Technequality

Understanding the relation between technological innovations and social inequality

Modelling assessment of income schemes

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Description of deliverable

Deliverable 4.4 reports on the socio-economic impact of increase in the minimum wage in the European Union (EU) based on the proposal for a Directive on adequate minimum wages, and of implementing permanently the changes to the social assistance scheme in the Netherlands. The deliverable describes the scenario and results. We use employment baseline projections which assume the displacement of workers by automation. In the minimum wage scenario, we assume that EUR 26 billion are required to raise the wage of 16 million EU workers to an adequate level. The increase in income for these workers is expected to have small positive economic impact and small negative employment impact. In the case of the Netherland, we assumed an earnings disregard regime for the displaced workers reaching social assistance. The scenario results show that the increase in disposable income has mitigation effect of the negative impact of automation from the baseline, and that the choice of financing method of the additional spending on social assistance impacts the level of economic growth.

1. Introduction

The purpose of this technical report is two-fold. One aim is to assess the socio-economic impact of increase in the minimum wage in the European Union (EU) based on the proposal for a Directive on adequate minimum wages adopted by the European Commission (EC) on 28 October 2020[1]. While the proposal does not specify how much the increase in minimum wage should be, the Member States will be required to ensure an adequate minimum wage (AMW), where adequate means if they are fair in relation to wage distribution in the country and if they provide a decent standard of living.

In the Impact Assessment accompanying the Commission proposal[2], a threshold is suggested for Member States (MSs) with statutory minimum wages: 50% of the average wage and 60% of the median wage to guide the assessment of adequacy. The trade unions are also in favour of this threshold i.e. taking the 'in-work-poverty wage' threshold of 60 % of the national full-time gross median wage as the reference to assess the adequacy of minimum wages[3].

The second aim is to assess the socio-economic impact of implementing permanently the changes to the social assistance scheme in the Netherlands in line with the experiments run in several municipalities under the Technequality project (Muffels *et al.*, 2021). In line with the purpose of the Technequality project to develop the evidence base of potential consequences for labour markets of automation in Europe, this technical report uses the automation risk estimated in Heald et al. (2019).

2. Baseline

Cambridge Econometrics' E3ME model is a computer-based model of the world's economic and energy systems and the environment. It was originally developed through the EC's research framework programmes and is now widely used in Europe and beyond for policy assessment. The model manual (Cambridge Econometrics, 2019) is available online at the model website www.e3me.com.

The E3ME model baseline includes preliminary COVID impacts (2020 only) based on official GDP projections from produced by the EC: the AMECO projections (DG ECFIN, 2021a) for the short term (i.e. two years ahead) and the Ageing report 2021 (DG ECFIN, 2021b) for the long term. The employment baseline projections assume the displacement of workers by automation in line with the scenario assuming low automation risk, full adoption by 2035, and employment protection from Heald et al. (2019).

Table 1: Summary of the baseline for EU-27

	2022	2026	2030	Growth 2022-30 (%)
GDP (Million Euro)	12,736,685	13,893,394	14,792,479	16
Total employment (000s)	206,532	187,809	172,210	-17
Working age population (15-64) (000s)	274,416	270,174	265,171	-3.37

Source: Cambridge Econometrics

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[1] Adequate minimum wages in the EU - Employment, Social Affairs & Inclusion - European Commission (europa.eu)
[2] LexUriServ.do (europa.eu)
[3] Policy Brief-EEESPolicy-N°1-2020-EN-V4.indd (etui.org)

Table 1 summarises GDP, employment and population levels in the EU over the projection period. Population growth is expected to slow to near-zero and working age population declining by 2030. Total employment in the EU is also expected to start falling by 2030 because of the ageing population and automation.

3. Scenario design

This section describes the modelling assumptions made to answer the research questions. Three different scenarios are explored, each one implementing a change in income (either wages or benefits) on top of the baseline assumptions:

1) Increasing the minimum wage to an amount equal to 60% of the median wage in each of the 27 EU Member States (MSs);
2) Increasing minimum wage only in the Netherlands by 30%; and
3) Increasing social assistance for workers in the Netherlands displaced by automation.

The following sub-sections detail the assumptions behind each scenario.

Increase in minimum wage across the 27 EU MSs

In this scenario, we explore the impact of changing the level of minimum wage to 60% of the median wage in each EU-27 MS. To identify the extent to which the increase in minimum wages will increase sectoral average wages, we gathered the following data:

- Total wage bill by country and sector, i.e. the sum of all wages paid in a given year;
- The number of employees by country and sector;
- The level of minimum wage in each country;
- The share of employees on minimum wage by country and sectors; and
- The share of employees below a certain threshold of the wage distribution (e.g. 60% of the median wage).

The total wage bill and number of employees by countries and sectors are taken from Eurostat's National Accounts data which show a 2-digit NACE sector level (Eurostat, 2021b). Average wages are then computed by dividing the total wage bill by the total number of employees for each MS and NACE 2-digit sectors. The level of nominal minimum wage by MS is available on Eurostat (Eurostat, 2021a) at a bi-annual frequency. In the case of the six MSs[4] without a statutory minimum wage, the level of minimum wage is proxied by the average wage of low-wage occupations estimated by Eurofound (Vacas, 2021).

The share of workers on minimum wage is not available from public data sources such as Eurostat, OECD and ILO, so we took it from the literature. Comparable statistics on income for the EU MSs are usually derived from data collected in the context of the European Union Statistics on Income and Living Conditions (EU-SILC) survey, which reports individual earnings alongside household and individual characteristics. This data source is used by Eurofound (Eurofound, 2021) and the ILO (ILO, 2020) in their annual review of minimum wages. A similar approach was followed by the European Commission (EC) in its impact assessment for the proposal on adequate minimum wages (European Commission, 2020a). These three publications produce different estimates for the share of workers on minimum wage due to the different estimation procedure implemented. In this report, we follow the estimates shown in the EC impact assessment (European Commission, 2020a), which also provides

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[4] Austria, Cyprus, Denmark, Finland, Italy and Sweden.

figures for the shares of workers on minimum wage by both MS and sectors estimated from EU-SILC 2017[5].

In this scenario, we consider 60% of the median wage as the new value for the minimum wage, following the EC proposal for adequate minimum wages in the European Union (European Commission, 2020b). Data on the share of workers below 60% of the median wage by MS are taken from the Structure of Earning Survey for the year 2018. Table A - 1 and Table A - 2 in the Appendix summarise the data used in this scenario.

The method to calculate the percentage change in average wage by sector due to the introduction of a minimum wage equal to 60% of the median wage is described in Figure 1. In the MSs[6] where the 60% of median wage threshold is already reached, we assumed that the level of minimum wage remains constant over the projection period.

Figure 1: Computation of changes in average wage following the change in minimum wage
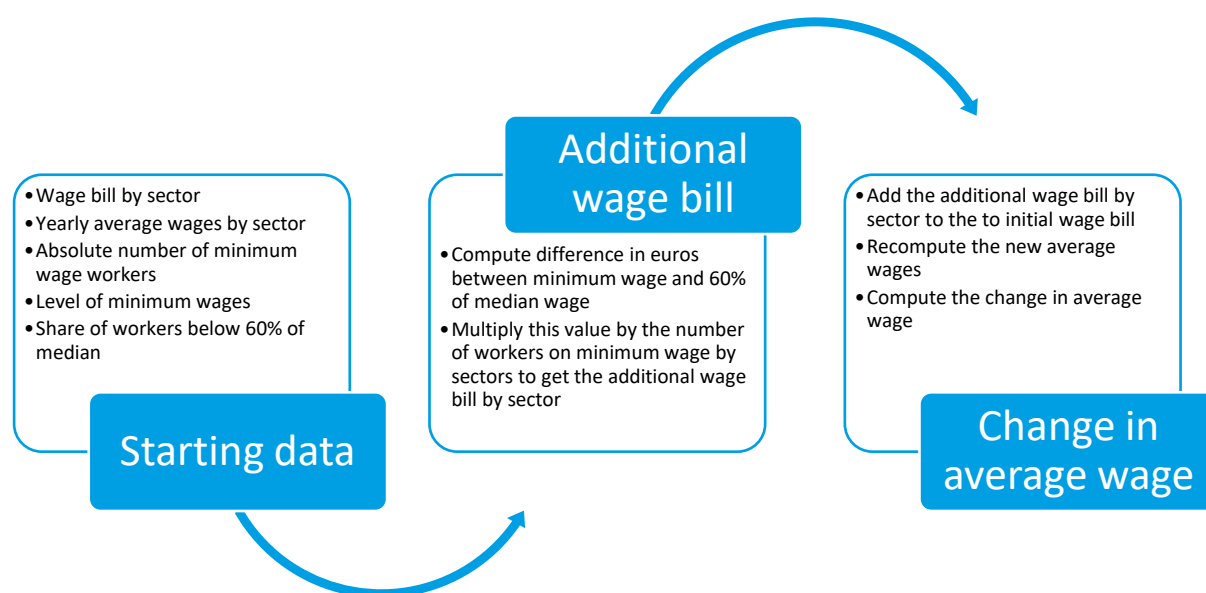
Source(s): Cambridge Econometrics

Figure 2 summarises the impacts caused by an increase in minimum wage in the economy. The direct effect of a higher minimum wage is the increase in the sectoral average wage, which, in turn, affects both the demand and the supply side of the economy. On the demand side, higher wages imply a higher disposable income, and therefore higher consumption and output, which will also increase labour demand. On the supply side, the increase in average wage on the one hand increases labour force participation rates and on the other hand raises labour costs for enterprises. Higher participation rates are expected to put downward pressure on wages, in particular in countries where the unemployment rate is low. Higher labour costs lead to higher labour costs for employers and thus can

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[5] The sectors are Agriculture, Construction, Trade, hospitality and transport, Professional services and Public and other services, see Figure A -1 and Figure A -2 for data on minimum wage workers by sectors.
[6] Namely France, Greece, Portugal and Sweden.

lead to lower labour demand from firms and/or an increase in industry prices, which could harm firm's competitiveness possibly resulting in lower output. Export prices could also increase, thus damaging economic activity abroad.

Figure 2 Impacts of an increase in minimum wage
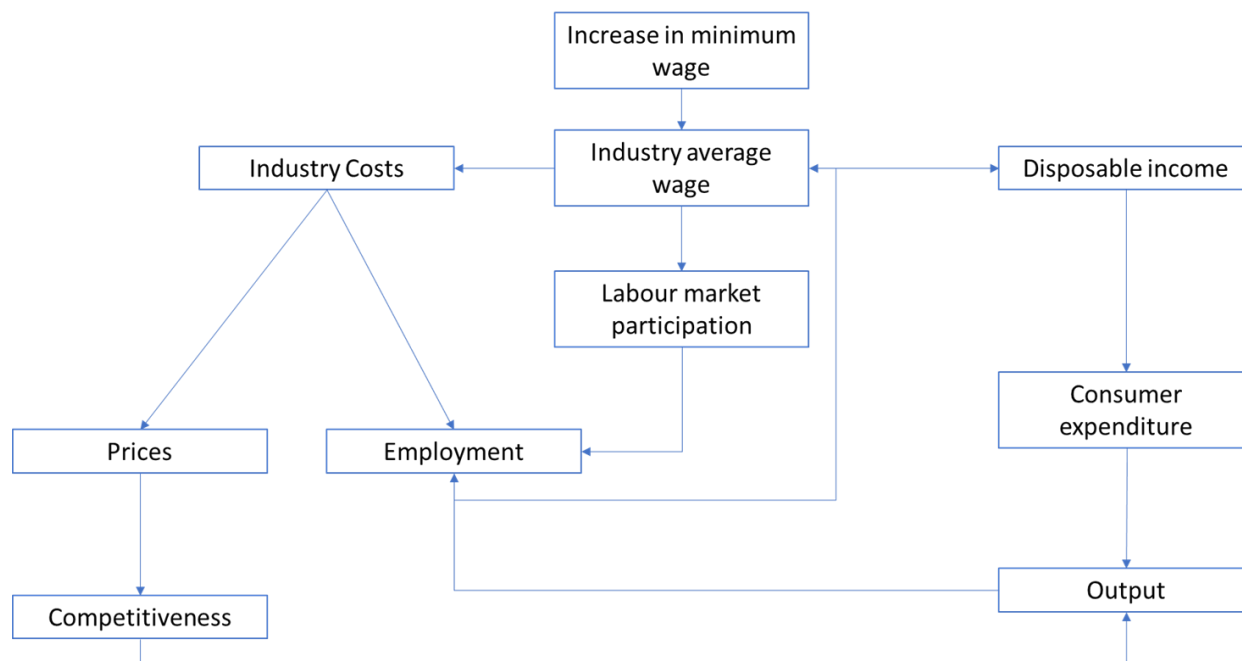
Source(s): Cambridge Econometrics

Increase minimum wage by 30% in the Netherlands

In this scenario, only the Netherlands are affected by the change in minimum wage, while the baseline assumptions apply in the other MSs. The same calculation methods for the inputs that enter the E3ME model as in the previous scenario were applied, except that the minimum wage in the Netherlands is increased by 30% instead of setting it at 60% of the median wage. The other MS react to the changes in minimum wages in the Netherlands but remain with same minimum wage level as in the baseline.

The difference between the two thresholds is sizeable: while increasing minimum wage to 60% of the median wage entails an absolute increase of around 65 euros per month per worker, a 30% rise corresponds to additional 473 euros per month per person[7].

Social assistance schemes in the Netherlands

In this scenario, a social assistance scheme for workers displaced by automation is implemented in the Netherlands. The assumptions of the scenario are based the results of randomized control trial (RCT) experiments run in the Netherland on three alternative welfare regimes as part of Technequality Work Package 4. One of the three regimes is a so-called earnings disregard regime in which people get a work bonus when they start to work or work more hours. In this work bonus regime people may keep 50% of the earnings up to the maximum of 203 euros per month for two years (i.e. the duration of the

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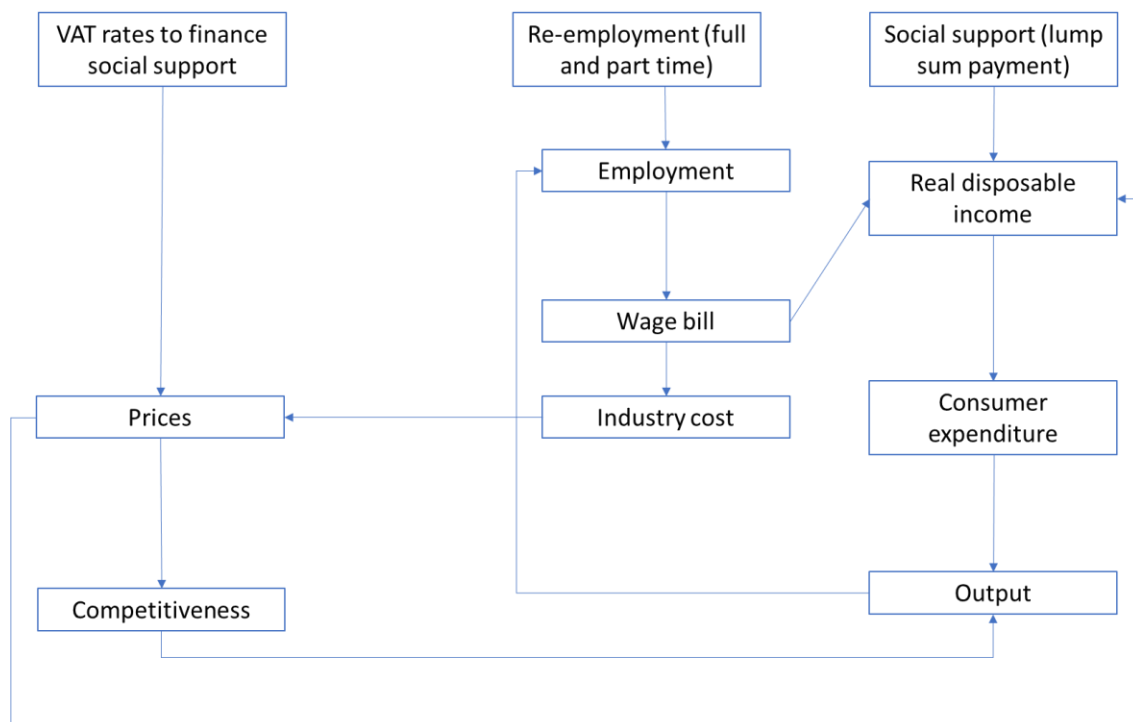[7] See Table A - 2 for data on minimum wages.

experiment). In this scenario, we assume that people may keep 50% of the earnings throughout the projection period.[8]

In the baseline scenario, 16% of jobs in the Netherlands are expected to be displaced by automation over 2021-30. On top of that, in this scenario it is assumed that:

- Among the 16% of workers displaced by automation, 14% of them manage to re-enter into full-time employment (Abeliansky et all, 2020).
- The rest will enter into social assistance, i.e. they will receive a lump-sum payment. Some of them (15% of those on social assistance[9] will enter into part-time employment) will received a higher amount that will depend on the number of hours they work (less than 16-20 hours per week).
- The lump sum payment is financed through higher VAT or through increase in income tax. We created two scenarios, one for each type of financing.

Figure 3 shows how the changes in the social assitance scheme impact the wider economy within the E3ME framework. Firm's labour costs are unaffected in this scenario, while the increase in VAT used to finance the increase in the number of people on social assistance scheme might reduce demand in the Netherlands. The baseline assumptions apply for the other MSs. The increase in the disposable income of people on social assistance who are also working part-time, is expected to increase the consumer expenditure in the economy, which in turn has a positive impact on output demand. More demand for goods and service will create, in turn, more employment demand.

Figure 3: Impact of the changes to the social assistance scheme

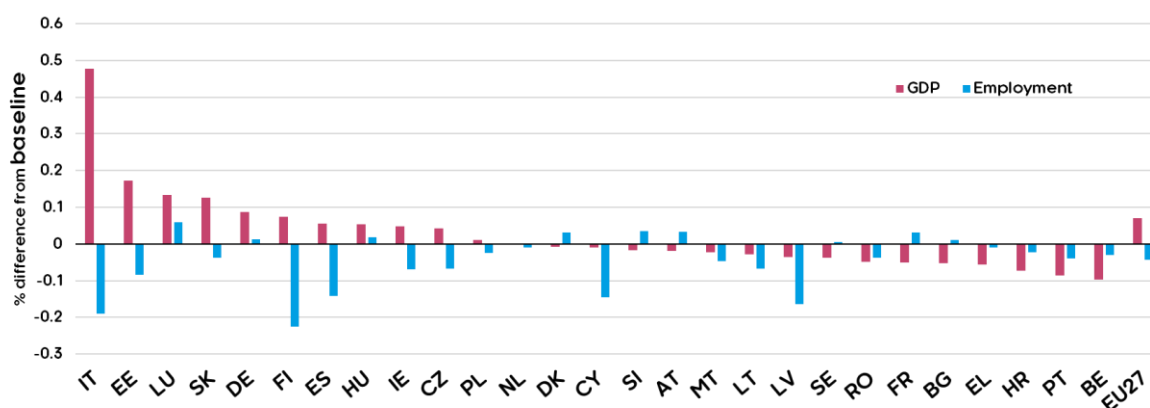*Source(s): Cambridge Econometrics*

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4. Results

In this section we present our analysis to estimate the socio-economic impact of increase in the minimum wage across the 27 EU MS, an increase in the minimum wage only in the Netherlands and a change in the social assistance conditions in the in the Netherlands. We first discuss the results of the quantitative macroeconomic assessment which is the primary input for estimating the cost of non-Europe.

Increase in the minimum wage in EU-27 MSs

Figure **4** shows the percentage difference from baseline in GDP and employment in 2030, following the implementation of higher minimum wages in most EU MSs. Overall, the magnitude of the difference to the baseline is relatively small, i.e. an increase in EU GDP of 0.07% by 2030 and a reduction of 0.04% in EU employment.

Figure 4: GDP and employment % difference from baseline across MSs, 2030

Source(s): Cambridge Econometrics

The share of workers on minimum wage varies considerably between MSs (from 2% in Malta to 26% in Romania). For a total of 16 million workers in the EU-27 experiencing an increase in disposable income. The positive effect on EU GDP of a higher demand driven by higher disposable income marginally offsets the negative effect caused by higher prices. On the contrary, EU employment declines because of higher labour costs faced by firms following the increase in minimum wage, which slightly reduces business demand for labour.

In
Figure **4**, MSs are grouped almost evenly between those that experience an increase in GDP and those who experience a decline, with the absolute magnitude of changes being below 0.1% compared to the baseline in most cases, with the exceptions of Slovakia, Luxembourg, Estonia and most notably Italy. Italy experiences the highest increases in GDP from 0.3% in 2022 to 0.5% 2030 since Italy does not have a statutory minimum wage[10]. Across MSs, there is no clear pattern between the changes in GDP and changes in employment. Many MSs that experienced increases in GDP show decreases in

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[10] It must be taken into account that the initial level of minimum wage applied to Italy is a "constructed" value based on the lowest paid occupations, therefore the increase in wage bill is somewhat overestimated.

employment, for example Finland, Italy, Estonia and Spain. However, there are MSs where both GDP and employment increase (e.g. Luxembourg, Germany and Hungary) and MSs where both decrease (e.g. Latvia, Lithuania and Malta). This suggests that the relation between minimum wages, GDP and employment is not straightforward, and that the characteristics (spatial, sectoral, occupations) of the national economies need to be considered.

Figure **5** shows the percentage difference in EU employment by broad sectors during the period 2021-30. It is possible to see that the sectors with the sharpest decrease in employment are agriculture, and trade, hospitality and transport followed by construction[11], which is to be expected given that these sectors feature the highest presence of minimum wage workers, suggesting that these sectors are sensitive to the cost of labour. The impact is visible mostly in the first half of the period, before moderating somewhat towards 2030. In industry and professional services, the gap from the baseline increases in the second half of the projection period. Public and other services is the only sector where employment is higher compared to the baseline, although the difference is negligible.

Figure 5 Employment percentage difference from baseline by broad sector, EU27
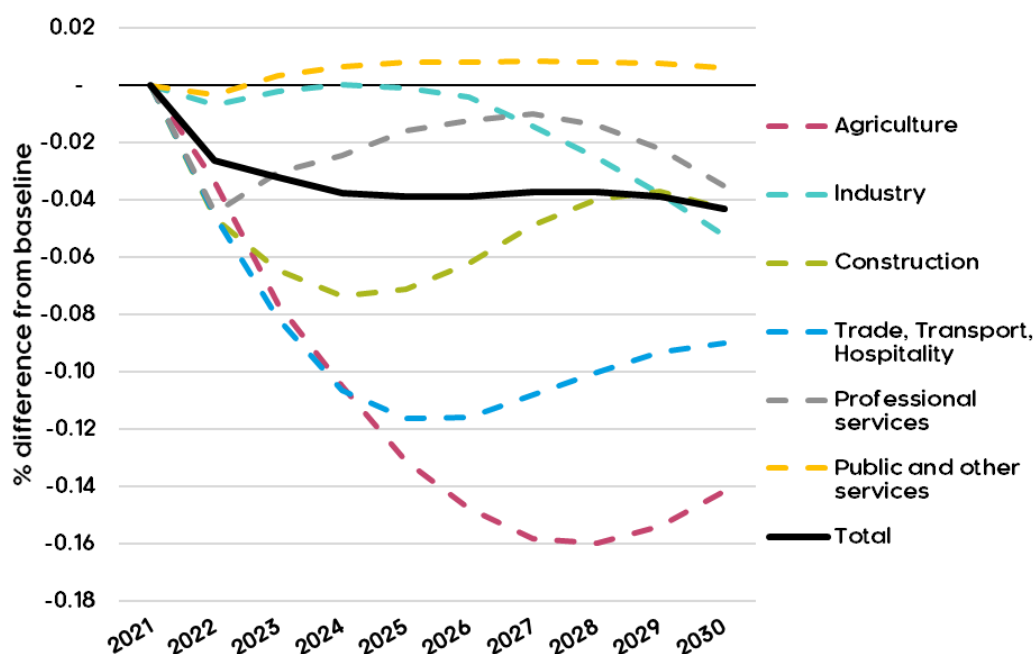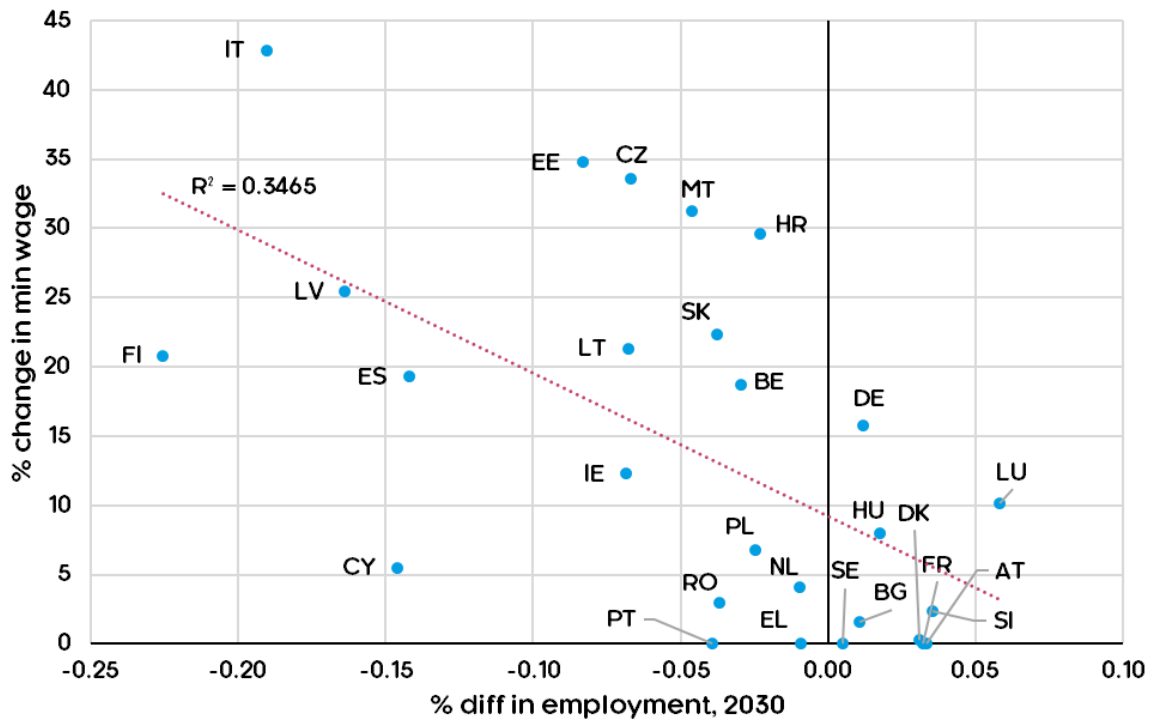

Source(s): Cambridge Econometrics

Higher percentage increase in minimum wages in individuals MSs are often associated with higher decline in employment, although this relationship does not hold true for every MS, as shown in Figure 6. Overall, the impact of increases of minimum wage on employment is relatively limited, ranging from -0.2% in Finland to 0.06% in Luxembourg in 2030.

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[11] See Figure A -1 in the appendix.

Figure 6 Relation between changes in minimum wages and changes in employment
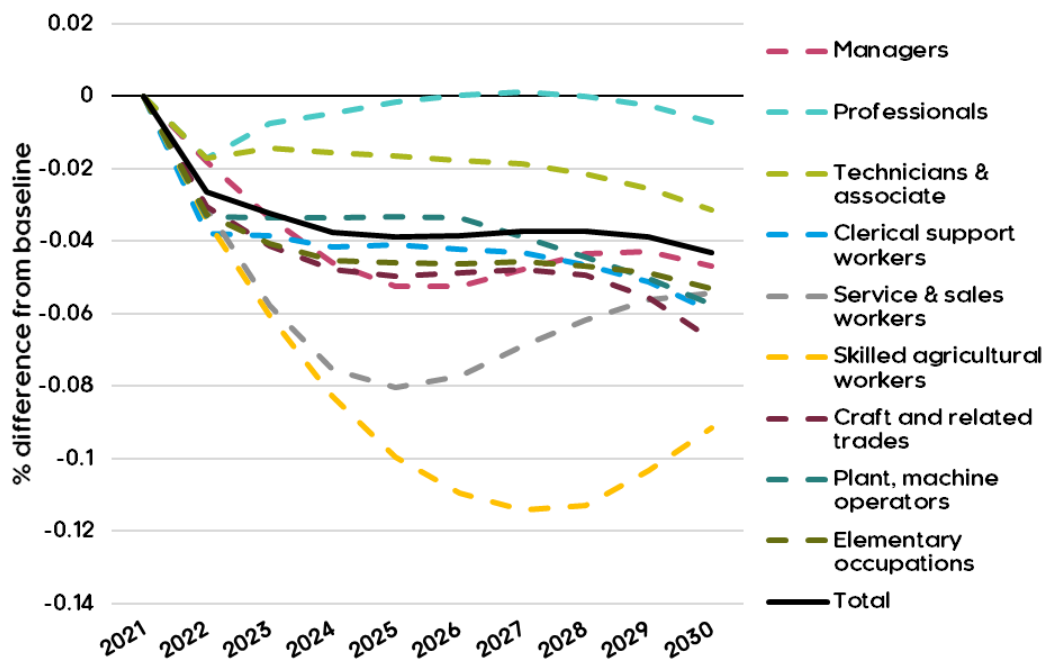

Source(s): Cambridge Econometrics

The sectoral impacts highlighted above drive the change in employment by occupations, as shown in

Figure 7. The decline in agriculture causes employment to decline among skilled agricultural workers, whereas the decline in trade, transport and hospitality sector causes employment losses among service and sales workers. Employment among professionals is almost stable throughout the period.

Figure 7 Employment percentage difference from baseline by occupations, EU-27

Increase in minimum wage directly increases the EU disposable income, as shown in

Figure 8. The increase in disposable income is the highest after the implementation of the measure in 2022, at a 0.2% difference from the baseline. In the following years, the increase in prices and decline in employment reduce the difference compared to the baseline, which is nonetheless still positive in 2030 at 0.1%.

Figure 8 Real disposable income, EU-27
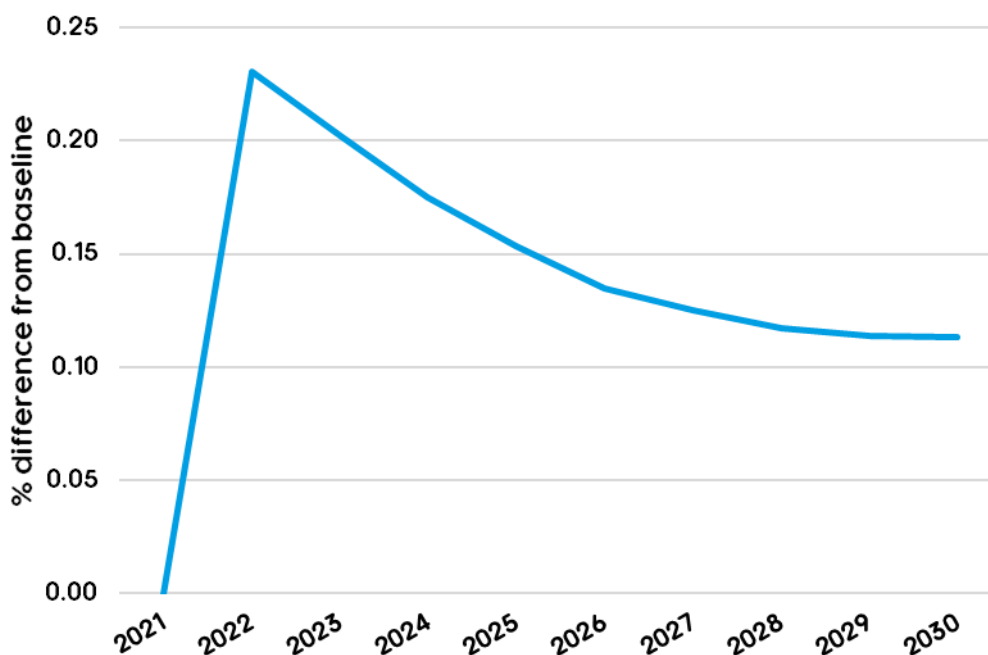
This scenario highlighted how higher disposable income across EU economies will increase economic growth at the small expense in terms of EU employment. The implementation of EU directive will have heterogeneous outcomes across MSs depending on national characteristics such as the share of minimum wage workers by sectors, the sectoral composition of employment and the competitiveness of the economy. At the EU level, agriculture, and trade, transport and hospitality are the sector with the sharpest drop in employment, while the most affected occupations are skilled agricultural workers, and service and sales workers.

Increase minimum wage by 30% in the Netherlands

Figure 9 shows the percentage difference in GDP with respect to the baseline following an increase in minimum wage by 30% and by reaching 60% of the median wage (as described in the previous scenario) in the Netherlands.
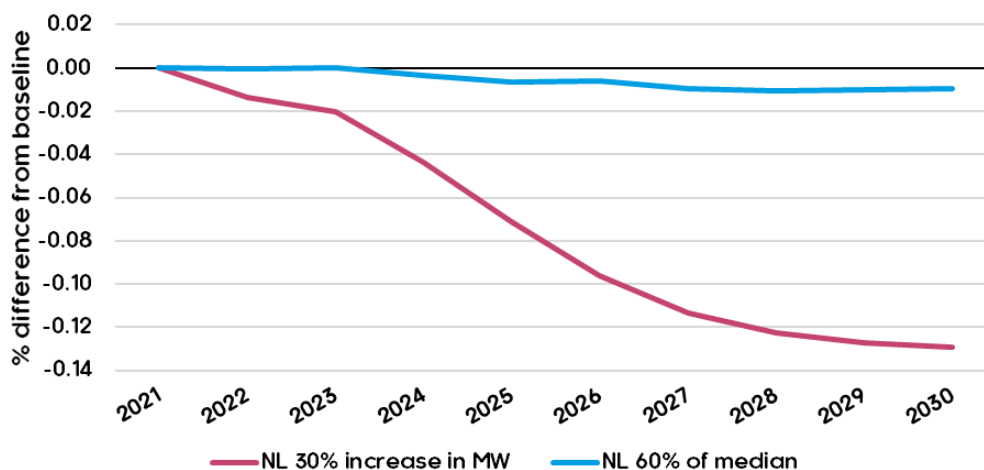
Figure 9 GDP percentage difference from baseline, Netherlands
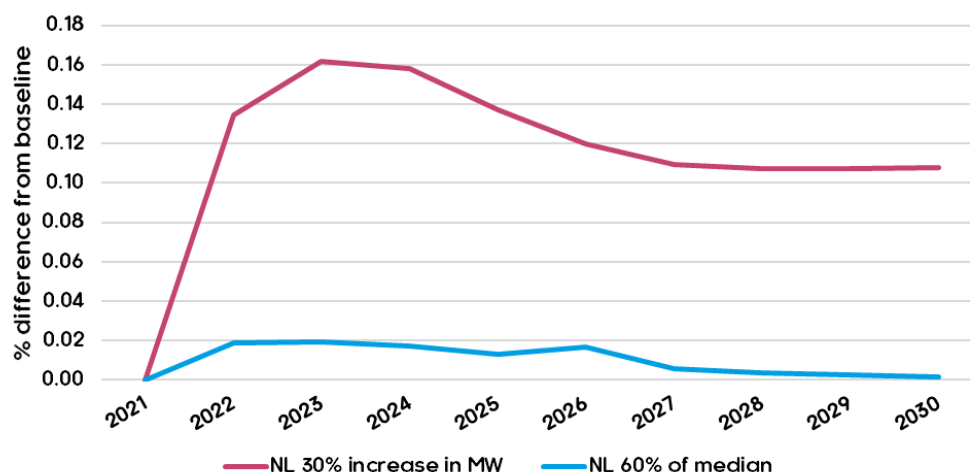
In the Netherlands, the wage corresponding to 60% of the median wage is only 4% higher than the current minimum wage[12]. Therefore, a 30% increase would have a higher impact on the economy, as shown in **Figure 9**. In this scenario, the increase in demand caused by higher wages more than offsets the negative effects caused by higher prices, with GDP reaching a peak difference from the baseline of 0.16% in 2023, before gradually declining to 0.11% in 2030. In comparison, setting the minimum wage to 60% of the current median wage has a negligible impact. The other MSs do not increase their minimum wage in this scenario, therefore the Netherlands does not have to face higher import prices for goods coming from the rest of the EU-27.

Figure 10 Employment percentage difference from baseline, Netherlands

The increase in labour costs has the opposite effects on employment, as shown in

Figure 10. The negative impact of increase in minimum wage is much stronger in the case of a 30% increase compared to 60% of current median wage, with the difference with respect to the baseline widening over the projection period, reaching -0.13% in 2030.

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[12] Which is considered to be the 2018 level, to maintain consistency between the various data sources.

Figure 11 shows percentage difference in employment by broad sector. The 30% increase in minimum wage causes a noticeable decline in employment within Trade, transport and hospitality (-0.28% in 2030 compared to the baseline) and Industry (-0.21% om 2030 compared to the baseline). Employment in the other sectors is between 0% and -0.12% below the baseline in 2030. For public sector, the decision is political so not based on econometric estimates. In the public and other services sector, the decision to keep the same number of employees is not affected by wages but by the need to satisfy the demand for public services.

Figure 11 Employment percentage difference from baseline by broad sector, Netherlands
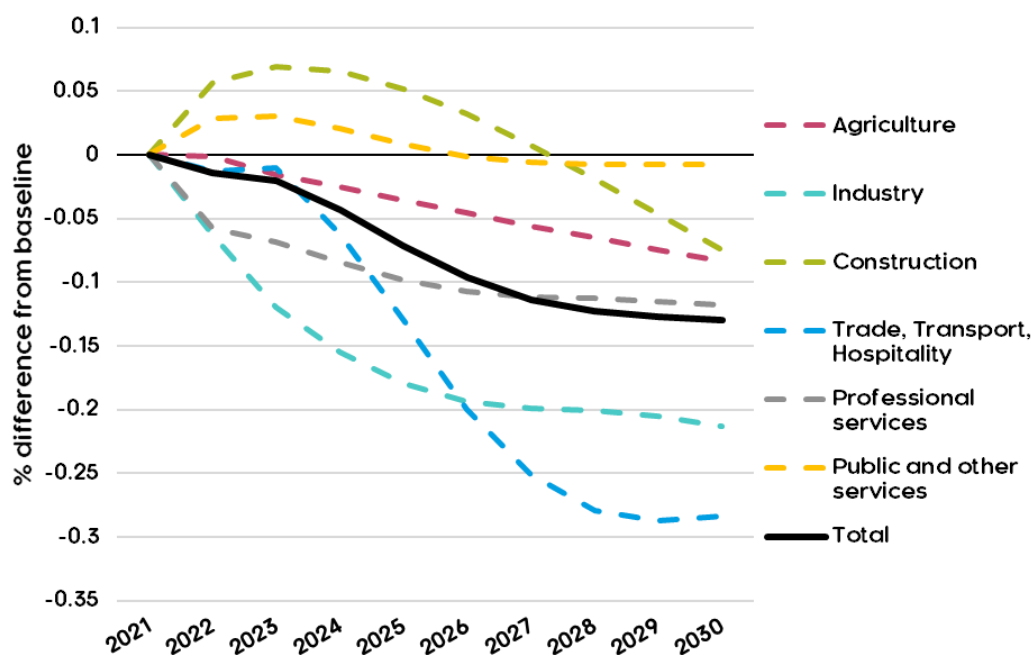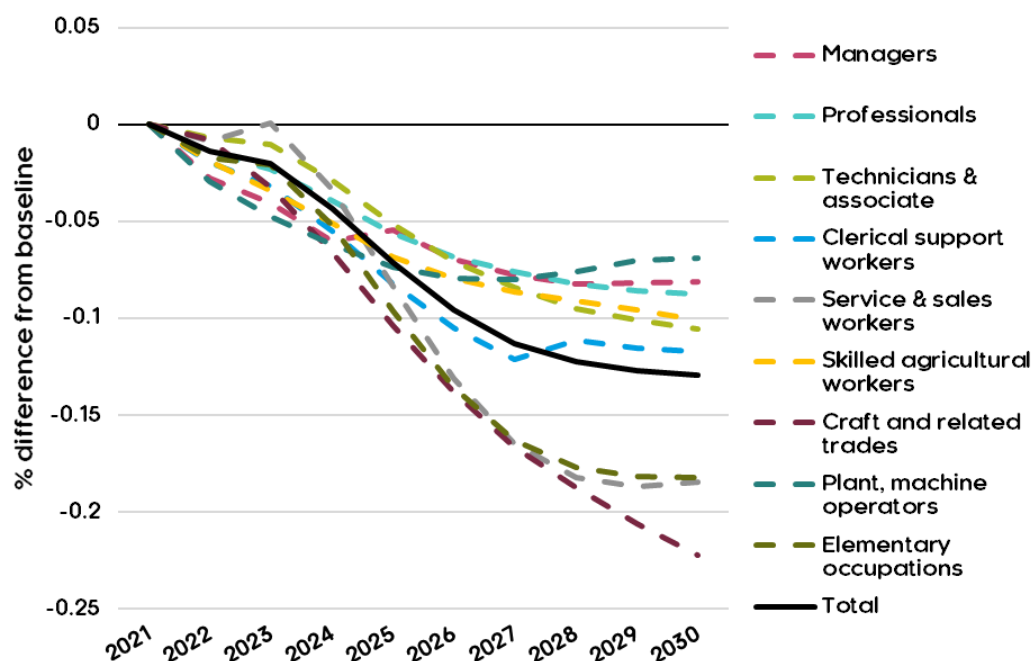

Source: Cambridge Econometrics

Following the sectoral developments, the occupations that experience the sharpest decline are Craft and related trades workers, Elementary occupations and Sales and services workers, whose employment level is around 0.2% lower in the scenario compared to the baseline, as shown in **Figure 12**.

This scenario shows how the magnitude of the change in minimum wage affects the Dutch economy. A 30% increase in minimum wage causes small in magnitude but more visible effects compared to the 4% increase implied in the previous scenario. Within the Dutch economy, the most affected sectors are trade, transport and hospitality and industry, since they might the most sensitive to change in competitiveness compared to other EU MSs. In turn, the most affected occupations are craft and related trades workers, elementary occupations and sales and services workers.

Figure 12 Employment percentage difference from baseline by occupations, Netherlands
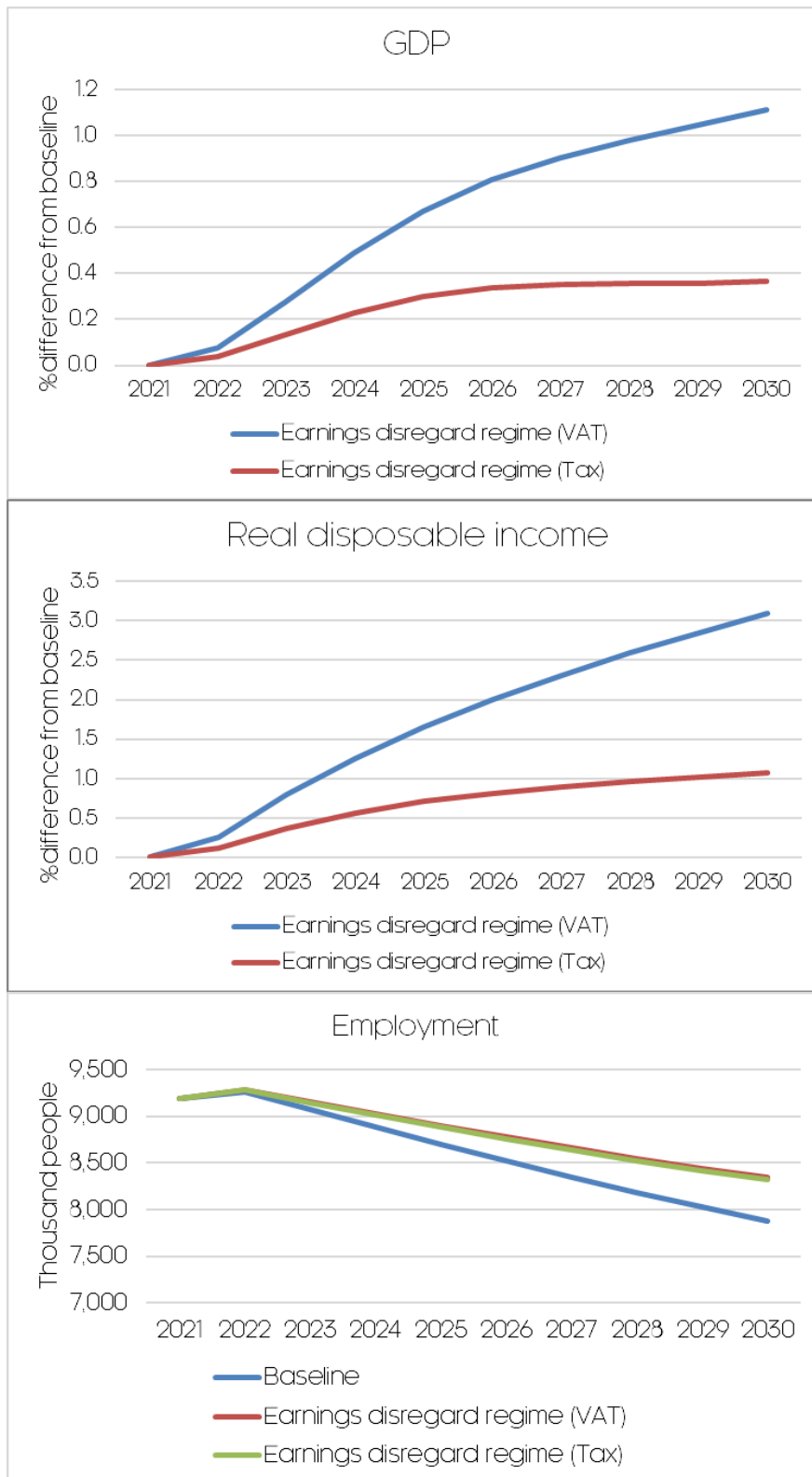

Source: Cambridge Econometrics

Social assistance scheme in the Netherlands

Figure 13 shows the percentage difference compared to the baseline in disposable income, employment and GDP brought by the change in conditions of social assistance scheme (i.e. earnings disregard regime) in the Netherlands, as described in Section 3. The impact on GDP is positive and increasing over time, reaching between 0.4%-1% compared to the baseline in 2030. The increase in GDP is driven by the increase in total disposable income brought by the change in the social assistance scheme (1%-3% higher compared to the baseline in 2030), which in turn increases demand and boosts employment (6% higher employment compared to the baseline in 2030). The increase in the employment includes the share of displaced workers re-entering employment and those on social assistance working part-time. The increase in the number of people on social assistance is being financed through a VAT increase or through increase in income tax. The VAT increase financing of the additional public spending means higher prices which has a different impact as opposed to higher income taxes (which is the other method of financing the additional public spending). The main assumption in this scenario is that the lump sum payment is an increase in income (and not wealth), which basically mean that people mostly spend it rather than save it. This behavioural assumption partly drives the increase in GDP but it seems plausible that low income households who receive the social assistance scheme will spend the financial assistance rather than save it.

Figure 13 GDP, disposable income and employment, The Netherlands

Source(s): Cambridge Econometrics

As shown in **Figure 13**, the employment in the baseline is on a declining trend due to the automation assumption. In the earnings disregard regime of social assistance, the employment is declining at a slower rate, regardless of how the scheme is being financed. These results show that the increase in disposable income has mitigation effect of the negative impact of automation from the baseline, and that the choice of financing method of the additional spending on social assistance impacts the level of economic growth.

At the sectoral level, it is possible to see that all sectors experience an increase in employment compared to the baseline, with the industry sector benefiting the most. This development is partly explained by the assumed employment re-instatement effect. Most of the workers displaced by automation were employed in the industry sector, and those that manage to re-enter the labour market are likely to be employed again within the industry sector driven by the additional demand for goods and services. The distribution of employment by occupation is driven by the increase in industrial employment results in 11% and 7% increases in employment for plant and machine operators, and crafts and related trades workers, respectively, compared to the baseline.

The changes in the social assistance scheme does not add additional burden firms in terms of higher labour costs, and therefore it does not further decrease employment. On the contrary, both GDP and employment increase sizeably. Industry is the sector that increases the most in terms of employment in this scenario, driven by the increase in disposable income.

5. Conclusions

This report presents the results of how different income support schemes may interact with automation and help mitigate undesirable consequences such as workers displacement. The schemes implemented were based either on an increase in minimum wage or on changes in social assistance in the form of a lump sum payment for displaced workers.

On the one hand, the effects of a higher minimum wage increase disposable income which boosts demand and employment, while, on the other hand, a minimum wage increases costs for firms leading to higher prices in some sectors, lower labour demand and a loss of competitiveness. At the EU level, when the minimum wage is set to increase to 60% of the median wage in each MSs, the income effect dominates causing an overall increase in GDP but the price effect causes a small decrease in employment. The sectoral composition of each economy plays a major role in how the effects are absorbed, i.e. the sectors impacted negatively by the increase in minimum wage versus the sectors which benefit from additional disposable income. An increase in consumer expenditure leads to increased purchases of certain goods and services (e.g. retail, hotels & catering) while minimum wage increase are likely to affect more agriculture and industry (where it is easier to substitute labour for capital). In this scenario, we assume that EUR 26 billion are required to raise the wage of 16 million workers to an adequate level.

The situation at the MSs level is quite heterogeneous, with GDP increasing in broadly half of the MSs and decreasing in the other half, depending on the structure of the national economy (e.g. how competitiveness is affected, to what extent higher prices abroad impact domestically), and on the (sectoral) share of workers earning minimum wage. In general, a higher number of minimum wage earners and a bigger increase in minimum wage may potentially lead to increase in prices hampering economic activity. However, the magnitude of this effects turns out to be relatively small. In conclusion, policymakers should pay particular attention to the share of workers earning minimum wage in each sector.

In the Netherlands, a 30% increase in minimum wage (explored in a separate scenario) has a noticeable positive impact on output while decreasing employment by a similar order of magnitude.

The change in the social assistance scheme has different outcomes: both employment and GDP increase compared to the baseline, since the increase in demand is not offset by higher labour costs for firms (as the in minimum wage scenario). This modelling exercise highlighted the trade-offs that might arise while implementing income support schemes and suggests a careful reflection over their multiple effects that must take into account the structure of the national economy.

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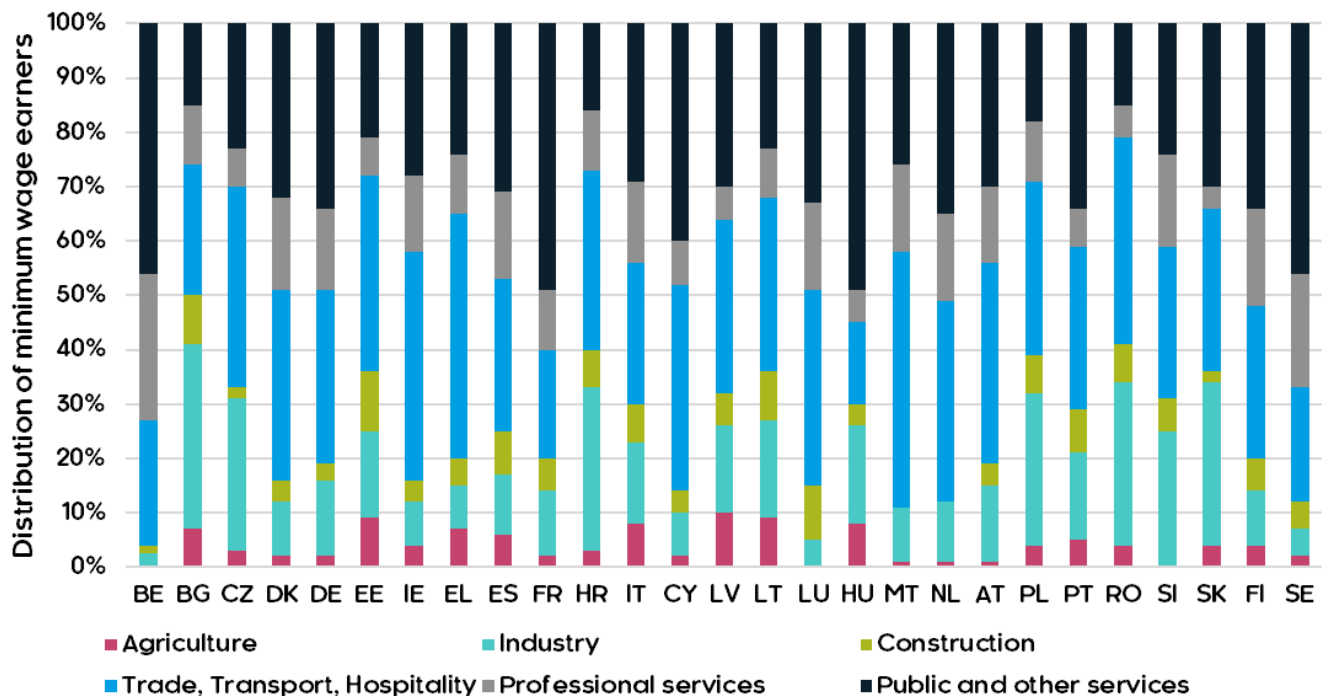
Appendix – Additional tables and figures

Figure A -1 Share of workers by broad sectors, EU27
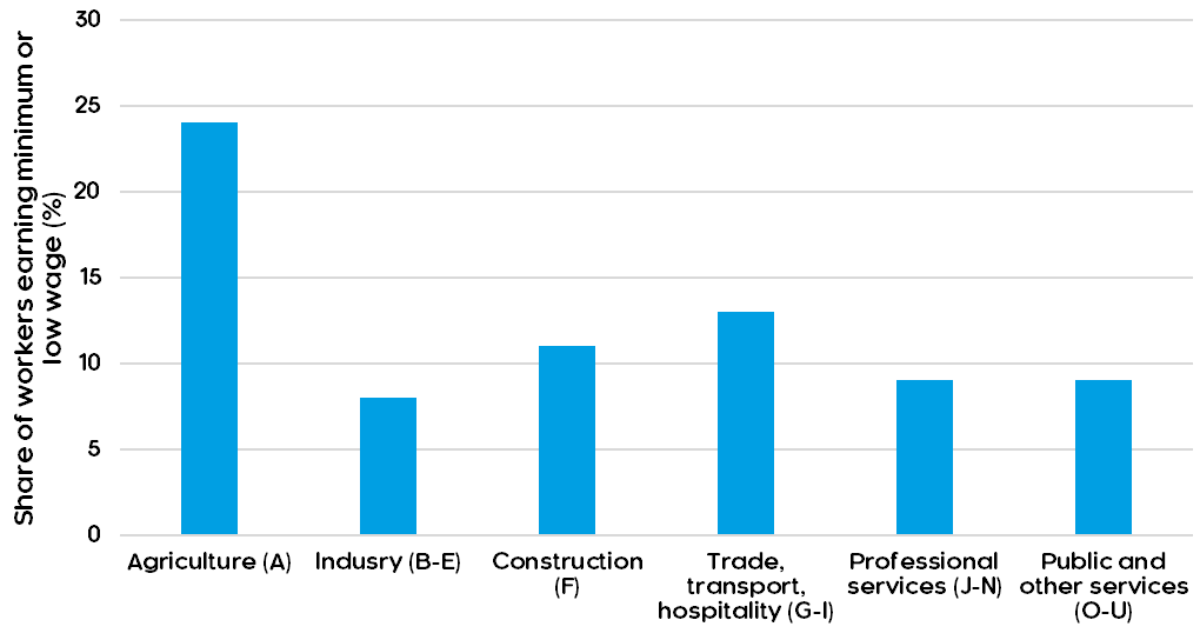
Source(s): European Commission (2020a)

Figure A -2 Distribution of minimum wage workers by MSs and broad sectors

Source(s): Based on European Commission (2020a)

Table A - 1 List of data sources used in the minimum wage scenario

Variable	Dataset	Breakdown
Total wage bill	Eurostat, nama_10_a64	MS, 2-digit NACE rev.2
Employees	Eurostat, nama_10_a64_e	Countries,2-digit NACE rev.2
Minimum wage level	Eurostat, earn_mw_cur; Vacas (2021)	MS
Share of employees on minimum wage	EC impact assessment (European Commission, 2020a)	MS, broad sectors
Employees earning less than 60% of median wage	Structure of Earning Survey, earn_ses_monthly	MS

Source(s): Cambridge Econometrics

Table A - 2 Data on minimum wage by MSs

Member States	60% of monthly median wage (ths €), 2018	Monthly minimum wage (ths €), 2018	Difference 60% median - minimum wage (ths €), 2018	Difference 60% median - minimum wage (%), 2018	Share of workers on minimum wage (%), 2017
BE	1.86	1.59	0.29	19%	3%
BG	0.27	0.26	0.00	2%	11%
CZ	0.64	0.47	0.16	34%	4%
DK*	2.43	2.4	0.01	0%	13%
DE	1.73	1.5	0.24	16%	5%
EE	0.67	0.5	0.17	35%	7%
IE	1.81	1.61	0.20	12%	9%
EL	0.68	0.68	0.00	0%	3%
ES	1.02	0.86	0.17	19%	8%
FR	1.42	1.5	-0.08	-5%	7%
HR	0.60	0.46	0.14	30%	1%
IT*	1.26	0.9	0.38	43%	17%
CY*	0.89	0.8	0.05	5%	13%
LV	0.54	0.43	0.11	25%	8%
LT	0.49	0.4	0.09	21%	5%
LU	2.20	2.0	0.20	10%	10%
HU	0.48	0.45	0.04	8%	8%
MT	0.98	0.75	0.23	31%	2%
NL	1.64	1.6	0.07	4%	5%
AT*	1.59	1.6	0.00	0%	16%
PL	0.54	0.5	0.03	7%	10%
PT	0.56	0.67	-0.12	-17%	18%
RO	0.42	0.41	0.01	3%	26%
SI	0.86	0.84	0.02	2%	3%
SK	0.59	0.48	0.11	22%	8%
FI*	1.77	1.5	0.31	21%	8%
SE*	1.88	1.9	-0.01	-1%	13%

Source: European Commission (2020a) for share of workers on minimum wag, Structure of Earning Survey (Eurostat code earn_ses_monthly) for monthly median wage, Eurostat (earn_mw_cur) and Vacas (2021) for monthly minimum wage.
Note: Figures might not match exactly due to rounding.

* These MS don't have a statutory minimum wage, the figures shown here are an avearage of the lowest paid occupations computed in Vacas (2021).