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Danish productivity and competitiveness in a globalised world

Danish companies participate in the international division of labour with significant production abroad under Danish ownership, along with products being produced by foreign subsidiaries. There are indications that these activities are largely made possible by the position of strength of the Danish companies and that part of the profits from foreign activities cover the cost of employees and intellectual property rights in Denmark. Overall, there are indications of good productivity and competitiveness in manufacturing, but these trends are best illustrated at industry level and there are industries where things look weaker.

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Danish companies are increasingly participating in the international division of labour

Danish companies have significant direct investments in foreign subsidiaries, and the volume of production abroad under Danish ownership (merchanting and processing) has increased significantly in recent years. Relatively few large Danish companies are responsible for the majority of global activity. Income from activities abroad increases national income and contributes to the current account surplus.



Manufacturing abroad is an integral part of the business model of Danish companies

Production abroad under Danish ownership differs from other production in that it does not directly draw on labour in Denmark. However, there are indications that these activities are to a large extent made possible by the position of strength of the Danish companies and that part of the profits from foreign activities cover the cost of employees and intellectual property rights in Denmark. Manufacturing abroad thus contributes to the competitiveness of Danish companies.

Overall, there are indications of good productivity and competitiveness in manufacturing

Overall, there are indications of good productivity and competitiveness in manufacturing, but there are a number of sub-industries where things look weaker. Competitiveness depends on a number of factors that determine the overall conditions for companies, and it is increasingly about more than just labour costs. The different factors carry different weights across companies, and productivity and competitiveness are best analysed at industry level.

Why is it important?

In recent years, the scope of Danish companies' activities abroad has increased significantly. Understanding the impact of these activities on current account, productivity and competitiveness is crucial for assessing the Danish economy.

Main chart Good productivity growth in Danish manufacturing overall

Index 2000=1



Note: The chart shows real GVA per hour. For Denmark, revenue from merchanting has been added to Statistics Denmark's figures for manufacturing, as Statistics Denmark (unlike foreign statistical agencies) include merchanting in trading activities. The Danish figures then become comparable with those of other countries.

Source: OECD, Bureau of Economic Analysis and Statistics Sweden.



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01 Danish companies are increasingly producing globally

Danish companies are increasingly having their goods and services produced abroad. This chapter documents how production abroad has developed over time and how it is distributed across companies and industries. The chapter also explains the different ways in which production abroad can be organised and highlights how such activities affect the current account and GDP.

Denmark is a small, open economy that has, and historically has had, significant foreign trade. This trade consists largely of conventional trade in goods across borders, and trade in services across countries. There is also a significant degree of financial integration, with investors spreading their holdings of securities across countries. However, other types of international activities have become more important in recent years. This includes Danish companies increasingly having their goods and services produced abroad, and foreign companies also have production in Denmark. Such activities can affect the interpretation of key economic variables such as production, productivity and competitiveness.

There are several reasons why Danish companies place part of their production abroad: In some cases, it may make sense to locate production close to the markets where the products are sold. There may also be cost considerations, so labour-intensive production is increasingly likely to take place in countries where wages are lower than in Denmark. By organising production across countries, large companies, in particular, can also find it easier to find sufficient qualified labour in certain areas. The increased use of manufacturing abroad may be underpinned by advances in information and communication technology.

Production abroad is organised in several ways. Traditionally, foreign direct investment, FDI, has played a significant role. FDI entails a Danish company buying or establishing a foreign subsidiary. The subsidiary will typically buy materials that it processes and sells a processed product on. In connection with production, the parent company will often receive royalties from the subsidiary as payment for the use of intellectual property.¹ The Danish parent company will also receive the subsidiary's profit after tax as income – categorised in the national accounts as *return on FDI*.

Ways of organising production abroad other than FDI have become more important in recent years. As an alternative to the subsidiary buying raw materials and selling their product, Danish companies can instead take ownership of the products they have processed abroad. This is referred to as *processing*. In other instances, there will be no processing of the goods that the Danish company owns abroad. The company will instead buy a product in one country and sell it on in another country in unchanged form. This is known as *merchanting*. Merchanting can, for example, include "pure" wholesale of raw materials, but also cases where the Danish company buys finished goods for

¹ Intellectual property includes research and development, oil, gas and mineral exploration, computer software, original works of art and entertainment, etc.

resale and may influence the production of the foreign company from which the goods are purchased (for example, in the form of ownership).

Merchanting activities are particularly prevalent in wholesale and manufacturing industry, while processing primarily takes place in manufacturing. In practice, the distinction between merchanting and processing is not always clear cut, as whether processing has taken place or whether the goods could be considered unchanged is ambiguous. In the analysis, merchanting and processing will collectively be referred to as M&P. They are also sometimes referred to as "exports that do not cross the Danish border" or "production abroad under Danish ownership".

The volume of merchanting and processing and foreign direct investments has grown significantly

In line with globalisation, the scope of Danish companies' activities abroad has grown significantly. Statistics Denmark has calculated the volume of processing since 2010. In the years leading up to 2021, processing exports fluctuated between 1.3 and 3.1 per cent of GDP, see chart 1. Since then, however, the volume of processing exports has increased significantly, reaching 8.2 per cent of GDP in 2024. Although there has also been an increase in inbound processing activities, the net contribution to the trade balance was 6.6 per cent of GDP in 2024, see chart 2. The increase in merchanting activities has been more moderate, reaching 2.2 per cent of GDP in 2023. Merchanting is a net concept and is therefore only included on the export side of the current account.

In the period 2010-24, net returns from FDI for companies almost doubled when calculated as a share of GDP, see chart 2. This reflects that there has been a significant increase in foreign direct investment by Danish companies, while foreign companies have only modestly increased their direct investments in Denmark. Danish subsidiaries producing abroad will often utilise intellectual property rights in the form of patents that belong to the parent company. The subsidiary compensates the parent company by paying royalties and with the increase in foreign direct investments, the income from royalties has also increased.

CHART 1

Increasing activity in foreign manufacturing

International manufacturing is the main contributor to increasing exports



Note: *Merchanting* is only calculated as net exports.

Source: Statistics Denmark, DataBank table BBQ, UHQ and NAHL2.

CHART 2



Note: *Merchanting* is only calculated as net exports. Source: Statistics Denmark, DataBank table BBQ, UHQ and NAHL2.

Net processing activities now contribute the most

Whether a company owns a product directly, as with M&P, or owns 100 per cent of another company that owns the product instead, as is often the case with FDI, is not necessarily of great economic importance to the company. In principle, the same physical activity can often generate revenue as a combination of FDI and royalties or as M&P. However, in relation to national accounts, how revenues are distributed between FDI, royalties and M&P is key. For example, M&P returns and royalties are included in Danish gross domestic product, GDP, while this is not the case with FDI. In all cases, however, the return will be included in Gross National Income, GNI. Overall, the contribution to GNI from international activities has increased since 2010, see chart 3. Returns on M&P, royalties and FDI are all included in the current account, but where M&P and royalties come in via the trade balance, returns on FDI are recognised as income.

The royalty payment from the subsidiary to the parent company must follow the principles embedded in the transfer-pricing rules and thus must be made on a market basis.² However, it is difficult to determine whether the royalties paid accurately reflect the benefits a subsidiary receives from being part of a Danish group. To the extent that the transactions recorded in the national accounts do not correspond exactly to the principles of the transfer pricing rules, for example, due to measurement problems, the value added attributed to Danish production in the national accounts may vary depending on which production structure Danish groups choose.

When royalty payments are correctly priced, the calculation of Danish GDP will not be affected by the choice of production structure. The profits generated in Denmark via M&P would, in the case of foreign ownership of the goods, have been transferred to Denmark as royalties instead. If royalty payments are too high or too low, it will result in too much or too little profit in Denmark, and thus too much or too little gross value added, GVA, in Denmark. Either way, the current account and GNI will remain largely unchanged. Box 1 explains how international production structures affect key variables in the national accounts.³

Chart 4 illustrates the importance of M&P and royalties in the manufacturing industry, where they accounted for 36 per cent of total value added in 2023. The manufacturing industry's net return from FDI is more moderate. This reflects that the income from Danish companies' direct investments in foreign subsidiaries is to some extent offset by the return on foreign direct investments in Danish companies.

BOX 1

Companies can organise their production in different ways

Danish companies have different ways of organising their production. In a small country with large global companies, the location where production takes place is especially important. Denmark's gross domestic product and the current account are increasingly influenced by global production, and in order to analyse productivity and competitiveness, it is therefore important to understand how global production is included in the national accounts. The following examples and accompanying illustration show different production structures.

Continues ...

² See the Danish Tax Agency info (*link*).

³ See also Jørgensen et al. (2018) for a discussion of how globalised production affects different indicators in the national accounts. See the Danish Economic Councils (2024a and 2024b) for analyses of how companies use M&P and how it affects the Danish economy. ... continued

Conventional goods exports from Denmark

Conventional exports of goods refers to a company producing a product in or importing the product to Denmark and then selling it abroad. For example, if the product is produced by automated production in, or imported to, Denmark, the production will not directly require employees in Denmark. Intermediate consumption includes the import of raw materials and/or machinery, as well as equipment for maintenance for automated production. With this type of production, intermediate consumption and value added will be included in Denmark's total production in the national accounts. The sale of the product abroad minus the cost of importing inputs for the production of the product will be included in the current account as net exports, see the first example in chart A.

Processing export

A company produces or purchases a raw material and then has it processed abroad before final sale. Here, intermediate consumption will also be included in total revenues. Intermediate consumption takes place abroad, but covers the purchase of raw materials and the remuneration of labour in the foreign company. GVA comes from the profit after remuneration of labour, capital and purchase of goods. The sale of the product minus the costs of imported inputs into production will be included in the current account as net exports in the trade balance.

Merchanting

A company buys a product, possibly just raw materials, abroad and sells it to a third party abroad without being involved in the production of the product. For example, a Danish company may have developed a product that it gets a foreign company to produce with an agreement to subsequently buy the finished product, which is resold at a higher price. In this situation, only GVA (unchanged from the previous examples) and not intermediate consumption is included in Danish production. However, net exports are the same as in the previous examples, where they are the difference between the purchase and selling price of the product abroad.

Production by foreign subsidiaries

Danish companies can choose to have their foreign subsidiaries, acquired through FDI, handle production and sales. In this example, the subsidiary has full ownership of the product. Intermediate consumption and GVA therefore do not accrue to Denmark but instead to the country where the subsidiary is located. If patent rights owned by the Danish parent company are used in production, the subsidiary must pay the Danish owner for the use of the patents. These are called royalty payments, and will be included as Danish GVA and as Danish exports of services in the trade balance. In this case, there will be no Danish export of goods, as the foreign subsidiary owns the goods. However, profits from the subsidiary's sales are recognised in the current account as income in the form of net returns on FDI.

Chart A

Gross value added depends on how companies organise their production



Note: The illustration shows four different ways in which Danish companies can organise their production and how such organisation affects the calculation of production and the current account in the national accounts. The columns should be seen in relation to the other production structures on the first axis.

Source: Danmarks Nationalbank.





Note: Other GDP including terms of trade covers GDP excluding M&P activities and royalties and terms of trade effects. Terms of trade made a significant negative contribution in 2023.

Source: Statistics Denmark and Danmarks Nationalbank

CHART 4

Significance of M&P and royalties for manufacturing industry



Note: For M&P, no industry disaggregated data is available before 2016. The chart does not show traditional GNI, but approximated GNI based on GVA.

Source: Statistics Denmark and Danmarks Nationalbank.

Foreign activities included in the current account

With the exception of one year, Denmark has had a current account surplus since 1990, see chart 5. From 2010-23, the surplus averaged 8.1 per cent of GDP. The surplus is a reflection of savings exceeding investments at a national level. From this perspective, the current account primarily reflects the fact that Denmark has high savings as a share of GDP, while investments are on par with those of comparable countries. Companies in particular save more than they invest, although the large increase in the current account surplus around 2008-09 reflects an increase in the household savings surplus, see chart 6.⁴ There has also been a positive contribution to savings from the public sector for significant periods.

CHART 6

Substantial current account surplus over a number of years

The level has been high, especially after the financial crisis



Source: Statistics Denmark.

Company savings contribute significantly to the current account surplus



Note: Financial companies include banks and mortgage credit institutions, investment funds, insurance and pension companies and holding companies.

Source: Statistics Denmark.

The current account can also be considered in terms of its individual

components. Traditionally, the current account is divided into the trade balance, net investment income and other items. Chart 7 shows that Denmark has had a trade surplus for decades, which includes trade in goods and services. Investment income is the return on Danish investments abroad minus the return on foreign investment in Denmark. While net investment income was previously negative, it has been positive since 2005. This should be seen in light of the fact that Denmark's net foreign assets became positive around that time. The other items primarily reflect Denmark's development aid and net payments to the EU and therefore contribute negatively to the current account.

Both the trade balance and net investment income contribute positively to the current account



Source: Statistics Denmark.

Chart 8 focuses on the contributions of companies' activities abroad and the four aspects of *global production* (FDI returns, royalties, merchanting and processing) are all depicted in different shades of grey. The net contribution from global production as a share of GDP has increased by approximately 7 percentage points since 2010, while the net contribution from the other items has decreased and was moderately negative in 2023. These other items make up the part of the current account that is not directly related to global production. They are imports and exports of goods and services produced in Denmark, the net return on the part of the international investment position not categorised as FDI, and net current transfers.

The fact that income from other items has been modest on average in recent years is merely an accounting consideration. It cannot be taken to mean that the current account surplus would have been close to zero in the absence of international activities. The analysis in chapter 2 indicates that M&P revenues are used to pay domestic labour and intellectual property rights, among other things, and thus support imports via private consumption. Shareholder wealth will be increase because of dividend payments and the portion of profits retained as savings in the company and reflected in rising equity prices. This also contributes to consumption and therefore imports.

Income from international activities thus finds its way into the economy through various channels and affects the 'other' items in the current account. The current account covers large gross positions, see chart 9. In the long term, all income will in principle be converted into consumption, so it is not obvious that the increasingly global organisation of companies' production will lead to a permanently higher current account surplus. However, there are indications that countries with significant merchanting exports have larger current account

surpluses than other countries. This may reflect that companies use merchanting revenues to invest abroad rather than expanding their domestic capital stock.⁵ A particular issue also concerns the portion of profits that accrue to business foundations through their ownership of companies. The foundations often have a very long horizon and their funds may therefore only very gradually affect demand and thus the other items in the current account.

CHART 8

Contributions from the activities of Danish companies abroad make up a large share of the current account surplus



Note: In 2022, the shipping industry received an extraordinary boost in the form of higher shipping rates. This explains the large increase in "other items". Source: Statistics Denmark.

CHART 9

International activities account for only a small share of the current account from a gross perspective



Note: The line in the chart, BB, indicates the total current account as a percentage of GDP.

Source: Statistics Denmark UHQ, NAN1 and BBY.

Large contributions from international activities compared to other countries

There are indications that international activities are relatively more important in Denmark compared to most other countries. Chart 10 shows that Denmark ranks relatively high in terms of merchanting revenue. This should also be seen in light of the fact that the actual prevalence of merchanting in Denmark compared to some other countries in the chart may be underestimated for two reasons. Firstly, the merchanting activities in selected countries may reflect that some companies have a tax incentive to place profits in those countries.⁶ Secondly, the relatively high recorded prevalence of merchanting in some countries may reflect differences in reporting and publishing methods. In international statistics, goods exports are typically only divided into general trade and merchanting. The part of the trade in goods that should really be categorised as processing is thus partially included in the calculation of merchanting in a number of countries.

Denmark has a substantial amount of merchanting relative to comparable countries



Note: The chart shows merchanting exports as a share of GDP in 2023 Source: OECD.

Of the OECD countries, apart from Denmark, only Germany and Austria publish data for processing. If the German and Austrian current account is displayed as in chart 8, the picture is markedly different from Denmark. Like Denmark, Germany has a significant current account surplus, but the German surplus is dominated by the conventional components, whereas the net contribution from M&P is modest, see chart 11. Austria has a relatively modest current account surplus and processing plays virtually no role, see chart 12.

CHART 11

Germany's current account surplus is not mainly due to production abroad



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Source: OECD and DESTATIS

CHART 12

Austria's current account surplus reflects global production but is relatively modest



Source: OECD and OENB

International manufacturing is concentrated in large companies in selected industries

Despite the significant revenues from production abroad, relatively few Danish companies are directly involved.⁷ Approximately 2,300 companies have this type of activity, the vast majority of which have conducted FDI, see chart 13. Only around 120 companies have exports in the form of merchanting or processing. Even among the relatively few companies with M&P activities, the concentration is significant. The 10 per cent of companies with the highest M&P exports accounted for 89 per cent of total M&P exports in 2023, see chart 14. The significant increase in M&P activities in recent years is largely driven by these companies, while the contribution to the total growth in M&P activities from other companies has been more subdued.

CHART 13

A smaller group of large companies have international operations



Note: Data for 2023. The three categories are not mutually exclusive, as a company can be involved in more than one of the activities.

Source: Own calculations based on data from Statistics Denmark and Danmarks Nationalbank.

CHART 14





Note: Companies with M&P in the top 10 per cent are those that were among the 10 per cent with the highest M&P out of all companies with M&P activities in each year.

Source: Own calculations based on data from Statistics Denmark and Danmarks Nationalbank.

Mainly large companies have production abroad. This is especially true for companies with processing, where the median company had an average of approximately 3,200 employees in 2023. The vast majority of processing activities took place in manufacturing companies, see chart 15. Companies with merchanting activities were less concentrated in one industry. They are also generally somewhat smaller than companies with processing activities, but with an average of around 1,300 employees, they are still large. The return from foreign direct investments is more broadly distributed across industries than M&P exports, as more companies from a wider part of the economy have made

⁷ The results in this section are based on data on merchanting and processing from Statistics Denmark, data on foreign direct investments collected by Danmarks Nationalbank and accounting data from Bisnode. All datasets are at company level and are matched using the companies' CVR number. They are then aggregated to group level using ownership data. Companies owned by other companies (with an ownership share of more than 50 per cent) are considered to belong to the same group as the parent company. However, industry breakdowns are based on data at company level. For foundation-owned companies, the owning foundation is not included in the group definition. Holding companies are included in the group definition regardless of their industry affiliation. such investments, see chart 16. On average, companies with FDI had 215 employees in 2023.

CHART 15

M&P is especially concentrated in manufacturing



CHART 16

Net income from FDI primarily accrues to manufacturing and services



Note: *For confidentiality reasons, other sectors cannot be shown separately for processing and are therefore included in services. Data for 2023. Note: Data for 2023. Source: Danmarks Nationalbank.

One form of production abroad does not exclude the others and companies using M&P often own foreign production facilities themselves. 78 per cent of companies with over 100 employees involved in merchanting or processing have made foreign direct investments, compared to just 30 per cent of other companies with over 100 employees. In a number of cases, M&P activities are organised such that the companies' own foreign subsidiaries are responsible for processing activities or sell the goods that are subsequently exported as merchanting to the Danish company.

Compared to other larger companies (with over 100 employees), there are indications that the larger companies with foreign operations are doing well. Their profit margin thus exceeds that of other large companies, see chart 17. This gives rise to significant savings, so despite also investing more than other companies, they have a high net lending.⁸

⁸ Net lending is an expression of companies' financial savings and is calculated by subtracting investments from total savings. Although from the perspective of the individual company, FDI is probably often considered on par with investment in the domestic production apparatus, it is not deducted in the calculation of net lending. This contributes to companies with FDI activities having higher net lending than other companies, see Andersen et al. (2024).

Source: Own calculations based on data from Statistics Denmark and Danmarks Nationalbank.

Companies with international operations have high savings, invest a lot and have high profits...



Companies with M&P activities (+100 employees)
Companies with FDI (but not M&P) (+100 employees)
Other companies (+100 employees)

Note: Data for 2023. Net lending is defined as in Andersen et al. (2024). The median illustrates the characteristics of the typical company with international operations. A chart based on averages shows the same qualitative picture, but large companies with international activities pull the average up somewhat.

Source: Own calculations based on data from Statistics Denmark and Danmarks Nationalbank.

CHART 18

...and they make up a large part of the economy



Note: The chart shows the share of the total for non-financial corporations and holding companies accounted for by the two groups of companies. Data for 2023. Only non-financial corporations and holding companies with at least 1 employee are included in the chart, excluding subsidiaries of foreign companies. *FDI* = foreign direct investment (assets). Companies are defined as having FDI if they have foreign direct investments, regardless of whether they generate net income from them.

Source: Own calculations based on data from Statistics Denmark and Danmarks Nationalbank.

Although only a relatively small number of companies are involved in international production, their size and profits make them very important to the Danish economy. In 2023, they accounted for around a third of employment and just over half of value added among Danish non-financial corporations and holding companies, see chart 18. The just over 100 companies with merchanting and processing activities alone accounted for 27 per cent of the value added and 10 per cent of employment in non-financial corporations. Companies with international activities account for 87 per cent of net lending among Danish companies.

02 Merchanting and processing is an integral part of companies' business model

This chapter discusses how companies' profits abroad are related to their activities on Danish soil. This has implications for the interpretation of company productivity and competitiveness.

Merchanting and processing differs from other production in that it does not directly draw on labour in Denmark. It thus contributes to boosting companies' profits without necessarily leading to an immediate increase in domestic labour costs, and an increase in the return on M&P can therefore be considered pure profit. For unchanged domestic employment, an increase in M&P revenue will lead to a reduction in the companies' wage share and an increase in the profit share. However, there will be an indirect effect on domestic employment if an expansion of production abroad results in increased Danish employment, for example, related to organising the new production.

It has sometimes been argued that it gives a better picture of developments in the Danish economy if the contribution from Danish companies' activities abroad is disregarded. In this context, however, the specific issue under consideration is important. It can be argued that fluctuations in the demand for domestic labour and thus capacity pressure in the Danish economy within the typical forecast horizon of 2-3 years primarily depend on the production that takes place on Danish soil.⁹ Against this background, it is often appropriate to disregard the contribution from M&P when assessing capacity pressures in the Danish economy and thus labour market tightness in the short term.

It has also been discussed whether disregarding revenue from M&P to some extent gives a more accurate picture of Danish companies' productivity and competitiveness.¹⁰ This view is based on the assumption that these activities are not, or only to a limited extent, related to the companies' domestic activities. However, this chapter argues that profits abroad are largely made possible by the companies' activities at home. Against this background, ignoring the foreign activities that are an integral part of a company's business model will not give an accurate picture of productivity and competitiveness.

M&P should not be considered in isolation from the company's other activities

One indication that M&P activities build on companies' other activities can be obtained by looking at the distribution of M&P returns across the remuneration of capital and labour. Wages for foreign labour only accounted for approximately 12 per cent of the total value added in processing in manufacturing in 2023, with the remaining approximately 88 per cent going to capital, see chart 19.¹¹ in contrast, wages in Danish manufacturing companies account for approximately 50 per cent of total GVA for activities taking place on

⁹ See, for example, Danmarks Nationalbank (2024) and the Danish Economic Councils (2024c). ¹⁰ See Pedersen et al. (2019), which proposes various corrections for value creation from production abroad.

¹¹ It is this 87 per cent that is included in the Danish company's GVA, whereas wages for foreign employees are included in the national accounts as imports of processing services.

Danish soil, see chart 20. This is slightly less than for the economy as a whole, reflecting the fact that manufacturing is relatively capital-intensive. In the pharmaceutical industry, where intellectual property rights play a major role, the wage share in their domestic activities is approximately 28 per cent.¹²

CHART 19

CHART 20

Remuneration of factors of production in Danish processing income



Remuneration of factors of production in the Danish economy excluding processing



Source: Own calculations based on data from Statistics Denmark and Danmarks Nationalbank.

A very low wage share in processing would seem to indicate that foreign labour is paid very poorly relative to its value. However, it is more likely to reflect that foreign production benefits from being part of a Danish group. This could be in the form of knowledge gained through research and development in Denmark, marketing and brand value, or management and organisation of production. In the case of production in foreign subsidiaries, the use of intellectual property rights would be reflected in the form of royalties to the Danish parent company. However, with M&P, all costs for domestic activities that support profits abroad must be covered by the profits from the foreign production.

In any case, the observed returns of the production factors must be a reflection of the Danish company's position of strength. In this context, a position of strength can reflect strong products and brands, possibly supported by intellectual property rights, or that the company is well-organised, something it can utilise to create efficient production in other countries. Alternatively, other companies could establish themselves in the country where the processing activity takes place and achieve correspondingly high profits. This would contribute to increased competition and reduce prices and profits and thus the returns on capital.

Indications that revenue from M&P is used to pay labour in Denmark

The fact that profits from processing are largely made possible through the Danish company's position of strength means that it must contribute to covering costs in Denmark. This may include labour costs related to management and marketing, as well as costs associated with intellectual property rights in the

 $^{\rm 12}$ When calculating the wage share, wages for research and development activities being counted as an investment is taken into account.

Note: Data for 2023.

Source: Own calculations based on data from Statistics Denmark and Danmarks Nationalbank.

Note: Data for 2023.

form of research and development. In the national accounts, the direct labour costs of research and development (salaries for researchers) are counted as an investment rather than a cost, as research activities contribute to the creation of intangible capital in the form of patents. The costs associated with research and development activities come from the value of the patents subsequently being amortised.¹³ In this way, the immediate labour costs for research and development actually reflect the cost of generating new knowledge, although they are initially recorded as an investment and only become an expense when the investment is amortised.

Chart 21 supports the hypothesis that revenue from activities abroad is an integral part of the companies' business model and thus also covers domestic expenses. The chart shows that 84 per cent of companies with M&P were profitable in 2023. However, if revenue from M&P is mechanically disregarded, only around 60 per cent of companies are profitable, and this share has remained relatively stable over a number of years. In comparison, 69 per cent of all Danish companies made a profit in the same year.

The hypothesis that revenue from M&P is used to pay for labour and intellectual property rights in Denmark can also be substantiated by focusing on the ten industrial companies with the largest exports. Chart 22 shows that since 2016, the profit margin for those companies has been significantly higher than that for all industrial companies. However, excluding revenue from M&P, the profit margin for the top ten exporting industrial companies has been modest, and even negative in 2023.

CHART 21

CHART 22

If M&P is excluded, 40 per cent of companies with M&P made a loss



Source: Own calculations based on data from Statistics Denmark and Danmarks Nationalbank.





Note: The grey lines are the ten industrial companies with the highest exports in 2023.

Source: Own calculations based on data from Statistics Denmark and Danmarks Nationalbank.

If the value added of domestic activities is as modest as indicated by the calculations where M&P is removed, then unprofitable activities in Denmark should in principle cease and companies should concentrate on activities abroad instead. The fact that this does not happen is an indication that foreign activities

¹³ In national accounting terms, this is the consumption of fixed capital.

cannot stand alone, but are dependent on the position of strength that the company has developed based on activities in the Danish headquarters. Most companies with M&P activities are large and profitable companies. Their involvement in M&P activities reflects that it has made sense for them to relocate their production to other countries for various reasons.

While it does not seem appropriate to disregard all of the revenue that reflects activities abroad, it could be argued that at least part of profit from abroad should be attributed to the foreign activities. Chart 22 therefore illustrates a hypothetical profit margin based on the assumption that the companies' employees generate the same value added relative to wages regardless of the country in which they are employed. This means that part of profits is attributed to foreign entities at the expense of profits attributed to the company in Denmark. Under this assumption, large companies with M&P activities have high profits in Denmark compared to other companies without M&P activities.

For the individual company, and thus also typically in a macroeconomic context, there is therefore no point in looking separately at the part of production that takes place in Denmark and exclude the part that takes place abroad under Danish ownership. As an alternative to having production in the form of processing abroad, the company could build a production facility in Denmark instead. Due to higher Danish wages, this production facility could conceivably be based more on machines rather than employees. In such a situation, however, there would be no doubt that the added value generated by automated production should be attributed to the Danish headquarters.

03 Overall indications of good productivity and

competitiveness in the manufacturing industry

Analysing the current account and companies' profits leads naturally into a discussion of productivity and competitiveness. This chapter sheds light on productivity and competitiveness in manufacturing and compares developments in Denmark with those in other countries. It highlights a number of reservations in relation to the interpretation of indicators of competitiveness.

Productivity indicates the ability of companies to produce goods and services based on their input of capital and labour. A relatively simple approach is to look at the amount of goods and services generated per hour worked or per person employed. More sophisticated estimates also take into account the size and composition of the capital stock. This includes physical capital in the form of machinery and buildings, as well as the intangible assets that companies have at their disposal, i.e. in the form of patents.

The growth of productivity is crucial for the development of society's overall prosperity. While prosperity also depends on factors such as employment and the prices of a country's goods compared to the prices of imports from abroad (the terms of trade), there are limits to how much these factors can contribute. Although labour market reforms, for example, have helped to increase employment, a sustained trend towards ever increasing working hours per capita is hardly realistic. On the other hand, there is no limit in principle to how much productivity can be increased through new production methods made possible by the continuous creation of new technology and knowledge. Advances in productivity are therefore the key driver of a country's long-term growth and prosperity.

Competitiveness describes the ability of Danish companies to compete with companies in other countries. This can be on the export markets, where Danish companies compete with both domestic manufacturers and exporters from other countries, but also on the Danish market, where a large number of foreign manufacturers are present. Competitiveness is a broad concept and, as discussed below, there is no clear-cut definition of what it describes. The definition depends on a wide range of factors that determine a company's overall circumstances and is therefore about much more than just labour costs. There is a clear link between productivity and competitiveness, so improving productivity will, all else being equal, help boost competitiveness.

While productivity is crucial to long-term prosperity, competitiveness can be linked to the current account. The current account is often viewed from a savings/investment perspective, but a current account surplus can also be seen as a sign of good competitiveness in the sense that there is high demand for Danish goods and services compared to those produced in other countries. High demand for Danish goods on the domestic market will tend to reduce imports, while on international markets it will support Danish exports. Both factors work in favour of increasing the trade surplus, which is an important element in the overall current account.

Against this background, the large Danish current account could be taken as an indication of good competitiveness among Danish export companies. In practice, however, the current account depends on a wide range of factors and there is no clear link between the current account and competitiveness. The International Monetary Fund, IMF, calculates an 'EBA norm'¹⁴ for each country, which can be considered a benchmark for the current account and which depends on a number of country-specific factors. For Denmark, the IMF finds an EBA norm of 6.3 per cent of GDP in 2023.¹⁵ The IMF also notes that the calculated norm does not reflect all relevant factors. Regardless of competitiveness therefore, Denmark is expected to have a significant current account surplus.

Competitiveness depends on many factors

Overall, competitiveness is a measure of how companies in a country are doing compared to competing companies in other countries. Competitiveness therefore depends on a wide range of factors. This includes access to highly skilled labour. A country's research and education sector plays a crucial role in this, but the presence of a well-functioning healthcare system and childcare facilities, as well as a wide range of other conditions that enable people to be effective in the labour market, are also important. Another important competitiveness parameter often emphasised, is appropriately designed business regulation that achieves the desired results for society without imposing unnecessary burdens on businesses, as well as the importance of a country's infrastructure. Furthermore, costs – including wages, but also other production costs and taxes – plays a role. The importance of the different factors varies significantly across industries.

There is a close link between competitiveness and companies' productivity. Many of the factors mentioned above contribute to competitiveness by supporting productivity. This can be through new innovative products conceived by a skilled labour force and that can be sold at relatively high prices. A flexible regulatory framework that avoids unnecessary bureaucracy also supports productivity by enabling employees to focus on the core business of the company. Finally, a well-functioning infrastructure will support access to employees and other inputs in production and make it easier to sell products on global markets.

The organisation IMD, International Institute for Management Development, publishes an annual competitiveness indicator for a wide range of countries based on 59 individual criteria.¹⁶ The criteria are grouped under four main headings: Economic Performance, Government Efficiency, Business Efficiency and Infrastructure. Based on this ranking, Denmark was the third most competitive country in the world in 2024, reflecting a top ranking in Business Efficiency and a second place in Infrastructure. The two single areas that drag down the most are high prices and high taxes. The Ministry of Industry, Business and Financial Affairs has a similarly broad perspective in its approach to growth and competitiveness. The ministry concluded in 2023 that a competitive regulatory framework, a well-developed infrastructure, a flexible labour market, sound public finances and a high level of investment in research and development all contributed to strong competitiveness.¹⁷

¹⁴ EBA is an abbreviation for External Balance Assessment. For details on the methodology, see Allen et al.

^{(2023).} ¹⁵ See IMF (2024), Annex III.

¹⁶ See IMD (*link*).

¹⁷ See the Ministry of Industry, Business and Financial Affairs (2023).

The *Draghi report* on Europe's competitiveness is very much about productivity and economic growth.¹⁸ Specifically, it lists three ways to restore sustainable growth in Europe: Firstly, the innovation gap with the US and China must be closed, especially when it comes to advanced technologies. Secondly, a plan for how the green transition can contribute to Europe's competitiveness must be developed. And thirdly, action must be taken to strengthen Europe's security and reduce dependencies on other countries, including China.

Danmarks Nationalbank's traditional indicators point to good competitiveness in manufacturing overall

Danmarks Nationalbank has typically used three indicators of the competitiveness of Danish companies: Wages, unit labour costs and the wage share. All indicators are assessed relative to foreign competitors.¹⁹ The focus for all three indicators is on manufacturing, which, unlike many services, is exposed to international competition. It is also easier to measure production in manufacturing than in the services, making international comparisons more reliable.

As discussed below, these indicators should be interpreted subject to a number of caveats. Indicators of competitiveness, where production volumes and values are assessed relative to labour costs, largely reflect the amount of capital employed, including intellectual property. As such, they do not say much about wages relative to other countries, and thus about wage competitiveness in a narrow sense. The changes in production structures over the past decades have further complicated the interpretation of the indicators.

Relative wage growth, which illustrates wages abroad compared to Danish wages, is a conventional measure of wage competitiveness. It is also the simplest of the three measures. An increase in relative wage growth means that wages rise more abroad than in Denmark, making Danish companies more competitive. Chart 23 shows that competitiveness according to this indicator has improved moderately since 2010, following a period of gradual weakening of competitiveness leading up to the global financial crisis.

CHART 23

Overall indications of improved competitiveness in manufacturing since the financial crisis



CHART 24





¹⁹ Specifically, developments in Denmark are compared to those of Denmark's most important trading partners weighted according to their weight the index for the effective krone rate, see nationalbanken.dk (<u>link</u>).

¹⁸ See Draghi (2024).

As discussed above, competitiveness depends on much more than wages. To some extent, this is reflected in *relative unit labour costs*, which take into account that competitiveness depends on labour productivity in addition to wages. Unit labour costs indicate the labour costs of producing a unit of goods or a service, implying that the factors that support companies' productivity are implicitly included in the calculation of competitiveness. As measured by this indicator, competitiveness can be improved by wages increasing less than abroad or by productivity increasing more. According to the indicator, competitiveness of manufacturing as a whole has improved since 2008, largely reflecting a greater increase in labour productivity compared to other countries. M&P has contributed significantly to this trend.

The third measure of competitiveness, *the relative wage share*, indicates the share of wages in GVA at current prices abroad compared to in Denmark. An increase in GVA in current prices can either reflect an increase in volumes sold or in prices. In contrast to the other indicators, the relative wage share will thus interpret an increase in the prices of Danish products compared to similar production abroad – the terms of trade – as an improvement of competitiveness. Wages and productivity will have the same effect on competitiveness as when it is calculated based on relative unit labour costs. But beyond that, an increase in the prices that companies can achieve in export markets will boost competitiveness. The relative wage ratio is thus the most complete of the three measures of competitiveness.

When the relative wage share is used as an expression of a company's competitiveness, it is crucial for its interpretation that prices to a significant extent reflect factors beyond the control of an individual company. This is the case, for example, if Danish companies specialise in the production of goods and services where prices generally rise relative to the prices of other products, thereby structurally improving their terms of trade. In principle, poor productivity growth or rising wages resulting in high production costs could lead to higher prices in the short term. This would falsely indicate a strengthening of competitiveness. In the long term, however, it will not be possible for Danish companies to export at prices that do not reflect market conditions.

The indicator based on the relative wage share shows largely the same picture as relative unit labour costs. It confirms that the overall competitiveness of the manufacturing industry has strengthened since the financial crisis. But a weakening of the terms of trade in 2023 is visible in the form of a weakening of competitiveness. The overall improvement in competitiveness, which primarily reflects a favourable trend in value added, should be seen in light of the fact that Denmark ranks well based on the parameters highlighted by IMD, see above. However, manufacturing is made up of a number of industries that face very different conditions. The developments shown in chart 22 cannot therefore be transferred to individual industries, and some industries may have experienced a trend in competitiveness that is significantly weaker than for manufacturing as a whole.

A broader industry definition supports the overall picture of competitiveness

Although manufacturing accounts for the majority of foreign trade, when assessing competitiveness it can be useful to consider a larger part of the economy.²⁰ One reason for this is that manufacturing is dependent on auxiliary activities from other industries. An auxiliary activity is generally linked to a company's core activity, but if it is sufficiently extensive, it can be seen as an independent core activity and thus be assigned a separate industry classification. Auxiliary activities can also be placed in their own industry if they are outsourced. The industry classification of auxiliary activities can differ across

²⁰ See also the discussion in Pedersen et al. (2019).

countries, and as such, the relative wage ratio is considered for the private non-farm industries, which make up a larger part of the private sector than just the manufacturing industry.²¹

The relative wage share in the private non-farm industries does not change the picture that the overall competitiveness of Danish companies has improved since 2010, see chart 24. However, the trend is less pronounced for the private non-farm industries as a whole compared to manufacturing. The difference reflects that the relative wage share in the private non-farm industries has remained largely unchanged since 2010. As manufacturing has typically accounted for around 20 per cent of the private non-farm industries measured by GVA during the same period, its influence on the overall development is therefore moderate. It is important to realise that ancillary activities to the manufacturing industry are only a small part of private non-farm industries. The indicator based on private non-farm industries therefore be considered irrelevant in this context.

Competitiveness indicators should be interpreted with caution

All measures of competitiveness are, by their very nature, just indicators. They can give an indication of the competitiveness of the Danish economy, but they cannot stand alone and should be complemented by a broader assessment of economic conditions. New forms of production with significant use of intellectual property rights and production abroad under Danish ownership have also made the indicators more difficult to interpret, and it is important to recognise that there are large differences across industries and that competitiveness is best illustrated at industry level. The most important aspects concerning the interpretation of the indicators are elaborated on below.

The indicators are best suited for assessing competitiveness in traditional manufacturing companies, where the majority of employees are engaged in physical production and the capital stock consists primarily of machinery and buildings. This reflects the fact that the indicators are calculated based on the average cost and the average output and value added of a labour hour and thus do not take into account that different groups of employees contribute in different ways. The measure of competitiveness is therefore most easily interpreted if the labour force is relatively homogenous across the company. In such a situation, good competitiveness can to some extent be interpreted to imply that it will be beneficial to hire more employees if there is sufficient demand for the company's products.

The interpretation of competitiveness is complicated by the fact that the indicators on the cost side only consider labour costs. This does not take into account the cost of capital. Low labour costs may reflect that production is highly capital-intensive and therefore still costly. If companies in one country base their production primarily on labour, while companies in another country rely more heavily on capital, the capital-intensive country will appear more competitive based on the relative wage ratio. Therefore, it is also relevant to include indicators based on company profits that take into account the cost of capital.

The interpretation of the competitiveness indicators is further challenged by the fact that since 1990, intellectual property rights have become an increasingly important factor behind production in manufacturing, while labour is less important, see chart 25. This means that the link between costs, employment and production is less clear, as costs are largely linked to the development of

 $^{\rm 21}$ The private non-farm sector includes most of the private sector excluding financial companies, agriculture and fishing.

intellectual property, for example, through the research and development behind many patents. Once these costs are incurred, it will typically be possible to scale production up and down with relatively moderate implications for the company's overall labour costs. The strong emphasis on intellectual property rights is particularly prevalent among large, globally orientated Danish companies.²²

CHART 25

Intellectual property rights make up the majority of the return on capital in manufacturing industry, while labour takes up less and less



Source: Statistics Denmark and own calculations.

Production abroad, which has also become more prevalent in recent years, is a particular challenge when measuring productivity and competitiveness. When a company has production abroad, wages for foreign labour are recorded as an import of processing services. Profits from foreign production, on the other hand, are included in GVA, but as return on capital, while there are no expenses for Danish labour. The direct effect of production abroad under Danish ownership is therefore to reduce the wage share and thereby to improve competitiveness measured by the relative wage share.

The full effect of production abroad on the wage share is moderated by the fact that, according to the discussion in chapter 2, there are indications that income from M&P is to some extent used to pay domestic labour, which contributes to the activities abroad taking place. However, the possibility of production abroad means that for many companies, a high GVA per unit of wages does not necessarily mean that it would be optimal for them to expand physical production in Denmark, even if the competitiveness of the company as a whole is good. High value added may be achieved through extensive production abroad, and any expansion of production may be most profitable to locate abroad due to differences in labour costs. These facts emphasise that good competitiveness from the company's point of view cannot be taken to mean that all groups in the workforce are competitive compared to similar groups in other countries.

²² This is analysed in an upcoming analysis from Danmarks Nationalbank titled "The increasing importance of the largest companies" to be published on 19 March.

The conventional measures of competitiveness assume that value added and labour costs occur at the same time. This may be a good description of conditions in traditional service and manufacturing companies where the lead time from production to sale is short. In industries where production is largely based on intangible assets created through research and development activities, on the other hand, it can take years or even decades from the time these activities take place until the company realises revenue from sales.²³ During the years of research and development but without sales, productivity and competitiveness may therefore appear weak, while the opposite will be true when sales start. This is another reason why conventional measures of productivity and competitiveness should be interpreted with caution.

Although companies as a whole may appear competitive, this does not exclude the possibility that competitiveness may be driven by selected companies in specific industries. There are also differences in what is important for competitiveness in different industries. For example, access to labour with specific skills can have a major impact on productivity and thus competitiveness in high-tech industries, whereas the level of wage may be less important. In other industries, however, wages may be an important parameter. It is therefore necessary to delve deeper into the individual industries and possibly also into individual companies within each industry.

There will always be differences in competitiveness across industries, and differences in the value added from labour are a significant factor in the dynamics that underpin economic growth at the macro-level. From 2001-09, almost half of the growth in productivity in the Danish business sector came from company dynamics, where highly productive companies expanded at the expense of those with lower productivity.²⁴ The contribution from this kind of dynamics was most important in the manufacturing and internationally competitive services, illustrating the importance of the economy continuously adapting to the conditions faced by companies.

Finally, it should be noted that from a societal perspective, there is no "optimal" level of competitiveness when defined by the three indicators illustrated in chart 23. If wages rise faster than labour productivity, it can make the workforce less attractive for companies to hire and unemployment rates can rise as a result. In such a situation, a country can be said to have a competitiveness problem. Conversely, a very low wage share can point to structural problems such as a lack of competition on the product side, or companies being able to keep wages down despite productivity gains. However, it could also be an indication that production has become more capital-intensive, as is the case in many of the large companies whose importance has increased in recent years.

Economy-wide productivity and value added

For the Danish economy as a whole, productivity measured as real GVA per hour worked has developed roughly in line with Germany and the rest of the euro area, see chart 26. Productivity in the US has increased significantly faster than in Europe, which has attracted significant attention.²⁵ Productivity in the early 2000s also increased faster in Sweden than in Denmark, which to some extent may reflect compositional differences. Sweden has thus specialised in industries with relatively high potential for productivity gains, but this was offset by a decline in relative prices in those industries.²⁶

In the remainder of the analysis, competitiveness is expressed as GVA per unit of wages, which is the inverse of the wage share. Instead of calculating the wage

²³ For a discussion of the time delay, see, for example, Sauré (2015) in a Swiss context.

²⁴ See the Productivity Commission (2013).

²⁵ See, for example, Draghi (2024).

²⁶ See the Productivity Commission (2012).

share relative to a weighted group of countries, as in chart 23, GVA per unit of wages is compared with selected individual countries, namely Germany, USA and Sweden. These countries are Denmark's three largest trading partners among the advanced economies, and their companies are thus potentially important competitors for Danish companies.²⁷

If Danish companies can generate high value added per unit of wages relative to their foreign competitors, it is considered a sign that they are competitive. Competitiveness can be improved through higher productivity, higher prices for the companies' products or lower wages for employees. The caveats related to the interpretation of the indicators of competitiveness discussed above also apply to this indicator.

Despite the varying trends in productivity, GVA per unit of wages is generally close to the 2000 level, see chart 27. This also applies to Germany and Sweden, whereas in the US there has been a slight increase. The stable wage share reflects the fact that while GVA per unit of wage has generally increased in manufacturing, this has been offset by a decrease in manufacturing's share of employment. Conversely, employment has increased in the less capital-intensive service industries, where GVA per unit of wages is lower. But GVA per unit of wages for the economy as a whole cannot be directly related to competitiveness. This reflects the fact that a large part of the economy, such as the public sector, faces little or no competition from foreign actors.

CHART 26

Economy-wide productivity



CHART 27



GVA per unit of wages in the whole economy

Source: OECD, Bureau of Economic Analysis and Statistics Sweden.

Note: Productivity is calculated here as real GVA per hour worked. Source: OECD, Bureau of Economic Analysis and Statistics Sweden.

Overall indications of good productivity in the manufacturing industry

In the following, focus is on manufacturing, which is highly exposed to international competition. Since 2000, productivity in manufacturing has increased by 160 per cent, calculated as real GVA per hour, see the solid green line in chart 27. That is more than in Sweden, Germany and the US. Productivity growth was particularly strong following the global financial crisis of 2008-09.

²⁷ These are the three countries with the highest weights in the calculation of the effective krone rate index. Their total weight in the index is 42.5 per cent, see nationalbanken.dk (*link*).

In recent years, activities abroad have contributed significantly to the growth of manufacturing. However, the conclusion of good overall productivity growth in Danish manufacturing in recent years is robust to alternative treatments of the contribution from these activities. For Denmark, chart 28 shows two dashed lines in addition to the solid line. The lower dashed line excludes the contribution from M&P. This line thus only includes revenue from activities on Danish territory. Due to lack of data for processing, it is not possible to make this calculation across countries. Even if revenue from M&P is completely excluded, productivity growth for Danish companies since 2000 has been better than German companies and almost on par with Sweden and the US.

CHART 28

Good productivity growth in Danish manufacturing overall – even if contributions from M&P are excluded



Note: The solid lines show real GVA per hour. The solid line for Denmark is based on the total GVA or profits in manufacturing. It is calculated by adding revenue from merchanting to Statistics Denmark's figures for manufacturing, as merchanting in Statistics Denmark's figures (unlike the foreign statistical agencies) is included in trading activities. The Danish figures then become comparable with other countries. The top dotted line also includes net income from FDI. The lower dashed line excludes contributions from M&P.

Source: OECD, Bureau of Economic Analysis and Statistics Sweden.

In the upper dashed line in chart 28, net income from foreign direct investment is added to GVA. This is based on the assumption that the return from foreign direct investments may to a certain extent be made possible by the company's domestic activities, see also the discussion in chapter 2.²⁸ The upper dotted line thus represents an upper limit for the value added per hour in manufacturing. Chart 29 shows GVA per hour plus FDI revenue for manufacturing in all countries in the comparison. Even when FDI income is included for all three countries, the productivity of Danish companies has performed better than that of their counterparts in Germany and the US.

Competitiveness and profitability

Based on the developments in GVA per unit of wages, the competitiveness of Danish manufacturing has generally developed well since the global financial crisis in 2008-09. This is shown in chart 30, which shows that the value added per

²⁸ Utilisation of their parent company's R&D activities by foreign subsidiaries is reflected in royalty payments included in GVA. However, in practice, it can be difficult to calculate the value of this, and Danish production may therefore be either over or underestimated in the royalty payment.

CHART 29





Note: The chart shows the upper dashed line from chart 28 calculated for all countries.

Source: OECD, Bureau of Economic Analysis and Statistics Sweden.

unit of wages increased from 1.7 in 2000 to 2.7 in 2023, corresponding to a decrease in the wage share in manufacturing from 60 per cent to 40 per cent.²⁹ Value added per unit of wages has also increased in Sweden, Germany and the US, but to a lesser extent than in Denmark, which now has the best competitiveness of the four countries according to this measure.³⁰ Even if the element of companies' profits that comes from M&P is mechanically disregarded, GVA relative to wages is higher than in Germany and has increased moderately since 2010, see the lower dashed line in chart 30.

CHART 30

CHART 31





Good profits in Danish manufacturing as a whole



The top dotted line for Denmark also includes net income from FDI. The Note: lower dashed line excludes contributions from M&P

Source: OECD, Bureau of Economic Analysis, Statistics Sweden and own calculations based on data from Statistics Denmark.

Note: See note to chart 28.

Source: OECD, Bureau of Economic Analysis, Statistics Sweden and own calculations based on data from Statistics Denmark.

Companies are generally managed with the aim of maximising value for their owners. Therefore, an indicator of earnings, namely profit per unit of wages, is also considered.³¹ This recognises that companies across countries may have different costs of capital. This measure gives a clearer picture of the overall performance of Danish manufacturing companies. Profit per unit of wages in Danish manufacturing increased from around 0.4 in 2000 to 0.9 in 2022 and 1.2 in 2023, see chart 31. In 2021, profitability exceeded that of the US, Sweden and Germany. In Denmark's case, if revenue from M&P is mechanically disregarded, earning in 2023 is roughly on par with Germany.

Strong growth in the pharmaceutical industry

Manufacturing covers a number of industries that are characterised by significant differences in productivity and competitiveness. Accounting for 11.2 per cent of employment and 37 per cent of value added in 2023, the pharmaceutical industry is often highlighted as an industry that has contributed significantly to the growth of the Danish economy in recent years. Chart 32 also shows that since 2000, productivity in the industry has increased more than in the corresponding

²⁹ The fact that GVA per wage unit has developed better in manufacturing than in the Danish economy as a whole reflects both weaker productivity growth in other parts of the economy and the fact that the manufacturing's share of total employment has fallen. ³⁰ The increase in industrial GVA per wage unit is a global phenomenon that has attracted considerable

interest, see, for example, Autor et al. (2017). ³¹ The return includes 'net profit and mixed income', which is calculated by deducting wages and fixed

capital consumption from GVA.

industry in Germany and more than for manufacturing as a whole. This development has been particularly significant in recent years. The strong increase in productivity in the pharmaceutical industry has resulted in a significant improvement in the industry's competitiveness measured as GVA per unit of wages, see chart 33.

The pharmaceutical industry is an example of an industry where GVA relative to wages can be interpreted as an indicator of a company's competitiveness as a whole, but is probably less informative about whether, for example, wages relative to value added for certain types of labour make it worthwhile to hire more employees for production in Denmark. A large GVA can thus be made possible by researchers who develop a new product that can be patented and subsequently give rise to large production and profits - possibly through automation or production abroad. However, this does not necessarily mean that it would be optimal for the company to expand the actual physical production of the product in Denmark, as it could potentially take place abroad at lower costs.

The low wage share in the pharmaceutical industry also means that fluctuations in wages will only have a modest impact on overall costs and profits for companies. The pharmaceutical industry is an example of an industry where a number of the factors highlighted by the World Competitiveness Center, IMD, probably matter more than wages for competitiveness.

CHART 32

Productivity in the Danish pharmaceutical industry has grown significantly more than in Germany in recent years



The US and Sweden do not publish real GVA data for the pharmaceutical Note: industry. Source: Statistics Denmark and OECD.

CHART 33





Note: Sweden does not publish data for the pharmaceutical industry alone. Source: Statistics Denmark and OECD.

The strong performance of the pharmaceutical industry obviously means that it has contributed positively to productivity and competitiveness in manufacturing as a whole.³² If the pharmaceutical industry is mechanically excluded in the case of Denmark, both productivity and competitiveness have developed better than for manufacturing as a whole in Germany. The overall increase in productivity since 2000, excluding the pharmaceutical industry in Denmark, has been roughly

³² Novo Nordisk plays a significant role in the pharmaceutical industry. Based on our own calculations based on published accounts and the NABP36 table in statistikbanken.dk, Novo Nordisk's share of the pharmaceutical industry's GVA can be estimated at around 75 per cent in recent years.

on a par with the US, while GVA per wage unit in recent years has been slightly below the level for manufacturing as a whole in the US, see charts 34 and 35.

The calculation, which mechanically disregards the pharmaceutical industry, cannot be taken as an indication of how productivity and competitiveness would have actually evolved in the absence of this industry. Employees in the pharmaceutical industry can thus be assumed to be highly skilled compared to the labour force as a whole. If they had not worked in the pharmaceutical industry, it is likely that they would have helped boost productivity and competitiveness in other industries instead. However, this illustrates that the overall indicator is not an indication that competitiveness is equally good across all parts of the manufacturing industry.

CHART 34

Even without the pharmaceutical industry, there are signs of good productivity growth in Danish manufacturing



Note: Productivity is measured as real GVA per hour. The solid line is based on the total GVA manufacturing. It is calculated by adding revenue from merchanting to Statistics Denmark's figures for manufacturing, as merchanting in Statistics Denmark's figures (unlike the foreign statistical agencies) is included in trading activities. The Danish figures then become comparable with other countries. The dotted line shows Denmark excluding the pharmaceutical industry. CHART 35



Competitiveness is more moderate without the pharmaceutical

Note: The solid line is based on the total GVA in manufacturing. It is calculated by adding revenue from merchanting to Statistics Denmark's figures for manufacturing, as merchanting in Statistics Denmark's figures (unlike the foreign statistical agencies) is included in trading activities. The Danish figures then become comparable with other countries. The dotted line shows Denmark excluding the pharmaceutical industry.

Source: Statistics Denmark and OECD.

Source: Statistics Denmark and OECD.

Significant differences across industries

As discussed above, competitiveness is best illustrated at industry level. In the following, productivity and competitiveness are therefore considered for the three industries with the largest employment. These are machinery, the food, beverage and tobacco industry and the metals industry, which together accounted for 46.6 per cent of total hours worked in manufacturing in 2023, see chart 36. There are significant differences in how productivity and competitiveness have developed in the three industries.

For the three largest industries in terms of employment their share of employment exceed their share of GVA, for the pharmaceutical industry it is the other way around



In the machinery industry, productivity has increased by 85 per cent since 2000, see chart 37. This is a larger increase in productivity than for Germany and the US. The industry has only a modest net return from FDI, so the top dashed line does not deviate significantly from the solid line. In contrast, M&P activities have accounted for a significant share of the industry's value added in recent years. However, even excluding all value added from M&P, since 2000 the sector has seen an increase in GVA/hour that is in line with the US.

CHART 37





Note: Productivity is calculated as real GVA per hour. See also the note to chart 28. Source: OECD, Bureau of Economic Analysis, Statistics Sweden and own calculations based on data from Statistics Denmark.

CHART 38





Note: See the note to chart 28.

Source: OECD, Bureau of Economic Analysis, Statistics Sweden and own calculations based on data from Statistics Denmark.

The machinery industry is characterised by a gradual increase in value added per unit of wages from 2005-19, after which it decreased, see chart 38. However, if returns from FDI are added to the sector's value added, GVA per unit of wages has remained roughly unchanged since 2019. It is also worth noting that industry profits will be negative in 2022-23 if the contribution from M&P is excluded (not shown in the chart). This supports the point made in chapter 2 that M&P revenues are best viewed as an integral part of a company's business model.

CHART 39



Good productivity growth in the food industry



Source: Statistics Denmark, OECD and Bureau of Economic Analysis.

CHART 40





Note: The dotted line is GVA plus income from FDI. Merchanting and processing are insignificant for the food industry.

Source: Statistics Denmark, OECD and Bureau of Economic Analysis.

Denmark has also seen good productivity growth in the *food industry* since 2008 with an increase of 44 per cent, see chart 39. If income from FDI is added, the trend is even stronger. This industry has virtually no M&P. However, the value added per wage unit for the food industry does not follow the same pattern and is generally at a moderate level compared to the other countries, see chart 40.

Productivity growth has been relatively weak in the *metals industry* and has only increased by around 12 per cent since 2000, see chart 41. However, this is slightly more than for the US. The industry has also been characterised by relatively modest profits for a number of years, see chart 42. Since 2018, the value added per unit of wages has increased slightly and was higher than Germany's in 2019-22. The metals industry in Denmark has very little M&P and FDI, which therefore does not contribute to the results.

CHART 42

metals industry

Weak productivity growth in the metals industry. Neither M&P nor FDI are present to any significant extent.



Note: Real BVT. The US does not calculate hours for the metals industry, so productivity for the US is based on number of employees. See also the note to chart 28. The metals industry in Denmark has very little M&P and FDI - the dashed lines in chart 28 are therefore indistinguishable from the full time series.

Source: OECD, Bureau of Economic Analysis and Statistics Sweden.

No excessively large differences across companies

In line with differences in productivity and competitiveness across industries, there are also differences between companies within the same industry. Just because an industry has a good productivity performance on average, it does not necessarily apply to all companies within the industry. Some variation is natural, as there are companies in all stages of development at any given time. Typically, a company will not be highly productive in the first few years of its lifespan, when investments in, for instance, production equipment and product development have more focus than, for example, scaling production. Furthermore, differences in product composition and other factors give rise to differences in productivity and competitiveness across companies.

The rest of the chapter focuses on international comparisons of the dispersion of productivity and competitiveness across industries based on company-level data.³³ Comparisons of levels, on the other hand, should be made based on data from the national accounts, as shown in the previous charts. Chart 43 shows the average GVA per employee in manufacturing at company level in selected deciles for various countries in 2019.³⁴ The average value added per employee among the 10 per cent least productive industrial companies (1st decile) is only 14 per cent of the average value added among the 10 per cent most productive in Denmark.35

Despite the large differences in productivity across Danish companies, the differences are generally no greater than for the other countries in chart 43. According to the aggregated figures, the productivity and competitiveness of

³⁵ Note that productivity is seen here as GVA per person employed. Especially when looking at the company level, some variation in this measure is to be expected as it does not take into account differences in capital intensity across different types of companies.



Value added per unit of wages is also weak in the Danish



Note: See the note to chart 28 Source: OECD, Bureau of Economic Analysis and Statistics Sweden.

³³ In this part of the analysis, data at company level (CVR number level) is used for international comparability. The results are therefore not comparable with previous results based on group level data. They are also not directly comparable to macro-level results. ³⁴ Note that the scale in chart 43 and selected charts below is logarithmic.

Danish manufacturing companies has developed well overall in the years after 2019. Based on the data available for other countries, it is not possible to assess the productivity dispersion across companies in a recent period. For Danish companies, however, there are no signs that the spread has changed significantly since 2019.

CHART 43



Danish productivity is not just driven by a few highly productive companies

Note: *Data for 2022 is only available for Denmark and is deflated to 2019 prices using the GDP deflator. The chart shows the average labour productivity in the 1st, 4th, 7th and 10th decile of labour productivity. Only companies in manufacturing with at least 20 employees are included. Data for 2019. Labour productivity is calculated as value added divided by the number of employees (not FTEs). Differences in levels between countries cannot necessarily be interpreted accurately as the data is from a microdata exercise where there are different sources and reporting methods in different countries, not official statistics.

Source: Competitiveness Research Network, Statistics Denmark and Danmarks Nationalbank.

The dispersion in productivity is reflected in a significant dispersion in the competitiveness of companies measured as the ratio of GVA to total labour costs, see chart 44. Again, Denmark does not differ significantly from the other countries in the comparison. There have been no major changes in the dispersion in Denmark in the period 2010-19, which is the period where data from other countries allows a comparison, see chart 45. Subsequently, from 2019-22, the most competitive companies in Denmark, expressed by the 9th decile, have seen a relatively strong increase in GVA per unit of wages. This indicates that the improvement of competitiveness in manufacturing in recent years has mainly been driven by the most competitive companies.

There is no greater variation in competitiveness across manufacturing companies in Denmark than in other countries

Distribution of GVA/payroll across industrial companies



- Note: The chart shows the average GVA relative to payroll in the 1st, 4th, 7th and 10th decile for GVA/payroll respectively. Only companies in the manufacturing industry with at least 20 employees are included. Data for 2019. Level differences between countries cannot necessarily be interpreted accurately as the data is from a microdata exercise where there are different sources and reporting methods in different countries, not official statistics.
- Source: Competitiveness Research Network, Statistics Denmark and Danmarks Nationalbank.

Dispersion in productivity and competitiveness in selected industries

Charts 46-53 look at the dispersion in productivity and competitiveness across companies in the metals, machinery, food and pharmaceutical industries, respectively. In contrast to chart 43, focus is on fractiles in the distribution rather than averages in the individual deciles. This is because in some industries there are too few companies to calculate averages within deciles. The differences in productivity and GVA per unit of wage are often smaller within individual industries than for manufacturing as a whole. This reflects that there are large differences in capital intensity across industries. Industries with a large capital stock compared to the number of employees will typically have a relatively high GVA per wage unit, which contributes to the dispersion when companies from several industries are considered together.

The dispersion of productivity across companies in the metals industry is smaller than in most other countries in the comparison, see chart 46. The weak productivity growth in the macro figures does not reflect the fact that there is a larger share of low-productive companies in Denmark than in other countries. There is also less variation in the competitiveness of firms within the metals industry in Denmark than in other countries. However, this primarily reflects the fact that the most competitive Danish companies in these industries have a lower GVA per unit of wage than their counterparts in other countries. Thus, there are indications that the competitiveness of the majority of Danish metal companies is comparable to that of foreign companies, but that the most competitive companies in Denmark are also not fully on par with their counterparts in other countries.

CHART 45

Improvement in the competitiveness of Danish manufacturing companies in recent years largely driven by the most competitive

Change over time in median and 9th decile for GVA/payroll





- Note: Only companies in the manufacturing industry with at least 20 employees are included.
- Source: Competitiveness Research Network, Statistics Denmark and Danmarks Nationalbank.

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The macro figures indicate that the Danish machinery industry is relatively productive. The dispersion across companies suggests that the reason is that even the least productive machinery companies are relatively productive in international comparison, rather than it is due to a few highly productive companies, see chart 48. The dispersion of competitiveness is also comparable to other countries.

The food industry also shows a dispersion in productivity comparable to that of other countries, while the dispersion in competitiveness is smaller than in other countries, see charts 50 and 51.³⁶ There are indications that the weak GVA per unit of wage at the macro level reflects the fact that the best companies on this parameter are not on par with the best in other countries.

Finally, a comparison of the dispersion of productivity in the pharmaceutical industry shows little difference to other countries, see chart 52. The dispersion in competitiveness is smaller in Denmark than in other countries. However, it should be noted that there are only a few companies in the pharmaceutical industry in Denmark, so the comparison with other countries is subject to significantly more uncertainty than for the other industries.

CHART 46

Productivity in the metal industry – relatively low dispersion in Denmark



Note: *Data for 2022 is only available for Denmark and is deflated to 2019 prices using the GDP deflator.

Data for 2019. Only companies with at least 20 employees are included. Note that the countries compared in charts 46 and 47 are not exactly the same. This is due to differences in data availability. Level differences between countries cannot necessarily be interpreted accurately as the data is from a microdata exercise where there are different sources and reporting methods in different countries, not official statistics. Source: Competitiveness Research Network and Danmarks Nationalbank.

CHART 47





 Note: Data for 2019. Only companies with at least 20 employees are included. Note that the countries compared in charts 46 and 47 are not exactly the same. This is due to differences in data availability. Level differences between countries cannot necessarily be interpreted accurately as the data is from a microdata exercise where there are different sources and reporting methods in different countries, not official statistics.
Source: Competitiveness Research Network and Danmarks Nationalbank.

³⁶ These figures include companies in the food industry and, unlike the aggregated figures, do not include companies in beverage and tobacco production.

Productivity in the machinery industry – even the least productive in Denmark are relatively productive in international comparison

Value added per employee, 1,000 euros (logarithmic scale)



Note: *Data for 2022 is only available for Denmark and is deflated to 2019 prices using the GDP deflator.

Data for 2019. Only companies with at least 20 employees are included. Note that the countries compared in charts 48 and 49 are not exactly the same. This is due to differences in data availability. Level differences between countries cannot necessarily be interpreted accurately as the data is from a microdata exercise where there are different sources and reporting methods in different countries, not official statistics.

Source: Competitiveness Research Network and Danmarks Nationalbank.

CHART 49

Competitiveness in the machinery industry comparable to other countries



Note: Data for 2019. Only companies with at least 20 employees are included. Note that the countries compared in charts 48 and 49 are not exactly the same. This is due to differences in data availability. Level differences between countries cannot necessarily be interpreted accurately as the data is from a microdata exercise where there are different sources and reporting methods in different countries, not official statistics.

Source: Competitiveness Research Network and Danmarks Nationalbank.

CHART 50

Dispersion in productivity in the food industry comparable to other countries



Note: *Data for 2022 is only available for Denmark and is deflated to 2019 prices using the GDP deflator.

Data for 2019. Only companies with at least 20 employees are included. Note that the countries compared in charts 50 and 51 are not exactly the same. This is due to differences in data availability. Level differences between countries cannot necessarily be interpreted accurately as the data is from a microdata exercise where there are different sources and reporting methods in different countries, not official statistics.

Source: Competitiveness Research Network and Danmarks Nationalbank.

CHART 51

Lower dispersion in competitiveness in the food industry compared to other countries



Note: Data for 2019. Only companies with at least 20 employees are included. Note that the countries compared in charts 50 and 51 are not exactly the same. This is due to differences in data availability. Level differences between countries cannot necessarily be interpreted accurately as the data is from a microdata exercise where there are different sources and reporting methods in different countries, not official statistics.

Source: Competitiveness Research Network and Danmarks Nationalbank

Dispersion in productivity in the pharmaceutical industry comparable to other countries



Note: *Data for 2022 is only available for Denmark and is deflated to 2019 prices using the GDP deflator.

Data for 2019. Only companies with at least 20 employees are included. Note that the countries compared in charts 52 and 53 are not exactly the same. This is due to differences in data availability. Level differences between countries cannot necessarily be interpreted accurately as the data is from a microdata exercise where there are different sources and reporting methods in different countries, not official statistics. Furthermore, the number of pharmaceutical companies in Denmark is low, which increases the risk of random fluctuations and means that the 1st and 9th deciles cannot be shown for 2022 for confidentiality reasons.

Source: Competitiveness Research Network and Danmarks Nationalbank.

CHART 53





Note: Data for 2019. Only companies with at least 20 employees are included. Note that the countries compared in charts 52 and 53 are not exactly the same. This is due to differences in data availability. Level differences between countries cannot necessarily be interpreted accurately as the data is from a microdata exercise where there are different sources and reporting methods in different countries, not official statistics. Furthermore, the number of pharmaceutical companies in Denmark is low, which increases the risk of random fluctuations and means that the 1st and 9th deciles cannot be shown for 2022 for confidentiality reasons.

Source: Competitiveness Research Network and Danmarks Nationalbank.

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