

How can various structural changes in the economy affect wages and inflation?

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This article contains a review of the research literature on various structural changes that may have affected wage and price formation over the past 25 years. During that period, there have been extensive changes both in Sweden and abroad that have affected the Swedish labour market. First, significant reforms have been carried out on the Swedish labour market; for example, the unemployment compensation level has been considerably lowered. Second, increases in foreign trade appears to have had effects on producer prices. Third, trade has also had some effects on wages, although it is primarily technological developments benefitting highly educated workers that seems to have had an impact on wage formation. Fourth and finally, migration has risen sharply over the period, affecting labour force composition, for example in terms of education level. Somewhat surprisingly, it is suggested in the literature that the increases in migration and labour market integration within the EU in the past few decades have had limited effects on wages in general. However, this does not rule out that the effects potentially have been greater for certain sectors, for instance the construction sector.

1 Introduction

In this article, a review is performed of the theoretical and empirical literature that concerns structural factors on the labour market and the effects of changes therein on wages and inflation. The labour market has been affected by considerable structural changes both in Sweden and abroad.

In Sweden, extensive labour market reforms have been carried out that may have affected wage formation. Unemployment compensation levels have fallen relatively sharply in Sweden in the past 25 years, although this does not seem to have had any great effects on wages, see Gottfries et al. (2008) and Jonsson and Theobald (2019). Substantial changes to, for instance, the pension system, have also been made – which can affect labour supply – for example the possibility of working until the age of 67.

Other structural factors might also have affected the labour market. For example, trade with low-wage countries has increased, leading to firms in Sweden closing down and their employees having to seek new employment that might pay less. However, this also causes the least productive Swedish firms to disappear, while at the same time the more productive Swedish export firms grow, leading to increased productivity and higher wages for workers in the export industry. On the whole, the increase in trade does not seem to have had any significant effects on wage formation. However, there is support for it having led to declining producer prices, although this has not affected aggregate inflation dynamics to any great extent.

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Major demographic changes have also taken place in the past 25 years, which might have affected wages and inflation. For example, migration can bring about an increase in labour supply which, in turn, affects wage formation. It seems, however, that the high level of migration in the past few decades has had relatively small effects on wages, see for example Engdahl (2016). The increase in wage dispersion in many countries appears instead to have been caused by technological developments, which have benefited highly educated workers. In Sweden, wage dispersion has been relatively unchanged since the turn of the millennium. Migration seems however to have affected prices in sectors that employ a high percentage of workers with low education. Considerable improvements in human health over time also seem to have led to an increase in labour supply, which in turn might have affected wages.

Section 2 provides a brief description of wage formation, while section 3 discusses possible effects of changes in unemployment compensation systems and rigid wages. Section 4 offers an overview of what the literature says about possible effects of the increase in world trade. How the altered demographics, migration and an increasingly integrated European labour market affect wage and price formation is discussed in section 5, while section 6 looks at the effects that other structural changes have on wage and price formation. Finally, the main messages are summarised in section 7.

2 Wage formation in brief

Wages are normally determined in negotiations between the labour market parties. In order to gain an understanding of what affects wage formation, it can be useful to study how wages are determined in simple models.

A common method for analysing the labour market and wage formation is to use search and matching models. When workers and firms negotiate wages, they also take into account what would happen if they fail to agree. For example, the worker might leave the firm, and in that case the firm loses the value of the production that the worker would have provided until a replacement could be found. The worker's alternatives are affected by how many other workers are searching for a job, and the intensity of their job search. How intense unemployed workers look for work is affected by how much they receive in unemployment compensation, how high a probability they have of finding a job, and how costly it is to look for one. The wage negotiated between the firm and worker thus depends on the compensation level, unemployment and the firm's productivity.

Changes in the labour force will affect unemployment and hence also wages. If the labour force increases, unemployment rises, which in turn pushes down wages. Changes in demand can also affect wages. If firms demand less labour, for instance due to a drop in demand abroad for goods, or due to the relocation of firms to other countries, this reduces the probability that workers find new jobs, which in turn lead to lower wages.

Ultimately, inflation is affected since inflation depends on how the marginal costs of firms change. Marginal costs depend on wages, labour productivity and the price of capital and other input goods. Under certain conditions, the marginal costs in the period t , MC_t , are closely related to the unit labour cost.

$$(1) \quad MC_t = k \frac{w_t N_t}{Y_t} = k \frac{w_t}{A_t}$$

where k is a constant, w_t is nominal wages, N_t is employment or hours worked, Y_t is production and $A_t = Y_t/N_t$ is productivity. How wages and productivity develop in relation to each other will then be important for inflation.

2.1 Productivity

Productivity growth, measured as GDP per hour worked, slowed down in the mid-1970s and grew relatively slowly until the mid-1990s. In the United States, productivity growth took off around 1995 and grew at a faster rate for around a decade. A few years before the financial crisis in 2008, productivity growth slowed down once more, and the growth rate has also been low after the crisis. Fernald (2014) studies the reasons for why growth took off and then slowed down, and finds that it appears to be driven by IT-related sectors. In Sweden, the slowdown seems to have occurred just before the financial crisis, that is to say somewhat later than in the United States, see National Institute of Economic Research (2017). The reason for the rapid productivity growth before the financial crisis seems to be related to IT sectors in Sweden as well, see Calmfors et al. (2019).

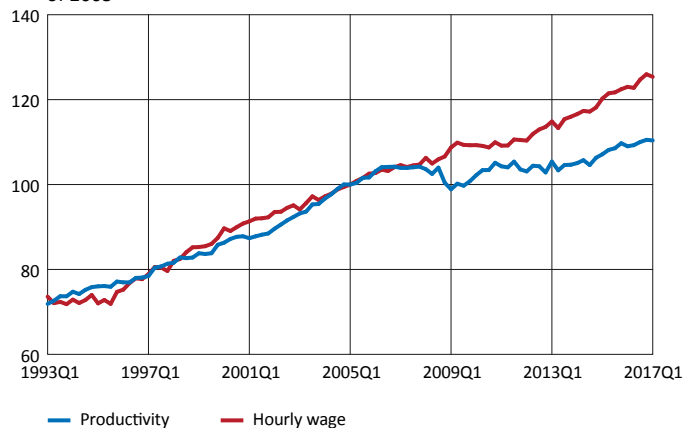
2.2 Wages

Wage growth in Sweden, measured as average hourly wage, has been relatively good since the crisis of the 1990s. In the years following the 2008 financial crisis, however, nominal wage changes has fallen.¹ This pattern partially differs from wage growth in other countries – wages in the United States rose for example in the 1990s, but have developed weakly since the turn of the millennium. Another important international trend has been that wage dispersion, measured for example as the difference between the wage of the highest-paid 10 per cent and that of the lowest-paid 10 per cent, has widened relatively sharply since the mid-1990s, see OECD (2012). In Sweden wage dispersion increased up until the turn of the millennium, but has subsequently been relatively constant, see Carlsson et al. (2017).

Figure 1 shows real wages and productivity from 1993 to 2017. Wages grew at more or less the same rate as productivity until the financial crisis in 2008. After the crisis, productivity has grown somewhat slower than real wages.

Figure 1. Productivity and real hourly wage 1993Q1–2017Q1

The wage and productivity level is indexed at 100 for the first quarter of 2005



Note. Productivity is calculated as GDP per hour worked.

Source: Own calculations from the National Accounts (via DORIS)

Westermarck (2019) estimates wage equations in order to get an idea about what factors affect for example aggregate industrial wages in Sweden. The results indicate that productivity and competitor prices affect Swedish industrial wages, but also wages in competing countries.

1 National Mediation Office, short-term wage statistics.

3 Change in the unemployment compensation level

The level of unemployment compensation affects wage formation through the negotiations between workers and firms. For example, lower unemployment compensation means that an unemployed worker earns relatively more by working, and therefore searches for employment more intensively. At the same time, this makes it more difficult for an employed worker to find a new job, because of the greater competition for new jobs. Then it will also be more difficult for an employed worker to negotiate a higher wage by threatening to switch jobs, which leads to wages dropping or at least rising less than they would have done had the benefit level not declined.² If the drop in benefit levels affects large groups, the change will in turn cause a drop in unemployment, because the lower wages make it more profitable for firms to hire, making it easier to find a new job. This in turn then affects wage negotiations and job search behaviour. These general equilibrium effects can cause the total effect of a change in the compensation system to differ substantially from the effect for an individual person in isolation.

The unemployment compensation system has undergone major changes since the beginning of the 1990s. How the system is devised, for example with a cap on benefits, leads to variation in the replacement rate for different income groups. For a middle-income earner, for whom the benefit cap usually tends to limit compensation, the replacement rate at the end of the 1980s was at around 90 per cent, and then dropped to 65 per cent in 2006. The new government that took office in 2006 then carried out reforms that led to the replacement rate dropping further to below 50 per cent. In recent years, changes in the benefit system have led to a rise in the replacement rate to over 50 per cent again. For workers with a low income, for whom the cap in the compensation system is not binding, the drop has been less drastic.³

The effects of these changes have been analysed in several studies. Roughly, these can be divided up into two categories – studies based on microdata and studies based on aggregate data. An example of a study that looks at microdata is Bennmarker et al. (2011). Therein, the authors find that the changed compensation levels between 2007 and 2009 led to a drop in wages of 2.5 to 5.2 per cent.

A problem with studies based on microdata is that they do not usually take account of the general equilibrium effects described above. A drop in wages caused by a lower unemployment compensation level leads to a rise in the profits of firms, which makes them want to hire more workers, and the improved job prospects tend in turn to push up wages. These effects moderate the initial wage drop. A paper that studies this problem by looking at macrodata is Forslund et al. (2008), in which the authors look at how changes in the compensation system from the 1960s to 1997 have affected wage formation in the Nordic countries. They find that the partial effect on wages, that is to say the effect of a changed replacement rate at a given unemployment level, is in line with the findings in Bennmarker et al. (2011): Wages drop by at least 3.8 per cent if the replacement rate drops by 10 per cent (that is to say that the replacement rate drops from 0.6 to 0.54). They also quantify the general equilibrium effects and find that they differ substantially from the direct effect. The effects of an altered replacement rate largely operates through quantity adjustment, that is to say changes in employment and unemployment, and the effects on wages are small when general equilibrium effects are taken into account. Specifically, wages drop by 1.1 per cent and unemployment by 22 per cent if the replacement rate is cut by 10 per cent; that is

² If the alternative for the worker is unemployment, the replacement rate has a more direct impact on negotiation. If the replacement rate decreases, the alternative to working at the firm, that is to say unemployment, will be worse for the worker, and this causes wages to drop.

³ Because workers also might have private insurance, the drop in the benefit level can be smaller. A drop in benefits from unemployment benefit funds gives workers a greater incentive to take out private insurance.

to say, if unemployment is 6 per cent initially, it will drop to just below 5 per cent. When unemployment changes, this has indirect effects on wages causing the total impact on wages to be much smaller than the direct effect.⁴

Zhang (2017) studies a new Keynesian DSGE model in which the replacement rate is subject to shocks. The model is estimated on American data and the results are in line with those for Sweden. A shock leading to a drop in the replacement rate by 10 per cent causes a drop in wages of 1 per cent at most. Jonsson and Theobald (2019) also find relatively small effects when they study the effects of an altered replacement rate in a new Keynesian model that is calibrated for the Swedish economy: If the replacement rate drops by 21 per cent, wages fall by 1 per cent at most.

When the replacement rate changes, this can also have implications in terms of how different shocks affect wages and unemployment. A higher replacement rate also causes wages to rise. This means that the surplus that a worker generates in a firm will be lower, as wages rise in relation to the worker's productivity. In the event of a negative shock, the surplus decreases more and the value of hiring a worker falls more if the replacement rate is higher, which in turn leads to fewer vacancies when the replacement rate is high. Workers who are employed will also generate a lower surplus in the event of a negative shock, leading to more workers losing their jobs. A negative shock thus leads to higher unemployment if the replacement rate is high, while the effects on wages will be smaller, because the replacement rate limits how much they can fall. Similarly, a positive shock leads to employment increasing more if the replacement rate is high. Unemployment will thus be more volatile while wages will be less volatile, the higher the replacement rate, see Hagedorn and Manovskii (2008) and Pissarides (2009) for details. For low replacement rates, however, this relationship need not hold because a low replacement rate leads to precautionary saving potentially varying more over the business cycle, see den Haan et al., (2017).⁵ This counteracts the traditional effects that changes in replacement rates have on the labour market.⁶

3.1 Effects caused by rigid wages

In the 2008 financial crisis, production and employment dropped sharply in several countries, but the effects on nominal wages do not seem to have been large. A reason for this is that if wages are downwardly rigid, that is to say they are difficult to adjust downwards, wages do not fall much in a deep recession. The relationship between wage inflation and unemployment will in that case be weaker than in normal times. After the economy has recovered from the deep recession, wage growth can be weak for some time, due to the same sluggishness in wage formation that stopped them from falling much in the recession. Because wages have not fallen much, the scope for increasing wages is smaller during the recovery. Another factor that can add to this is that firms that know that lowering wages in a recession might be difficult, are not as inclined to raise them so much when the economy is in a boom, see Daly and Hobijn (2014 and 2015), and Elsby (2009). Elsby et al. (2014) find however that downwardly rigid nominal wages were perhaps not such an important factor for wages and employment in the United States and the United Kingdom during the Great Recession. One reason for this is that the drop in employment was relatively similar to that in other recessions when inflation was high and hence nominal downward rigidity not so

4 It is worth noting that the changes that the centre-right government carried out may have had effects on labour supply that differ from the effects of a traditional cut in replacement rates. A drop in the replacement rate makes unemployment less attractive, which in turn makes it less attractive to participate in the labour force (for a certain wage level) On the other hand, a tax cut that only targets individuals in employment makes it more attractive to have a job (for a given wage level), which in turn ought to increase labour force participation.

5 Compensation ratios below approx. 0.55.

6 In a model with precautionary saving and incomplete markets, a recession will increase precautionary saving, which in turn leads to a drop in demand and prices. If wages are rigid, profits fall, which leads to a rise in unemployment. In that case, demand falls even more, which pushes unemployment up further. Because of this self-generating process, a shock can have major effects on unemployment. The reason for why these effects are small when the replacement rate is high is that a high replacement rate causes precautionary saving to be low, and the self-generating process is subdued.

important, for example the recession at the beginning of the 1980s. They also claim that relatively flexible wages for new employees mean that downwardly rigid salaries in existing jobs do not matter so much for job creation.

4 Increases in trade

In the past few decades, the growth and increased international trade of China have been a major and important factor that has affected international trading patterns. The political changes and the liberalisation of the economies in Eastern Europe have also had major effects on international trade, as has the enlargement of the EU. How this affects inflation, prices and wages is described below.

4.1 Effects on inflation and prices

Increased imports of goods from low-wage countries should affect inflation and prices if the goods are cheaper, compared with the products they replace. The size of the effects has however been questioned by for instance Ball (2006), who claims that they have not been so significant. Auer and Fischer (2010) find on the other hand that the effects on prices are economically significant when they study the consequences of increased imports from low-wage countries to the United States.⁷ They find that if the volume of imported products increases by 1 percentage point in a manufacturing sector, producer prices in the sector fall 2.35 per cent.⁸ Auer et al. (2013) conduct a similar study for a number of European countries.⁹ For Sweden, they find that if imports increase by one percentage point in a sector in a manufacturing sector, prices in the sector fall by 2.6 per cent. They also study how wages are affected and find that the effect is much smaller than for prices. Wages only fall by 0.57 per cent if imports increase by 1 per cent. Because imports increased by 4 percentage points between 1995 and 2007, wages fell by 2.3 per cent over the same period. Auer et al. (2012) perform an equivalent analysis of increased imports from China to the Nordic countries for the period 1995 to 2008 and find similar effects – if imports increase by 1 percentage point, producer prices fall by 2 per cent.¹⁰ In total, producer prices fell by 14 per cent during the period.

The effects on sectoral prices will thus be relatively large when imports increase in these studies. However, at the aggregate level the results can be different, for example because the increased imports can, through general equilibrium effects, affect other parts of the economy. In simple macroeconomic models of open economies, consumers will demand products produced both in Sweden and abroad. The prices are affected by marginal costs which, through wage formation, depend on both domestic and international factors, for example domestic and international resource utilisation. Prices and inflation are then also affected by both domestic and international factors. If imports increase international factors will have larger effects. Milani (2009) studies this in a small new Keynesian model on US data but finds that the increased trade only has small effects on inflation.

From a theoretical angle, increases in trade also implies that import prices have larger effects on inflation, besides international resource utilization. Ihrig et al. (2010) study whether globalisation has led to international factors having larger effects on inflation dynamics in 11 OECD countries, including Sweden, in a model based on a Phillips curve with adaptive expectations. They find however that the effect of import prices have not increased

7 Low-wage countries are China, Brazil, Indonesia, India, Malaysia, Mexico, the Philippines, Thailand and Vietnam. 'Low-wage country' means countries with a GDP per capita that is lower than 20 per cent of GDP per capita in the United States. Also, the countries may not have an export share of commodities exceeding 30 per cent in trade with the United States, and the country's exports must account for at least 0.4 per cent of imports to the United States.

8 They assume that the effects of changes in import shares do not differ between sectors.

9 Low-wage countries are China, India, Malaysia, Mexico, the Philippines and Thailand.

10 In terms of volume the effect is smaller – if the percentage of imports increases by 1 percentage point, producer prices fall by 0.8 per cent.

over time. Bianchi and Civelli (2015) also find that globalisation has not led to any substantial changes in how inflation is affected by international factors.¹¹

4.2 Effects on wages

4.2.1 Effects in models

In recent decades, the OECD countries have extended their trade with countries with a less-educated labour force. The theoretical effects of this on wages has been analysed by Stolper and Samuelsson (1941). The model they use consists of a small open economy with perfect competition on goods markets and several different sectors. Several production factors are used, the sectors differ in terms of the importance of highly educated labour, and the supply of production factors is fixed. In sectors with technology that requires more highly educated labour, the share of highly educated workers will be higher than in other sectors. Increased trade in goods for which workers with low education are important causes a drop in the relative price of such goods, which in turn means that the cost of producing them in richer countries also decreases. Wages for workers with low education will thus drop, while wages for highly educated workers rise.¹²

One problem with the approach described above is that wages rise for highly educated labour while at the same time employment is unchanged. However, this is not consistent with how wages and employment have developed empirically. There, both wages and demand have risen. A reason for this could be that highly educated workers are complements (or is complement to firms with high productivity), which could give results more in line with data. Exporting firms are also larger, more productive and pay higher wages than non-exporting firms. Melitz (2003) analyses this in a model in which it is costly to export. Firms with sufficiently high productivity will therefore both export and produce for the domestic market, while firms with lower productivity will only produce for the domestic market. Exporting firms are larger than those that only produce for the domestic market. If trade increases, more firms choose to export while at the same time the least productive ones close down. Productivity hence increases, which tends to push up average wages. This mechanism can give results that are more consistent with empirical data. Helpman et al. (2010) also find that the average wage rises when trade increases, when they analyse the effect on wages and wage dispersion. This is because exporting firms are more productive than non-exporting firms. But, the relationship between wage dispersion and trade is not linear. Both when no foreign trade occurs (autarchy) and in the case of all firms exporting, the firms are identical – in the one case no firms export and in the other all of them do. Because the firms are identical in terms of exports, wage dispersion in the economy will be low. However if an economy opens up for trade, inequality will increase, because some workers now work at firms that export that have higher productivity and wages, compared with in an autarchy.¹³ In a situation where all firms export, a change to less openness will lead some firms to cease exporting.¹⁴ This leads to a drop in the productivity and wages of these firms, which widens wage dispersion. Wage dispersion will be largest when the economy trades with other countries but is not too open. In that case, the firms differ, with some exporting and paying high wages while others only producing for the domestic market and having a lower wage level.

11 They estimate a vector autoregression in which they study whether the dependence of inflation on international factors has been affected over time.

12 The marginal costs do not change for the commodity to which highly educated labour is important because the price is unchanged. If one wage drops, the other must rise in order for marginal costs to be unchanged.

13 Highly productive workers tend to work at exporting firms, which also pushes up wages.

14 Modelled through the cost of exports increasing.

4.2.2 Empirical findings

Most of the studies described below analyse the effects that increases in trade has on wage dispersion. Although wage dispersion is not of primary interest if we want to find out the effects on average wages and inflation, we might still get an idea about the importance of the trade mechanism. If increases in trade only has small effects on wage dispersion, it is not unreasonable to think that the effects on the average wage, and hence inflation, also might be small. Wage dispersion in Sweden has not changed so much since the turn of the millennium, which means that the trade mechanism has perhaps not had such a great impact on wages in Sweden.

The way in which increases in trade affects the economy empirically has been studied using both macro- and microdata. A panel study by the OECD based on 22 countries finds that increases in trade does not cause wage dispersion to increase, apart from in countries with weak job security, see Cahuc et al. (2014). Burstein et al. (2016) study whether it is technological developments or trade that have driven increases in wage dispersion in the United States. They find that it is primarily driven by technological change and that globalisation only explains a relatively low share of the widened wage gap between highly paid and low-paid workers, see also Helpman (2016). Trade is affected by free-trade blocs, for instance the EU internal market. Another example is MERCOSUR, which was formed in 1991 and includes Brazil, Argentina and Uruguay. Helpman et al. (2017) have studied how this has affected wages for workers and firms using Brazilian microdata during the period 1986 to 1998. Although MERCOSUR does not have a direct bearing on Sweden, an indication of the effects of free-trade areas on wages can perhaps nevertheless be obtained by studying the effects of MERCOSUR. Helpman et al. find that increased trade causes wage dispersion to increase. The increase in wage dispersion is chiefly driven by differences in wages between exporting firms and firms that only operate on the domestic market, which is in line with their model from 2010. Akerman et al. (2013) examine Swedish data for the period 2001 to 2007 and find that the share of wage dispersion caused by differences between firms is much smaller, which is an indication that the effects of increases in trade are perhaps not so large in Sweden. This could be due to differences in wage formation and regulation on the labour market between Sweden and Brazil, and could imply that the effects of trade on wages are smaller in Sweden than in Brazil. If wages respond less in Sweden compared with Brazil, the adjustment could instead occur on the employment margin.

Autor et al. (2013) analyse effects of increased competition from China on the American labour market. They find that employment declines more on local labour markets, which are more exposed to competition from China, and that wages only fall slightly on these labour markets. By comparing local labour markets with varying degrees of import increases from China, they find that the effects on employment are relatively large – employment drops by 4.5 per cent more on the labour market that is more exposed to competition. Specifically, they compare two local labour markets at the 25th and 75th percentiles in the breakdown of import growth from China, that is to say labour markets with import growth that is relatively low and high, respectively. Import growth was approximately double for the region at the 75th percentile (3.1 per cent) compared with the region at the 25th percentile (1.6 per cent) during the period 2000 to 2007. Employment in other sectors does not seem to have been affected to any considerable extent, although unemployment increases more in the sector exposed to competition. Also, wages fall 0.8 per cent more on the labour market that is more exposed to competition.

Helpman's (2016) conclusion is also that the effects on wages from increases in trade are not so substantial in a literature review of papers that have studied the effects of growing trade on wages. The increase in wage dispersion of the past few decades is mainly explained, according to Helpman, by technological developments that have benefited highly educated workers.

4.3 Offshoring

Globalisation and increased trade can also affect wage formation due to the offshoring of operations to other countries. The mechanisms are relatively similar to those when trade increases. If firms offshore operations with a low content of qualified labour, this could lead to that wages for low-skilled workers decline compared with those of high-skilled, see for instance Feenstra and Hanson (1997).¹⁵ Just as in the models describing the consequences of altered trade patterns, offshoring operations can also cause higher average productivity, because the firms offshore the operations with relatively low productivity. This can in turn push up the average wage, see Grossman and Rossi-Hansberg (2008).

A number of empirical studies have been conducted to study the effects of offshoring on wages. A study that might be of interest to Sweden is described in a study by Hummels et al. (2014) which looks at effects of offshoring in Denmark during the period 1995 to 2006. They use Danish microdata and can follow workers in Denmark who remain at the same firm following the offshoring. They find that, for highly educated workers who remain at the firm, offshoring causes wages to rise, while they drop for workers with low education who remain. The effects can be considerable – a worker with low education at the firm that doubles its offshored operations has a drop in wages equalling one-and-a-half years of professional experience. For highly educated workers, the effects are the opposite and they receive substantial wage increases as an effect of the offshoring. Hummels et al. also study what happens when the workers who lose their jobs or change jobs are also included, and find that the effects on wages for highly educated workers are not statistically significant, while the effects for workers with low education are negative. A handful of studies also analyse general equilibrium effects of increased offshoring, but the available results indicate that the effects can be small, see Hummels et al. (2018).

5 Demographic changes

5.1 Effects of changes in the age structure

Changes in the population structure, caused for instance by longer life expectancy, or increased migration, will affect labour supply, which can in turn affect wages. If the labour supply decreases, for example if fewer young persons start working, this causes a drop in the supply of labour in relation to capital, which pushes up real wages and prompts a decline in the real interest rate. However, fewer young persons on the labour market also leads to lower savings, which can counteract the effect on capital formation. Krueger and Ludwig (2006) find that the first effect dominates. Demographic changes thus tend to drive wages and real interest rates in different directions. Gagnon et al. (2016) study which effects demographic changes have on the economy in a general equilibrium model, with a focus on the real interest rate. They find that the growing share of the elderly, through lower labour supply, causes higher real wages and a drop in the real interest rate in line with the findings in Krueger and Ludwig. Empirically, real interest rates have fallen while at the same time real wages have shown weak growth in the past few decades in many countries, which is not in line with the effects in demographic models. There is therefore reason to doubt that demographic factors are important in explaining the development of real wages in the past few decades.

Juselius and Takats (2016) study the relationship between age structure and inflation in a panel estimation for a number of different countries. They find that when the working-age population increases, this tends to push inflation down. They therefore claim that increased retirement in the next few decades will, conversely, substantially push up inflation.

¹⁵ In the paper, a low-skilled worker is one who works in production, while a high-skilled worker is employed in other operations at the company.

A problem with the findings is that demographic changes largely drive long-term trends in inflation, for example it appears that the higher inflation rate in the 1970s and 1980s was driven by demographic changes. Clearly, other explanations for the high inflation rate are possible, such as altered monetary policy regimes. The Bretton Woods system, with relatively stable fixed exchange rates, was abandoned at the beginning of the 1970s and replaced by a system with greater instability.

The findings described above mainly refer to how demographic changes affect the size of the labour force in relation to the population. However, another way in which the age structure can affect inflation is through changes in the composition of the employed. If the firms' cost of producing a commodity varies with the age of workers, the age structure for workers in the economy will affect firms' prices, and hence inflation. The correlation between age, wage and productivity has been studied by for instance van Ours and Stoeldraijer (2010) and Aubert and Crespon (2006) on Dutch and French microdata, respectively. In both studies, the authors find that wages and productivity are affected about the same by age. An effect of this is that the cost of producing a commodity does not depend on the age structure of the employed, which in turn means that prices and inflation are not affected either. Other studies find however that wages and productivity are not affected in the same way, which could mean that the age structure among workers actually does affect firms' costs and hence inflation.

5.2 Effects of migration

Migration to Sweden has been high in recent decades, and from low- and middle-income countries in particular (Engdahl, 2016). In 1985 more than half of the foreign-born had a Nordic background and, out of the rest, the share who came from other high-income countries, and from low- and middle-income countries, was more or less equal. In 2010 picture was completely different. Out of the foreign-born, the share from low- and middle-income countries was then at around two thirds, while the last third consisted of around as many from the Nordics as from other high-income countries.¹⁶ Also in terms of the distribution across different categories of education, the composition has changed over time. A significant change is that the share of foreign-born lacking upper-secondary education has increased relatively sharply. However, the share with a long post-secondary education has also increased.

5.2.1 Effects in models

Bentolila et al. (2008) study the effects that migration has on inflation in a DSGE model in Spain for the period 1982 to 2006. The percentage of migrants increased sharply during the period, primarily from the turn of the century when it rose from around 3 per cent to 14 per cent. They find that the effects have been significant: The annual inflation rate would have been 2.2 percentage points higher during the period 1999 to 2006 had migration not increased. They estimate this in a simple model however and it could be the case that migration is correlated with other inflation-driving variables. Spain introduced the euro in the same period, for example. The results should therefore be interpreted with caution.

The effects of migration on wages are not clear-cut. In a simple model for a small open economy that produces one commodity and has two types of labour, and in which capital is mobile, the average real wage need not be affected by migration in the longer term, because the capital stock is adjusted to the increased labour supply. In the short term however increased migration can cause wages to decrease, because the capital stock per

¹⁶ Olli Segendorf and Theobald (2019) convey a similar picture for 2017, although their breakdown of countries is not entirely consistent with Engdahl's.

worker falls, which in turn causes a decline in labour productivity.¹⁷ Wage dispersion can also be affected, if the relative supply of workers with low and high education changes. If the migrants' composition differs from that of the domestic population, wages will drop for jobs (or qualifications) for which the number of migrants exceeds the domestic share, and rise when the share of migrants is lower than that of the domestic population. For example, the relative wages of cleaners and physicians decrease in the event of immigration with an over-representation of cleaners and physicians in relation to the domestic population. If the migrants' qualifications, for example in terms of education, are similar to those of the domestic population and they have the same ability to be integrated into the labour market, then migration has no effect on wages, at least not in the long run when the capital stock has adjusted. If the migrants are a complement to domestic-born, that is to say if the firm has a domestic-born worker, the value of hiring a foreign-born worker is relatively high, in which case increased migration can lead to higher productivity, see for example Jaumotte et al. (2016). Increased migration of highly educated workers can also prompt more innovation, which can push up productivity. A mitigating effect on productivity over time in Sweden is however that the share with a low education among foreign-born has increased, which ought to have a directly negative impact on productivity. However, the share with a lengthy post-secondary education has also increased among foreign-born. The quality of education also varies between countries, and some groups of migrants tend to have a much poorer education quality than domestic-born with the same education, see Olli Segendorf and Theobald (2019). Also, the complementarity mechanism works through employment, and the employment rate among foreign-born has fallen from being on a par with or higher than that of domestic-born in the 1950s, 1960s and 1970s, to being around 80 per cent in the 2000s (Ekberg 2009), which implies that effects of migration on wages via this mechanism may have decreased over time.

Besides capital adjustment, there are other possible margins in the economy that reduce the effects of migration on wages. The simple model described above has only one commodity, which means that there can be no changes in the composition of commodity production. In reality several commodities are of course produced, and increased immigration can give an inflow of labour that is more important to some sectors than others. If for example there is an inflow of labour with low education, this causes wages for workers with low education to decrease. This pushes up profits in sectors that employ a large proportion of workers with low education and production therefore increases. This prompts an increase in demand for labour that counteracts the initial drop in wages. Another moderating factor is that firms can choose technology endogenously.¹⁸ If there is an inflow of migrants with low education, firms will endogenously select technologies that use workers with low education to a greater extent, when costs of these technologies fall. Demand for workers with low education then increases somewhat, which once more moderates the initial drop in wages.

5.2.2 Empirical findings

Most of the studies described below analyse the effects of migration on wages. We first describe studies that analyse effects on wages and then in Section 5.4 studies on how prices are affected.

Dustmann et al. (2013) study a general equilibrium model with different types of labour.¹⁹ In the model, there are migration of all types of labour. They find that the effects on wages for a certain group depend on how many migrants belong to that group. Having numerous

17 How the capital stock reacts to migration is important to the size of the effects in the short and medium term. According to Dustmann et al. (2008) the effects on wages will be much smaller if the adjustment to the capital stock is taken into consideration. Given that 10 per cent of the deviation in the capital stock from the long-term level per worker caused by migration disappears per year, wages for workers with low education decline by 1.1 per cent in the medium term, compared with 3.6 per cent if capital adjustment is not taken into account.

18 The companies have several technologies to choose from, and choose the one that best suits the company.

19 Different types of labour are imperfectly substitutable.

migrants in a group leads to wages falling in the group, but they can rise for other groups. If the composition of migrants is identical to the domestic population, the average wage is not affected at all, at least not in the long run when capital has adjusted. They then study how migration has affected wages in the United Kingdom and find that the effects there differ between different income groups: Migration leads to wages increasing for workers with income over the 40th percentile, while they drop for workers below the 20th percentile. The effects on the average wage are slightly positive.

Ottaviano and Peri (2012) study what happens to wages in the United States during the period 1990 to 2006 in a structural approach. They find that the effects of increased migration are slightly positive irrespective of education level for workers born in the United States – wages increase by approximately 1 per cent. For certain groups, however, wages are negatively affected: For workers who migrated before 1990, wages fall by just over 6 per cent.

Blau and Kahn (2012) perform an accounting analysis of how the distribution of income has been affected by the increased share of foreign-born in the United States between 1980 and 2010. Specifically, they study how income dispersion has been affected for the entire population, and for domestic-born and foreign-born, respectively. They find that income dispersion has increased over the period, and that it has widened to around the same extent for domestic-born as for the entire population. The increase in the number of foreign-born thus seems only to have contributed only slightly to the increase in income dispersion. However, it can be indirectly affected via general equilibrium effects. It could for example be the case that the increase in wage dispersion among domestic-born is driven by migration via heightened competition for jobs within certain education and occupation categories, which pushes down wages for some groups of domestic-born too. However, it is once again worth noting that wage dispersion in Sweden has not changed so much from the turn of the millennium until 2013, which suggests that the mechanism via migration has perhaps not been so important for wages in Sweden, see Carlsson et al. (2017). One reason for this could be that a substantial share of migrants that have arrived in Sweden since the turn of the millennium have a relatively weak connection to the labour market, see also section 5.3.2 below.

Several studies of the effects that migration has on the wages of domestic-born have been carried out on microdata. They can be roughly divided into two types: a regional approach, in which variation in immigration between regions is used, and a national approach, in which variation in the share of immigrants across different categories of education or experience is used instead. The results in the regional approach are normally that the effects on wages are not particularly large. Card (1990) finds relatively small effects when studying the effects of migration from Cuba on the labour market in Miami.²⁰ A problem with this approach however is that it is difficult to deal with the fact that migration can cause workers who lose their jobs to move to other regions.²¹ Borjas (2003) addresses this by looking at occupation categories instead of regions – the so-called national approach. He finds a somewhat larger effect for the United States, where migration caused average wages to fall by 3.2 per cent between 1980 and 2000.

A problem when measuring this is that migrants tend to want to move when conditions on the labour markets are good. An approach is therefore sometimes used in which exogenous variations are employed, so-called natural experiments, in which there is an attempt to tackle the problem by finding supply-driven migration. Hunt (1992) looks at the effects of repatriation of French Algerians after French colonial rule ended. In 1962 around

20 In the regional approach an equation is estimated of the type

$$(1) \Delta w_{ijt} = a_i \Delta m_{ijt} + x_{it} b_i + e_{ijt}$$

where Δw_{ijt} is the change in wages for workers i region j with education level i , Δm_{ijt} is the change in the number/percentage of migrants in region j with education level i , x_{it} control variables (for example age gender), a_i and b_i coefficients and e_{ijt} a disturbance term. Problems with endogeneity, for example that migrants move to regions where demand is high and wages rise, are addressed using instruments.

21 They are then not included in the wage and employment statistics of the region.

half a million individuals with a European background moved to France from Algeria – around 1.6 per cent of the French labour force.²² The effects on both wages and unemployment were relatively modest, however. Wages fell by 1.3 per cent and unemployment rose by 0.3 percentage points for French nationals who did not belong to the repatriated group. The fall of the Soviet Union also caused several major waves of migration, because it became easier to leave the former communist states in Eastern Europe. Two examples of studies that look at this are Friedberg (2001), who studies migration to Israel, and Glitz (2012), who analyses immigration into Germany from Eastern Europe.²³ Migration to Israel was considerable – between 1989 and 1995 Israel's population increased by 13.6 per cent. Nonetheless, migration does not seem to have had any negative effect on wages. Migration to Germany was also substantial – over a 15-year period after the fall of the Berlin Wall, 2.8 million ethnic Germans moved to Germany. Here too, the effects on wages were relatively small and in most cases not significant, while unemployment for individuals living in Germany before the migration seems to have been affected more. For 10 migrants who found work, 3.1 workers residing in Germany before the migration became unemployed.²⁴

Engdahl (2016) analyses the effects of migration on wages in Sweden. He finds that an increase in the share of immigrants of 1 percentage point within a certain education and experience group causes the monthly wage to decrease by around 0.3 per cent. It is worth noting however that the effects on wages are mainly driven by migrants with a Nordic background, and that there is no statistically significant effect on wages of migration from other countries. Engdahl also makes comparisons with results for other countries and finds that the effects in Sweden are smaller than in for example the United States and Canada, but more or less on a par with Norway. The construction industry seems to be affected more than other industries, however. In Norway estimations for the construction industry give more or less twice the wage elasticity as for the private sector as a whole.

The studies above mainly deal with the effects of migration on wages for domestic-born workers. However, there are considerable wage differences between foreign-born and domestic-born. Wages for foreign-born are often lower than those of domestic-born, see Pekkala Kerr and Kerr (2011). The results for Sweden vary over time, and average income from employment appears to have been higher or on a par with domestic-born in the 1960s and 1970s, but has subsequently fallen back and is now much lower, see Ekberg (2009) and also section 5.3.²⁵

5.3 Specific waves of migration

In the past decade, two important waves of migration have often been discussed. The first concerns the effects of the enlargement of the EU in 2004 and 2007, respectively, and is mainly labour-market-driven migration. The other concerns the increase in refugee immigration, which is not labour-market-driven in the same way as migration within EU.

5.3.1 The enlargement of the EU

The internal market considerably facilitates cross-border labour mobility within the EU. This has gained significance mainly since the Eastern European countries became EU members, because the large wage differences between Western and Eastern Europe give Eastern Europeans substantial incentives to move.

22 Hunt (1992) cannot distinguish the wages of the repatriated group from those already residing in France, so the wage effect is estimated as the effect on average wage for both groups.

23 Glitz (2012) studies immigration to what was West Germany before 1990, from Eastern Europe, excluding East Germany (DDR).

24 The estimation might also be affected by the emigration of individuals who were already residing in the region. These effects seem to have been small however.

25 Ekberg studies income from employment, which is income from an employer and income from self-employment. The studies in section 5.3 that discuss Sweden use earned income.

Bratsberg et al. (2017) study the effect of the enlargement of the EU on wages in Norway in different sectors, and find that the effects are relatively large. They break down the sectors according to the percentage of migrants they contain, and find that the difference in wage increase between sectors with a low and high share of migrants, respectively (sectors in the 10th and 90th migrant share percentiles, respectively), is around 7 per cent during the period 2004–2013, with the wage increase being greater in the sector with a low share of migrants.²⁶ Over the same period, average wages increased by 40 per cent, so the difference between the sectors with a low and high share of migrants, respectively, is not negligible, but neither is it of the same magnitude as total wage increases. The fact that an increased share of migrants causes lower wages within an industry does not mean that the total effects on wages are negative, as Bratsberg et al. can only identify relative wage effects and not general equilibrium effects.²⁷

Ruist (2017) studies income for migrants who immigrated to Sweden when the EU was enlarged. Because Ruist looks at earned income and not wages, the levels are also affected by the employment rate. He finds that income is much lower when the migrants arrive in Sweden, particularly for women, but reach levels close to that of the domestic population relatively quickly. An important reason for the low income for women is a low employment level in the initial years following immigration. Because the migrants differ from the population as a whole, Ruist devises comparable age groups for the domestic population. He finds that the median income for men is initially approximately 80 per cent of the median income for the equivalent domestic group, while women's income is at 20–30 per cent when they arrive in Sweden. After around eight years, the median income of both men and women is around 90 per cent of that of the domestic group.

5.3.2 Refugee immigration

The studies that look at refugee immigration normally look at earned income and not wages. Just as in Ruist's study, this does not give a good measure of the monthly wage of refugee immigrants, because earned income is also affected by how much the individual works.

Earned income for refugee immigrants is much lower than for domestic-born, especially soon after they have arrived in Sweden. However, even after a relatively long time in Sweden, earned income is far below that of domestic-born people. After around 10 years in Sweden, earned income is between 40 and 75 per cent of the comparable level of domestic-born, and after 25 years in Sweden it is approximately 65–80 per cent of the level of domestic-born, see Forslund et al. (2017).²⁸ A reason for the worse outcomes for refugee immigration than for migration caused by the enlargement of the EU could be that the latter has mainly been labour-market-driven and that EU migrants therefore move if there is a high probability of getting a job, which does not apply to refugee immigration to the same extent. Lewis and Swannell (2019) find in a study of 35 countries for the period 1990–2013 that, under free movement, migration reacts more strongly to variables that are related to the wage level (GDP per capita) and the state of the economy (expected growth). More individuals will thus be willing to move to a country with high wages or with a booming economy if there is free movement, compared with when mobility is limited.

26 The sectors are ranked according to how high a share of migrants work in the sector. If there are 100 sectors for example, the one with the lowest share is chosen first, then the one with the next-lowest share, and so on. The sector with the 10th migrant share percentile is thus the tenth sector in the ranking, and the sector with the 90th migrant share percentile is the ninetieth sector in the ranking.

27 Dustmann et al. (2013) is an example of a model in which migration can give a higher average wage.

28 They compare migrants of a certain age and gender with the equivalent domestic-born group. Note that education level and quality of education can differ between migrants and domestic-born of the same age and gender.

5.4 Effects on prices

Cortez (2008) and Frattini (2008) study migration effects on prices in the United States, Israel and the United Kingdom. Both find results that are in line with the results for wages: an increase in migration appears to lead to a drop in prices in service sectors that employ a high share of workers in low-wage occupations. In the United States an increase in the share of migrants with low education of 10 per cent causes prices to drop by 2 per cent in sectors with a high share of migrants. Frattini also finds similar effects in the United Kingdom.

6 Other structural reforms and changes

Substantial reforms in areas other than those described above have been carried out in the past 25 years that could have affected the labour market. The pension reform, which was carried out after the crisis of the 1990s, strengthened incentives to work longer, for example. Laun and Wallenius (2015) find in a calibrated model that the average age of retirement increases by just over two years from 62.4 to 64.7. Laun (2012) has studied the effects of the tax relief initiatives carried out between 2007 and 2009 for the over-65s, and finds that the changes appear to have caused more persons over the age of 65 to work. Employment appears to have increased by 1.5 percentage points in the year after the individuals turn 65. The effects on employment thus appear to be somewhat smaller than those brought about by the changes to the pension system in the 1990s. In recent times too, labour supply in Sweden appears to have increased, see Flodberg and Löf (2017). Although the studies do not look at the effects on wages, increased labour supply tends to lead to wages increasing slower than they would have done without the reforms.

Another substantial change is that the health of both pensioners and the working population has improved over a long period of time. Combined with for instance altered rules in the pension system, this could have considerable effects on the labour force. Johansson et al. (2016) study this by using two different approaches: one based on mortality and one based on self-reported health. Here, only the results from the first approach are described – the results for self-reported health are similar. In the approach based on mortality, they compare individuals in the 55–69 age range in 2009 with individuals with the same mortality in 1985. A potential labour force participation rate is then constructed for individuals in the 55–69 age group in 2009 that are assumed to have the same probability of working as a person active in 1985 with the same mortality.²⁹ The potential labour supply in 2009 can be viewed as follows: the age group with the same mortality as a younger group in 1985 is assumed to have the same labour force participation as the younger age group had in 1985. Potential labour force participation in 2009 is 8 per cent higher than the actual level for 55-year-olds, 9 per cent higher for 60-year-olds, 33 per cent higher for 65-year-olds and 39 per cent higher for 69-year-olds. The effects are thus substantial for individuals close to or over national pension age. Changes in the regulatory system that affect, for example, the national pension age can thus have major effects on labour supply. The stricter rules for obtaining national sickness benefit may also have resulted in a higher labour supply, see Forslund (2019). Jonsson and Theobald (2019) study the effects of poorer matching efficiency and changes in bargaining power. They show that changes in bargaining power may have caused slower wage growth.

²⁹ In 1985 the age of individuals with the same mortality as those in the 59–69 age range in 2009 was below the statutory retirement age. A picture can hence be obtained of how labour supply changes if the retirement age is increased and labour supply is used for those who were not limited by the statutory retirement age on the labour market in 1985, in order to gain an understanding of how individuals today with the same health in the 65–69 age range are affected by a higher retirement age.

7 Concluding remarks

In the past 25 years, extensive structural changes have occurred both in Sweden and abroad that have affected the Swedish labour market. In this article, various structural changes have been studied which, via the labour market, might have affected wages, prices and inflation. Several studies only focus on wages however and not on inflation, which is also affected by cost pressure.

A number of reforms have been carried out that have affected the Swedish labour market, for instance the unemployment replacement rate has been considerably reduced, see Jonsson and Theobald (2019). Available empirical studies indicate however that this does not appear to have had any substantial effects on wages, although it may have had greater effects on employment, see e.g. Forslund et al. (2008). Earned tax credits may have increased labour supply, as well as a high migration level, changes to the pension system, stricter application of sickness benefits and sharp improvements in human health over time. Increased labour supply in turn tends to lead to slower wage increases. Weaker bargaining power for workers may also have caused slower wage growth.

Other structural changes have also been significant. Increased foreign trade during the period seems for example to have had effects on producer prices in studies based on microdata (see for example Auer et al., 2012, and Auer et al., 2013), while the effects in analyses based on aggregate data are more ambiguous. Trade has also affected wages, but is not the most important explanation for changes in wage formation in the past 25 years. Instead, it seems that technological developments benefiting highly educated workers have been the main driver. Demographic changes that affect factors like the share of the population that is of working age might have impacted inflation, although the results ought to be interpreted with caution. The increase in migration and the integrated European labour market in the last few decades have had some effect on wages, according to Bratsberg et al. (2017), although the results in Engdahl's study from 2016 suggest that the effects on wages have probably been limited, with the exception of migration from the Nordic countries. The effects might also have been greater for certain sectors, such as the construction sector.

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