small decrease can be noticed. This could imply that the observed rail freight multiplier of 2.158, based on 2012 data substituted in 2010, could be slightly overestimated and would decrease when data was substituted in original 2012 data.

This confirms that the Leontief multiplier of rail freight indeed drops significantly by 2012, however still remains higher compared to the road sector and IWW.

3.3.2.4. 2015 sensitivity analysis

Repeating the exercise for 2015 data results in

Table 9, where the 2015 data is substituted in raw 2014 data as this is the most recent raw data available. Caution should be used when interpreting these results, as this assumes that the economy did not shift significantly between 2014 and 2015. However, it can be seen from the table that the multiplier of the rail freight sector remains more or less constant when substituting 2015 data in raw 2010 or raw 2014 data, going from 2.080 to 2.077. This could imply that the approximation of 1.883 when substituting the 2015 data into the original 2010 table holds some validity under the presented assumptions and limitations.

Table 9: Leontief multipliers - original vs. raw (EUR, 2010 - 2015)

Rail data for split	Supply / Use data	24	49	49 + 52 *(split)*	52	50
-	**2010** (clean)	**1.630**	**1.659**		**1.674**	**1.630**
	2010 (raw)	**1.936**	**1.966**		**1.935**	**2.100**
	2014 (raw)	**1.893**	**1.867**		**2.006**	**1.750**
SPLIT B LOGISTICS **(2015)**	**2010** (clean)	**1.619**	**1.648**	**1.883**	**1.706**	**1.572**
	2010 (raw)	**1.935**	**1.949**	**2.080**	**1.945**	**2.103**
	2014 (raw)	**1.893**	**1.853**	**2.077**	**2.018**	**1.755**

Source: own composition based on Troch, Vanelslander & Sys (2017a) and National Bank of Belgium (2018a)

It is clear that, although the rail freight sector became more profitable by 2015, it still holds a bigger indirect impact on the Belgian economy compared to road transport and IWW. The latter features a substantial drop when comparing raw 2014 data to 2010. This confirms the earlier-mentioned downward trend in direct economic impact, added value creation and employment in the previous section and indicates the difficulties that this sector is currently facing to obtain a sustainable growth.

3.4. Linking the employment

This final section will link the obtained results to the employment figures. In order to do so, a small addition to the previous methodology should be explained. This will be done in section 3.4.1, together with the data gathering. Section 3.4.2 will discuss the results.

3.4.1. Data used and methodology

Once the table with Leontief multipliers is calculated, different other multipliers can be calculated as well by performing some modifications. The Leontief multiplier is a final demand to output multiplier (f ➔ o), meaning that it indicates the additional generated output for each additional unit of final demand. As the analysis is built around financial data, each EUR of additional final demand results in a total increase in EUR (output) for the national economy. In a first step to add employment, the net multiplier (l_{ij}^{*}) needs to be obtained (Coppens, 2017). This net multiplier can be calculated when Leontief multipliers of each sector (l_{ij}) are divided by the diagonal element of the respective sector (l_{jj})in the Leontief matrix:

$$l_{ij}^{*} = \frac{l_{ij}}{l_{jj}} \quad (1)$$

By adding the net multipliers of a sector, an output to output multiplier (o ➔ o) is obtained, meaning that for each additional unit of output of a sector, the total output of the economy is calculated. Secondly, employment can be taken into account. In order to do this, an additional assumption needs to be made. This assumption states that employment *(e)* and output *(o)* are proportional within the observed economy (Coppens, 2017). As such, the required employment input per unit of output can be calculated by dividing the sector employment with the total output produced in this sector:

$$\frac{e_i}{o_i} \quad (2)$$

Equation (1) states that an increase of output in sector j by 1 results in an increased output of sector i by the net multiplier l_{ij}^{*}. Due to the assumption that employment and output are proportional, equation (2) can be used to calculate the effect on employment by multiplying both formulas:

$$l_{ij}^{*} * \frac{e_i}{o_i} \tag{3}$$

By adding the newly calculated multipliers of a sector, an output to employment multiplier (o ➔ e) is obtained, meaning that for each additional unit of output of a sector, the total effect on the employment is calculated. The employment multiplier can be taken one final step further. As the assumption states that employment and output are proportional, one additional unit of output in sector j requires an amount of employment equal to (2), but then applied to sector j. As such, for each sector link it can be calculated how the employment in a sector i would react to an additional employee in sector j (Coppens, 2017). Dividing the multipliers obtained from (3) by the employment requirements of sector j gives the following formula:

$$\frac{o_j}{e_j} * l_{ij}^{*} * \frac{e_i}{o_i} \tag{4}$$

By adding the newly calculated multipliers of a sector, an employment to employment multiplier (e ➔ e) is obtained, meaning that for each additional employee hired in a sector, the total effect on the employment is calculated.

For these calculations, additional data on employment is required. For this analysis, data is gathered from the NBB online statistics database (National Bank of Belgium, 2018b). Employment data for each NACE sector has been used for the respective years 2010, 2011, 2012 and 2014. To split the rail freight sector, complementary with the input-output analysis, employment data from the representing rail freight organization 'Lineas' is used. It should be taken into consideration that the case of seconded employees, as observed in section 2.2, has an impact on the results. As a result, a distinction between calculation with and without the appointed employees will be made.

3.4.2. Results

By applying equation (1) – (4) to the earlier found results of the input-output exercise, the tables in the next subsections can be calculated.

3.4.2.1. Output to Output multiplier (Net multiplier)

Table 10 gives an overview of the net multipliers, obtained by (1). Due to the assumption that there is no final demand by customers and government for rail freight transport, there is a limited impact on the observed values for this sector. For the remaining sectors, logically, the net multipliers is lower than the earlier observed values.

Table 10: Net multipliers (EUR, 2010 - 2015)

Rail data for split	Supply / Use data	24	49	49 + 52 *(split)*	52	50
ORIGINAL I/O (2010)	**2010** (clean)	**1.407**	**1.466**		**1.509**	**1.602**
	2010 (raw)	**1.491**	**1.742**		**1.652**	**1.894**
	2011 (raw)	**1.472**	**1.778**		**1.665**	**2.031**
	2012 (raw)	**1.483**	**1.756**		**1.659**	**1.966**
	2014 (raw)	**1.493**	**1.668**		**1.689**	**1.679**
SPLIT B LOGISTICS (2011)	**2010** (clean)	**1.42**	**1.504**	**2.416**	**1.534**	**1.544**
	2010 (raw)	**1.492**	**1.739**	**2.734**	**1.656**	**1.894**
	2011 (raw)	**1.473**	**1.775**	**2.773**	**1.669**	**2.032**
SPLIT B LOGISTICS (2012)	**2010** (clean)	**1.419**	**1.508**	**2.153**	**1.536**	**1.545**
	2010 (raw)	**1.491**	**1.743**	**2.598**	**1.656**	**1.895**
	2012 (raw)	**1.484**	**1.757**	**2.539**	**1.663**	**1.967**
SPLIT B LOGISTICS (2015)	**2010** (clean)	**1.419**	**1.504**	**1.880**	**1.544**	**1.546**
	2010 (raw)	**1.490**	**1.740**	**2.077**	**1.665**	**1.897**
	2014 (raw)	**1.492**	**1.666**	**2.074**	**1.702**	**1.681**

Source: own composition based on Troch, Vanelslander & Sys (2017a) and National Bank of Belgium (2018b)

3.4.2.2. Output to Employment multiplier

The net multiplier is only a first step towards the employment analysis. Therefore it is interesting to observe

Table 11, where the employment is taken into account by applying (3) to the net multipliers. Within this table, only the direct employees of the rail freight sector are taken into account. For each million unit of output of the rail freight sector, employment increases by 9.582 employees in 2011 (using the 2010 base data). This is similar to the employment impact of the remaining land transport sector. Employment impact by IWW is considerably lower with a rise of 3.594 FTE for each additional unit of output created by this sector. These findings correspond with the comparative analysis in section 2.3, where it was found that the sector of IWW creates very high added value with a relatively low amount of labour capital. Looking at the sensitivity, the 2011 employment figures are once again applied to the raw base data for 2010 and 2011.

ational Bank of Belgium (2018b)

Table 12 and

Table 13 give an overview of the results when the exercise is applied to the rail freight data of 2012 and 2015, with base data of 2010 and raw data of 2010 and respectively 2012 and 2014. It can be concluded that the employment effect of the rail freight sector is decreasing over time to respectively 8 and almost 7 FTE per additional million EUR of rail freight output. This is lower than the remaining land transport sector, although the sensitivity analysis shows that the observed value for 2010 clean data is an overestimation for this sector. In addition, it should be stated that the remaining land

transport sector also includes public transport such as taxi's, busses and metro, which impacts on the results.

Table 11: Output to Employment multipliers (FTE/mio EUR of output, 2011)

Rail data for split and employment	Supply / Use + employment data	24	49	49 + 52 *(split)*	52	50
ORIGINAL I/O (2010)	**2010** (clean)	**3.495**	**9.156**		**7.939**	**3.773**
	2010 (raw)	**2.824**	**9.352**		**7.168**	**4.890**
	2011 (raw)	**2.438**	**8.885**		**6.956**	**5.298**
SPLIT B LOGISTICS (2011)	**2010** (clean)	**3.611**	**9.686**	**9.582**	**7.980**	**3.594**
	2010 (raw)	**2.825**	**9.362**	**10.232**	**7.217**	**4.905**
	2011 (raw)	**2.438**	**8.892**	**9.886**	**7.004**	**5.319**

Source: own composition based on Troch, Vanelslander & Sys (2017a) and National Bank of Belgium (2018b)

Table 12: Output to Employment multipliers (FTE/mio EUR of output, 2012)

Rail data for split and employment	Supply / Use + employment data	24	49	49 + 52 *(split)*	52	50
ORIGINAL I/O (2010)	**2010** (clean)	**3.495**	**9.156**		**7.939**	**3.773**
	2010 (raw)	**2.824**	**9.352**		**7.168**	**4.890**
	2012 (raw)	**2.513**	**8.436**		**6.623**	**4.673**
SPLIT B LOGISTICS (2012)	**2010** (clean)	**3.609**	**9.724**	**8.003**	**7.999**	**3.598**
	2010 (raw)	**2.826**	**9.394**	**11.024**	**7.214**	**4.906**
	2012 (raw)	**2.513**	**8.464**	**9.114**	**6.658**	**4.682**

Source: own composition based on Troch, Vanelslander & Sys (2017a) and National Bank of Belgium (2018b)

Table 13: Output to Employment multipliers (FTE/mio EUR of output, 2015)

Rail data for split and employment	Supply / Use + employment data	24	49	49 + 52 *(split)*	52	50
ORIGINAL I/O (2010)	**2010** (clean)	**3.495**	**9.156**		**7.939**	**3.773**
	2010 (raw)	**2.824**	**9.352**		**7.168**	**4.890**
	2014 (raw)	**2.527**	**7.541**		**6.605**	**3.754**
SPLIT B LOGISTICS (2015)	**2010** (clean)	**3.606**	**9.673**	**6.963**	**8.034**	**3.602**
	2010 (raw)	**2.821**	**9.351**	**7.480**	**7.262**	**4.918**
	2014 (raw)	**2.52**	**7.532**	**6.831**	**6.699**	**3.799**

Source: own composition based on Troch, Vanelslander & Sys (2017a) and National Bank of Belgium (2018b)

A similar exercise for the output to employment multipliers can be made when taking the seconded employees into account. employees into account. These results are shown in n period between 2010 and 2012.,

Table 15 and Source: own composition based on Troch, Vanelslander & Sys (2017a) and National Bank of Belgium (2018b)

Table 16 for respectively 2011, 2012 and 2015.

Table 14: Output to Employment multipliers, including seconded employees (FTE/mio EUR of output, 2011)

Rail data for split and employment	Supply / Use + employment data	24	49	49 + 52 *(split)*	52	50
ORIGINAL I/O (2010)	**2010** (clean)	**3.495**	**9.156**		**7.939**	**3.773**
	2010 (raw)	**2.824**	**9.352**		**7.168**	**4.890**
	2011 (raw)	**2.438**	**8.885**		**6.956**	**5.298**
SPLIT B LOGISTICS (2011)	**2010** (clean)	**3.622**	**9.584**	**13.682**	**7.979**	**3.592**
	2010 (raw)	**2.831**	**9.277**	**14.342**	**7.215**	**4.903**
	2011 (raw)	**2.443**	**8.812**	**13.970**	**7.002**	**5.316**

Source: own composition based on Troch, Vanelslander & Sys (2017a) and National Bank of Belgium (2018b)

Table 15: Output to Employment multipliers, including seconded employees (FTE/mio EUR of output, 2012)

Rail data for split and employment	Supply / Use + employment data	24	49	49 + 52 *(split)*	52	50
ORIGINAL I/O (2010)	**2010** (clean)	**3.495**	**9.156**		**7.939**	**3.773**
	2010 (raw)	**2.824**	**9.352**		**7.168**	**4.890**
	2012 (raw)	**2.513**	**8.436**		**6.623**	**4.673**
SPLIT B LOGISTICS (2012)	**2010** (clean)	**3.61**	**9.713**	**8.582**	**7.995**	**3.597**
	2010 (raw)	**2.826**	**9.384**	**11.604**	**7.211**	**4.905**
	2012 (raw)	**2.514**	**8.455**	**9.694**	**6.655**	**4.681**

Source: own composition based on Troch, Vanelslander & Sys (2017a) and National Bank of Belgium (2018b)

Table 16: Output to Employment multipliers, including seconded employees (FTE/mio EUR of output, 2015)

Rail data for split and employment	Supply / Use + employment data	24	49	49 + 52 *(split)*	52	50
ORIGINAL I/O (2010)	**2010** (clean)	**3.495**	**9.156**		**7.939**	**3.773**
	2010 (raw)	**2.824**	**9.352**		**7.168**	**4.890**
	2014 (raw)	**2.527**	**7.541**		**6.605**	**3.754**
SPLIT B LOGISTICS (2015)	**2010** (clean)	**3.607**	**9.655**	**7.641**	**8.035**	**3.602**
	2010 (raw)	**2.822**	**9.335**	**8.160**	**7.263**	**4.918**
	2014 (raw)	**2.521**	**7.520**	**7.512**	**6.700**	**3.799**

Source: own composition based on Troch, Vanelslander & Sys (2017a) and National Bank of Belgium (2018b)

It can be noticed that the obtained employment multipliers for rail freight are much higher compared to the previous tables. This is due to the increased employment taken into account for the sector, related to the same output production. As such, an increased need for employment input per

production unit is obtained. This also results in a decrease of the multiplier for sector 49, as the allocated employment is no longer taken into account within this sector. Nevertheless, the increase for the rail freight sector is much higher compared to the decrease in the remaining land transport sector. This is due to the difference in scale of both observed sectors, and indicates the importance of correct data for the rail freight sector when interpreting this analysis.

Looking at the trend over the three observed years, it can be once again concluded that the employment multiplier is decreasing from 13.682 FTE per million EUR of additional rail freight output, to 7.641 FTE per million EUR of additional rail freight output. The latter is already closely relating to the observed 6.963 FTE per million EUR of additional rail freight output in 2015 when only direct employees are taken into account. This leads to a similar conclusion from the micro-level analysis that the rail freight sector is stabilizing after a turbulent transition period between 2010 and 2012.

3.4.2.3. Employment to Employment multiplier

Taking it one final step further, the employment to employment multiplier can be calculated by adopting (4) to the obtained results. This results in Table 17 for the direct employment.

It can be concluded that for each additional employee hired by the rail freight sector, more than 5 FTE are hired within the national economy according to the 2015 data. Sensitivity analysis shows that this figure is relatively stable to any shifts in data. This is much higher compared to the remaining land transport sector, where each additional employee results in 1.384 FTE for the national economy. This endorses the earlier statement that the remaining land transport sector generates only limited national economic impact, whereas rail freight transport has a very high effect on its national economy. Also IWW have a considerable impact, generating up to 4 FTE for each additional hired employee in 2015.

Table 17: Employment to Employment multipliers (FTE, 2015)

Rail data for split and employment	Supply / Use + employment data	24	49	49 + 52 *(split)*	52	50
ORIGINAL I/O (2010)	**2010** (clean)	**2.264**	**1.357**		**1.814**	**4.113**
	2010 (raw)	**3.111**	**1.606**		**2.203**	**7.568**
	2014 (raw)	**3.095**	**1.605**		**2.261**	**3.957**
SPLIT B LOGISTICS (2015)	**2010** (clean)	**2.378**	**1.384**	**5.468**	**1.888**	**4.022**
	2010 (raw)	**3.108**	**1.600**	**5.876**	**2.208**	**7.612**
	2014 (raw)	**3.087**	**1.599**	**5.364**	**2.269**	**4.004**

Source: own composition based on Troch, Vanelslander & Sys (2017a) and National Bank of Belgium (2018b)

When the case of seconded employees is taken into account, this results in
Table 18. The multiplier for the rail freight sector drops to 3.9 FTE hired in the national economy, for each additional hired employee in this sector. This is a comparable result to IWW, and still considerably

higher compared with the remaining land transport sector. Caution should however be used when interpreting these results, as the sensitivity analysis shows that results for the remaining land transport sector are stable when applying raw data (from 2010 to 2014), whereas the results for the rail freight sector are decreasing when using these data, indicating that the multiplier of 3.902 might be an overestimation of reality. The same is valid for the sector of IWW.

Table 18: Employment to Employment multipliers, including seconded employees (FTE, 2015)

Rail data for split and employment	Supply / Use + employment data	24	49	49 + 52 *(split)*	52	50
ORIGINAL I/O (2010)	**2010** (clean)	**2.264**	**1.357**		**1.814**	**4.113**
	2010 (raw)	**3.111**	**1.606**		**2.203**	**7.568**
	2014 (raw)	**3.095**	**1.605**		**2.261**	**3.957**
SPLIT B LOGISTICS (2015)	**2010** (clean)	**2.379**	**1.385**	**3.902**	**1.889**	**4.022**
	2010 (raw)	**3.109**	**1.602**	**4.167**	**2.209**	**7.612**
	2014 (raw)	**3.088**	**1.601**	**3.835**	**2.270**	**4.004**

Source: own composition based on Troch, Vanelslander & Sys (2017a) and National Bank of Belgium (2018b)

4. SCENARIO APPLICATION, CONCLUSION AND RECOMMENDATIONS

In this deliverable, the two established models for measuring direct and indirect economic impact have been expanded with new data. The micro-level analysis for direct impact, based on a company case analysis of Lineas, included a view on the case of seconded employees and a comparative analysis with other land transport sectors and rail freight transport in some European countries. The main focus of these analyses is still on two main economic indicators, being the generated gross added value and the employment figures. The input-output analysis for indirect impact is extended with data for the rail freight sector in 2012 and 2015. In addition, a sensitivity analysis is performed based on raw base data for 2011, 2012 and 2014, which is closer to the received data from the rail freight sector for the respective years 2011, 2012 and 2015. Finally, employment is linked to the observed Leontief multiplier, indicating the economic impact in terms of job creation for each additional output or hired FTE.

From the direct economic impact analysis, it can be concluded that the road freight sector is a labour-intensive sector, where added value is mainly created from this employment. The sector is also showing an upward trend. An opposite story is perceived for the sector of IWW. Added value in this sector is mainly generated by profit and not by labour capital as employment is rather limited. This sector is also struggling with a downward trend after some very strong years. The rail freight sector can be considered a mix of both road and IWW, generating added value mainly by paying wages to employees, but with an increasing share of profit figures contributing to the added value as well.

Compared to the road sector, the economic indicators confirm that the relatively high amount of employment generates higher amounts of revenue that are slowly being turned into profit. The increased competition, the transformation from the incumbent rail freight operator into a fully

privately owned organization with new rail freight strategies and the efforts taken to stimulate the modal shift are showing the first signs of paying off and are slowly turning rail freight transport into a profitable business with a positive added value creation.

The indirect economic impact analysis for 2012 and 2015 demonstrate that this upward trend has a negative effect on the indirect economic effects. As profitability is partly reached due to cost cutting, it is not surprising that the spill over effects to other sectors are decreasing. Nevertheless, the multiplier remains at a respectable level of 1.883. This means that each additional EUR of final rail freight demand results in a total increase of the Belgian economy by 1.883 EUR. Taking into account the sensitivity analysis, it is argued that the observed values are rather insensitive to a change in the basic data. Substituting the obtained rail freight data in the raw data of the corresponding years results in a shift of 1.4%, -2.2% and -0.1% in the respective years 2011, 2012 and 2015 and compared to the raw data of 2010. As such, it can be argued that the observed values obtained from substituting the received rail freight data in the 2010 base data, under the assumptions made in the original analysis, are a good approximation of the actual values. When employment is linked to the exercise, it is concluded that the rail freight sector has a relatively high impact on job creation, although these multipliers are decreasing over the years. Nevertheless, for each additional million EUR of rail freight produced, 7 supplementary FTE are required by the Belgian economy in 2015. In addition, each hired FTE in the rail freight sector results in more than 5 FTE for the national economy in 2015. This is much higher compared to the not so labor-intensive market of IWW, but lower compared to the general sector of remaining land transport. When taking into account the case of seconded employees, workforce on the payroll of a different company but fully allocated to the rail freight sector, the level of employees hired per additional unit of output created increases to 8.582 whereas the multiplier of employees hired for each additional FTE within the rail freight sector decreases to 3.902.

The first analysis of direct impact has been compared with the worst-case scenario from deliverable 1.3. Similarly, the previous analysis of indirect impact was compared with the best-case scenario. The extension analyses from this deliverable will be compared within the medium case scenario, where the modal shift is partially reached by 2030 resulting in an increase of total volume by 64%. When the assumption is made that all ratios remain constant, this scenario will result in a partial realization of the economic benefits indicated, both direct and indirect, within this deliverable. On the other hand, within this scenario, road transport also remains a dominant mode of transport by 2030. Results have shown that this is not necessarily a bad situation, as road transport also has some strong points in terms of job creation and added value generation. Although indirect effects are lower, road transport, in itself or as a part of the intermodal chain, clearly has a positive direct impact on the Belgian economy. Therefore, it is important that rail freight transport and road transport continue to work together and find optimal structures to maximize the benefits and strengths that characterize each sector separately.

Other recommendations following from this research are linked to further research and data collection and management. As it has been mentioned several times, data is scarce and often lacks uniformity, making it difficult to draw strict conclusions from the observed data and results. Cooperation between

rail freight organizations, and even road companies, and enforcement by the government to keep track and publish certain sets of data, is sure to help future evolutions of these land transport markets. As such, the explained methodologies can be used on more consistent and more complete datasets, which will certainly help to build a strong case for future developments. As rail freight is often executed cross-border, this should be implemented on European level as well. Moreover, future evolutions should be monitored with taking competition into account as well. As profitability in the rail freight sector is strongly linked to the capacity of bundling flows, it is important to be able to state findings and conclusions based on a full view of the rail freight market, competitors included.

As for future research it is recommended to monitor the evolution of the economic indicators. For the indirect analysis, 2018 is also a very interesting year as the Federal Planning Office will publish the use, supply and input output tables for 2015. This will help to understand the current direction of indirect impact of the rail freight sector when including the already obtained rail freight data.

REFERENCES

Amadeus, 2018. A database of comparable financial information for public and private companies across Europe , database, url: https://amadeus.bvdinfo.com/version-2018620/home.serv?product=AmadeusNeo

AML, 2007. Annual account in EURO for period 01/01/2005 – 31/12/2006, document 07455.00206, general assembly AML, 20/06/2007, Antwerpen

AML, 2009. Annual account in EURO for period 01/01/2007 – 31/12/2008, document 09467.00140, general assembly AML, 29/05/2009, Antwerpen

AML, 2011. *Annual account in EURO for period 01/01/2009 – 31/12/2010*, document 11365.00273, general assembly AML, 31/05/2011, Antwerpen

AML, 2013. *Annual account in EURO for period 01/01/2011 – 31/12/2012*, document 13411.00571, general assembly AML, 28/06/2013, Antwerpen

AML, 2015. *Annual account in EURO for period 01/01/2013 – 31/12/2014*, document 15397.00538, general assembly AML, 24/06/2015, Antwerpen

AML, 2016. *Annual account in EURO for period 01/01/2015 – 31/12/2015*, document 16216.00561, general assembly AML, 16/06/2016, Antwerpen

B Logistics, 2016. *Annual account in EURO for period 01/01/2015 – 31/12/2015*, document 16147.00354, general assembly B Logistics, 29/04/2016, Brussels.

B Logistics, 2015. *Annual account in EURO for period 01/01/2014 – 31/12/2014*, document 15149.00008, general assembly NMBS Logistics, 28/04/2015, Brussels.

B Logistics, 2014. *Annual account in EURO for period 01/01/2013 – 31/12/2013*, document 14322.00526, general assembly NMBS Logistics, 30/04/2014, Brussels.

B Logistics, 2013. *Annual account in EURO for period 01/01/2012 – 31/12/2012*, document 13131.00200, general assembly NMBS Logistics, 17/04/2013, Brussels.

B Logistics, 2012. *Annual account in EURO for period 01/01/2011 – 31/12/2011*, document 12195.00555, general assembly NMBS Logistics, 09/05/2012, Brussels.

B Logistics, 2011. *Annual account in EURO for period 01/01/2010 – 31/12/2010*, document 11582.00405, general assembly NMBS Logistics, 20/04/2011, Brussels.

BCTN MEERHOUT, 2008. *Annual account in EURO for period 01/07/2005 – 30/06/2007*, document 08028.00274, general assembly BCTN MEERHOUT, 31/12/2007, Meerhout

BCTN MEERHOUT, 2010. *Annual account in EURO for period 01/07/2007 – 30/06/2009*, document 10019.00180, general assembly BCTN MEERHOUT, 08/12/2009, Meerhout

BCTN MEERHOUT, 2012. *Annual account in EURO for period 01/07/2009 – 31/12/2011*, document 12220.00001, general assembly BCTN MEERHOUT, 09/05/2012, Meerhout

BCTN MEERHOUT, 2014. *Annual account in EURO for period 01/01/2012 – 31/12/2013*, document 14670.00234, general assembly BCTN MEERHOUT, 30/06/2014, Meerhout

BCTN MEERHOUT, 2016. *Annual account in EURO for period 01/01/2014 – 31/12/2015*, document 16200.00318, general assembly BCTN MEERHOUT, 20/06/2016, Meerhout

Beelen, M., 2011. *Structuring and modelling decision making in the inland navigation sector.* Doctoral thesis, 314p., University of Antwerp: Faculty of Applied Economics, Department of Transport and Regional Economics, Antwerp.

Bloemen, P., 2017. *Toegevoegde waarde*, Economie Lokaal, url: https://www.economielokaal.nl/toegevoegde-waarden/

COBELFRET, 2008. *Annual account in EURO for period 01/09/2005 – 31/12/2007*, document 08243.00250, general assembly COBELFRET, 10/06/2008, Wilrijk

COBELFRET, 2009. *Annual account in EURO for period 01/01/2008 – 31/08/2009*, document 09881.00300, general assembly COBELFRET, 13/11/2009, Wilrijk

COBELFRET, 2011. *Annual account in EURO for period 01/09/2009 – 31/08/2011*, document 11615.00490, general assembly COBELFRET, 14/11/2011, Wilrijk

COBELFRET, 2013. *Annual account in EURO for period 01/09/2011 – 31/08/2013*, document 13661.00216, general assembly COBELFRET, 08/11/2013, Wilrijk

COBELFRET, 2016. *Annual account in EURO for period 01/09/2013 – 31/08/2015*, document 16071.00578, general assembly COBELFRET, 22/02/2016, Wilrijk

Coppens, F., 2017. *Presentation on Input-Output Analysis : Derived results.* Presentation at the University of Antwerp, C-202, 10 November 2017, Antwerp.

De Grave Antverpia, 2008. *Annual account in EURO for period 01/01/2006 – 30/06/2008*, document 08801.00072, general assembly De Grave Antverpia, 14/10/2008, Antwerpen

De Grave Antverpia, 2010. *Annual account in EURO for period 01/07/2008 – 30/06/2010*, document 10605.00157, general assembly De Grave Antverpia, 12/10/2010, Antwerpen

De Grave Antverpia, 2012. *Annual account in EURO for period 01/07/2010 – 30/06/2012*, document 12627.00206, general assembly De Grave Antverpia, 09/10/2012, Antwerpen

De Grave Antverpia, 2014. *Annual account in EURO for period 01/07/2012 – 30/06/2014*, document 14671.00020, general assembly De Grave Antverpia, 14/10/2014, Antwerpen

De Grave Antverpia, 2016. *Annual account in EURO for period 01/07/2014 – 30/06/2016*, document 16679.00294, general assembly De Grave Antverpia, 11/10/2016, Antwerpen

DHL GF, 2008. *Annual account in EURO for period 01/01/2006 – 31/12/2007*, document 08477.00192, general assembly DHL GF, 29/05/2008, Brucargo

DHL GF, 2010. *Annual account in EURO for period 01/01/2008 – 31/12/2009*, document 10159.00288, general assembly DHL GF, 27/05/2010, Brucargo

DHL GF, 2012. *Annual account in EURO for period 01/01/2010 – 31/12/2011,* document 12155.00288, general assembly DHL GF, 31/05/2012, Brucargo

DHL GF, 2014. *Annual account in EURO for period 01/01/2012 – 31/12/2013*, document 14204.00194, general assembly DHL GF, 30/05/2014, Brucargo

DHL GF, 2016. *Annual account in EURO for period 01/01/2014 – 31/12/2015*, document 16230.00405, general assembly DHL GF, 26/05/2016, Brucargo

DHL Road Freight, 2007. *Annual account in EURO for period 01/01/2006 – 31/12/2006*, document 07358.00049, general assembly DHL Road Freight, 02/05/2007, Grimbergen

DHL Road Freight, 2008. *Annual account in EURO for period 01/01/2007 – 31/12/2007*, document 08323.00274, general assembly DHL Road Freight, 06/05/2008, Grimbergen

DHL Road Freight, 2009. *Annual account in EURO for period 01/01/2008 – 31/12/2008*, document 09154.00258, general assembly DHL Road Freight, 05/05/2009, Grimbergen

DHL Road Freight, 2010. *Annual account in EURO for period 01/01/2009 – 31/12/2009*, document 10152.00505, general assembly DHL Road Freight, 04/05/2010, Grimbergen

DHL Road Freight, 2011. *Annual account in EURO for period 01/01/2010 – 31/12/2010*, document 11148.00106, general assembly DHL Road Freight, 03/05/2011, Grimbergen

DHL Road Freight, 2012. *Annual account in EURO for period 01/01/2011 – 31/12/2011*, document 12227.00084, general assembly DHL Road Freight, 02/05/2012, Grimbergen

DHL Road Freight, 2013. *Annual account in EURO for period 01/01/2012 – 31/12/2012*, document 13208.00270, general assembly DHL Road Freight, 07/05/2013, Grimbergen

DHL Road Freight, 2014. *Annual account in EURO for period 01/01/2013 – 31/12/2013*, document 14250.00079, general assembly DHL Road Freight, 06/05/2014, Grimbergen

DHL Road Freight, 2015. *Annual account in EURO for period 01/01/2014 – 31/12/2014*, document 15182.00251, general assembly DHL Road Freight, 05/05/2015, Grimbergen

DHL Road Freight, 2016. *Annual account in EURO for period 01/01/2015 – 31/12/2016*, document 16170.00208, general assembly DHL Road Freight, 03/05/2016, Grimbergen

DHL Road Freight, 2017. *Annual account in EURO for period 01/01/2016 – 31/12/2017*, document 17127.00381, general assembly DHL Road Freight, 02/05/2017, Grimbergen

Federal Planning Office, 2016. Input-output tables: multipliers 210 – ESA 2010. URL: https://www.plan.be/databases/data-57-en-input+output+tables+multipliers+2010+esa+2010, updated 23/05/2016, Brussels.

H. Essers NV, 2007. *Annual account in EURO for period 01/01/2006 – 31/12/2006*, document 07447.00302, general assembly H. Essers NV, 07/07/2007, Eksel

H. Essers NV, 2008. *Annual account in EURO for period 01/01/2007 – 31/12/2007*, document 08544.00202, general assembly H. Essers NV, 12/07/2008, Eksel

H. Essers NV, 2009. *Annual account in EURO for period 01/01/2008 – 31/12/2008*, document 09408.00348, general assembly H. Essers NV, 18/06/2009, Eksel

H. Essers NV, 2010. *Annual account in EURO for period 01/01/2009 – 31/12/2009*, document 10354.00285, general assembly H. Essers NV, 30/06/2010, Eksel

H. Essers NV, 2011. *Annual account in EURO for period 01/01/2010 – 31/12/2010*, document 11330.00144, general assembly H. Essers NV, 30/06/2011, Eksel

H. Essers NV, 2012. *Annual account in EURO for period 01/01/2011 – 31/12/2011*, document 12302.00043, general assembly H. Essers NV, 21/06/2012, Eksel

H. Essers NV, 2013. *Annual account in EURO for period 01/01/2012 – 31/12/2012*, document 13304.00323, general assembly H. Essers NV, 20/06/2013, Eksel

H. Essers NV, 2014. *Annual account in EURO for period 01/01/2013 – 31/12/2013*, document 14225.00471, general assembly H. Essers NV, 19/06/2014, Eksel

H. Essers NV, 2015. *Annual account in EURO for period 01/01/2014 – 31/12/2014*, document 15253.00403, general assembly H. Essers NV, 18/06/2015, Eksel

H. Essers NV, 2016. *Annual account in EURO for period 01/01/2015 – 31/12/2016*, document 17208.00290, general assembly H. Essers NV, 15/06/2016, Eksel

Inter Ferry Boats, 2016. *Annual account in EURO for period 01/01/2015 – 31/12/2015*, document 16126.00118, general assembly Inter Ferry Boats NV, 26/04/2016, Brussels.

Inter Ferry Boats, 2015. *Annual account in EURO for period 01/01/2014 – 31/12/2014*, document 15124.00085, general assembly Inter Ferry Boats NV, 28/04/2015, Brussels.

Inter Ferry Boats, 2014. *Annual account in EURO for period 01/01/2013 – 31/12/2013*, document 14123.00159, general assembly Inter Ferry Boats NV, 29/04/2014, Brussels.

Inter Ferry Boats, 2013. *Annual account in EURO for period 01/01/2012 – 31/12/2012*, document 13120.00492, general assembly Inter Ferry Boats NV, 30/04/2013, Brussels.

Inter Ferry Boats, 2012. *Annual account in EURO for period 01/01/2011 – 31/12/2011*, document 12118.00389, general assembly Inter Ferry Boats NV, 24/04/2012, Brussels.

Inter Ferry Boats, 2011. *Annual account in EURO for period 01/01/2010 – 31/12/2010*, document 11131.00078, general assembly Inter Ferry Boats NV, 27/04/2011, Brussels.

JOST, 2007. *Annual account in EURO for period 01/01/2006 – 31/12/2006*, document 07577.00138, general assembly JOST, 22/06/2007, Waimes

JOST, 2008. *Annual account in EURO for period 01/01/2007 – 31/12/2007*, document 08504.00185, general assembly JOST, 27/06/2008, Waimes

JOST, 2009. *Annual account in EURO for period 01/01/2008 – 31/12/2008*, document 09854.00033, general assembly JOST, 31/10/2009, Waimes

JOST, 2010. *Annual account in EURO for period 01/01/2009 – 31/12/2009*, document 10297.00516, general assembly JOST, 28/06/2010, Waimes

JOST, 2011. *Annual account in EURO for period 01/01/2010 – 31/12/2010*, document 11444.00403, general assembly JOST, 09/07/2011, Waimes

JOST, 2012. *Annual account in EURO for period 01/01/2011 – 31/12/2011*, document 12299.00453, general assembly JOST, 22/06/2012, Waimes

JOST, 2013. *Annual account in EURO for period 01/01/2012 – 31/12/2012*, document 13365.00517, general assembly JOST, 28/06/2013, Waimes

JOST, 2014. *Annual account in EURO for period 01/01/2013 – 31/12/2013*, document 14331.00215, general assembly JOST, 27/06/2014, Waimes

JOST, 2015. *Annual account in EURO for period 01/01/2014 – 31/12/2014*, document 15322.00062, general assembly JOST, 29/06/2015, Waimes

JOST, 2016. *Annual account in EURO for period 01/01/2015 – 31/12/2016*, document 16322.00541, general assembly JOST, 27/06/2016, Waimes

JOST, 2017. *Annual account in EURO for period 01/01/2016 – 31/12/2017*, document 17365.00202, general assembly JOST, 30/06/2017, Waimes

K+N, 2008. Annual account in EURO for period 12/09/2005 – 30/12/2007, document 08528.00110 + 08676.00352, general assembly K+N, 30/07/2008, Geel

K+N, 2011. *Annual account in EURO for period 31/12/2008 – 31/12/2010*, document 11110.00344 + 11084.00246, general assembly K+N, 21/04/2011, Geel

K+N, 2013. *Annual account in EURO for period 31/12/2010 – 31/12/2012*, document 13122.00059 + 13111.00315, general assembly K+N, 25/04/2013, Geel

K+N, 2015. *Annual account in EURO for period 01/01/2013 – 31/12/2014*, document 15116.005076 + 15095.00448, general assembly K+N, 30/04/2015, Geel

K+N, 2017. *Annual account in EURO for period 01/01/2015 – 31/12/2016*, document 17116.00283 + 16108.00493, general assembly K+N, 27/04/2017, Geel

Lineas, 2012. *Customer and Supplier data of accounting year 2012 (confidential).* Data set directly obtained from Lineas, 2017.

Lineas, 2015. *Customer and Supplier data of accounting year 2015 (confidential).* Data set directly obtained from Lineas, 2017.

NBB, 2007. *Nationale rekeningen – Deel 2: Gedetailleerde rekeningen en tabellen 1997 – 2006*, instituut voor de nationale rekeningen, Brussel, ISSN 1780-4353.

National Bank of Belgium, 2018a. *Online Statistics database: National accounts < Supply and use tables < A64 x P64 < years 2010 – 2011 – 2012 - 2014.* url: stat.nbb.be, last consulted: 05/04/2018.

National Bank of Belgium, 2018b. *Online Statistics database: Population and labour market < Employment – annual detailed data < Domestic concept – A64.* url: stat.nbb.be, last consulted: 05/04/2018.

Plouvier Transport, 2008. *Annual account in EURO for period 01/01/2006 – 31/12/2007*, document 08323.00329, general assembly Plouvier Transport, 13/05/2008, Antwerpen

Plouvier Transport, 2010. *Annual account in EURO for period 01/01/2008 – 31/12/2009*, document 10236.00487, general assembly Plouvier Transport, 11/05/2010, Antwerpen

Plouvier Transport, 2012. *Annual account in EURO for period 01/01/2010 – 31/12/2011*, document 12333.00157, general assembly Plouvier Transport, 05/06/2012, Antwerpen

Plouvier Transport, 2014. *Annual account in EURO for period 01/01/2012 – 31/12/2013*, document 14329.00154, general assembly Plouvier Transport, 09/07/2014, Antwerpen

Plouvier Transport, 2016. *Annual account in EURO for period 01/01/2014 – 31/12/2015*, document 16305.00447, general assembly Plouvier Transport, 28/06/2016, Antwerpen

Rederij Ringoot en zoon, 2008. *Annual account in EURO for period 01/01/2006 – 31/12/2007*, document 08651.00234, general assembly Rederij Ringoot en zoon, 29/08/2008, Antwerpen

Rederij Ringoot en zoon, 2011. *Annual account in EURO for period 01/01/2008 – 31/12/2009*, document 11095.00391, general assembly Rederij Ringoot en zoon, 15/04/2011, Antwerpen

Rederij Ringoot en zoon, 2013. *Annual account in EURO for period 01/01/2010 – 31/12/2011*, document 13610.00088, general assembly Rederij Ringoot en zoon, 05/06/2012, Antwerpen

Rederij Ringoot en zoon, 2016a. *Annual account in EURO for period 01/01/2012 – 31/12/2013*, document 16055.00468, general assembly Rederij Ringoot en zoon, 22/02/2016, Antwerpen

Rederij Ringoot en zoon, 2016b. *Annual account in EURO for period 01/01/2014 – 31/12/2015*, document 16408.00048, general assembly Rederij Ringoot en zoon, 28/06/2016, Antwerpen

Schenker, 2007. *Annual account in EURO for period 01/01/2006 – 31/12/2006*, document 07726.00276, general assembly Schenker, 26/04/2007, Antwerpen

Schenker, 2008. *Annual account in EURO for period 01/01/2007 – 31/12/2007*, document 08864.00064, general assembly Schenker, 22/12/2008, Antwerpen

Schenker, 2009. *Annual account in EURO for period 01/01/2008 – 31/12/2008*, document 09286.00316, general assembly Schenker, 28/05/2009, Antwerpen

Schenker, 2010. *Annual account in EURO for period 01/01/2009 – 31/12/2009*, document 10245.00178, general assembly Schenker, 30/04/2010, Antwerpen

Schenker, 2011. *Annual account in EURO for period 01/01/2010 – 31/12/2010*, document 11231.00027, general assembly Schenker, 26/05/2011, Antwerpen

Schenker, 2012. *Annual account in EURO for period 01/01/2011 – 31/12/2011*, document 12223.00028, general assembly Schenker, 24/05/2012, Antwerpen

Schenker, 2013. *Annual account in EURO for period 01/01/2012 – 31/12/2012*, document 13222.000345, general assembly Schenker, 23/05/2013, Antwerpen

Schenker, 2014. *Annual account in EURO for period 01/01/2013 – 31/12/2013*, document 14204.00600, general assembly Schenker, 22/05/2014, Antwerpen

Schenker, 2015. *Annual account in EURO for period 01/01/2014 – 31/12/2014*, document 15232.00181, general assembly Schenker, 28/05/2015, Antwerpen

Schenker, 2016. *Annual account in EURO for period 01/01/2015 – 31/12/2016*, document 16222.00107, general assembly Schenker, 26/05/2016, Antwerpen

Schenker, 2017. *Annual account in EURO for period 01/01/2016 – 31/12/2017*, document 17177.00378, general assembly Schenker, 08/06/2017, Antwerpen

SOMEF, 2008. *Annual account in EURO for period 01/01/2006 – 31/12/2007*, document 08115.00103, general assembly SOMEF, 14/04/2008, Liège

SOMEF, 2010. *Annual account in EURO for period 01/01/2008 – 31/12/2009*, document 10112.00221, general assembly SOMEF, 12/04/2010, Liège

SOMEF, 2012. *Annual account in EURO for period 01/01/2010 – 31/12/2011*, document 12088.00511, general assembly SOMEF, 10/04/2012, Liège

SOMEF, 2014. *Annual account in EURO for period 01/01/2012 – 31/12/2013*, document 14101.00329, general assembly SOMEF, 14/04/2014, Liège

SOMEF, 2016. *Annual account in EURO for period 01/01/2014 – 31/12/2015*, document 16115.00343, general assembly SOMEF, 11/04/2016, Liège

SOMTRANS, 2008. *Annual account in EURO for period 01/01/2006 – 31/12/2007*, document 08365.00386, general assembly SOMTRANS, 28/06/2008, Wijnegem

SOMTRANS, 2010. *Annual account in EURO for period 01/01/2008 – 31/12/2009*, document 10412.00255, general assembly SOMTRANS, 05/06/2010, Wijnegem

SOMTRANS, 2012. *Annual account in EURO for period 01/01/2010 – 31/12/2011*, document 12407.00435, general assembly SOMTRANS, 30/06/2012, Wijnegem

SOMTRANS, 2014. *Annual account in EURO for period 01/01/2012 – 31/12/2013*, document 14499.00373, general assembly SOMTRANS, 30/06/2014, Wijnegem

SOMTRANS, 2016. *Annual account in EURO for period 01/01/2014 – 31/12/2015*, document 16630.00467, general assembly SOMTRANS, 15/09/2016, Wijnegem

Sys, C., Van De Voorde, E., Vanelslander, T. and Van Hassel, E., 2017. *De binnenvaart: Traditionele modus, innovatieve toekomst?* Research paper, 26p., University of Antwerp: Faculty of Applied Economics, 2017-004

Transport Joosen, 2007. *Annual account in EURO for period 01/01/2006 – 31/12/2006*, document 07536.00014, general assembly Transport Joosen, 25/06/2007, Brecht

Transport Joosen, 2008. *Annual account in EURO for period 01/01/2007 – 31/12/2007*, document 08500.00026, general assembly Transport Joosen, 25/06/2008, Brecht

Transport Joosen, 2009. *Annual account in EURO for period 01/01/2008 – 31/12/2008*, document 09551.00325, general assembly Transport Joosen, 25/06/2009, Brecht

Transport Joosen, 2010. *Annual account in EURO for period 01/01/2009 – 31/12/2009*, document 10317.000002, general assembly Transport Joosen, 25/06/2010, Brecht

Transport Joosen, 2011. *Annual account in EURO for period 01/01/2010 – 31/12/2010*, document 11346.00388, general assembly Transport Joosen, 30/06/2011, Brecht

Transport Joosen, 2012. *Annual account in EURO for period 01/01/2011 – 31/12/2011*, document 12335.00472, general assembly Transport Joosen, 26/06/2012, Brecht

Transport Joosen, 2013. *Annual account in EURO for period 01/01/2012 – 31/12/2012*, document 13325.00258, general assembly Transport Joosen, 25/06/2013, Antwerpen

Transport Joosen, 2014. *Annual account in EURO for period 01/01/2013 – 31/12/2013*, document 14438.00309, general assembly Transport Joosen, 10/08/2014, Antwerpen

Transport Joosen, 2015. *Annual account in EURO for period 01/01/2014 – 31/12/2014*, document 15368.00530, general assembly Transport Joosen, 30/06/2015, Antwerpen

Transport Joosen, 2016. *Annual account in EURO for period 01/01/2015 – 31/12/2016*, document 16377.00046, general assembly Transport Joosen, 30/06/2016, Antwerpen

Transport Joosen, 2017. *Annual account in EURO for period 01/01/2016 – 31/12/2017*, document 17233.00579, general assembly Transport Joosen, 26/06/2017, Antwerpen

Troch, F., Vanelslander, T., Sys, C., Stevens, V., Verhoest, K., Mostert, M., Tawfik, C., Limbourg, S., Merchan, A., Belboom, S., Léonard, A., 2015. *Deliverable D 1.3. Scenario development*, University of Antwerp and University of Liège, url: http://www.brain-trains.be/

Troch, F., Vanelslander, T., Sys, C., 2016. *Deliverable D 3.1: Methodology proposal for the macro-economic influence of rail freight transport*, University of Antwerp, url: http://www.brain-trains.be/

Troch, F., Vanelslander, T., Sys, C., 2017a. *Deliverable D 3.2: Scenario 1 – Best-case (indirect impact)*, University of Antwerp, url: http://www.brain-trains.be/

Troch, F., Vanelslander, T., Sys, C., 2017b. *Deliverable D 3.3: Scenario 2 – Worst-case (direct impact)*, University of Antwerp, url: http://www.brain-trains.be/

Van Dijk, 2018. *Krachtige belgische & luxemburgse bedrijfsinformatie*, database, url: https://www.bvdinfo.com/nl-be/home

Van Moer Groep, 2007. *Annual account in EURO for period 01/01/2006 – 31/12/2006*, document 07317.00025, general assembly Van Moer Groep, 16/05/2007, Beveren-Waas

Van Moer Groep, 2008. *Annual account in EURO for period 01/01/2007 – 31/12/2007*, document 08155.00157, general assembly Van Moer Groep, 16/05/2008, Beveren-Waas

Van Moer Groep, 2009. *Annual account in EURO for period 01/01/2008 – 31/12/2008*, document 09265.00162, general assembly Van Moer Groep, 18/06/2009, Beveren-Waas

Van Moer Groep, 2010. *Annual account in EURO for period 01/01/2009 – 31/12/2009*, document 10154.00154, general assembly Van Moer Groep, 01/06/2010, Beveren-Waas

Van Moer Groep, 2011. *Annual account in EURO for period 01/01/2010 – 31/12/2010*, document 11223.00571, general assembly Van Moer Groep, 23/06/2011, Beveren-Waas

Van Moer Groep, 2012. *Annual account in EURO for period 01/01/2011 – 31/12/2011*, document 12254.00044, general assembly Van Moer Groep, 30/06/2012, Beveren-Waas

Van Moer Groep, 2013. *Annual account in EURO for period 01/01/2012 – 31/12/2012*, document 13255.00284, general assembly Van Moer Groep, 22/06/2013, Beveren-Waas

Van Moer Groep, 2014. *Annual account in EURO for period 01/01/2013 – 31/12/2013*, document 14312.00238, general assembly Van Moer Groep, 28/06/2014, Beveren-Waas

Van Moer Groep, 2015. *Annual account in EURO for period 01/01/2014 – 31/12/2014*, document 15270.00272, general assembly Van Moer Groep, 27/06/2015, Beveren-Waas

Van Moer Groep, 2016. *Annual account in EURO for period 01/01/2015 – 31/12/2016*, document 16329.00463, general assembly Van Moer Groep, 25/06/2016, Beveren-Waas

Van Moer Groep, 2017. *Annual account in EURO for period 01/01/2016 – 31/12/2017*, document 17095.00387, general assembly Van Moer Groep, 24/03/2017, Beveren-Waas

Vanelslander T., Troch F., Dotsenko V., Pauwels T., Sys C., Tawfik C., Mostert M., Limbourg S., Stevens V., Verhoest K., Merchan, A., Belboom, S. and Leonard, A., 2015. *BRAIN-TRAINS: transversal assessment of new intermodal strategies: deliverable D1.1-1.2, SWOT analysis*, University of Antwerp and University of Liège, url: http://www.brain-trains.be/

Vanstraelen, A., 2005. *Financiële rapportering en analyse met oefeningen*, Tweede herwerkte en geactualiseerde utigave, Uitgeverij Acco, Leuven, ISBN 90-334-5945-0

Welten, J. P. P. J., 1996. *Berekening En Toepassing Van Nederlandse Grootte-eenheden En Standaardbedrijfseenheden (nge 1992 En Sbe 1994)*. Den Haag: Landbouw-economisch instituut.

Xpedys, 2016. *Annual account in EURO for period 01/01/2015 – 31/12/2015*, document 16294.00111, general assembly Xpedys, 29/04/2016, Brussels.

Xpedys, 2015. *Annual account in EURO for period 01/01/2014 – 31/12/2014*, document 15149.00119, general assembly Xpedys, 28/04/2015, Brussels.

Xpedys, 2014. *Annual account in EURO for period 01/01/2013 – 31/12/2013*, document 14322.00528, general assembly Xpedys, 29/04/2014, Brussels.

Xpedys, 2013. *Annual account in EURO for period 01/01/2012 – 31/12/2012*, document 13139.00433, general assembly Xpedys, 30/04/2013, Brussels.

Xpedys, 2012. *Annual account in EURO for period 01/01/2011 – 31/12/2011*, document 12116.00541, general assembly Xpedys, 18/04/2012, Brussels.

Xpedys, 2011. *Annual account in EURO for period 01/01/2010 – 31/12/2010*, document 11131.00069, general assembly Xpedys, 20/04/2011, Brussels