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Research Report

Opportunities and risks of a due diligence law: Brief report on behalf of the IMPULS-Foundation

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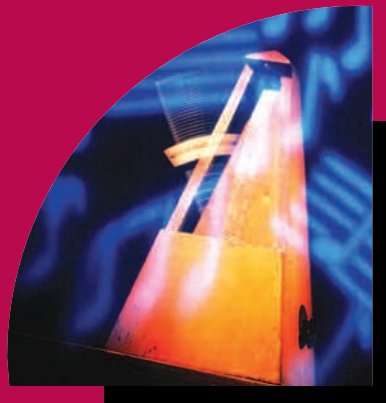
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IMPULS



Opportunities and risks of a due diligence law

Foundation for mechanical engineering,
plant engineering, and information technology

Brief report on behalf of the
IMPULS-Foundation

Opportunities and Risks of a Due Diligence Law

Final Report



Kiel, 10 August 2021

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This brief report is a translation of the original study that was written in German.

Executive Summary

In order to strengthen human rights and environmental standards and to contribute to the achievement of the Sustainable Development Goals (SDGs) defined by the United Nations to enable a decent life, the German Federal Government has drafted a law on corporate due diligence in supply chains. This was submitted to the German Bundestag on 19 April 2021 for a resolution and was adopted in an amended version on 11 June 2021. This short report examines how such a due diligence law will affect German companies in the mechanical and plant engineering sector. Effects on suppliers in developing countries are also investigated.

The law obliges companies based in Germany to ensure compliance with minimum standards along their entire value chain. The degree of responsibility depends on whether direct or indirect suppliers are considered. At the EU level, there are also plans to regulate due diligence obligations. The debate there is currently still broader. Among other things, an increased due diligence obligation is also being discussed for indirect suppliers.

Companies in the German mechanical and plant engineering sector source at least 4.2% of their direct intermediate products from countries which, according to the International Trade Union Confederation, are to be classified as problematic with regard to their working conditions. Assuming that suppliers from these countries require particularly intensive scrutiny, the German mechanical and plant engineering industry would be significantly affected by a due diligence law. If indirect upstream products are also considered, the share from countries with problematic working conditions according to the International Trade Union Confederation increases to at least 8.9%. If, as is currently being discussed at EU level, the corporate due diligence obligation also extends to indirect suppliers, this would again greatly increase the number of supplier relationships that need to be actively audited. Other factors relevant to the law, such as the prevalence of the worst forms of child labour, are not explicitly considered in this short report, so that the number of suppliers to be audited is likely to be significantly higher when further indicators are taken into account.

Due diligence laws increase the cost per supplier relationship, as importing companies must audit each supplier for compliance with human rights and environmental standards. Beyond the accounting costs, there is also a risk for each supplier that human rights violations will initially go undetected and eventually be sanctioned by fines or exclusion from public procurement. These implicit costs and risks will have an impact on firm behaviour. For companies in the mechanical and plant engineering sector, this means on the one hand rising costs for their input products sourced - directly or indirectly - from abroad. In order to minimise the implicit costs in particular, companies will also reduce the number of their suppliers or relocate parts of their supply chains to industrialised countries where the risks of human rights violations do not exist, are lower or easier to monitor. This shift away from the international division of labour also leads to higher production costs, reduces the competitiveness of affected companies and makes them more vulnerable to idiosyncratic shocks by increasing their dependence on remaining suppliers.

From the perspective of suppliers, especially in developing countries, export costs increase as firms have to provide evidence for their compliance with regard to respect for human rights separately for each importer through bureaucratic processes. Depending on the form of a possible European regulation, this documentation obligation could in turn also extend to the control of their suppliers. The consequence is a loss of export business or even market exit. Consequently, employment is either lost altogether or shifted away from the export sector to the domestic market. The economic literature has produced very clear empirical evidence that exporting companies, even in developing countries, pay higher wages on average, hire more qualified employees and even pay more attention to corporate social responsibility than companies that only serve the domestic market (or are even active in the informal sector). Thus, in the worst case, a due diligence law would have a counterproductive effect by harming precisely those suppliers in developing countries that place the highest value on human rights and environmental standards.

For the design of a due diligence law, especially at the European level, this brief report therefore proposes a negative list approach as an alternative. This is a centrally maintained list of companies with which no trade relations may exist due to concerns about human rights or environmental standards. This approach is both more cost-effective for European companies and their suppliers and more effective in terms of strengthening human rights in supplier countries and should therefore be implemented as the core of a due diligence law at the European level.

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1 Introduction

Both in Germany and at the European level, so-called supply chain laws (due diligence laws) shall be implemented to oblige companies to monitor compliance with human rights and environmental standards along their entire supply chain. In Germany, a corresponding draft law was forwarded to the Bundestag on 19 April, 2021 (Printed Paper 19/28649, Federal Government, 2021) and was adopted by the Bundestag on 11 June, 2021 as amended by the Committee for Labor and Social Affairs (Printed Paper 16/30505, Bundestag, 2021). This brief report examines the possible effects of this law on companies in the German mechanical and plant engineering sector and on their suppliers abroad. It also looks at a possible EU regulation currently under discussion (European Parliament, 2021).

Against the background of the Guiding Principles on Business and Human Rights adopted by the United Nations Human Rights Council in 2011 (UN, 2011), the German Federal Government launched the National Action Plan on Business and Human Rights (NAP) back in 2016. Under the NAP, companies should ensure respect for human rights along their entire supply chain on a voluntary basis. Since in 2020 only 13 to 17 % of the companies surveyed by the German government and participating in the NAP monitoring had fulfilled all the requirements of the NAP (Auswärtiges Amt, 2021), the Federal Ministers Müller (BMZ) and Heil (BMAS) initiated a legal regulation to ensure that German companies fulfilled their due diligence obligations.

The German "Act on Corporate Due Diligence in Supply Chains" (Federal Government, 2021; Bundestag, 2021) will come into force from 2023 and will apply to companies with headquarters or branches in Germany and more than 3,000 employees. From 2024, the threshold at which the law takes effect will drop to 1,000 employees. According to the German government (2021), the law so far thus affects 2,217 companies with their headquarters in Germany. In the manufacturing sector, approx. 634 companies (1.4 %), and in the mechanical and plant engineering sector 137 companies (2.2 %) would be directly affected by this new law.¹

With regard to the standards to be complied with, the Act is based on the requirements of the United Nations (UN, 2011), the OECD (OECD, 2018a) and the International Labor Organization (ILO, 2021a; b), e.g. on the minimum age of children in employment and the prohibition of the worst forms of child labor. The law obliges the companies concerned to develop a risk management system, to conduct an annual risk analysis and to draw up, implement and regularly monitor preventive measures and take remedial action. The law covers the companies' own business operations, their direct suppliers and their indirect suppliers. However, a detailed risk analysis is only provided for the company's own business area and for direct suppliers. With regard to indirect suppliers, action is only required if the company becomes aware of human rights violations. In contrast to the German Due Diligence Act, direct

¹ These figures are based on 2017 data available in the Statistical Yearbook Germany 2018.

responsibility of companies for their indirect suppliers along the entire supply chain is being discussed very intensively at European level (European Parliament, 2021).²

In order to evaluate the effects of a due diligence law on companies in the mechanical and plant engineering sector, this brief report proceeds as follows. In a first step, chapter 2 analyses the supplier structure in the German mechanical and plant engineering industry. In order to assess the significance of the Act, this chapter shows the proportion of primary products that companies in the mechanical and plant engineering sector source from those countries that could be problematic in terms of the protection of human rights and appropriate working conditions. Chapter 3 then describes factors that influence the implementation of the law in companies and, building on this, the impact that implementation could have on companies' operations. It also discusses possible alternatives to the current design of the Act that could significantly reduce costs for companies. Chapter 4 describes the impact that the Act could have on companies specifically in developing countries. It also addresses the question of whether the Act could even be counterproductive for the stated objectives. Finally, Chapter 5 discusses both possible opportunities and limitations of such a law. Chapter 6 concludes with a summary and concrete recommendations for action.

2 International interdependencies in mechanical and plant engineering

In order to gain an idea of the extent to which companies in the mechanical and plant engineering sector could be affected by a German or European Due Diligence Act, this chapter analyses the sector's economic links with supplier countries that could be problematic in terms of compliance with environmental and social standards. For this purpose, both direct suppliers and indirect suppliers are considered.

The authors are not aware of a comprehensive indicator that reliably reflects all risks relating to human rights and environmental protection at the country level. In order to classify individual countries in terms of human rights risks, this report draws on the annual survey of the International Trade Union Confederation (ITUC) on working conditions in different countries. Criteria include physical violence against workers, freedom of assembly, the right to form trade unions and collective bargaining autonomy. Thus, in 2020, the ITUC surveyed 141 countries and classified them into different categories (ITUC, 2020). These range from mild and sporadic violations of workers' rights (score 1) to serious violations (score 5) or a breakdown of the legal system (score 5+). In the following sub-chapters, it is assumed that suppliers in countries with a score of 5 require at least closer scrutiny by German companies.

While the ITUC score is a widely accepted indicator to measure violations of workers' rights, its validity in terms of the overall human rights situation is limited (Felbermayr et al., 2021). For example, in

² The possibility contained in the original draft for domestic non-governmental organizations and trade unions also to lodge complaints within the framework of civil proceedings was excluded in the resolution recommendation of the Committee on Labor and Social Affairs of 09 June 2021 (Bundestag, 2021).

particularly poor countries, the index correlates negatively with the proportion of working children in the population of 7- to 13-year-olds. Accordingly, in the countries with better labor rights in the sample analyzed by Felbermayr et al. (2021), child labor occurs more frequently on average. Equally seemingly paradoxically, the authors show that there is no statistical correlation between improved workers' rights and precarious female employment in the countries studied. All in all, the ITUC score thus represents only one, albeit important, aspect in relation to human rights violations and thus the scope of application of the Due Diligence Act.

Information on imports by the German machinery and equipment sector comes from the OECD's input-output tables (OECD, 2018b). These contain information on the value of intermediate products (in USD) purchased by a given sector in a given country from another sector in another country. In this way, the importance of countries that are problematic in terms of human rights as suppliers for the German mechanical and plant engineering sector can be illustrated. The tables contain information on the flow of goods for 36 economic sectors in 66 countries in 2015.³ Consequently, data is not available for all countries that are identified as problematic by the ITUC.⁴ The actual share of intermediate goods from countries with problematic working conditions is therefore likely to be even higher than indicated in the following subchapter. Companies that work with suppliers from these countries must also be prepared for increased risk analyses with regard to possible human rights violations.

2.1 Direct linkages

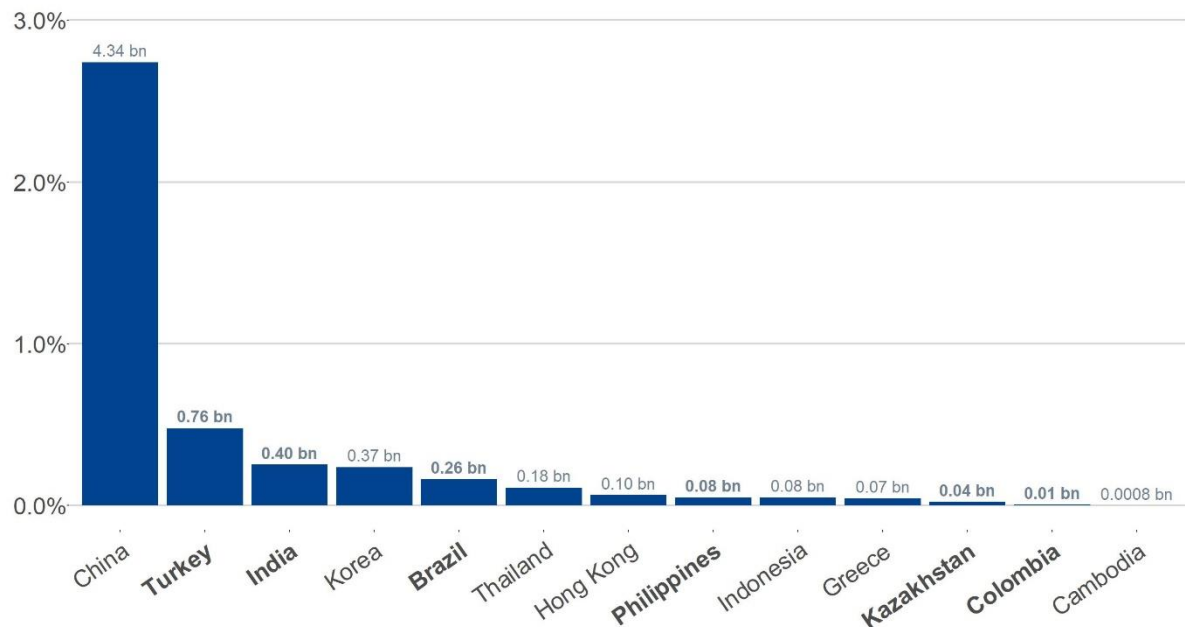
The law passed by the German Bundestag states that companies are directly responsible for their direct suppliers. Accordingly, the following figures show the value of intermediate products that the German mechanical and plant engineering sector sources directly from countries with potentially problematic human rights situations. Specifically, Figure 2-1 shows the value of intermediate products (in USD) that German mechanical and plant engineering companies source from countries with an ITUC score of 5. The countries with the most serious violations of workers' rights are again marked separately (in bold).⁵

³ Countries not directly covered are summarized in the variable "Rest of the world". Data on more recent years are not available in the structure required for this analysis. The monetary values therefore refer to 2015. Assuming a comparable supplier structure in 2015 and 2021, however, the relative shares of individual countries are comparable to the present (Felbermayr et al., 2015; 2020).

⁴ Input-output data are not available for countries with an ITUC score of 5+. These countries are Burundi, the Central African Republic, Libya, Palestine, Somalia, South Sudan, Sudan, Syria and Yemen. However, in 2019, imports from these countries accounted for only 0.4% of total German imports in that year (Destatis, 2021). Input-output data are also not available for several countries with an ITUC score of 5. These are Afghanistan, Algeria, Bahrain, Bangladesh, Belarus, Ecuador, Egypt, Eritrea, Eswatini, Guatemala, Honduras, Iran, Iraq, Kuwait, Laos, Pakistan, Ukraine, the United Arab Emirates and Zimbabwe (ITUC, 2020). However, in 2019, these 19 countries accounted for only 8% of German imports from the total 32 countries with a score of 5 (Destatis, 2021). The 13 countries for which data are available thus represent 92% of total German imports from the countries with an ITUC score of 5.

⁵ No input-output tables are available for four of the ten countries with the most serious violations of workers' rights worldwide according to the ITUC (2020). It is therefore not possible to quantify the value of intermediate products that the German mechanical and plant engineering industry obtains from these countries. The countries concerned are Egypt, Bangladesh, Honduras and Zimbabwe.

Figure 2-1: Value and share of intermediate products used by the German mechanical and plant engineering sector from countries with serious violations of workers' rights (ITUC Score 5)



Note: Countries with the most serious violations of workers' rights according to ITUC (2020) in bold. Input-output data is only available for 13 of the 32 countries with an ITUC (2020) score of 5.

Source: ITUC (2020) and OECD ICIO tables (2018b).

China is by far the most important source country for companies in the German mechanical and plant engineering sector, both overall and among the countries with an ITUC score of 5. German machinery and plant manufacturers sourced intermediate products from this country in the amount of USD 4.3 billion in 2015, which corresponds to a share of 2.7% of the total intermediate products used in this sector or 10.5% of imported intermediate products. Turkey and India follow, accounting for 0.5% and 0.3% of total inputs used (1.8% and 1% of imports, respectively). Both countries are already no longer among the ten largest suppliers of mechanical and plant engineering products, which are dominated by European countries (Felbermayr et al., 2020).

It might seem surprising that even an EU member like Greece and an OECD country like the Republic of Korea are rated with an ITUC score of 5. In Greece, during the financial crisis, trade union rights (freedom of association and collective bargaining autonomy) were severely curtailed (ITUC, 2021a). In the Republic of Korea, basic trade union rights are also not recognized. Strikes are allowed but are subject to strict regulations (ITUC, 2021b). However, this does not necessarily mean that Greece and the Republic of Korea are equivalent to the other ITUC category 5 countries in terms of human rights, as they may differ in terms of other criteria not covered by the ITUC score.

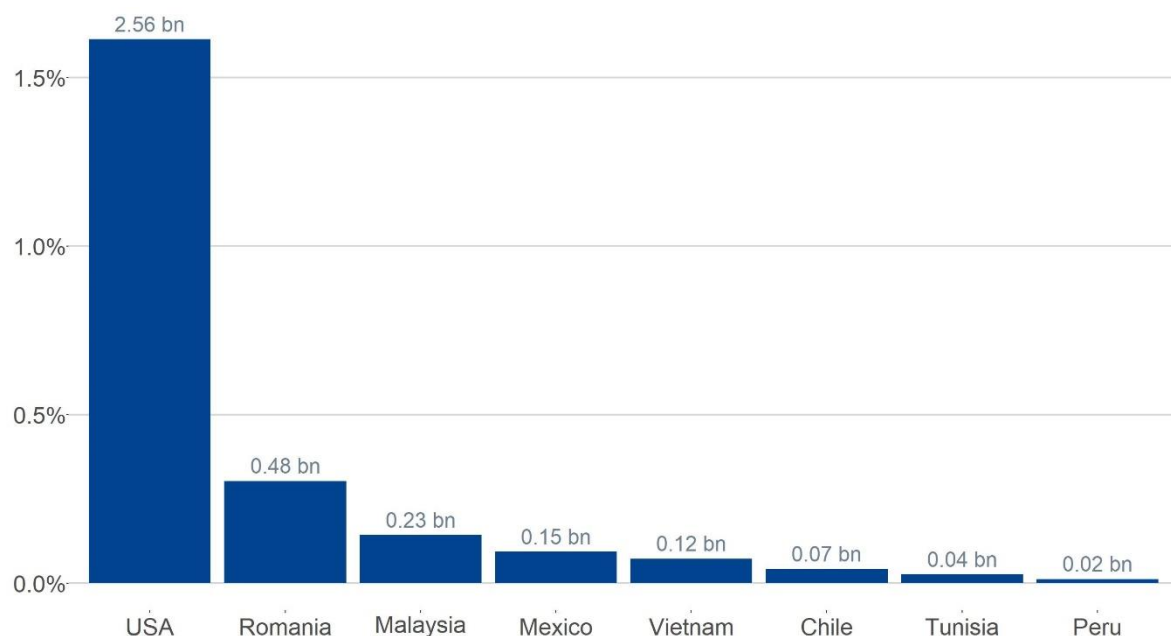
Overall, 4.2% of the total input used in German mechanical and plant engineering, or 16.2% of imported intermediate products, originate from 13 of the 32 countries with serious violations of workers' rights according to the ITUC. In 2015, this corresponded to a value of USD 6.7 billion. Just under 1% of the

total input products used, or 3.7% of the imported input products, came from six of the ten countries with the most serious violations of workers' rights worldwide according to the ITUC. The share of imports from these countries in the mechanical and plant engineering sector thus corresponds roughly to the share in the metal and electrical industry as a whole (Felbermayr et al., 2021).

As no data are available for 19 of the 32 countries with an ITUC score of 5, the actual share of intermediate products from problematic countries is even higher. In 2019, however, these 19 countries accounted for only 8% of total German imports from countries with an ITUC score of 5 (Destatis, 2021). The majority (92%) of imports from problematic countries thus came from the 13 countries for which input-output tables are available. Assuming that the regional import structure of the machinery and plant manufacturing sector is comparable with total imports, the distortion resulting from this limited data availability is likely to be relatively small.

If the countries with an ITUC score of 4 are also included in the analysis (Figure 2-2), the share of problematic countries in the total number of intermediate products used increases by 2.3 percentage points to a roughly 6.5%. If only the imported intermediate products are considered, the share of problematic countries even increases by almost 8.9 percentage points to around 25.1%. However, the USA account for 6.2 percentage points of this increase.⁶ Again, input-output data is not available for all countries with an ITUC score of 4, so that the actual proportion of problematic countries is likely to be even higher.

Figure 2-2: Value and share of intermediate products used by the German mechanical and plant engineering sector from countries with ITUC score 4



⁶ The USA have a score of 4 because they have been shown to have systematic violations of workers' rights, such as violations of the right to privacy, cases of anti-unionism and barriers to recognition of collective bargaining parties (ITCU, 2021c). In terms of criteria not covered by the ITUC score with relevance to the Due Diligence Act, the USA may well differ from the other countries listed in Figure 2-2.

Note: Input-output data are only available for 8 of the total 41 countries with an ITUC (2020) score of 4.

Source: ITUC (2020) and OECD ICIO tables (2018b).

Assuming that a significant proportion of companies based in these countries do not or only insufficiently fulfil the requirements of a German Due Diligence Act with regard to labor standards and human rights, significant challenges for companies in the mechanical and plant engineering sector can be expected due to the presented interdependencies. This also applies in the event that suppliers in these countries are only required to undergo more detailed due diligence.

2.2 Indirect linkages

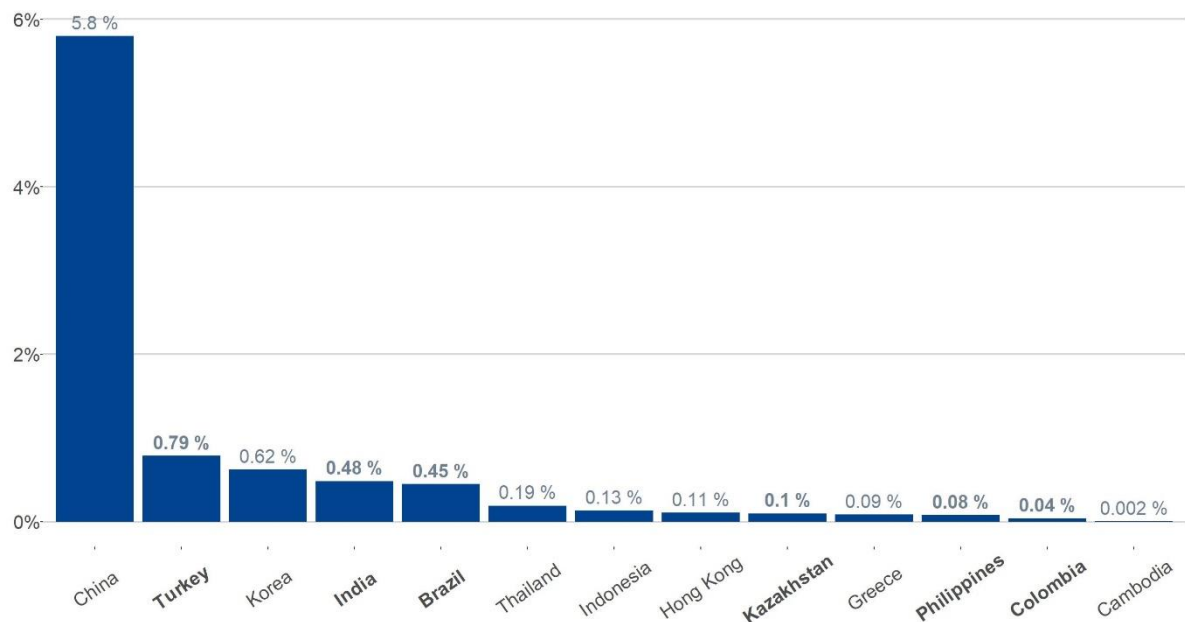
According to the current discussion at the European level, the corporate due diligence obligation should also extend to indirect suppliers in the event of a European due diligence law. Accordingly, indirect linkages also play a role. Indirect suppliers are also relevant for the German Supply Chain Act, as at least a limited duty of care is to be applied here. The indirect supplier relationships of companies in the mechanical and plant engineering sector with countries that are problematic in terms of human rights are therefore already important against the background of a German due diligence law.

In order to assess the relevance of a due diligence obligation that also applies to indirect suppliers for companies in the German mechanical and plant engineering sector, this subsection also considers intermediate products that may originate from Germany or Europe, but which in turn were manufactured with the help of inputs from other countries that could be problematic in terms of human rights. Thus, with the help of the OECD (2018b) Input-Output Tables, it is possible to determine the value of intermediate inputs that contribute to the production of final products in the machinery and equipment sector from all countries, explicitly considering indirect suppliers. In this way, it can be shown how important individual supplier countries are both directly and indirectly for the German mechanical and plant engineering sector (Felbermayr et al., 2020).⁷

Analogous to Figure 2-1Figure 2-3shows the share of countries with serious violations of workers' rights in the total number of intermediate products used in German mechanical and plant engineering. In contrast to the previous sub-chapter, however, indirect intermediate products from indirect suppliers are also taken into account. China remains the most important supplier even when indirect intermediate products are considered. Its share of total intermediate products used by the German mechanical and plant engineering sector is 5.8%, which is more than twice as high as when only direct intermediate products are considered. Turkey remains in second place with a share of 0.8%.

⁷ This calculation is done with using a so-called Leontief inverse. For a detailed description of the methodology, see Felbermayr et al. (2015).

Figure 2-3: Share of countries with serious violations of workers' rights (ITUC score 5) in total input of direct and indirect intermediate products in the German mechanical and plant engineering sector

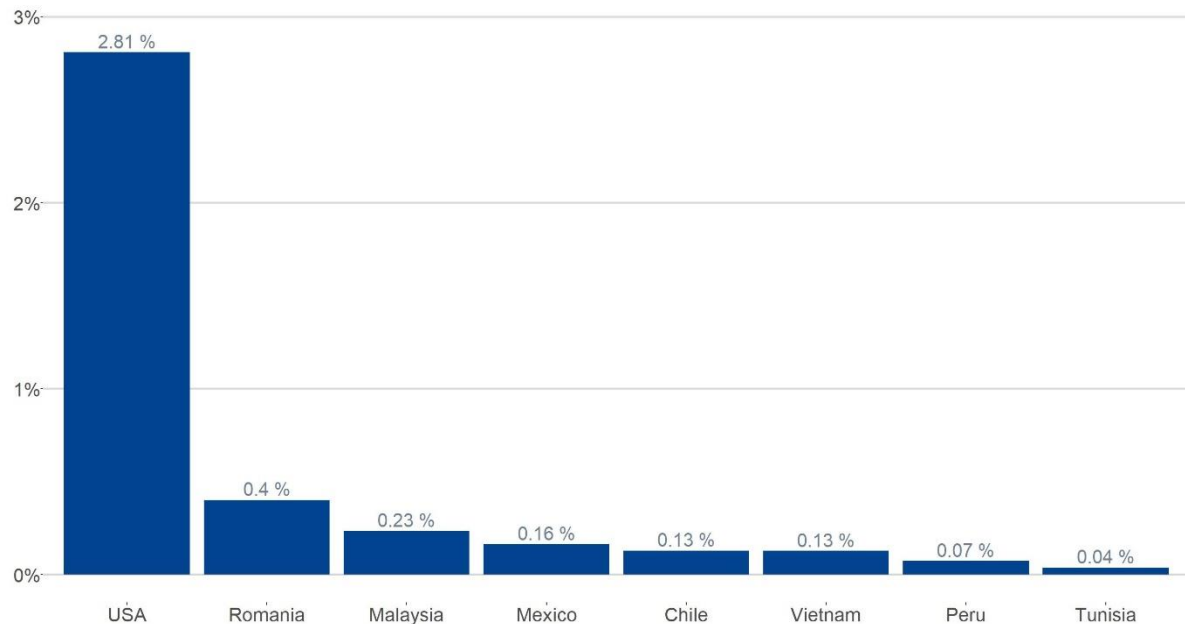


Note: Countries with the most serious violations of workers' rights according to ITUC (2020) in bold. Input-output data is only available for 13 of the 32 countries with an ITUC (2020) score of 5.

Source: ITUC (2020) and OECD ICIO tables (2018b).

Overall, if indirect intermediate inputs are included in the analysis, just under 8.9% of intermediate inputs used in the German mechanical and plant engineering sector originate from countries with an ITUC score of 5 for which data are available. A comparison with the share of direct intermediate inputs from the same countries (4.2%) shows that whether or not indirect suppliers are taken into account clearly matters in the context of corporate due diligence. Taking indirect linkages into account, 1.9% of all intermediate products (just under 1% of direct intermediate products) come from the six of the ten countries rated worst by the ITUC. If also those countries with an ITUC score of 4 are considered (Figure 2-4), the proportion of countries to be classified as problematic increases by 4 percentage points to a total of 12.9% (6.5% for direct intermediate products).

Figure 2-4: Share of countries with an ITUC score of 4 in total input of direct and indirect intermediate products in the German mechanical and plant engineering sector



Note: Input-output data are only available for 8 of the total 41 countries with an ITUC (2020) score of 4.

Source: ITUC (2020) and OECD ICIO tables (2018b).

Conclusion: German mechanical and plant engineering companies source a significant proportion of their intermediate products from countries which, according to the International Trade Union Confederation, are to be classified as problematic in terms of their working conditions. Looking only at direct input products from direct suppliers, the share of input products from countries with an ITUC score of 5 amounts to roughly 4.2%. China is the most important supplier with a share of 2.7%. If indirect suppliers with whom there are indirect links are also considered, the proportion of particularly problematic countries increases to at least 8.9%.

Due to limited data availability, not all relevant countries could be considered, so that the actual share of countries to be classified as problematic is likely to be even higher. In addition, the ITUC score, with its focus on workers' rights, only covers a subset of the human rights to be protected, so that the number of countries to be classified as problematic is likely to be even higher if additional indicators are used. Assuming that suppliers from these countries have to be at least closely checked with regard to working conditions in their plants, a German due diligence law could pose significant challenges for the companies concerned.

The share of primary products from problematic countries more than doubles when indirect linkages are taken into account. It is therefore highly relevant for the German mechanical and plant engineering industry whether only direct suppliers are covered by the due diligence obligation or whether, as is currently being discussed at the European level, the due diligence obligation should also extend to indirect suppliers. The German law with its limited due diligence for indirect suppliers could already lead to considerable challenges due to the importance of certain problematic countries for the supply chains of the mechanical and plant engineering industry.

3 Effects on companies in the mechanical and plant engineering sector

3.1 General cost drivers

Due diligence laws increase the costs per supplier relationship, as importing companies have to check each supplier with respect to compliance with human rights and environmental standards. The German government (2021) estimates the compliance costs of a German due diligence law for affected companies at EUR 43.5 million annually plus a one-off compliance cost of EUR 109.7 million. With 2,217 affected companies with more than 1,000 employees (Federal Government, 2021), this would correspond to average costs of EUR 19,621 per company and year, plus one-off costs of EUR 49,481 per company. These costs vary depending on the degree to which the company is affected.

In addition to these accounting costs, there is also a risk for every supplier that human rights violations will initially go undetected and will eventually be sanctioned by penalties of "up to 2% of average annual turnover" (BMAS, 2021: 20). This represents a severe penalty for companies with small margins. In addition, affected companies are threatened with the exclusion from public contracts. These implicit costs resulting from diffuse legal risks and the associated ex-ante risk in the choice of suppliers are difficult to quantify and are consequently neglected in the calculations of the German government (2021). Added to this are the costs of certification audits, insofar as certification companies are hired to audit suppliers.

All companies involved are therefore confronted with direct and indirect implementation costs, which occur per supplier relationship (key account). Companies must analyze their direct suppliers with regard to human rights and environmental risks (monitoring/monitoring costs) both once when the law is introduced (fixed costs) and on a regular basis ("once a year as well as on an ad hoc basis", BMAS, 2021: 10) and document this accordingly. This also applies to the obligation to document an effort (instead of an obligation to succeed).

From a supplier perspective, marginal production costs are also likely to increase in all import source countries, as suppliers need to incorporate the costs of reporting and monitoring the rules set by their German or European customers into their production processes (Rudloff and Wiek, 2020). This in turn reduces the overall cost advantages of importing for a German company.

As a consequence, German companies need to re-evaluate their input sourcing strategy. For example, a German company may decide to accept higher costs for goods purchased abroad and stick to its current procurement strategy for intermediate products. This is, of course, only possible as long as no explicit human rights violations are identified among the suppliers concerned. Another company could decide to change its input sourcing strategy by switching to another (more expensive) supplier in an industrialized country of less concern in terms of human rights violations, or by shifting production of some goods to another existing well-rated supplier, thereby reducing the number of suppliers to be screened. A third option would be to replace production sourced from abroad by domestic producers, or even to produce the goods in house, possibly combined with a substitution of labor for capital

(automation). This strategy, induced by the law, is also associated with higher costs, as advantages of the international division of labor are lost and production is no longer carried out in the lowest-cost production locations (Caliendo and Parro, 2015; Eaton and Kortum, 2002). All strategies introduced above assume that there are alternatives to the original suppliers in the first place.

It is likely that all of the above strategies will be observed depending on industry, firm and country specific factors. The important point here is that the due diligence law increases trade costs, which are central to firms' sourcing strategies (Bown and Zhang, 2019). Compared to a firm in another country that is not subject to a similar due diligence law, German firms may therefore become less competitive. In particular, it is important to keep pace with international supply chains (Godart et al., 2009).

As the German mechanical and plant engineering sector is integrated to an above-average extent into global production networks (Felbermayr et al., 2020), the loss of competitiveness could be relatively high. A reduction in the number of suppliers would also make companies more vulnerable to idiosyncratic shocks by increasing their dependence on remaining suppliers. Such a development would be strongly incompatible with the political target expressed against the background of the COVID-19 pandemic to become more independent of individual suppliers (Felbermayr et al., 2020).

3.2 Factors for successful implementation

One factor that could influence the successful implementation of a due diligence law is company size. For example, larger companies may benefit from their organizational structure, which allows for efficient reporting and monitoring of non-financial obligations. This may reduce the actual cost of firms' implementation of the new due diligence law (or spread the cost across different reporting activities). In turn, these large firms are heavily anchored in global production networks with a large number of suppliers, which makes them sensitive to changes in production costs in their supplier firms.

Larger companies, compared to smaller ones, are already heavily involved in monitoring and reporting procedures with trained staff and an organizational structure to fulfil non-financial obligations and policies (corporate social responsibility, code of conduct, responsible sourcing, participation in initiatives such as the Extractive Industries Transparency Initiative, etc.). These existing structures can also be used to report on suppliers' conduct in relation to human rights abuses. Synergies can therefore be expected, which will reduce, if not eliminate, the additional costs incurred. In addition, large importing firms often have foreign networks that are helpful in the search for suppliers and setting the terms of the business relationship in an international context (Halpern et al., 2015). Also, larger firms with correspondingly greater market power might be more likely to persuade their suppliers to comply with documentation requirements.

In contrast, smaller companies, may have less intensive links with suppliers in international production networks, which would reduce the implementation costs of the Due Diligence Act. However, smaller companies cannot rely on an organizational structure tailored to meet the many non-financial obligations imposed by the law without incurring significant costs. In addition, there is a risk that small

companies with little market power in particular will lose access to foreign suppliers if the latter are unwilling to comply with relevant documentation requirements.

It is also unlikely that best practice concepts established by large companies can be easily adopted by smaller companies. So far, the Due Diligence Act leaves it to companies to decide how to report on and monitor their suppliers with respect to compliance with the rights of workers. Thus, there is no guarantee that the practices chosen by larger companies can be easily implemented in companies that have not built up the organizational capacity which is necessary to meet their supply chain monitoring obligations. If this is the case, additional support for smaller firms may be needed.

A special feature of the German Due Diligence Act is that it will be implemented in two stages in 2023 and 2024 according to a company size threshold. First, in 2023, all companies with more than 3,000 employees will have to meet their compliance obligations under the new law. Second, beginning in 2024, all firms with more than 1,000 employees will be subject to the Supply Chain Act. This two-tiered approach is intended to avoid placing an excessive burden on smaller companies with the new reporting and monitoring obligations by allowing them more time to prepare, as they do not yet have the corresponding internal structures in place compared to larger companies.

However, it would be misleading to believe that all smaller companies will be fully exempt from the new regulation, at least until 2024. In fact, all German suppliers, regardless of size, will be exposed to the law if they supply a company that is directly affected by the law. Thus, a direct supplier must assure that it complies with corresponding "specifications and adequately addresses them along the supply chain" (Federal Government, 2021: 12).

The number of companies in Germany indirectly affected by the act is difficult to determine. A rough indication can be provided by the input-output data presented in the previous chapter. For the machinery and equipment sector, the data show that half of the German output produced by this sector is also an input in its own industry, which is quite a high share compared to other industries (Bachmann et al., 2020). In addition, the German mechanical and plant engineering sector supplies companies in other industries which are also covered by the law. Thus, some additional companies with a smaller threshold size than specified in the law will be affected at least indirectly by as early as 2023.⁸

An additional factor that could be relevant to the impact of the law on a company is the company's position within the supply chain. For example, downstream companies with a strategy of many supplier relationships are likely to be particularly affected compared to upstream companies with a reduced number of supplier relationships. Currently, the law concerns the need for German companies to audit their direct (immediate) suppliers. An additional control also of indirect suppliers, as currently discussed in the European Parliament (European Parliament, 2021), would have even more far-reaching

⁸ Companies indirectly affected by the law include mechanical and plant engineering companies that sell to companies operating in other German industries. Should the Due Diligence Act become a blueprint for an EU law, the number of companies indirectly affected through their supplier-customer relationships at EU level would increase further.

consequences. If the manufacture of a machine requires thousands of parts produced by hundreds of suppliers, it is more than questionable whether it is possible for one company to monitor all of these suppliers (ZVEI, 2021). Furthermore, the question of the definition of supply chains quickly arises, as it is often not clear where a supply chain even begins (Görg et al., 2021).

One potential way of reducing monitoring costs from a company perspective would be to divide the countries of origin into problematic and unproblematic countries with regard to the human rights situation. The ITUC score of the International Trade Union Confederation presented in Chapter 2, for example, could be used as a criterion. As already explained, however, a single indicator can only paint an incomplete picture of a country's actual human rights situation. Therefore, one indicator alone cannot be decisive in determining whether or not suppliers in a country need to be audited. Even if, despite these concerns, the ITUC index were to be used as the sole indicator, the impact on the German mechanical and plant engineering industry would still be considerable, as described in Chapter 2.

A potential way to track multiple complex networks of suppliers and better ensure the spread of human rights and fair labor practices would be to use blockchain technology. For example, by including predefined standards in smart contracts, transaction completion would only occur if these standards are met. However, blockchain technologies in supply chain management are not yet widespread and even less so when it comes to tracking the sustainable procurement of goods and services (Sabeti et al., 2018). The use of blockchains for reliable verification of standards is therefore not suitable, at least in the medium term.

Blockchain technology could also help larger companies become even more transparent about best practice outcomes in the future. This is true in terms of supplier development programs, from which other companies can widely benefit. The quality of information gathered from supplier development programs could be magnified by blockchain technology. The amount of effort and support expended to help their suppliers achieve their goals can be recorded and shared through blockchain technology (Kouhizadeh and Sarkis, 2018).

3.3 Possible alternatives

An alternative to the Due Diligence Act in its current form would be a so-called list approach. Here, a distinction is made between a positive list and a negative list. In both cases, the core would be the establishment of an official central certification body for foreign companies. In the case of a positive list, every foreign supplier would be inspected and certified once by the central body. German or European companies would then only be allowed to purchase goods and services from appropriately certified companies. The advantage of such a list is that each supplier would no longer have to be inspected separately by each company, which would reduce costs for both German companies and their suppliers. Furthermore, there would be legal certainty, as German companies can be sure that they will not be sanctioned as long as they restrict themselves to appropriately certified suppliers.

However, such a positive list approach would be highly problematic in terms of its compatibility with Union and WTO law (Felbermayr et al., 2021). It would presumably constitute a violation of the

prohibition of discrimination set out in Art. III:4 of the GATT, if reference is made exclusively to suppliers in third countries.⁹ In addition, a supplier would only be allowed to export to Germany or Europe after successful certification. Given the number of foreign suppliers, such an approach would be administratively unmanageable. Supply chains would be interrupted, at least temporarily, and market access for new suppliers would be made even more difficult.

While a positive list approach at the country level would be much more practicable than a company level approach, it would certainly raise WTO concerns to an even greater extent, as in this case there would clearly be discrimination against suppliers by country of origin. Following on from the discussion in the previous sub-chapter, the question also arises as to which indicators should be used as the basis for such a selection.

A more feasible and cost-effective alternative would therefore be a negative list approach. This is a centrally maintained list of companies with which no trade relations may exist due to concerns about human rights or environmental standards. As with a positive list, such an approach would offer legal certainty, since it would precisely define which suppliers are to be classified as problematic and with whom no business relations may therefore be maintained. The diffuse legal risks would be largely eliminated. In addition, since not every company has to be explicitly audited, the costs per supplier relationship are also considerably reduced from the company's point of view. Accordingly, there would no longer be any problematic incentives for companies to reduce the number of their suppliers.

The responsibility for such a negative list could lie with the EU Commission, as is already the case in other areas. For example, there is a list of airlines that are subject to an operating ban in the EU due to safety concerns (Felbermayr et al., 2021). This list is regularly updated by the EU Commission. The EU Regulation on Illegal Fishing also empowers the Commission to establish a list of vessels engaged in illegal fishing. Accordingly, imports into the EU of products caught by these vessels are prohibited. A negative list in relation to human rights abuses could be modelled on these existing approaches and should be implementable with appropriate lead time.

With regard to the design of the procedure, it would also be possible to draw on tried-and-tested structures and experience from the area of trade defense instruments (Felbermayr et al., 2021). For example, anti-dumping proceedings ensure legal protection for affected suppliers if they find themselves unjustly exposed to proceedings. Accordingly, allegations can be refuted before sanctions enter into force. Possible circumvention of the negative list through trade diversion or the establishment of new companies can also be countered by such instruments.¹⁰ If, for instance, following the implementation of an anti-dumping duty against a particular company, there is an increase in imports of the product concerned (or similar products) from other countries or even from the same country, the Commission will investigate whether there is circumvention of the duties. If this is the case, duties will also be imposed on these products. A similar procedure could be envisaged for a negative list.

⁹ For a more detailed discussion of the legal issues, see Felbermayr et al. (2021).

¹⁰ For a detailed analysis, see Felbermayr et al. (2021).

Conclusion: Due diligence laws increase the costs per supplier relationship, as importing companies have to check each supplier with regard to compliance with human rights and environmental standards. In addition to the accounting costs, there is also a risk for each supplier that human rights violations will initially go undetected and eventually be sanctioned by fines or exclusion from public procurement. As a consequence, companies will reduce the number of their supplier relationships and shift part of their value added to supposedly safer countries. The consequences of such a shift away from the international division of labor are rising production costs and lower competitiveness. This is all the more so the fewer countries implement due diligence laws with regard to human rights and environmental standards in global production networks. In addition, companies become more vulnerable to idiosyncratic shocks as their dependence on remaining suppliers increases. At worst, if the affected inputs are critical inputs without close substitutes, the entire business model could be threatened.

Large companies can exploit synergies in reporting and monitoring non-financial obligations to meet the obligations of the due diligence law. It is unclear whether the two-stage implementation of the law will help to overcome the difficulties faced by smaller companies, or whether these will merely be postponed. Additional support for these companies may therefore be necessary.

A cheaper and more effective alternative to the law would be a negative list approach. Such an approach would reduce the costs associated with monitoring supply chains, both for German companies and their suppliers, and strengthen legal certainty.

4 On the success of integrating developing countries into the international division of labor with industrial goods without due diligence laws

For years, German industry has participated in national, EU-wide and global voluntary commitments to safeguard human rights and environmental protection in global supply chains. These commitments include the well-known obligations to due diligence standards of conduct of the UN, OECD and the International Labor Organization ILO. In the sector-specific area of mechanical and plant engineering, the fulfilment of due diligence obligations to promote responsible supply chains when sourcing mineral raw materials from conflict and high-risk regions also plays an indirect role (see in detail Kolev and Neligan, 2021:11). This also involves voluntary commitments to financial transparency and accounting for extractive industries that are particularly susceptible to corruption (Extractive Industries Transparency Initiative - EITI). The Kolev/Neligan study also shows that sustainability goals are widely pursued in German industry and all the more so as companies face global competition. In 2017, the EU issued a regulation on due diligence for the import of conflict minerals, which has to be applied by EU importers since the beginning of 2021, with the Federal Institute for Geosciences and Natural Resources designated by the Federal Ministry of Economics as the control authority. (Franken, 2019).

Against this background, the question must be answered as to how developing countries have succeeded in the past in stepping out of the role of raw material supplier and into the role of competitive

suppliers in the manufacturing sector without already being bound by legal constraints through due diligence laws of the industrialized countries.

The empirical evidence for the change in the importance of the industrial sector in developing countries from the 1970s until after the economic and financial crisis of 2008 can be illustrated by a study conducted by the UN Industrial Development Organization (UNIDO) separately for developing regions and industrial sectors (UNIDO, 2015):

- For the world as a whole, the manufacturing sector's share of GDP stagnated between 1970 and 2014 and even shrank in favor of the tertiary sector in developed countries (Table 4-1).
- In developing countries, on the other hand, it rose by about 3 percentage points to almost 20%, with marked differences between developing regions.
- Particularly in the lower income regions (South Asia, Sub-Saharan Africa (ASS)), it showed a moderate increase from a low starting level, while the South-East Asian region in particular (dominated by the countries of the ASEAN group) showed a substantial increase of 9 percentage points to 25% of total value added.
- The East Asian region, dominated by China, stagnated in terms of share, albeit at the highest level of all developing and industrialized country regions of 30-33%.

This overall picture does not yet allow any conclusion on the success (or failure) of the integration of industrial goods production in developing countries into the global economic division of labor. Indeed, increases in the importance of the industrial sector for total value added did not correspond to the importance of this sector in the regions' export supply. While East and Southeast Asian countries achieved a 9% increase to over a quarter of total world manufactured exports (27%) between 1980 and 2019, the shares of Latin America and ASS in world manufactured exports remained at low levels of 6% and 1-2%, respectively (UN, Monthly Bulletin of Statistics, Table 42, current years).

The fact that this gap between regions was able to widen in this way is due to a variety of factors, including differences in the skill level of the labor force, foreign trade protection, the quality of governance, and fiscal and monetary stability. Openness to foreign investors, on the other hand, was not a distinguishing factor. Latin American countries were traditionally open to foreign investors, focusing on production for the domestic market behind high tariff walls. Asian countries were initially more restrictive towards foreign investors but, under the influence of investment from Japan, over time offered them an increasingly attractive terrain for export-oriented processing and thus for participation in global supply chains.

The UNIDO study mentioned above makes an important distinction between two types of global supply chains, the buyer-driven and the producer-driven chains. In the former, control over marketing, branding and distribution channels determines the composition and spatial structure of the chains, in which high price and competition intensity and decentralized manufacturing processes prevail. In the latter, it is control over technologies and production processes in which product differentiation, consumer preferences, increasing returns to scale, and oligopoly structures are determining factors. Exemplary for buyer-driven supply chains is the textile and apparel industry, whereas for producer-driven supply

chains is the machinery and electrical equipment industry (hereafter referred to as MEAI). The results for the MEAI are of particular importance for companies from the mechanical and plant engineering industry.

Table 4-1: Shares of the manufacturing sector in GDP at constant prices in %, 1970-2013 (five-year averages)

	1970–1974	1975–1979	1980–1984	1985–1989	1990–1994	1995–1999	2000–2004	2005–2009	2010–2013
World	16.90	16.59	15.97	16.03	15.42	15.56	15.66	16.07	16.24
Developed countries (OECD)	17.00	16.50	15.71	15.48	14.99	14.98	14.91	15.02	14.92
America	15.86	15.05	13.59	13.32	12.61	13.23	13.30	13.24	12.65
South America	22.00	18.72	17.53	18.16	17.40	15.58	14.53	13.67	12.53
Asia (excluding USSR))	19.26	18.63	18.86	19.17	19.17	18.89	19.47	21.39	22.60
Europe	17.56	17.34	16.66	16.27	15.65	15.22	14.93	14.50	14.35
Africa	14.31	14.84	15.05	16.17	16.44	16.93	16.28	16.67	17.00
Oceania	17.36	16.30	15.52	14.30	13.06	12.08	11.31	9.97	8.71
Developing countries (non-OECD)	16.30	17.03	17.23	18.60	17.44	18.24	18.81	19.54	19.81
America as a whole	18.58	18.57	17.60	17.53	16.52	16.25	15.74	15.38	14.27
North America	5.74	5.74	5.74	5.74	5.74	5.74	5.73	4.87	3.04
Central America	18.45	18.98	18.45	18.29	17.82	17.59	17.22	16.40	15.14
South America	18.61	18.57	17.57	17.51	16.47	16.18	15.66	15.32	14.23
Total Asia (excluding USSR))	19.45	21.39	21.87	22.84	23.24	24.53	24.99	26.17	26.17
East Asia	32.20	34.80	33.40	31.59	29.76	29.73	29.56	30.59	30.41
Southeast Asia	16.47	18.18	18.79	20.59	22.95	24.74	25.96	26.00	25.39
South Asia	10.95	11.58	11.94	12.68	13.12	14.28	14.00	15.08	14.84
Europe as a whole	19.80	21.11	19.46	20.83	16.46	15.72	16.49	15.81	15.23
Western Europe	12.84	12.74	12.67	12.59	12.42	14.52	17.29	16.72	14.85
Eastern Europe	14.23	15.40	15.75	15.45	13.72	15.52	17.18	20.19	22.29
Former USSR	18.65	19.63	18.17	19.97	15.97	15.37	16.15	15.40	14.77
Africa total	7.48	7.73	9.17	10.38	9.65	9.90	10.20	10.22	10.26
North Africa, Middle East	4.86	5.16	6.78	8.56	8.01	8.87	9.52	9.91	10.22
Africa south of Sahara	11.47	12.37	13.58	13.50	12.65	11.89	11.53	10.81	10.34
Oceania	16.75	14.47	11.53	11.85	10.25	9.14	9.20	9.37	8.33

Source: UNIDO, 2015: 32.

It is not surprising, given the difference between the two supply chain types, that according to the UNIDO study the spatial structure of value-added processes in the MEAI industry and the importance of supply chains in this industry show a very different picture than in the comparative textile and clothing industry (Ibid., Charts 3.1-3.11: 27-32). In 1990, out of eleven regions in the MEAI, the three most developed regions (North America, Western Europe and East Asia) dominated with almost 85% of the global value added in this industry (textiles and clothing: 73%). By 2011, this dominance had fallen slightly to a 77% share, as Eastern Europe and Southeast Asia posted share gains at the expense of the top three regions. However, it was still significantly higher than in the textile and clothing industry, where Southeast Asia and Latin America were able to compensate for the decline in the importance of

the production locations in the three leading regions in such a way that all five regions accounted for around 85% of global value added in 1990, as in 2011 (ibid.: 33-35).

The study breaks down the value added in the respective industries for eleven regions into three components: Production of final goods for consumption in their own region, exports of final goods, and exports of intermediate goods (as a proxy for the importance of supply chains).¹¹ Here we see that developing regions were more able to integrate into global supply chains in the MEAI industry between 1990 and 2011 than in the textile and clothing industry, although the dominance of industrial regions for the production of final goods remained strong. This was helped by a regional consolidation of neighboring industrial and developing regions in the supply chains of the MEAI industry: Eastern European intermediate goods producers supplied Western European final producers, South and Southeast Asian producers dealt equally with finished goods producers in East Asia, and Latin American producers with buyers from North America. As the supply chain in the MEAI industry includes the raw materials level, the ASS region also benefited from the rising demand in Western Europe and East Asia.

In all developing regions, with the exception of Latin America (limited to South America), intermediate goods exports gained in importance over production for the domestic region (ibid., charts 3.2 - 3.11). Only in South America did production for the domestic market remain dominant. This is essentially due to the sluggish recovery of this region after the debt crises of the 1980s and to the latent tendency of economic policy in the leading South American countries towards an import substitution strategy and thus to the implicit disadvantage of exports.

However, the study also makes clear that increasing participation in global supply chains does not necessarily go hand in hand with an increase in the share of value added in the MEAI industry. Sub-Saharan Africa exemplifies the opposite trend. In the absence of the ability to slowly rise to the role of a competitive producer of finished goods in the global market, a region's share of total value added in the MEAI industry may decline. In this context, the link between domestic suppliers and foreign investors remains important. Here, research by Pérez-Villar and Seric (2013) for African firms shows that linkages with emerging market investors result in less institutional distance from host country production conditions, and hence from domestic producers, than linkages with developed market investors. Thus, linking with investors from emerging markets also allows for lower transaction costs and better exploitation of the production opportunities of local producers.

Görg and Seric (2013) show that the linkages between domestic and foreign producers enable, on the one hand, a positive labor productivity effect for the domestic firm when the firm purchases services from foreign firms in the host country ("forward linkage" from the perspective of the foreign firm) and, on the other hand, can induce a positive product innovation effect for the domestic firm when it supplies to the foreign firm ("backward linkage" from the perspective of the foreign firm). However, these positive effects are dependent on support from the economic policy of the host country, on the one hand, so that the link between the two companies and thus the productivity gains can be realized at all, and

¹¹ The eleven regions are North Africa and the Middle East, Sub-Saharan Africa, Western Europe, Eastern Europe, Central Asia, East Asia, South and Southeast Asia, Oceania, North America, Central America and South America.

support from a technology transfer by the foreign company, on the other hand, so that the domestic company can achieve the innovation gains.

The UNIDO study does not allow any conclusion that due diligence laws of industrialized countries, which are mostly at the end of the production chain in the MEAI industry, can better ensure the positive productivity and innovation effects of the participation of companies from developing countries than activities in the supplier countries themselves. This includes the highest possible level of employment in the countries, which also and especially includes low-skilled workers, so that "learning on the job" effects can be realized. This includes targeted aid for companies from developing countries with resources from the foreign producers, who have a high business self-interest in this aid, and support from public funds of bilateral and multilateral development cooperation. The importance of economic policies of supplier countries oriented towards openness and consistency is particularly emphasized. The study also points out that rules of industrialized countries from the perspective of their interests in protecting the environment can be a barrier to market entry for small and medium-sized enterprises from developing countries (ibid.: 66). But here, too, both private and public aid has been offered and, as the experience of individual projects during the observation period of the UNIDO study shows, has also been successfully implemented. There is no other explanation for the success of most developing country regions in expanding their exports and thus also their export revenues through trade in intermediate goods.

Even beyond the UNIDO study, there is ample empirical evidence that exporters typically pay higher wages than companies that only serve the domestic market (Bernard and Jensen, 1995; Bernard et al., 2007). Companies that export to industrialized countries also often employ better qualified staff (Verhoogen, 2008) and pay more attention to corporate social responsibility (Görg et al., 2017).

From the perspective of these exporters, a German or European due diligence law represents a so-called non-tariff trade barrier. The documentation obligation required by the law and the possible need to monitor their own suppliers increase the companies' export costs. This more difficult market access will induce some companies to exit the German or European market (Melitz and Redding, 2014; Bernard et al., 2018), even if German companies do not terminate the business relationship anyway due to the consolidation incentives already described. The consequence in the affected countries would be increased unemployment or a migration of employment to informal sectors with often worse working conditions. In the worst case, a due diligence law would therefore be counterproductive in that it would harm precisely those companies that attach the greatest importance to human rights and environmental standards.

Due diligence laws, especially if they would create civil rights of action, also pose the following additional risks to supplier countries, particularly in the technology-driven MEAI:

- Higher control costs reduce incentives in companies to invest in the qualification of workers.
- Incentives are given to use new labor-saving production methods and can reduce employment levels, especially among unskilled workers in supplier countries.

- The labor-saving technical progress deepens the gap between a few well-educated and well-paid (due diligence law-compliant) employees and the large number of low-skilled job-seekers and could make the social inclusion intended as an important sustainability goal in the UNIDO study more difficult.
- The objective of providing quality employment, particularly for women, in industries beyond the traditional textile and clothing industry could be further undermined than it already is because companies would not be able to bear the higher training costs of moving workers between industries compared to the lower costs of moving within an industry.
- More labor-saving technical progress weighs on countries' balance of payments with higher spending on imported capital goods and could put downward pressure on countries' currencies.
- The share of domestic value added in countries in the total value added within the supply chain may decrease, making further integration into new supply chains more difficult.
- Direct sourcing of key raw materials from countries, particularly in sub-Saharan Africa, that would not comply with a due diligence law could cease and be replaced by indirect supplies from countries that disregard the goal of protecting people and the environment via due diligence laws. Transaction costs to avoid circumvention would rise in a game of "hare and hedgehog". Germany's political influence on unsafe countries would thus be weakened; the people in the countries themselves would be left alone.

Conclusion: The results of integrating supplier countries into global supply chains without legal requirements through due diligence laws show that many developing countries have succeeded in participating in global supply chains. In this context, unlike the textile industry, for example, the machinery and equipment industry shows that the three high-income regions in North America, Europe and East Asia have been able to maintain their traditional supremacy for longer thanks to the control of companies' technical know-how and the use of buyer preferences for heterogeneous products.

However, this by no means excludes the fact that developing regions have not been able to acquire important supplier functions in mechanical and plant engineering. In fact, they succeeded to a greater extent than in the textile and clothing industry, mainly by tying suppliers from neighboring regions with higher incomes (and correspondingly higher qualification levels of the workforce), for example in Central Europe (tied to Western Europe) or within the NAFTA region (Mexico to the USA/Canada) or in Southeast Asia (to Japan). In the absence of these ties, suppliers in the mechanical engineering sector either produced for a protected domestic market with little potential for expansion (South America) or remained at the level of raw material suppliers (sub-Saharan Africa).

For the mechanical and plant engineering sector, this means that successes in the spatial expansion of supply chains beyond neighboring regions in the past required above all the support of potential suppliers through economic policies geared to open markets and through targeted promotion policies in the home countries on the one hand, and through technology transfer by foreign companies to local suppliers on the other. Such success could be observed in Central Europe and in Southeast Asia, but not in South America, if one excludes Mexico as a member of NAFTA.

Once introduced, a due diligence law will particularly affect those suppliers that offer the best working conditions on average within the countries concerned. In the worst-case scenario, the human rights situation in such countries could therefore be worsened by a due diligence law.

5 Possible opportunities and limits of a statutory regulation for companies in the mechanical and plant engineering sector

The thoroughly skeptical view of empirical economic research on the possible positive effects of a legally fixed obligation to protect human rights and environmental protection via a due diligence law is countered by the argument that such a law could induce companies to strive for the goal of sustainability more strongly than through voluntary commitments (corporate social responsibility). In doing so, they would strengthen their reputation with customers who demand sustainability and achieve “first mover” gains over competitors who neglect sustainability goals (Görg et al., 2021).

Indeed, it can be shown that foreign companies that actively and voluntarily contributed through investments to improving relations between local suppliers in African countries and foreign parent companies and to improving the qualifications of employees of local suppliers improved the wage situation of the employees there and thus demonstrated more responsibility for the employees than other companies (Görg et al., 2018). There is thus much to suggest that the implementation of the law and, above all, the monitoring of efforts by state institutions will appreciate companies' own efforts and experiences to date and use them as a basis for possibly more far-reaching legal regulations.

Before evaluating this argument, however, an analysis should be made of the probable challenges that the mechanical and plant engineering sector will face in the future in terms of structural change. Here, economic research recognizes three major drivers of structural change: demand-related structural change in its sectoral and, above all, spatial effects, globalization-related structural change and, thirdly, technology-related structural change. Interrelations Between the three drivers there are interrelations.

The demand-related structural change in mechanical and plant engineering can include the following scenarios:

- In the ageing industrialized countries, the structure of demand will continue to shift from the manufacturing sector to services, which will also affect mechanical and plant engineering.
- As income levels and education levels rise, consumers will increasingly demand sustainably produced goods. Criteria for greater sustainability will be the longer economic and technical service life, ease of repair, reusability in the circular economy and, last but not least, the risk that the current use of inputs will have a negative impact on the later use of resources.
- In the emerging markets, but above all in the developing countries, mechanical and plant engineering will face rising domestic demand, which is not likely to be met solely from the old industrialized countries, but also by increasing shares of value added in the home country.
- Within mechanical and plant engineering, relatively labor-intensive assembly steps will be increasingly determined by the digitalization of production and the use of artificial intelligence (e.g. in quality, durability and replacement control).

The structural changes brought about by globalization may lead to

- Suppliers from emerging countries are increasingly conquering markets in poorer countries with standardized products that are adapted to local income and usage conditions, and are also setting up production facilities being close to the raw material base.
- Traditionally leading suppliers in the mechanical and plant engineering sector are countering this competitive pressure from emerging markets by also investing more heavily than before in developing countries.
- Securing access to raw material sources in a more geostrategic orientation than in the past of important supplier nations such as China is also becoming more important for mechanical and plant engineering and may, for example, require more own investments in the raw materials sector, including in marine mining.
- Control of intellectual property rights over software will become more important than control over the physical capital stock.
- The question of who can anchor and enforce new industrial norms and standards at the international level will become of central importance for competitiveness, especially in times of geopolitical conflict.

Technology-induced structural change can be divided into an exogenously determined component (inventions) and an endogenous component determined by political framework conditions and the incentives they provide. In the following, only the endogenous components relevant to due diligence laws will be discussed. These may include that

- the rising prices for resource consumption (including CO₂ prices, but also prices for water and land use) will induce resource-saving technical progress.
- more sustainability in the sense of recyclability, longevity, repair efficiency, but also protection of people from noise and pollutants will shape the entire sector in industrialized countries and later also in emerging countries, because economic policy will adopt and enforce administrative guidelines such as the so-called technical instructions (air, for protection against noise) by regulatory law.
- Digitalization, miniaturization and new materials (3D printing) can lead to services that are complementary to physical production becoming more important as a basis for competitiveness. However, cross-border trade in services, especially of a digital nature, such as trade in software, is considerably more complex than trade in goods (there are four so-called modes of supply instead of only one as in trade in goods). Thus, a due diligence law reaches its implementation limits more quickly in trade in services than in trade in goods.

If companies in the machinery and equipment sector did not recognize or knowingly ignored these developments, a due diligence law could be understood as a salutary constraint from a more far-sighted legislator. Indeed, the analyses of Görg et al. (2018) point to an important difference between declarations of intent to make voluntary commitments (CSR words) and actual activities (CSR deeds). For the latter, there is evidence that

- German industrial companies in general, including owner-managed and family-run small and medium-sized enterprises (SMEs), and the mechanical and plant engineering sector in

particular, have for years been steadily converting their supply chains to more resource-efficient production methods, partly as a result of exogenous technological progress, but also partly in order to reduce dependence on deposits of important raw materials in politically insecure producing countries.

- increasing technology intensity in machinery and equipment manufacturing requires increasingly skilled rather than low-skilled labor at all levels of the supply chain, and that human rights abuses, including financial exploitation, decrease as the skill level of the workforce increases, making a law at least partially redundant.
- due to its technological intensity, mechanical and plant engineering obtains a larger share of the value added in the upstream production steps from developed countries than other industries. Human rights violations are less frequent in these countries than in developing countries. Thus, redundancy would also be expected here.
- a due diligence law should ideally be designed at EU level for all EU members, as minimum requirements for product and labor standards have also already been adopted at EU level, and should focus on the elimination of cross-border negative externalities, i.e. environmentally harmful production methods, rather than on the level of wages.
- a law of a coercive nature (as ultima ratio) should always be measured against the availability of alternatives that would also result in state intervention and would require significantly lower enforcement costs for the same result. These include the enforcement of sustainability obligations within the framework of bilateral and regional trade agreements, the use of the possibilities of existing regulations in multilateral treaties (Art XX GATT, for example), financial support for the establishment of supply chains compatible with environmental and human rights through development cooperation and, above all, the adoption of negative lists on which companies are placed that verifiably disregard human rights and environmental protection.

Specific requirements must therefore be placed on a legal regulation that makes the transition from voluntary commitments as frictionless as possible for the companies concerned:

- The legal regulations should not counteract corporate goals in the direction of greater sustainability by imposing control requirements that cannot be fulfilled by companies in supplier countries or that can only be fulfilled at an unacceptably high cost. In the mechanical and plant engineering sector, achievable requirements include above all controls over internal company production methods and processes, but not controls over general working conditions that are determined by inadequate infrastructure outside the sphere of influence of the companies.
- A legal regulation should not put companies in a conflict situation between the government of a supplier country and the requirements of the law. This situation cannot be excluded in the case of public contracts from the supplier country or participation of public companies from the supplier country in the subsidiary of the German company and could be detrimental to the business of subsidiaries.
- Legislation should consider the side effects on the whole labor market of the supplier country and in particular avoid widening the already existing gap between working and pay conditions in local partner companies in the supply chain and the rest of the labor market.

- A legal regime should give companies the benefit of the doubt and, above all, should not make them responsible for deteriorations in general working conditions resulting from bad economic policies, such as excessive import substitution policies, and/or from external shocks in the local financial markets of the supplier country.
- A legal regulation should also grant a legal hearing to those responsible in the supplier countries, as they are responsible for adopting and enforcing product and labor standards. This hearing would be particularly important if different assessments of responsibilities were to arise between the German supervisory authorities and the German companies.

Conclusion: As in all industrial sectors, the future structural change in mechanical and plant engineering will be determined by three drivers: worldwide competition between locations (globalization), changes in the demand structure and technology-related structural change. Globalization will lead to the emergence of emerging markets as important locations and thus suppliers but also consumers. Demand-driven structural change in the traditional industrialized countries, shaped by demographic change and higher income levels, will see services increasingly taking the place of industrial goods. Finally, technology-driven structural change will be resource-saving. Automation, digitalization, miniaturization and new materials will accompany this structural change exogenously (through inventions) and endogenously (through policy incentives).

There is little to suggest that the current due diligence laws alone will significantly improve working conditions in supplier countries. They are too much geared to the current state of production conditions. It will be much more important in the future that automation and digitalization in mechanical and plant engineering will mean that fewer, but far more highly qualified and thus better paid employees working under better conditions will take the place of many low-skilled and poorly paid employees, and that services will become more important as a complement to physical production. Services set different skill profiles than goods production and are oriented towards tasks within flexible groups rather than fixed jobs. The controlling institutions set up in the law should see technological change as structural change demanded by the market, not as an attempt by firms to avoid responsibility for labor in the supply chain. Then legal regulation could follow on largely without friction from the voluntary commitments already in place among companies.

As the increasing technology intensity in mechanical and plant engineering requires an increasingly skilled workforce, and against the background of a negative correlation between human rights violations and workforce qualification, technological change can make the objectives of due diligence laws largely redundant as far as the production-related (downstream) stages of the value chain are concerned. Accordingly, for the mechanical and plant engineering sector, the main focus of the control requirements imposed by the due diligence laws at EU and national level will be on production methods and working conditions in the upstream, i.e. raw material-related stages. These stages are at the beginning of supply chains and are often located in regions where governments neglect or even ignore the control of production and working conditions. In addition, demand from industrialized countries is in competition with demand from countries such as China which do not take efforts to combat poor working conditions. Here, the expansion of concerted actions against certain producing countries, both at state level (Dodd-Frank Act) and on a voluntary basis, which already exist for mineral raw materials from conflict and high-risk regions (OECD, EU Regulation), would be the better way forward than a general due diligence law. A negative list could also be used here, which would categorically exclude companies from supply chains that contravene both state and voluntary measures. However, the limits of such an approach must not be concealed. As long as the mechanical and plant engineering industry is dependent on a few production sites in insecure regions for its raw materials and as long as countries

like China cannot be integrated into a concerted approach against the violation of human rights and environmental standards, even a negative list will have only limited success.

6 Conclusions and policy recommendation

This brief report has shown that the German mechanical and plant engineering sector could potentially be strongly affected by a German or European due diligence law. Companies operating in the mechanical and plant engineering sector source at least 4.2% of their direct inputs or 16.2% of their imported inputs from countries in which serious violations of workers' rights have been observed. Due to limited data availability, not all relevant countries could be considered, so that the actual share of countries to be classified as problematic is even higher. Moreover, as the analysis is limited to workers' rights using the ITUC score, the share of intermediate products from problematic countries is likely to increase further if more human rights indicators are considered. Assuming that suppliers in these countries at least require closer scrutiny by German companies, considerable financial burdens are to be expected.

If indirect inputs are also considered, the proportion of intermediate products from countries that are problematic in terms of human rights increases to at least 8.9% of total intermediate products used. Consequently, it is of extreme importance for companies in the mechanical and plant engineering sector whether, as provided for in German law, only direct suppliers have to be actively monitored or whether the corporate duty of care also extends to indirect suppliers, as is currently being discussed at European level.

The obligation to monitor suppliers with regard to compliance with human rights and environmental standards would result in additional costs for companies. These costs are not limited to the accounting costs estimated by the federal government (2021) but also include, above all, the diffuse legal risks arising from the law and, where applicable, the costs of certification audits. Since these costs are incurred per supplier and companies will strive to minimize the costs resulting from possible lawsuits, it is rational for the affected companies to reduce the number of their suppliers and, if necessary, to relocate parts of the value chain to Germany or the EU. This shift away from the international division of labor means that companies in the mechanical and plant engineering sector lose competitiveness vis-à-vis companies outside Germany or Europe that are not subject to a due diligence law. For consumers and downstream companies, this development is reflected in the form of higher prices, whereby passing on the costs to customers could be difficult depending on the degree of competition in the industry.

Some exporting companies in developing countries could exit the German or European market due to more difficult market access, which would lead to higher unemployment or migration of workers into informal sectors which are often characterized by worse working conditions in the specific countries. In this case, the intended goal of strengthening human rights and improving working conditions in the countries concerned would not only be missed, but the existing situation would even worsen. Given that exporters are usually relatively productive companies that pay higher wages, due diligence laws also impede precisely those companies that contribute strongly to the prosperity of the local population.

While a positive list approach would face legal and administrative obstacles, an alternative to the due diligence law in its current form is a European negative list approach. This is an officially maintained list of companies with which European companies are not allowed to trade. The main advantage of such a list is that European companies would no longer be obliged to check their suppliers independently. This would not only reduce costs for importers and exporters by avoiding double checks of the same exporter by several importers. It would also avoid problematic incentives for companies to reduce the number of their suppliers, which would have negative side effects for developing countries. A negative list approach would thus be more likely to strengthen human rights in affected countries while maintaining the competitiveness of European companies.

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