INTERNATIONAL MONETARY FUND

IMF Country Report No. 17/351

SWEDEN

SELECTED ISSUES

November 2017

This Selected Issues paper on Sweden was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on November 1, 2017.

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International Monetary Fund
Washington, D.C.

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November 1, 2017

Approved By
European Department

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CONTENTS

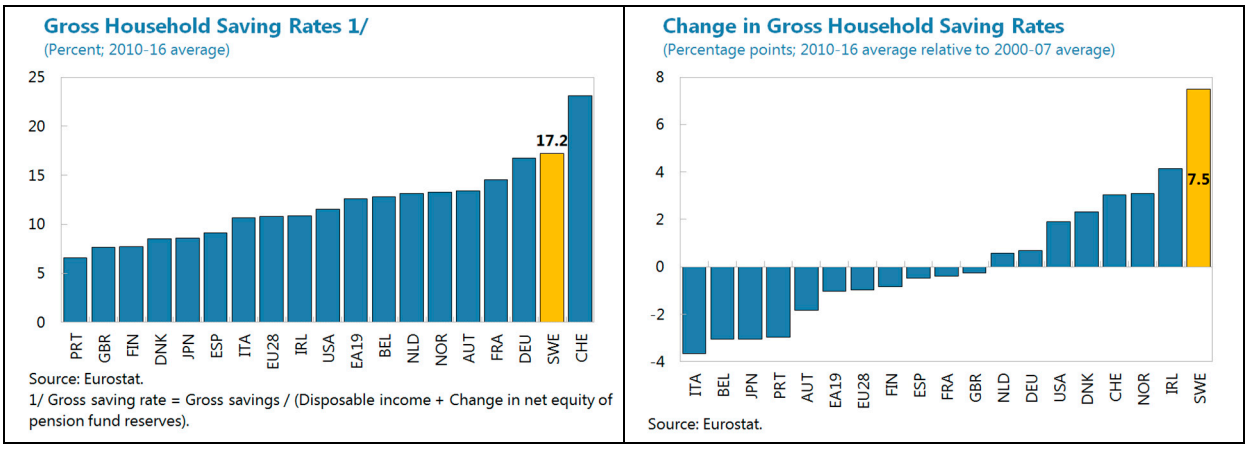
FIGURE

TABLES

HIGH HOUSEHOLD SAVINGS IN SWEDEN[1]

A. Introduction

1. Boosted by a large increase in savings after the global financial crisis, Swedish households save at one of the highest rates among advanced economies. The gross household saving rate averaged some 17 percent since the global financial crisis, increasing by 7.5 percentage points over its pre-crisis level—a much stronger increase than seen in any other advanced economy.[2] Saving rates can differ from country to country even if the underlying consumption and saving patterns of households are similar,[3] but the very sharp increase in the level of savings sets Sweden apart.



2. The implications for the current account are significant. The household sector has played an increasingly important role in saving formation since 2000, growing its share in total savings in the economy from one-eighth (3½ percent of GDP) to one-third (over 10 percent of GDP) in recent years. Net of investment, household savings are the dominant driver of net savings in the economy, and thus of the current account balance. Unlike other northern European economies with high savings and current account surpluses, Sweden has among the highest investment in the European Union at 25 percent of GDP (in contrast to Denmark, Germany and Netherlands with gross investment around 20 percent of GDP). Therefore, high household savings, rather than low investment, is the predominant driver of Sweden's significant current account surplus.

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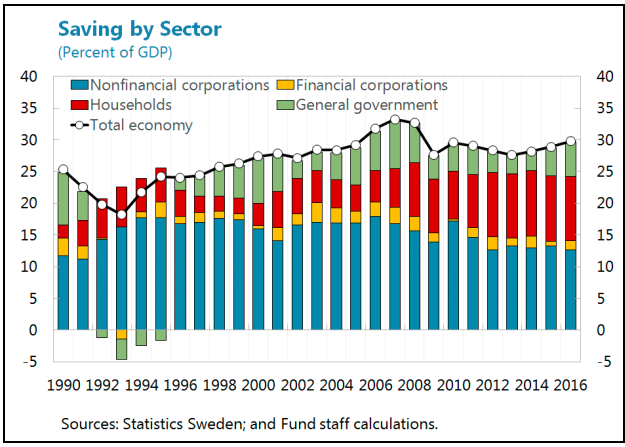
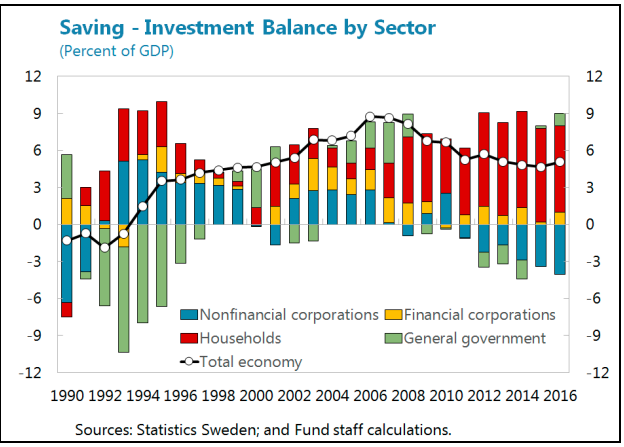
[1] Prepared by Evan Papageorgiou (EUR). I am grateful to Craig Beaumont (EUR) for guidance and to participants from the Swedish authorities at a presentation at the Riksbank on September 26, 2017 for their helpful comments.

[2] Gross savings are defined as gross disposable income minus final consumption expenditure plus the change in the net equity position of pension fund reserves. The gross household saving rate is equal to gross savings divided by the sum of gross disposable income and the change in the net equity position of pension fund reserves. Throughout this chapter the household sector includes non-profit institutions serving households (NPISHs).

[3] Rocher and Stierle (2015) identify at least 4 institutional factors and discuss estimation shortcomings that may account for differences on countries' saving rates.

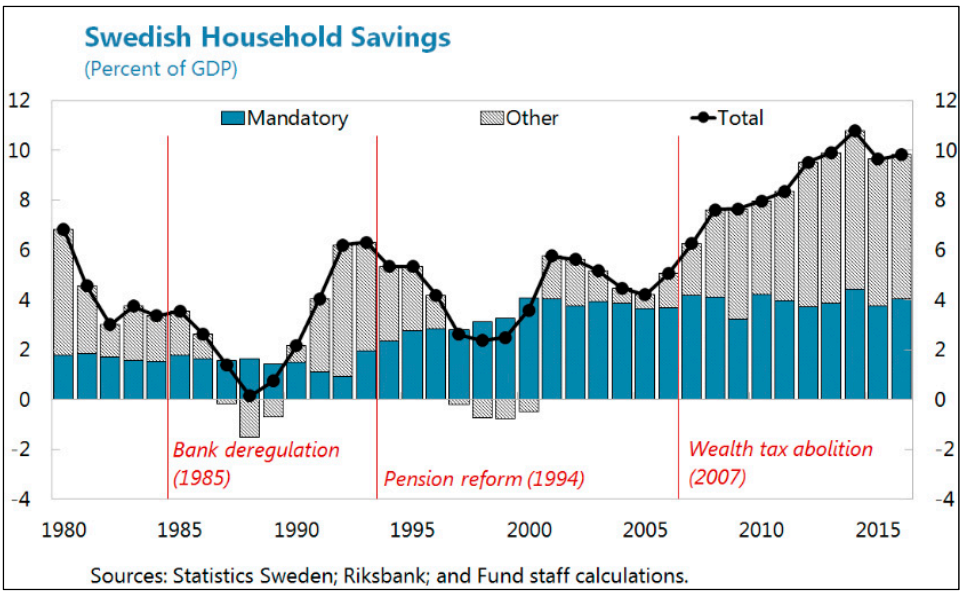




3. The rest of this chapter seeks to better understand developments in Swedish household savings. The next section further examines the behavior and structure of household savings in Sweden. Section C provides a cross-country analysis of savings, where a significant portion of the recent rise in savings is not accounted for, so possible explanations for the large increase in savings after the financial crisis are explored. The chapter concludes with a summary of findings, tentative policy implications, and issues needing further research.

B. How has Household Saving Evolved Since the Global Financial Crisis?

4. Before the financial crisis, the evolution of saving rates followed a cyclical pattern in line with broad economic developments. Increased borrowing and easier financial conditions following the credit deregulation in 1985 reduced savings substantially. The ensuing banking crisis in 1992, with a sharp rise in unemployment, prompted households to resume saving. The 1994 pension reform started a transition to a higher level of mandatory retirement savings, which have stabilized at an average of 3¾ percent of GDP per year. The dot-com boom-bust saw another cycle in the



saving rates with a decline followed by a temporary boost to saving rates before another modest decline in the years approaching the global crisis.

5. But this cyclical pattern appears to have broken-down after the global financial crisis. The abolition of the wealth tax in 2007, and global financial crisis soon after, coincided with the considerable ramp-up in savings by households, with no significant decline subsequently even almost a decade later. The excess of savings over mandatory pension contributions went from an average of 1.2 percent in the five years to 2007, to 6 percent of GDP in the last 5 years, even as household incomes and asset values have long recovered from the crisis.

6. Using household surveys to generate estimates of cohort level data may help understand this apparent change in savings behavior after the crisis. In the absence of granular data, dissecting the gross savings reported in the national accounts across cohorts requires the use of additional information. Detailed data published in the periodic *Household Budget Surveys* by Statistics Sweden provide the distributional information needed to scale the sample properties to the population, including shares of income and consumption by household type, number of people per household, and consumption units. Breaking down the gross saving rate for a given type of household then amounts to estimating the gross disposable income, final consumption expenditure, and the adjustment for the change in the pension net equity position:

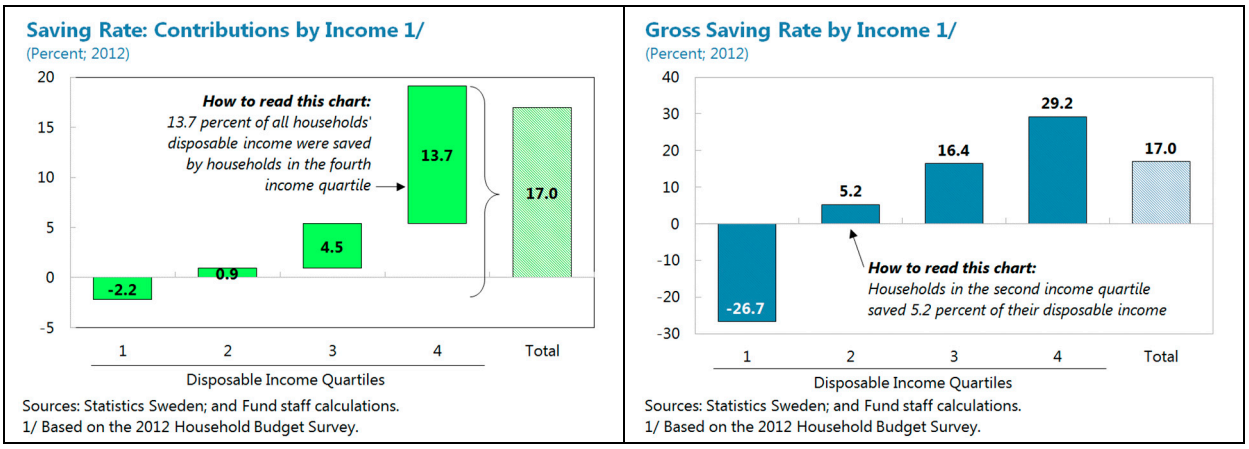
- The estimates of the gross disposable income and final consumption expenditure are proportional to the share of the given household type's disposable income and total expenditure in all households in the survey. Income and consumption are multiplied by the calculated population size for that household type.

- The estimate of the adjustment for the change in the pension net equity position needs to reflect the number of persons in the households that can save, so as not to dilute the saving rate of households with children. This is done by multiplying the population size of the given household type by the average number of persons in the household and divided by the average number of consumer units in the same household. Approximating saving units with consumption units is a critical assumption that carries drawbacks as children in a family would not save at all, hence likely leading to overestimation of savings by households with children. But this bias is likely lessened somewhat as children tend to reduce household savings on the family level.[4]

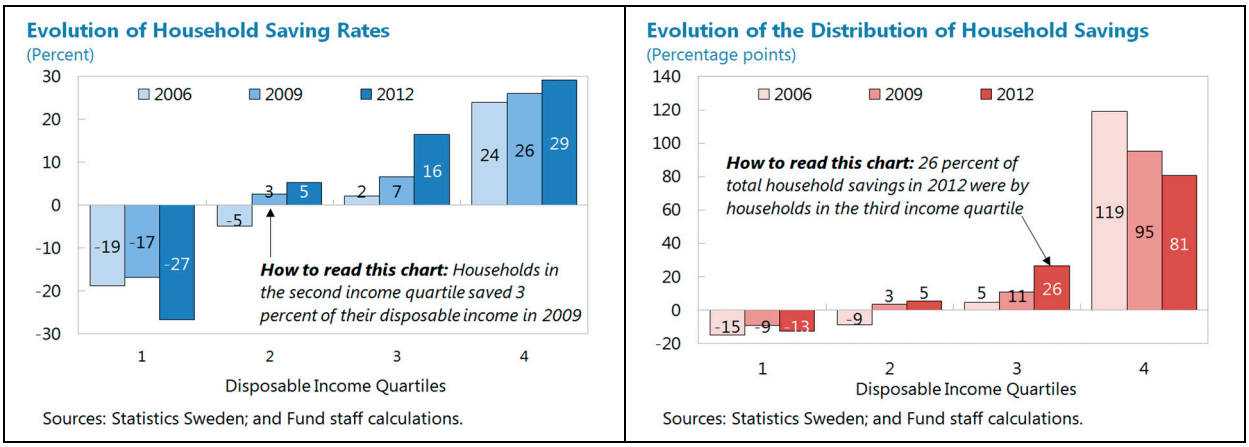
7. While overall household savings are high, there is considerable dispersion across households. Households in the upper half of the income distribution do virtually all the saving according to the most recent Household Budget Survey data (2012). Moreover, some 80 percent of all household savings (or 13.7 percentage points of the entire household sector's 17 percent of

[4] There is generally a negative relationship between the share of young people in the population and the propensity to save (see Edwards, 1996; and Koski, 2016).

income) were by households in the highest quartile of income. Households in the lowest quartile of incomes dis-saved (spent more than earned) by an estimated 27 percent of their income in 2012.



8. The overall increase in non-mandatory savings since the global financial crisis reflected an expansion of the savings of middle-income households. Households in the second and third income quartiles increased their saving rates by 10–14 percentage points between 2006 and 2012, compared to a 5-percentage point increase for households in the upper quartile of incomes. As a result, the contribution of middle-income (i.e., second and third quartile) households jumped to 31 percent of the total household savings, up from -4 percent before the crisis. Nevertheless, saving inequality remains considerably with the bulk of saving being performed by upper-income households, and low-income households dis-saving considerably.



C. Evaluating Household Savings

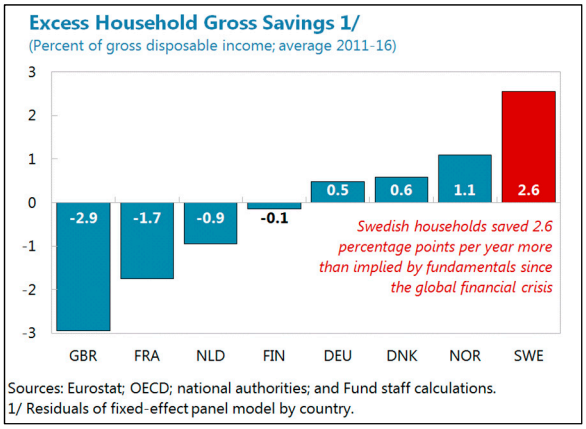
9. An equilibrium level of savings depends on demographics, economic uncertainty, and income effects, among other factors. There is a rich literature on the drivers of savings. Studies by Berg (1996), OECD (2004), and Deaton (2005) Ohrstrom (2008), Rocher and Stierle (2015), and references therein describe the saving behavior along the lines of the usual theories of the life-cycle hypothesis, permanent income hypothesis, precautionary savings theory, and the Ricardian

equivalence theory. Callen and Thimann (1997), Mody *et al.* (2012), Bebczuk *et al.* (2015), and Koski (2016), among others, discuss the empirical determinants of household savings, and specify a common set of macroeconomic variables that capture the effects of (i) economic uncertainty; (ii) demographic factors; and (iii) balance sheets. Some of the traditional variables among these factors and their expected sign on the saving rate are listed below. Other variables such as fiscal balance, inflation, interest rates, and volatility of GDP or asset prices are used in some surveys, but are not considered here.[5]

List of Typical Variables in Previous Studies of Household Savings

Variable	Type of variable	Effect	Expected sign
Unemployment rate	Economic uncertainty	Income uncertainty	Positive
Expected income growth	Economic uncertainty	Confidence/sentiment	Negative
Young-age dependency	Demographics	Need to support dependents	Negative
Old-age dependency	Demographics	Reduced income	Negative
Net wealth levels and growth	Balance sheet	Wealth effect	Negative
Assets level and growth	Balance sheet	Wealth effect	Negative

10. A standard econometric model for savings is fitted for a panel of peer economies as a benchmark. A fixed effects panel model on the gross household savings rate is estimated in line with the specification by Mody *et al.* (2012) and Callen and Thimann (1997) for the 4 Nordic economies (Sweden, Denmark, Finland, and Norway), and European peers (Germany, France, Netherlands and the United Kingdom) on data from 1995. In line with the table above the statistically significant explanatory variables are: the unemployment rate; 1-year forward looking gross disposable income growth (in lieu of the expected income growth); old-age dependency ratio; elderly employment ratio; household assets; household asset growth; and net wealth of households (see Appendix I for details). The elderly employment ratio is found to be important in improving the fit of the model, especially for the post-crisis period, where saving rates increased. The sign of the coefficients is as expected, except for net wealth (positive), which may be a sign that the target net wealth of households has not been stable and may have increased.



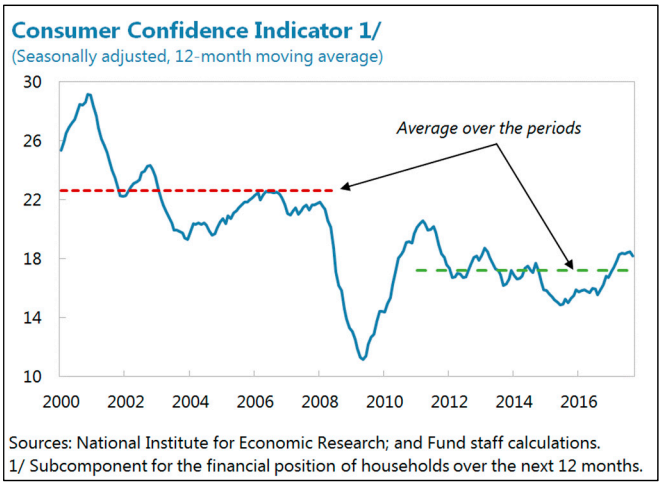
11. In recent years, Swedish household savings exceeds that expected based on savings behavior in peer economies. Despite the overall good fit of the model, a considerable part of the post-crisis rise in Swedish household

[5] For instance, Sweden's social model creates a clearer causal relation from the need for savings to the fiscal balance, because of the substantial automatic stabilizers that would activate during a recession. Similarly, interest rates and volatility variables have faded in importance in more recent studies as accommodative policies have become commonplace. More recently, Koski (2016) notes the large increase in Sweden's household saving rate since the crisis, but expects it to decline once real interest rates increase.

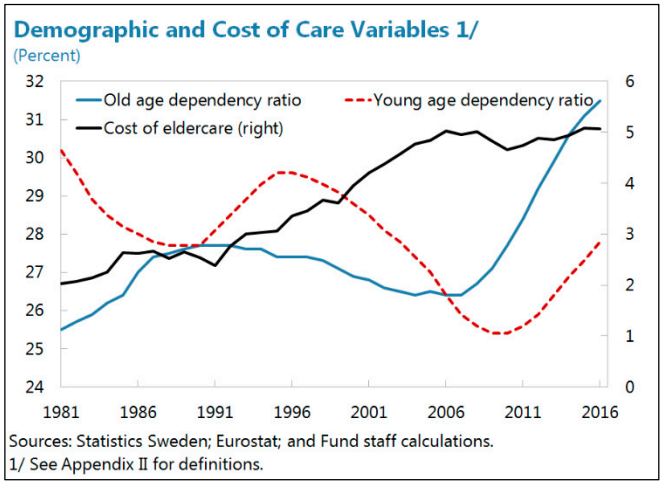
savings is not explained. As such, Swedish households save 2.6 percentage points per year more than in other similar economies, controlling for the typical variables used to model savings.

12. Investigating the persistent increase of the household saving rate since the global financial crisis in Sweden requires a country-specific study. Limiting the analysis only to Sweden allows for a richer and longer dataset so as to include the 1992 banking crisis and the credit liberalization period of the mid-1980s, and the range of explanatory variables can be broadened.

13. Several hypotheses could be considered to explain the large increase in household savings in recent years. Despite Sweden's strong employment growth and declining unemployment, there appears to have been a structural decline in consumer confidence since the global financial crisis, which may be linked to household's higher savings. Perhaps households see a need for higher savings to reach their wealth targets, as productivity growth has slowed, hence leading to reduced expectations for trend income growth. There may be other crisis "scarring effects" such as greater uncertainty around future asset values. The abolition of the wealth tax and the reduction in nominal property taxes may have also contributed a change in preferences for wealth holdings. High and rising house prices may also mean that younger households rely increasingly on transfers from parents to purchase a house, which could factor in driving up savings by this older and wealthier generation, in order to be able to make intergenerational transfers while remaining in their own dwelling. Some observers suggest that uncertainty about the viability of the Swedish model owing to significant inflows of migrants who have lower employment rates than the general population may also be eroding confidence.

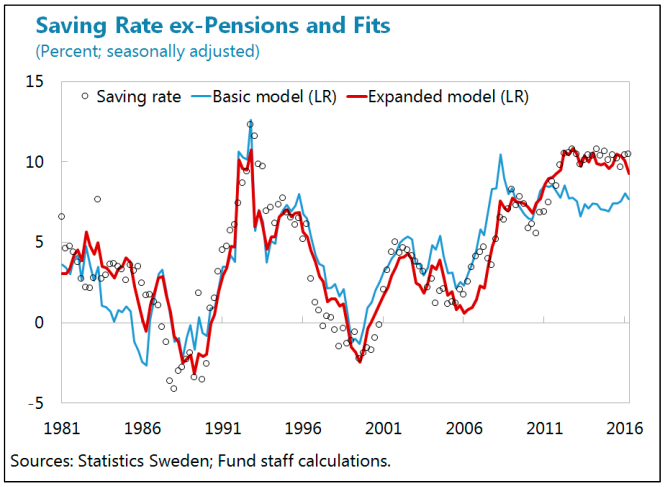


14. A key consideration is also the evolving nature of demographics and their role in shaping saving behavior. Sweden, like many advanced economies, has a large share of people approaching retirement age, but it also has a booming young population following an enduring increase in its fertility rate since 2000, as well as a surge of refugee arrivals more recently. This creates an unusual demographic profile where both the old- and young-age dependency ratios are rising rapidly.



Moreover, the decline in household saving that would normally result may be dampened by the increase in the elderly employment rate, as more people postpone retirement and continue saving. Anecdotal reports suggest this trend may reflect efforts to ensure adequate savings to smooth long-term consumption in the face of rising costs of elderly care. A variable reflecting the cost of elderly care per elderly person in the population is introduced to proxy the increase in employment in the context of the *orange envelope conjecture*.[6]

15. Two versions of an error correction model are estimated (see Appendix II for more details). Rather than the gross household saving rate, the error correction model regresses the gross household saving rate excluding pension savings to isolate the effect of the explanatory variables on non-mandatory savings. The basic model is similar to the panel model presented above, but without the elderly employment rate variable which is not available before 1995. Although the basic model has generally a good fit, the long-run specification of the model fails to capture the post crisis increase in savings as shown in the blue line in the chart aside. An expanded model introduces the proxy variable for the cost of elderly care interacted with the old-age dependency ratio. This addition improves on the overall model fit, but most importantly it fits very well the higher post-crisis saving rates (red line of the chart aside). Yet the coefficient on net wealth is still incorrectly positive, as higher household wealth should reduce the propensity to save. The short-term specification verifies the cointegration of explanatory variables and shows almost half of the gap is closed from year to year.



D. Conclusions

16. This chapter finds preliminary evidence that the large increase in savings after the financial crisis may be due to the rising cost of elderly care. The econometric analysis appears to confirm anecdotal explanations that extended life expectancies and a preference for higher quality residential care, has contributed to higher savings, and this may also account for higher savings among middle-income groups since the crisis. If confirmed by further analysis, policies to reduce public concerns around elderly care costs may be appropriate.

17. But further analysis using more granular data is needed to test alternative hypotheses for the rise in household savings. Many homeowners, and first-time homebuyers in particular, need to save substantial amount for down payments. Anecdotal reports indicate that parental

[6] Pension participants in Sweden receive an annual pension statement that among other information it includes the projected pension income at retirement, and the additional amount that can be expected if retirement is postponed by certain amount of years. The pension statement arrives in an orange envelope.

assistance in young people's home purchases could be behind the increased saving and serve as an additional bequest motive. Investigating this possibility would benefit significantly from household level data. If confirmed, there would be a further benefit from policies to improve housing affordability. All in all, further research on more granular data is required to reach a more definitive view on why Swedish household savings have increased so much since the crisis.

References

Bebczuk, R., Gasparini, L., Garbero, N., and Amendolaggine, J. (2015). "Understanding the Determinants of Household Saving: Micro Evidence for Latin America. CEDLAS." Working Papers 0189, CEDLAS, Universidad Nacional de La Plata.

Berg, L. (1996). "Age Distribution, Saving and Consumption in Sweden." Yale School of Management's Economics Research Network, 1–19.

Callen, T. and Thimann, C. (1997). "Empirical Determinants of Household Saving: Evidence from OECD Countries." IMF Working Papers WP/97/181. Washington: International Monetary Fund.

Deaton, A. (2005). "Franco Modigliani and the Life Cycle Theory of Consumption." BNL Quarterly Review, vol. LVIII, no 233–234, June-September, 91–107.

Edwards, S. (1996). "Why are Latin America's Savings Rates So Low? An International Comparative Analysis." Journal of Development Economics, 51(1), 5–44.

Koski, P. (2016). "Determinants of the Private Savings Rate in Sweden (Dissertation)." Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-198694.

Mody, A., Ohnsorge, F. and Sandri, D. (2012). "Precautionary Savings in the Great Recession." IMF Working Papers WP/12/42. Washington: International Monetary Fund.

Öhrström, F. (2008). "Determinants of the Private Savings Rate: A Study of the Swedish Case (Dissertation)." Retrieved from http://arc.hhs.se/download.aspx?MediumId=471.

Rocher, S. and Stierle, M. (2015). "Household Saving Rates in the EU: Why do they Differ So Much?" No 005, European Economy - Discussion Papers 2015 - Directorate General Economic and Financial Affairs (DG ECFIN), European Commission.

Sax, C. and Steiner, P. (2013). "Temporal Disaggregation of Time Series." The R Journal, 5(2), 80–88

Appendix I. Fixed Effects Panel Model for Gross Saving Rates

1. The table below lists the variables used in the fixed effects panel regression. The countries considered are Denmark, Finland, France, Germany, Netherlands, Norway, Sweden and the United Kingdom. Data are in annual frequency from 1995 (1996 for Norway) to 2016.

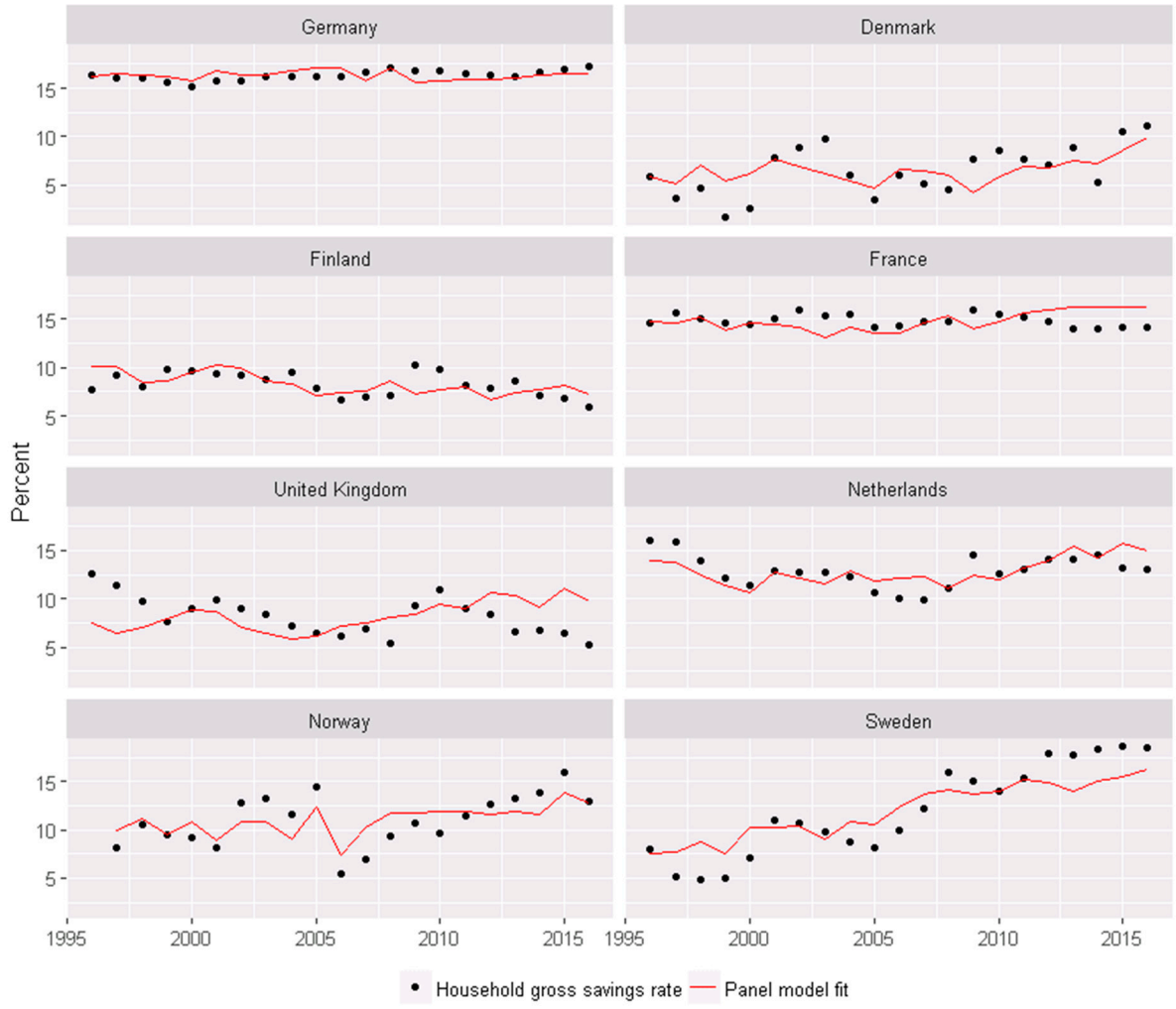
Data Description		
Variable	**Description**	**Source**
sr	Gross household saving rate, percent (dependent)	Eurostat (*nasa_10_ki*)
ur	Unemployment rate, percent	Eurostat (*une_rt_a*)
gdi.g	Real disposable income y/y growth, percent	OECD (table 14A) and IMF WEO
oad	Old-age dependency ratio (population of 65+ years old to population of 15–64 years old), percent	Eurostat (*demo_pjanind*)
emp65	Elderly employment rate (employed 65+ years old to population of 65+ years old), percent	Eurostat (*ifsa_egais* and *demo_pjanbroad*)
assets	Level of total household assets divided by gross disposable income, percent	OECD (tables 720R, 9B and 14A)
assets.g	Total household asset y/y growth, percent	OECD (tables 720R and 9B)
nwealth	Level of household net wealth (assets – liabilities) divided by gross disposable income, percent	OECD (tables 720R, 9B and 14A)

2. The country fixed effects regression on the gross household saving rates are estimated on the 7 explanatory variables considered, but with the 1-year forward growth of gross disposable income instead of the coincident indicator (using IMF WEO forecast for 2017). This is to control for the caveat of the second-order effect of unemployment on saving rates, whereby higher unemployment leads to higher savings due to higher labor income risk, but also by reducing expected income (as per Mody *et al.*, 2012). The estimated coefficients and regression statistics are shown below.

Country Fixed Effects Panel Estimates			
Term	**Estimate**	**Standard Error**	**Statistic**
ur	0.42^{***}	0.11	3.71
1-year lead of gdi.g ($gdi.g_{t+1Y}$)	-0.20^{*}	0.09	-2.27
oad	-0.27^{**}	0.09	-2.90
emp65	0.47^{**}	0.17	2.73
assets	-0.03^{***}	0.01	-3.36
assets.g	-0.20^{***}	0.04	-5.26
nwealth	0.05^{***}	0.01	5.14
R^2 = 0.41; K = 8 countries; T = 20-21 years; N = 167 observations; model F-statistic: 15.1 on 7 and 152 degrees of freedom, p-value < 0.001; significance levels: *** < 0.001 < ** < 0.01 < * < 0.05.			
Source: Fund staff calculations.			

3. The sign and magnitude of the estimated coefficients are consistent with the literature (see Mody *et al.*, 2012, for example) and theoretical considerations, except for the net wealth variable. The positive coefficient is at odds with an expectation that higher net wealth reduces the need for additional savings, and may be justified by the hypothesis that the desired net wealth may have increased over time. The panel chart below shows the model fit by country.

Gross Household Saving Rate Fixed-effects Panel Model Fits and Data



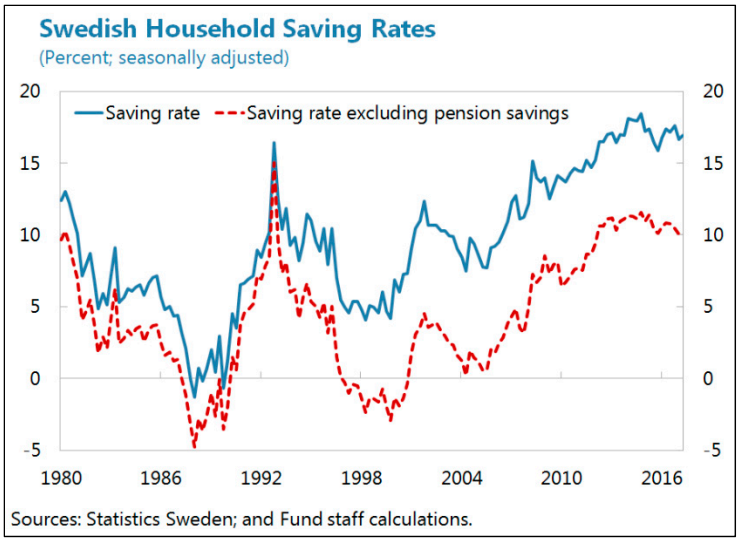
Appendix II. Error Correction Model for the Saving Rate Excluding Pensions

1. The error correction model of the Swedish household saving rate uses similar variables to the panel model described in Appendix I, but in quarterly frequency starting from 1980. Here the longer, quarterly timeseries are taken from Statistics Sweden, as opposed to OECD and Eurostat for the panel data, and the table below provides more information for the new variables. Certain variables that are available only annually, such as the household balance sheet and demographics, are converted to quarterly frequency via the Denton-Cholette method (see Sax and Steiner, 2013 for more). All the variables are seasonally-adjusted either by the source, or via a X-13ARIMA-SEATS procedure.

Data Description of Additional Variables

Variable	Description	Source
srxpen	Gross household saving rate excluding pension savings, percent (dependent)	Statistics Sweden (*NR0103DT*)
yad	Young-age dependency ratio (population of 0–14 years old to population of 15–64 years old), percent	Eurostat (*demo_pjanind*)
nwealth.g	Household wealth y/y growth, percent	Statistics Sweden (*000000KI*)
el.care	Deflator of residential care and social work activities (2016 prices) / deflator of final consumption expenditure of households (2016 prices) / (population of 65+ people / population)	Statistics Sweden (*NR0103DA*, *NR0103BV* and *BE0101C£*)

2. The dependent variable is the gross household saving rate excluding pension savings as reported by Statistics Sweden, which is preferable over the gross household saving rate in identifying the drivers of non-mandatory savings since the share of mandatory savings in GDP has remained relatively stable since the mid-1990s as mentioned in the text. It is calculated as gross saving rate ex pension savings = (gross savings – change in net equity of pension fund reserves) / gross disposable income.



3. An additional variable, *el.care*, is introduced as a proxy for the cost of elderly care, and it is estimated as the relative cost of elderly residential care to the cost of overall household consumption, further scaled by the share of elderly people in the population.

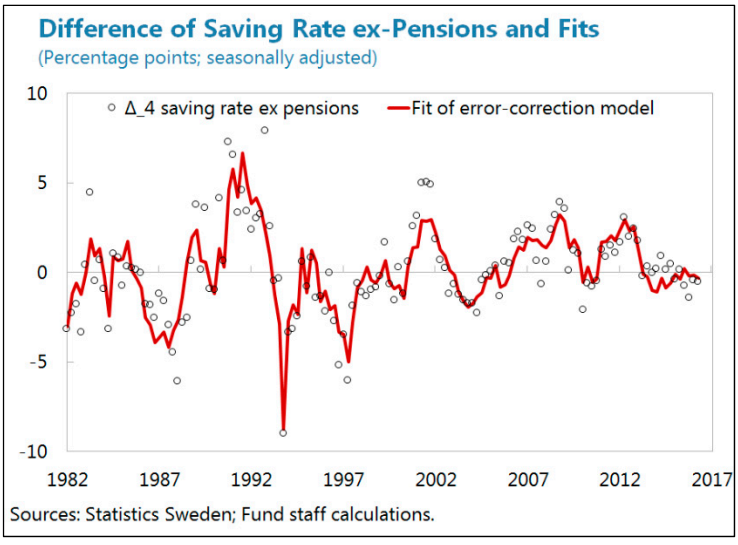
The table below shows the regression results for two models of the long-run specification of the saving rate. Unless otherwise noted the variables are coincident (no leads or lags). The expanded model introduces the elderly care variable interacting with the old-age dependency variable which improves the fit in the post-crisis period, as explained in the main text.

Long-Run Models for the Gross Household Saving ex-Pension Savings Rate

	Basic Model			Expanded Model		
Term	Estimate	Standard Error	Statistic	Estimate	Standard Error	Statistic
Intercept	11.73	8.16	1.44	235.94***	22.30	10.58
ur	0.66***	0.13	5.23	0.86***	0.10	8.26
$gdi.g_{t+4Q}$	-1.03***	0.11	-9.28	-0.66***	0.08	-8.43
yad	-0.56*	0.27	-2.09	-2.50***	0.27	-9.13
nwealth	0.01***	0.00	5.23	0.04*	0.01	2.53
nwealth.g	-0.19***	0.03	-6.60	-0.35***	0.06	-5.81
$assets_{t-4Q}$				-0.05***	0.01	-3.53
el.care				-44.44***	3.89	-11.43
oad				-5.92***	0.63	-9.38
el.care * oad				1.68***	0.15	10.97
	Adjusted R^2 = 0.64; model F-statistic: 50.2 on 5 and 136 degrees of freedom, p-value < 0.001.			Adjusted R^2 = 0.85; model F-statistic: 92.7 on 9 and 132 degrees of freedom, p-value < 0.001.		
	Significance levels: *** < 0.001 < ** < 0.01 < * < 0.05.					

Source: Fund staff calculations.

4. Unit root tests show that residuals of the expanded model are stationary, which, combined with an inspection of the order of integration of the model variables, suggest there is a cointegrating relationship between the variables. The short-run dynamics of the error correction model are specified in whole-year increments (4 quarters) for the expanded model in the table below.[1] The coefficient of the error correction term is highly statistically significant, and shows that



[1] Specifications with 1-, 2-, and 3-quarter increments did not provide meaningful or parsimonious estimates of the short-run dynamics with respect to the choice of variables, while long-lag effects (8 quarters and longer) did not have consistently statistically significant estimates.

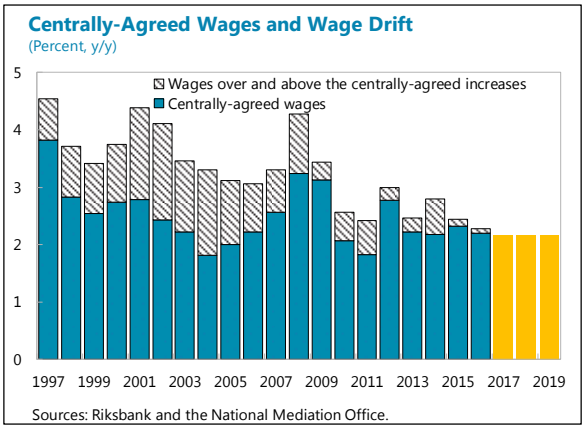
about half of the remaining gap from the long-run equation is closed each year. The non-significance of differences and lags of the cost of elderly care and net wealth variables in the final differences equation may be supporting the hypothesis that concerns about the increased cost of elderly care and an increase in the target net wealth are relatively more recent phenomena.

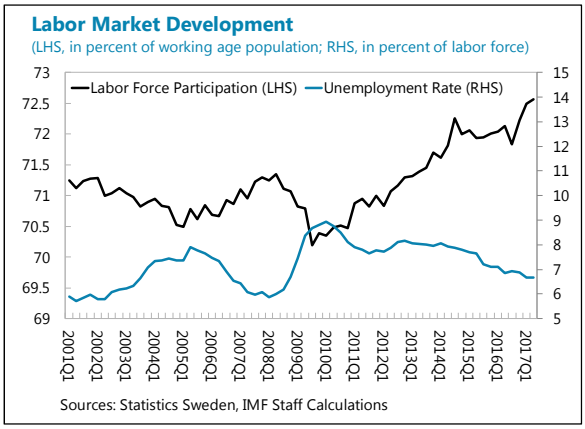
Error Correction Model for the Gross Household Saving ex-Pension Savings Rate			
Term	**Estimate**	**Standard Error**	**Statistic**
Intercept	-2.49	6.38	-0.39
Residual of expanded model$_{t-4Q}$	-0.51***	0.08	-6.77
Δ_4 gdi.g	0.5***	0.05	9.92
oad$_{t-4Q}$	1.19***	0.2	6.09
Δ_4 oad	-3.63***	0.51	-7.1
yad$_{t-4Q}$	-1.03***	0.11	-9.23
Δ_4 yad	-3.53***	0.68	-5.16
Δ_4 assets	-0.03***	0	-8.65
assets.g$_{t-4Q}$	-0.19***	0.02	-9.38
Adjusted R^2 = 0.73; model F-statistic: 48.2 on 8 and 131 degrees of freedom, p-value < 0.001.			
Significance levels: *** < 0.001 < ** < 0.01 < * < 0.05.			
Δ_4 denotes the difference operator over 4 periods (quarters).			
Note: The dependent variable is Δ_4 saving rate excluding pension savings.			
Source: Fund staff calculations.			

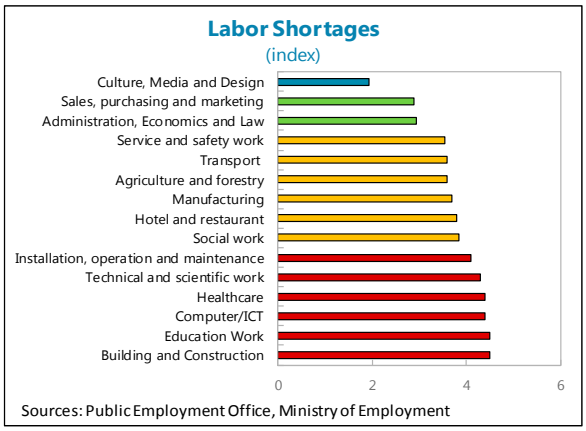
RECENT WAGE MODERATION IN SWEDEN[1]

A. Introduction

1. Nominal wage growth has been subdued in Sweden despite tighter labor market conditions in recent years. Strong employment growth has led to a steady decline in the unemployment rate from about 8 percent in 2012–14 to 6.7 percent by mid-2017, which is broadly in line with its pre-crisis average.[2] This decline in unemployment has occurred even as labor participation has risen to high levels. Similarly, enterprise surveys report labor shortages approaching all-time highs. Yet business sector nominal wage growth has been subdued at 2.3 percent on average in 2016–17, compared with 2.7 percent in the 4 years to 2015, and higher than 3 percent before the crisis.[3] The slowing in wage growth in the last few years is associated with very low wage drift, which is the amount by which aggregate wage growth exceeds the centrally-agreed rate owing to agreements at the firm-level. The centralized wage agreement reached in March 2017 provides for a cumulative wage increase of just 6.5 percent over the next 3 years.





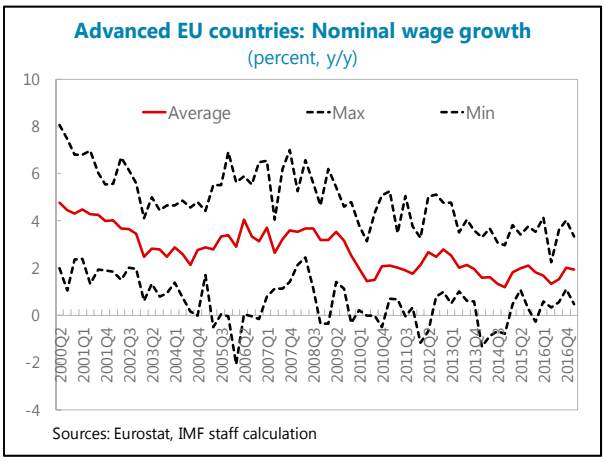


[1] Prepared by Yuanyan Sophia Zhang. This paper benefits tremendously from comments by Craig Beaumont, and useful discussions with the Swedish Authorities.

[2] Unemployment rates in Sweden tend to be higher than other countries as full-time students who search for work are counted among the unemployed. Excluding full-time students, the unemployment rate is about 4.5 percent.

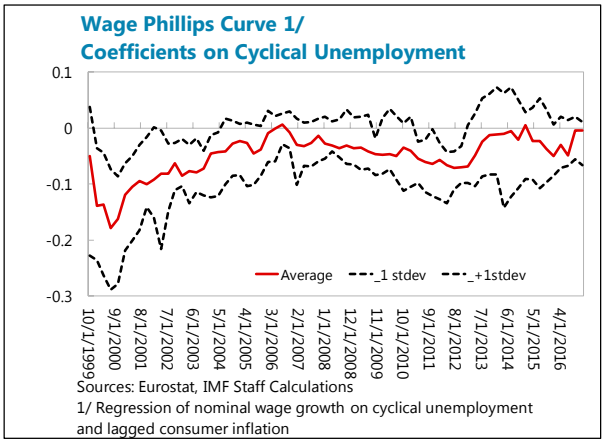
[3] Based on private sector earnings from the National Mediation Office. Public sector wages are seeing some recent uptick for some groups, such as teachers and nurses' assistants.

2. This "wage puzzle" is not unique to Sweden. An analytical chapter in the recent WEO (October 2017) finds that many advanced economies have seen a disconnect between their headline unemployment rates and nominal wage growth in recent years.[4] As in Sweden, unemployment rates have been declining in these countries since 2014, to reach their pre-crisis range, and this decline has largely reflected job creation. Yet, nominal wage growth has been broadly stable and remains below pre-crisis ranges for almost all these countries. For around three-quarters of these countries, real wage growth is below its pre-crisis range.



3. Much of the recent wage moderation in advanced economies is found to reflect a slowdown in productivity growth and subdued inflation expectations. For countries with unemployment rates below their pre-crisis range, the slowdown in the growth of trend measures of productivity accounted for over half of the wage moderation (WEO, October 2017).[5] Lower inflation expectations account for another 10–20 percent of the moderation.

4. Some analysis points to a "flattening of the Phillips curve" to account for the remaining wage moderation. In a wage Phillips curve that controls for trend productivity and inflation expectations, time-varying estimates on a sample of advanced EU countries shows a weaker impact from cyclical unemployment on wage growth since 2013.[6] This is consistent with findings in the October 2017 WEO.



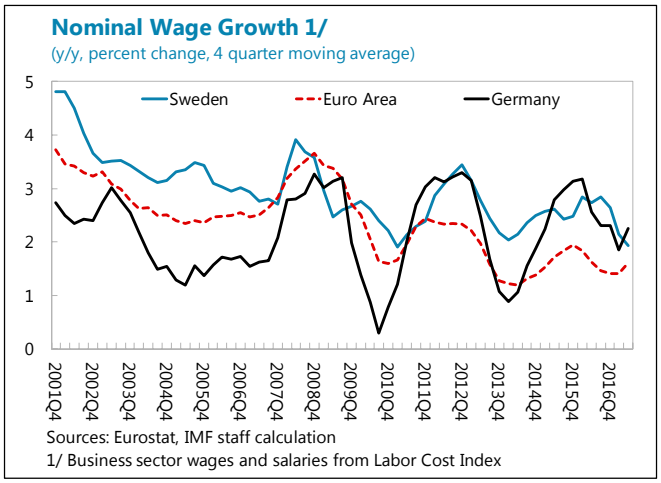
[4] Examples include the US, UK, Korea, Canada, Australia, France, and Italy. In Germany and Japan, nominal wage growth has risen in recent years, but from a low base.

[5] This moderation compares wage growth in 2016 with its average growth in 2000–2007.

[6] This Phillips curve is estimated at the country level by regressing nominal wage growth net of trend productivity growth on the unemployment gap (a measure of the cyclical component of unemployment) and lagged consumer price inflation. Time-varying parameters are estimated by using rolling windows over 5 years (20 quarters). The chart shows the average estimates across the EU countries. To check for robustness, inflation in the GDP deflator was also used instead of consumer price inflation. Trend productivity is calculated with a Hodrick-Prescott filter with a lambda parameter of 1600.

5. An alternative perspective is that a recovery in wage growth is being held back by labor market slack outside the headline unemployment measure. Recent studies have argued that headline unemployment indicators may understate the slack in some parts of the euro area (ECB, 2017) and the U.K. (Bank of England, 2017). For example, some workers who are not able to find permanent positions may accept part-time positions in the interim, with this group referred to as the "involuntary part-time employed". The availability of such workers could reduce wage growth for a given unemployment rate (WEO, October 2017). This literature indicates a need to control for broader measures of labor market slack when analyzing wage developments.[7]

6. In Europe, spillovers across countries may have also contributed to wage moderation. Ramskogler (2012) suggests that a process of wage-following behavior across EMU members under German leadership may have emerged since the introduction of euro, stimulated by rising competition across the tradable sectors. His analysis of this peer-wage-setting hypothesis finds that this wage-following behavior resulted in persistent wage moderation in many EMU countries, led by Germany. Some analysis also finds labor market slack in other European countries weighing on domestic wage growth (e.g. Riksbank Monetary Policy Report, July 2017; Chen, 2017). This type of spillover is well established in some labor markets, such as UK and Ireland, and could reflect actual or potential migration flows.[8] The rising numbers of posted workers flowing across European countries could make the effective supply of labor more elastic, which in some countries—most likely the smaller countries—could help mitigate labor shortages in some sectors, thereby containing the pressure for higher wage growth.[9]



7. The following sections investigate the drivers of recent wage moderation in Sweden. As background to the analysis, section B describes Swedish wage formation, discusses previous research on Swedish wages, and outlines the main stylized facts of Swedish labor market and wage developments. Section C lays out the analytical approach used in this paper including detailed econometric specifications. Section D presents the key results including determinants of the equilibrium wage level and drivers of short run wage dynamics. Based on this analysis, section E calculates the main contributors to the recent moderation of wage growth. Section F concludes.

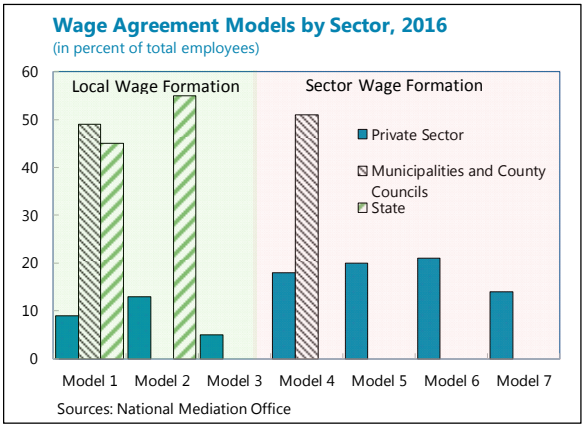
[7] Another strand of research highlights various structural factors that could lower wage growth, such as automation, the growing role of the largest companies in some sectors, declining unionization, and the changing structure of work, e.g., the rising share of temporary workers.

[8] Curtis and FitzGerald (1996).

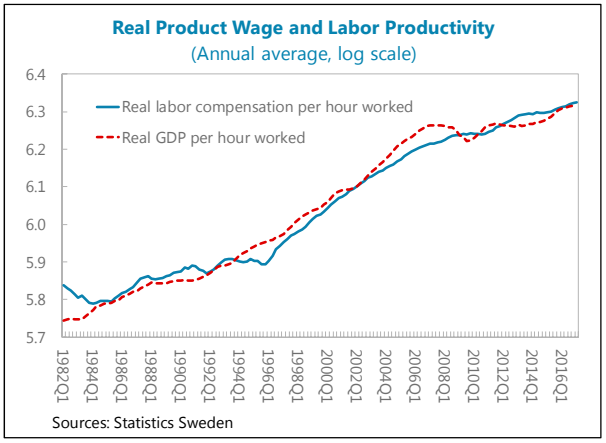
[9] European Commission, 2017, "Posting of workers"

B. Background on Swedish Wage Formation and Some Stylized Facts

8. Wage outcomes in Sweden reflect the nature of its wage bargaining system (Box 1). Since the Industrial Agreement of 1997, wage formation has been led by bargaining in the industrial sector, which sets a benchmark that is expected to be adopted by other sectors.[10] This has been in practice for the last two decades. Some wage negotiations are completed at the sector level, especially for blue-collar workers, while others also involve local/firm-level negotiations that take local economic conditions into consideration.[11] But the majority of private sector wage agreements are heavily influenced by the sector level negotiation, and only a small share of the agreements are solely determined at the local level.[12] Under such a wage formation system, led by the sector most exposed to international competition, domestic wages are more likely to be influenced by wages and labor market conditions in countries with firms that are actual or potential competitors. Germany's large industrial sector is a natural focal point for Swedish industrial companies and the corresponding unions.



9. Earlier analysis found that wage formation in Sweden is affected by both domestic and foreign factors. The National Institute of Economic Research (NIER) found that in the long run the level of wages is largely determined by labor productivity and by the price deflator for business sector value added (NIER, 2012). In the short run, they find that wage growth is largely affected by expected inflation, unemployment, profitability, and the trend rate of productivity growth. In a recent analysis of wages, the Riksbank found that economic developments or labor market conditions in the euro area can also have spillover effects on the domestic wage dynamics (Riksbank, July 2017).



[10] The increase agreed by industrial sector is a ceiling, which other sectors can only exceed with broad consensus.

[11] Based on National Mediation Office data, a rising share of employees covered by collective bargaining are affected by local/firm-level negotiations, up from 10 percent in 2013 to over 20 percent by 2015.

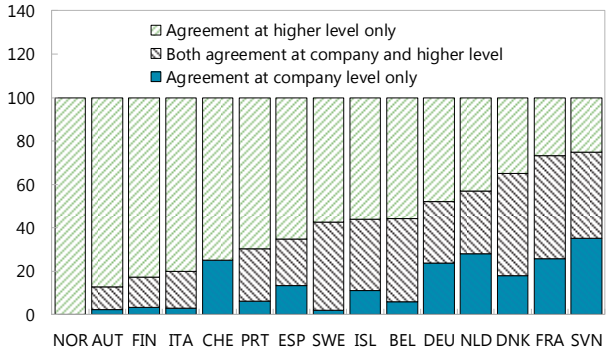
[12] There are seven broad wage agreement models in Sweden with different scales of firm/local flexibility in wage setting. Public sector wages, mostly state government jobs, are largely negotiated and set at the local level.

Box 1. Sweden's System for Wage Formation

Swedish wage bargaining system has gone through important changes in the past decades. For decades until the late 1980s, private sector wages were centrally negotiated at the national level by the Confederation of Trade Unions (Landsorganisationen, LO), the Negotiation Cartel for Salaried Employees in the Private Business Sector (PTK), and the Swedish Employers' Confederation (now called the Confederation for Swedish Enterprises, Svenskt Näringsliv).[1] Since the 1990s, wage negotiations largely took place at the sectoral level, involving 60 sectoral trade unions and 55 employer organizations, signing over 600 collective agreements in each bargaining round. The collective agreements cover over 90 percent of the employees.

Since the Industrial Agreement of 1997, wage formation has been led by bargaining in the industrial sector, which faces international competition. The wage agreement of the industrial sector sets a benchmark for wage increases that is expected to be adopted by other sectors. Therefore, conditions in the goods and labor markets relevant to the industrial production sector have a major influence on wage developments in other sectors, including the public and service sectors. This model has been challenged, particularly by the service sector (Eurofound); but so far, the structure remains broadly unchanged. Germany, the Netherlands, and a few other Nordic countries, who have close trading relationships among each other, have a similar wage bargaining system to Sweden (OECD 2017 Employment Outlook). These similarities may contribute to the potential for the wage spillovers across these countries.

Bargaining Levels [1/]
(share of employees covered by collective bargaining system)



Sources: OECD Employment Outlook, 2017 Chapter 4
1/ 2013 or latest year available.

In recent years, the wage bargaining system has become more "decentralized" with more negotiations at the firm/local level. Current models of wage agreements can be categorized into three main types – sectoral agreements, a combination of sectoral and firm/local agreements, and firm/local agreements. Private sector wage agreements take all three forms, with blue collar workers' wages largely determined at the sectoral level, and white collar workers' wages involving more firm/local level negotiations. A large share of public sector wage agreements, especially at the Central government level, were signed at the local level. Overall speaking, while sector-level wage agreements still dominate, the firm/local level agreements have increased from 10 percent in 2012 to close to 20 percent of employees covered by the collective wage bargaining system in 2015 (2017 Collective Agreement Negotiations Report) and more than 20 percent as of now (National Mediation Office). This allows wage formation to better reflect workers' productivity and firms' profitability, thereby safeguarding competitiveness and employment.

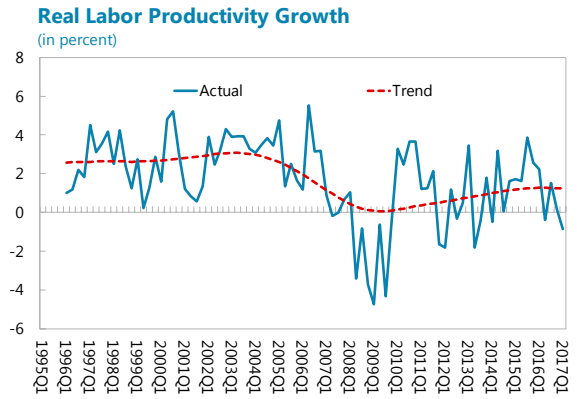
Several government agencies are involved in supporting an effective wage negotiation process. The National Institute of Economic Research (NIER) prepares an annual report analyzing the economic conditions for wage formation in Sweden**.** The National Mediation Office (NMO) mediates in labor conflicts which have declined to very low levels, promotes an efficient wage formation process by closely monitoring the bargaining process, and publishing monthly wage data.

[1] "Wage formation in Sweden", Eurofound

10. Some charts suggest that recent Swedish wage moderation could be mainly associated with slowing productivity growth and subdued inflation expectations, while labor market slack is declining both in Sweden and abroad (Figure 1). The trend rate of labor productivity growth has declined to about 1¼ percent in recent years from over 2 percent before the crisis. Inflation expectations stayed below the 2 percent target for several years until 2017. Various domestic labor slack indicators, as unemployment, also suggest a tightening of labor market conditions. Labor market lack in the euro area has also been declining, although the unemployment gap has not closed and involuntary part-time employment remains high.

Figure 1. Sweden: Productivity, Inflation Expectations, and Labor Market Conditions

Real productivity has slowed…

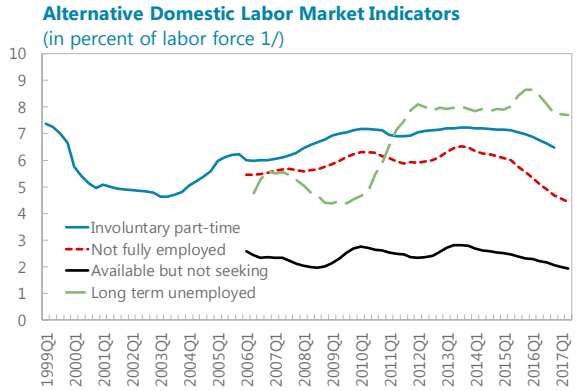


Sources: Eurostat, IMF staff calculations

.. and inflation expectations remained below the target for multiple years.

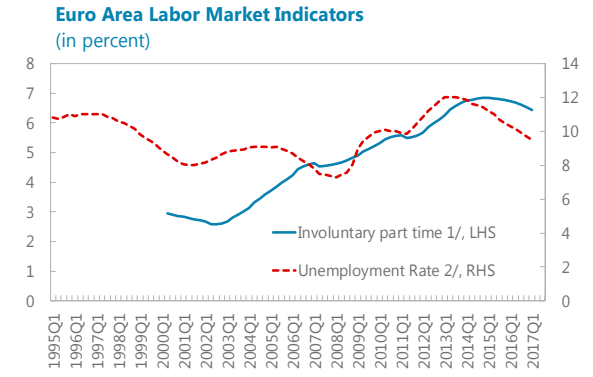
Sources: TNS Prospera, IMF staff calculations

Various domestic labor slack indicators, as unemployment, point to improving labor market conditions



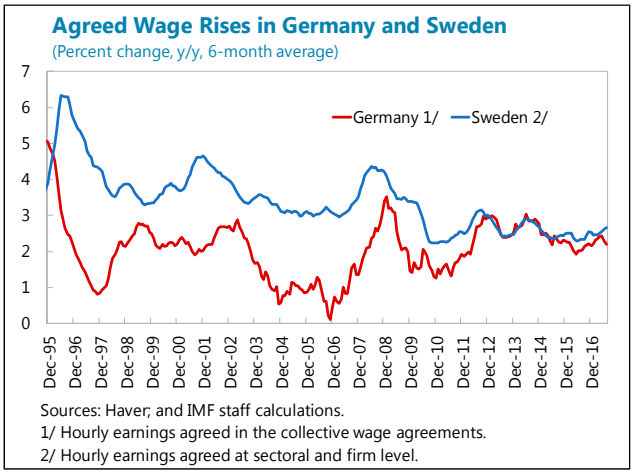
Sources: Statistics Sweden, Eurostat, staff calculation
1/in percent of total employment

Euro area labor market is tightening, though slack remains.

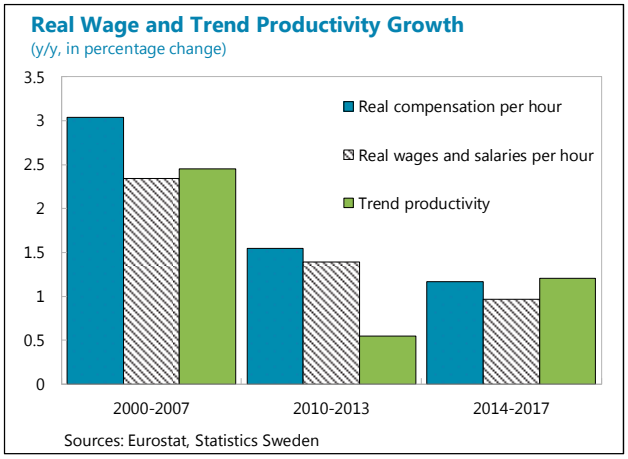


Sources: Eurostat
1/ in percent of total employment
2/ in percent of total labor force

11. It is also notable that subdued wage growth in Sweden has come at a time when Swedish wages appear to be following external wages more closely. Swedish wages have moved very closely with the agreed wages in Germany in recent years. This seems to reflect employers' growing emphasis on safeguarding cost competitiveness and export market share (Employers' Wage Negotiation Report 2017). The broad consensus with the trade unions on this approach appears to be motivated by protecting jobs in the sector.



12. Recent wage moderation could also be a temporary correction. Swedish real product wages broadly follow trends in labor productivity and have shown flexibility in relation to unemployment in the long run. Yet, real wages can temporarily deviate from the long run equilibrium level in case of unexpected shocks to inflation and productivity, or if wages were temporarily set too high/too low in relation to these fundamental factors. In fact, there was a period in 2011–13, where real wage growth exceeded trend productivity.



C. Model Specification and Data

13. We use a wage curve model, based on Blanchard (1997), to analyze the drivers of Sweden's moderate wage growth in recent years. A wage curve relationship can be derived from a range of underlying models, including wage bargaining and efficiency wages. In equilibrium, the wage curve implies that level of real wages is negatively related to aggregate unemployment (U). Extending this model to apply over time, it is necessary to augment this relationship with labor productivity (TLP). But there are significant costs to adjusting wages, especially to reducing wages, so in practice wages are more likely to follow a measure of the trend in labor productivity rather than actual labor productivity which is subject to cyclical swings and various other shocks.

$$\log RW = \alpha \log TLP - \beta U$$

14. An error-correction specification (ECM) is used to estimate the wage curve.[13] This specification appears similar to the more widely used Phillips curve in wages, except for the inclusion of an error correction term that depends on the lagged levels of real wages and trend labor

[13] Sargan (1964) originated the estimation of an error correction model for wages.

productivity. When real wages deviate from their long run equilibrium level in relation to trend labor productivity, this error correction term impacts nominal wage growth and promotes a return to equilibrium. It is important to include this term because wage behavior that is difficult to understand based on contemporaneous factors like inflation, productivity growth, and unemployment rates may reflect an ongoing unwinding of a wage "overhang" or other deviation from equilibrium. In Sweden's case, real wages have grown broadly in line with trend labor productivity before the crisis, but there was a period after the initial rebound from the crisis (2011–13) where real wages rose significantly faster than trend productivity which was rising only by ½ percent, partly due to low inflation.

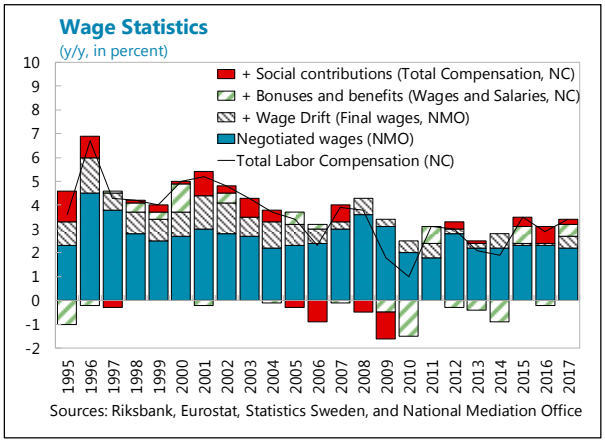
15. The wage curve ECM is enriched with other indicators of domestic labor market slack, inflation expectations, and international labor conditions. Real wages (RW) and trend labor productivity (TLP) are in the error correction term. Nominal wages (W) are determined by d*omestic factors (D),* including inflation expectations, unemployment gap, and additional labor market slack indicators (e.g. involuntary part-time employment), and by *foreign factors* (F), including German wage growth and foreign labor market slack (unemployment rate and involuntary part-time employment in the Euro Area). Altogether:

$$d\log W_t = \delta + \lambda_0 d\log W_{t-4} + \sum_{K=1}^{m} \lambda_{1,m} D_{t-i,m} + \sum_{K=1}^{m} \lambda_{2,m} F_{t-i,m} + (\phi_1 \log RW_{t-4} - \phi_2 \log TLP_{t-4}) + \eta_t$$

Note that the difference operator covers 4 quarters, reflecting the common approach of adjusting wages annually, and the error correction term refers to real wages and trend productivity 4 quarters earlier. The specification also controls for lagged dependent variable, $d\log W_{t-4}$ to reflect possible inertia or base effects.[14] A statistically significant negative coefficient on lagged real wages RW_{t-4} would indicate cointegration between real wages and trend productivity. The parameter ϕ_1 is expected to be approximately equal to ϕ_2, such that real wages grow broadly at the pace of trend productivity in equilibrium.

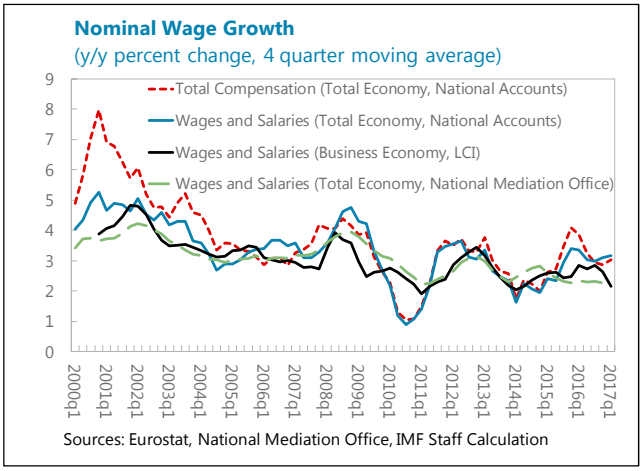
16. Data selection is as follows:

- **Nominal wages**: Our analysis is based on two wage measures: (1) wages and salaries from the national accounts as a ratio to hours worked and (2) total labor compensation from the national accounts as a ratio to hours worked. The key difference between the two measures is that total compensation includes employers' social security contributions.



[14] A base effect could arise in case of a temporary increase in the level of wages 4 quarters ago, which would tend to raise the y/y wage growth that quarter, while tending to lower the y/y growth rate 4 quarters later.

- Compared with the short-term wage statistics from the NMO, measures from the national accounts reflect structural changes in the composition of the labor force (by sector, occupation, and skill level). This makes the national accounts measures more consistent with the measure of labor productivity, which is an average across a changing composition of jobs. The LCI wages and salary measures are based on a more stable basket of jobs, and include bonuses and benefits (e.g. car, health care, sick leave), same as the wages and salaries measure from the national accounts; but the LCI wage and salary measures only cover the business sector.



- **Real wages:** the nominal wage indicator is deflated by the GDP deflator, not a consumer price measure. This ensures that real wages and real hourly labor productivity are measured consistently. It also reflects that firm's capacity to pay depends on the price of output.

- **Inflation expectations:** the TNS-Prospera survey provides inflation expectations on a quarterly basis covering a range of respondents including unions and employers. The 2-year ahead measure is used to reflect the tendency for centralized agreements to cover more than 1 year.

Definition of Key Variables

Variables	Abbreviation	Calculation	Source
Unemployment Gap	UnemGap	Percent deviation from HP-filtered equilibrium unemployment rate (lambda=12000)	LFS
Involuntary PT employment		Share of involuntary PT workers in share of total employment	Eurostat
Labor compensation per hour	W	total labor compensation per hour worked	Eurostat, National Accounts
Wages and salaries per hour	W	wages and salaries per hour worked	Eurostat, National Accounts
Trend productivity	TLP	HP-filtered trend real labor productivity per hour (lambda=1600)	Eurostat
Real Compensation/wage	RW	Compensation or wage / GDP deflator	
GDP deflator		Nominal GDP/Real GDP	Statistics Sweden
Expected inflation		2 year ahead expected inflation	TNS Prospera

D. Estimation Results

17. The estimation results indicate that wage formation has been influenced by both domestic fundamentals and international spillovers in recent decades. The above ECM specification is estimated for the period of 1995:Q1 to 2017:Q1 with labor compensation per hour from national accounts as the dependent in Table 1, and wages and salaries per hour from national

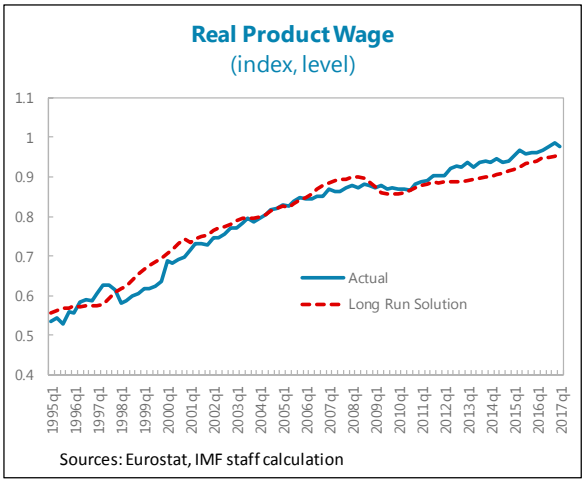
accounts as the dependent in Table 2. The coefficients on the lagged level of the real wage are statistically significant in all variants of the equation, indicating cointegration between real wages and productivity, with the rate of error correction ranging from -0.2 to -0.4. Variants on the general specification are reported as follows:

- **Models 1–3 include only domestic variables.**[15] In addition to the ECM term (difference between real wages and trend productivity), significant variables include both the unemployment gap and the changes in involuntary part-time employment, together with labor productivity growth.

- **Models 4–6 add indicators of labor market slack in the euro area (EA).** Changes in EA involuntary part-time employment is found to be statistically significant, while domestic labor slack indicators remain statistically significant.

- **Models 7–9 add German compensation/wage growth,** which are found to have a significant impact on Swedish compensation growth. In the more complete models (7–9), the coefficients on expected inflation, and euro area unemployment changes become significant, while the domestic unemployment gap remains statistically significant.

18. While results are robust to using data on wages and salaries excluding employer's social security contributions, the models of labor compensation tend to fit better. Hourly compensation growth is more closely related to trend productivity, labor market conditions, and German labor compensation growth (larger and more significant coefficients) than does hourly wages and salaries growth, while expected inflation has more direct and larger impact on wages and salaries than total compensation. The models of total compensation also show better fit, especially in its long-term relationship with trend productivity. Further analysis focuses on Table 1, model 9.



19. Estimation results confirm that labor productivity is the main driver of real labor compensation in the long run.[16] Estimated coefficients on lagged real labor compensation and trend productivity are approximately equal in absolute values (Table 1). The long-run solution of Table 1, model 9 is below, with a coefficient just over unity on labor productivity, and a long-

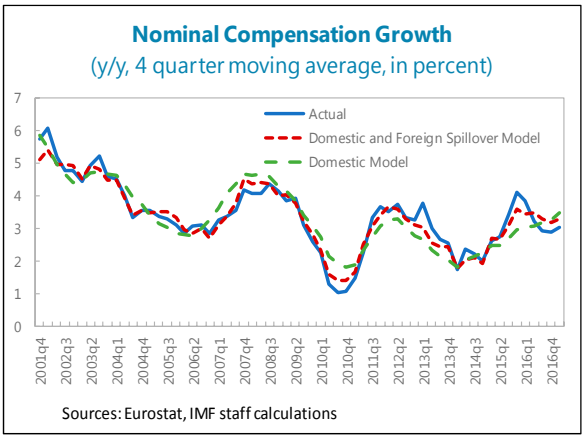
[15] Model 1 is similar to the basic wage equation in Blanchard (1997).

[16] This result holds whether wages are measured using national accounts data on labor compensation per hour or are instead measures by wages and salaries per hour from the Labor Cost Index.

run coefficient on the unemployment gap that is consistent with estimates in the wage curve literature.[17]

$$\log RW = -4.00 + 1.06 * \log LTP - 0.13 * UnemGap$$

20. The error correction model explains close to 80 percent of the total variation of the actual wage development. The domestic wage curve model (red line in text chart), which includes unemployment, productivity and expected inflation, has an R-square of only 60 percent. The spillover effects from the euro area labor market condition and German wage growth, added to the combined model, each contributes an additional 10 percent to the model fit.



E. Scenario Analysis and Comparison with Other Countries

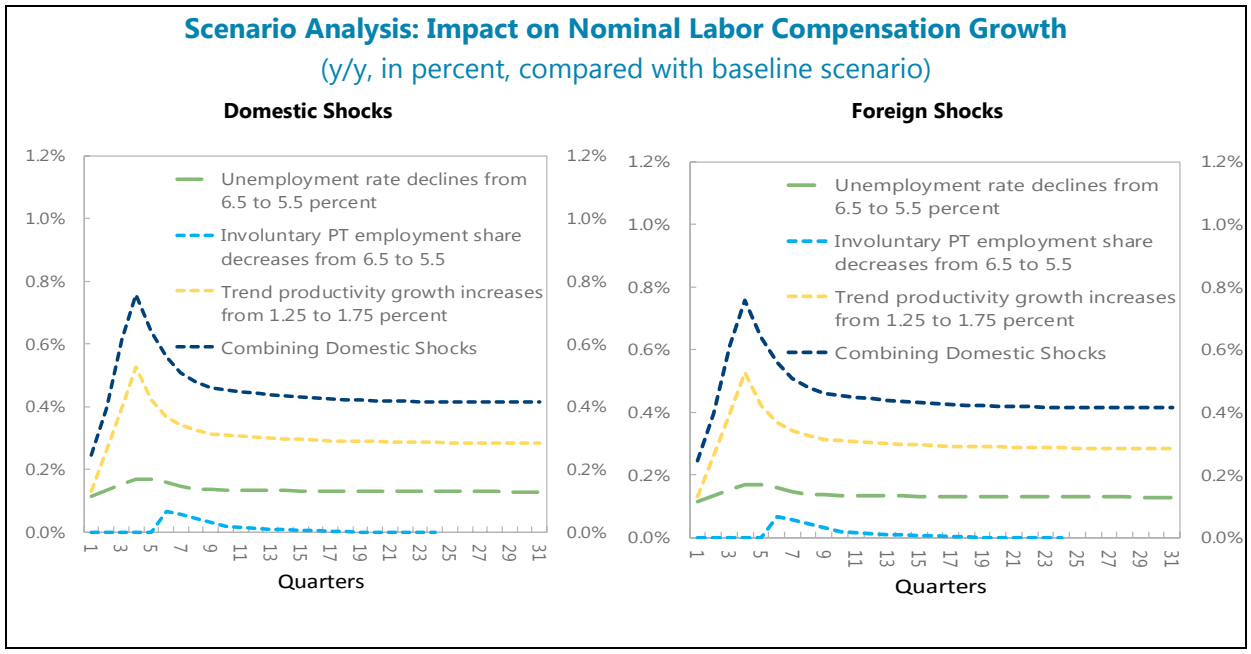
21. Scenario analysis suggests that further decline of unemployment, rise in German wage growth, and recovery of trend productivity could significantly raise domestic wage growth. The text chart below shows the magnitude by which nominal labor compensation growth would deviate from the baseline, in different scenarios, based on model 9. In the baseline, underlying variables are assumed to remain unchanged at the 2017Q1 level. Alternative scenarios assume plausible shocks to the underlying variables.

- **Domestic Shocks:** An increase in productivity growth from the current 1.25 to 1.75 percent would raise nominal labor compensation growth by 0.5 percent in the short run; and the immediate impact would dissipate over time as wages slowly converge to the equilibrium through the error correction mechanism. A decline in unemployment rate and involuntary PT employment share by 1 percentage point each has positive impact on wage growth, but of smaller magnitudes of 0.2 and 0.1 percent respectively. The combined effect from the domestic shocks could lift nominal labor compensation growth by about 0.8 percent y/y.

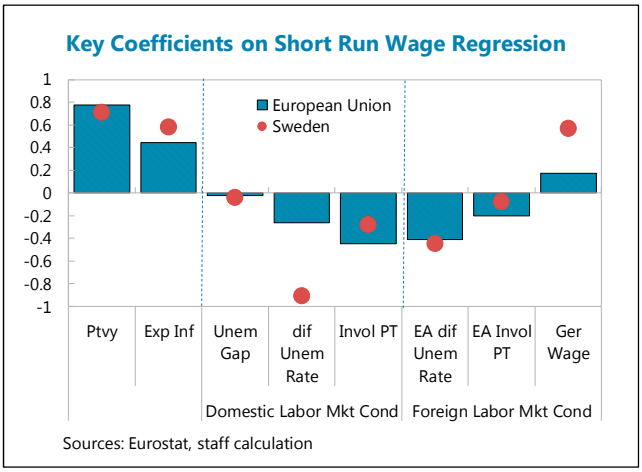
- **Foreign Shocks:** The spillover effect of an increase of German wage growth from 2 to 3 percent is close to 0.6 percent, much larger than the impact of falling euro area unemployment rate from 9.5 to 8.5 percent, which is about 0.1 percent. The combined effect could raise nominal compensation growth by about 0.7 percent y/y.

A combination of domestic and foreign factors could increase nominal compensation growth by about 1.5 percent.

[17] The coefficient on trend productivity is significantly higher than 1 at a 99 percent confidence level.



22. Compared with other EU countries, labor compensation in Sweden follows that in Germany more closely. Using the same model specification as the above Swedish models, we run a panel regression covering 22 EU countries over the same time horizon for comparison purposes.[18] Like Sweden, all the domestic and foreign variables included in the panel regression are statistically significant with expected signs. And the impact of productivity growth, expected inflation, and euro area labor market slack on labor compensation growth has been broadly comparable between Sweden and an EU average. However, the spillover effect of German wages is much larger in Sweden. While a percentage point increase of German labor compensation growth leads to a 0.6 percentage point increase in Swedish labor compensation growth, the average impact on EU labor compensation growth is only one third of the magnitude (about 0.2 percentage point).[19] In addition, in the long run, real labor compensation is also modestly more responsive to the unemployment rate in Sweden (-0.13 on unemployment gap) than in an average EU country (-0.11 on unemployment gap).

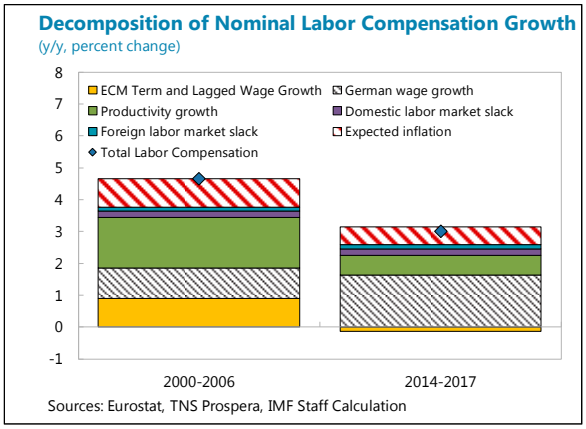


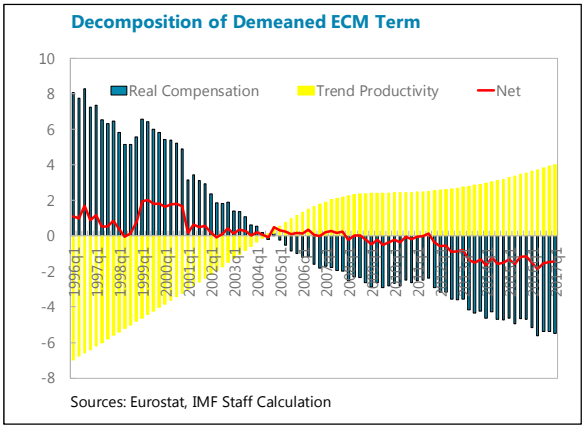
[18] The model specifications are the same as Sweden's model, except that lagged consumer price inflation is used as the proxy for inflation expectation while survey inflation expectation is used in the Sweden's model.

[19] A more comparable measure is to compute competitor wage index, as German wages maybe more relevant to Sweden and less relevant for some other EU countries.

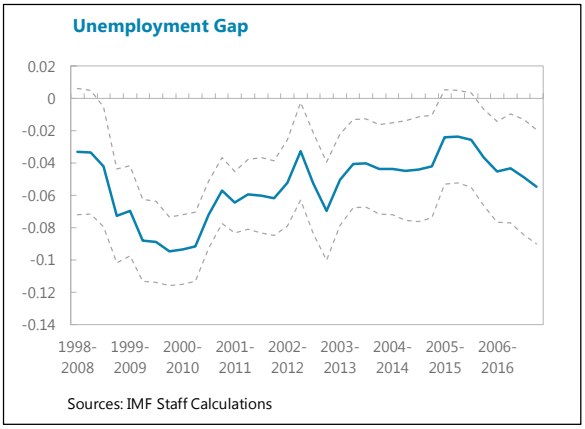
F. Analysis of Recent Wage Moderation

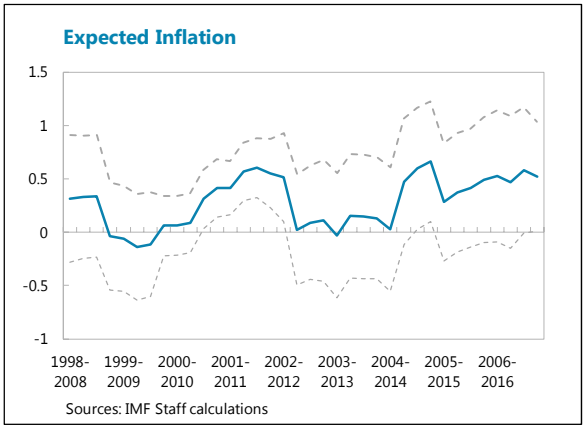
23. A decomposition exercise indicates that the recent wage moderation is associated with sluggish productivity growth and low inflation, together with an adjustment from higher wage growth in earlier years. Decomposing the nominal compensation growth into contributions from variables included in the most complete short-run regression (model 9), it is found that lower productivity growth and expected inflation are the main factors accounting for the lower level of labor compensation growth in recent years. In addition, the negative contribution from the error correction term in recent years reflects an adjustment to a period of real labor compensation rising more rapidly than the trend in labor productivity. This decomposition exercise assumes that coefficients are constant, but the following rolling regression analysis finds some changes in wage behavior that suggest additional factors could contribute to low wage rises in Sweden.



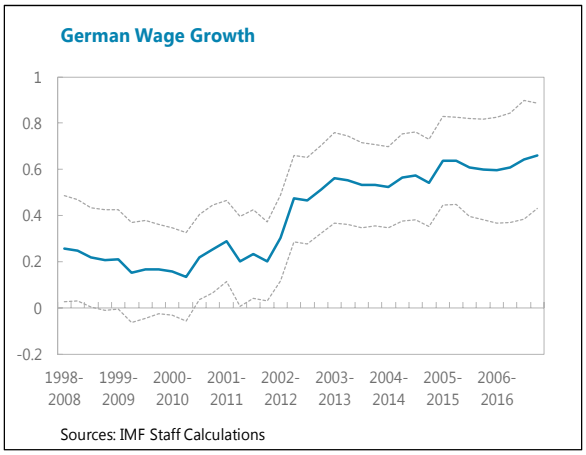


24. Rolling regressions suggest that wages remain responsive to domestic unemployment and inflation expectations. We run regressions of the specification 9 over 10 year rolling windows and found wage responsiveness to unemployment seems to remain broadly stable after accounting for the foreign spillover effects, in contrast to the flattening of Phillips Curve based on the simple domestic wage model. The impact of expected inflation has fluctuated but has shown no clear trend.

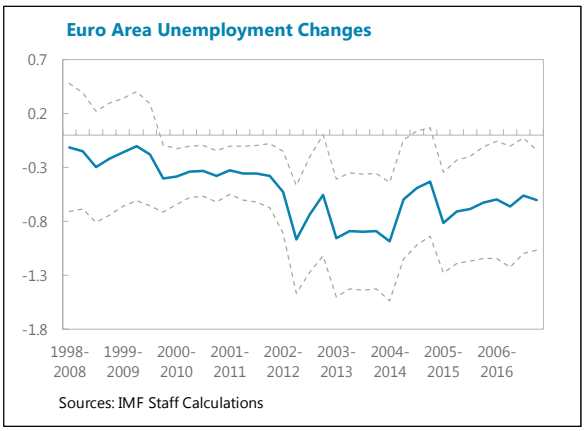




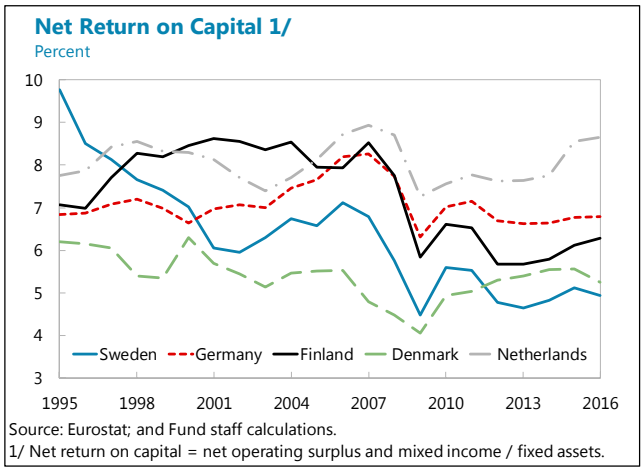
25. Yet, domestic wages appear to have become more responsive to German wage developments. The rolling coefficient on German wages rose notably since the early 2000s and have continued rising. Although recent German labor compensation growth, at around 2 percent, has been somewhat higher than the pre-crisis averages (close to 1 percent), they remain moderate.[20] Hence rising co-movement with German wages also contributed to Swedish wage growing more slowly than otherwise.



26. Foreign labor market conditions also become more important factors in domestic wage settings. The rolling coefficients on euro area unemployment changes also increased significantly since the early 2000s and stabilized in more recent periods. This is likely associated with higher integration of trade and freer labor flows across the EU countries.



27. Other structural factors not included in this analysis may have also contributed to the recent wage moderation. One possible source of wage moderation not included in the econometric analysis above is a decline in profitability, as seen in the lasting decline in the net return on capital in Sweden since the crisis to be the lowest among peer economies. Some of this decline may reflect structural changes in industry composition favoring less capital-intensive sectors, e.g. services (MPR September, 2016; Wage Formation, 2016). Yet, it could also be partly due to globalization increasing competition in the manufacturing sector, prompted firms to hire more temporary and part-time workers and to outsource more production (see WEO Oct 2017). Rising labor supply of labor that is not covered by the labor force survey data, e.g. posted workers in the construction sector, may also have alleviated wage pressure in certain sectors. These could all contribute to structurally lower wage growth than implied by model for the coming years.



[20] The low pre-crisis wage growth in Germany is discussed in Mineshima (2017).

G. Conclusions and Future Research

28. From a longer run perspective, Swedish wages have been growing at a pace that is broadly in line with domestic fundamentals. On average, real wages grew slightly over 1 percent as real productivity increased by 1 percent; and they also rose about 0.1 percent as the unemployment rate fell by 1 percentage point. Nominal wages also react to expected inflation and the trend in productivity growth with the magnitudes comparable to other EU countries. Overall, domestic fundamentals explain about 60 percent of total variation of the wage development.

29. The recent disconnect between nominal wage growth and unemployment is found to reflect a combination of closer external linkages in Swedish wage formation and a process of correction. Collectively agreed wages have been moving closely with those in Germany in recent years. Including these foreign factors significantly increases the fit of the wage models by about 20 percentage points. Regressions over rolling windows confirmed that wage responsiveness to euro area labor market conditions and German wage growth has indeed increased, especially after 2000. Wage moderation in recent years is also found to reflect some temporary drag on wage rises to gradually correct for high real wage levels relative to the trend in labor productivity reached in the years soon after the global financial crisis.

30. Further research could assess the structural factors underlying the rise in the impact of external labor market conditions. The analysis in this paper, unlike the traditional Phillips curve approach, finds that wage inflation is still sensitive to unemployment. This would suggest the omission of variables for broader indicators of domestic labor market slack, for foreign labor market conditions, and for the deviation from long-run equilibrium wage levels, could be driving the finding of a flattening of the Phillips curve. Yet, the wage curve estimated in this paper is found to have its own parameter instabilities, with a notable rise in the impact of German wages and changes in euro area unemployment sometime after 2000. Rising integration of the European labor market, potentially associated with the implementation of the Schengen Agreement, including its expansion to central European and Baltic countries from 2003, may be one significant contributor.

References

Aiko Mineshima (2017). "Wage and Inflation Dynamics in Germany and Implications for European Recovery and Rebalancing," IMF Selected Issues Paper. Washington: International Monetary Fund.

Bank of England (2017). "Why Has Wage Growth Remained Subdued?" Box in Chapter 3, Inflation Report, February.

Blanchard, Olivier (1998). "The Wage Equation," April, MIT Press.

Curtis and FitzGerald (1996). "Real Wage Convergence in an Open Labor Market," The Economic and Social Review, Vol 27, No. 4, July, 1996, pp 321–340.

European Central Bank (2017). "Assessing Labor Market Slack," Economic Bulletin, Issue 3.

International Monetary Fund (2017). "World Economic Outlook," October.

Jack Chen, "Drivers of UK Wage Growth," upcoming IMF working paper. Washington: International Monetary Fund.

National Institute of Economic Research (2012). "Wage Formation in Sweden."

——— (2015). "Wage Formation in Sweden."

——— (2016). "Wage Formation in Sweden."

Organization for Economic Cooperation and Development (2017). "OECD Economic Survey: Sweden." February.

——— (2017). "OECD Employment Outlook," April.

Paul Ramskogler (2012). "Is there a European wage leader? Wage spillovers in the European Monetary Union," Cambridge Journal of Economics.

Riksbank (2017). "Monetary Policy Report," April.

Sargan, J. D. (1964). "Wages and Prices in the United Kingdom: A Study in Econometric Methodology," 16, 25–54. in Econometric Analysis for National Economic Planning, ed. by P. E. Hart, G. Mills, and J. N. Whittaker. London: Butterworths.

Swedish Employers Association (2016). "Collective Agreement Negotiations 2017."

Table 1. Model of Nominal Labor Compensation Growth (National Accounts)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dependent Variable: Nomimal Labor Compensation yoy growth								
Sensitivity to cyclical variables									
L4.Dept Var	0.05	0.07	-0.12	-0.04	-0.45***	-0.48***	-0.03	-0.47***	-0.47***
	(0.11)	(0.10)	(0.11)	(0.11)	(0.11)	(0.12)	(0.08)	(0.09)	(0.09)
L4.Productivity growth	0.32*	0.32	0.49**	0.22	0.56***	0.67***	0.71***	0.64***	0.71***
	(0.19)	(0.22)	(0.19)	(0.23)	(0.18)	(0.24)	(0.25)	(0.20)	(0.21)
L4.Unemployment gap	-0.09***		-0.08***	-0.07**	-0.06***	-0.05**		-0.05**	-0.04**
	(0.02)		(0.02)	(0.03)	(0.02)	(0.02)		(0.02)	(0.02)
L4.dif. Unemployment rate	-0.70***		-0.33*	-0.52**	-0.35*	-0.31		-0.94***	-0.91***
	(0.16)		(0.19)	(0.25)	(0.18)	(0.21)		(0.23)	(0.23)
L4.dif. Involuntary PT workers 1/		-1.20***	-0.95***		-0.72**	-0.77**	-0.95***		-0.28
		(0.35)	(0.34)		(0.35)	(0.36)	(0.26)		(0.33)
L4.dif. EA Unemployment rate 1/				-0.25		0.04	-0.75***	-0.53**	-0.45*
				(0.34)		(0.26)	(0.17)	(0.24)	(0.26)
L4.dif. EA Involuntary PT workers					-1.06*	-1.14*		-0.06	-0.08
					(0.57)	(0.58)		(0.58)	(0.58)
L3.dif. German wage growth							0.54***	0.60***	0.57***
							(0.16)	(0.14)	(0.15)
L2.Expected inflation 1/	-0.32	0.20	-0.09	-0.13	-0.00	0.34	0.65**	0.52**	0.58**
	(0.31)	(0.34)	(0.29)	(0.32)	(0.36)	(0.31)	(0.31)	(0.24)	(0.25)
Constant	-1.45**	-1.30*	-1.60***	-0.94	-1.05**	-0.99*	-1.88***	-1.00*	-1.28**
	(0.56)	(0.67)	(0.55)	(0.67)	(0.49)	(0.57)	(0.59)	(0.52)	(0.61)
Sensitivity to long run level									
L4.Real Labor comp level	-0.33***	-0.31**	-0.34***	-0.25**	-0.24**	-0.20**	-0.38***	-0.29***	-0.32***
	(0.11)	(0.13)	(0.10)	(0.12)	(0.09)	(0.09)	(0.11)	(0.09)	(0.10)
L4.Trend Productivity	0.39***	0.35**	0.42***	0.26	0.28**	0.26*	0.48***	0.28**	0.34**
	(0.14)	(0.17)	(0.14)	(0.17)	(0.12)	(0.14)	(0.15)	(0.13)	(0.15)
Observations	72	72	71	71	61	61	72	62	62
R-squared	0.64	0.52	0.69	0.65	0.71	0.72	0.71	0.78	0.78

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

1/ lags on involunary PT workers, expected inflation, EA unemployment rate and EA involuntary PT workers across across specifications with the average lags listed in the table

Table 2. Model of Nominal Wages and Salaries Growth (National Accounts)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dependent Variable: Nomimal Wages and Salaries yoy growth								
Sensitivity to cyclical variables									
L4.Dept Var	-0.54***	-0.20	-0.43***	-0.44***	-0.43***	-0.41***	-0.38***	-0.41***	-0.39***
	(0.11)	(0.12)	(0.10)	(0.09)	(0.10)	(0.10)	(0.08)	(0.09)	(0.09)
L4.Productivity growth	0.32**	0.32*	0.36***	0.12	0.14	0.33*	0.28**	0.31**	0.28*
	(0.15)	(0.17)	(0.13)	(0.14)	(0.15)	(0.18)	(0.14)	(0.15)	(0.19)
L4.Unemployment gap	-0.08***		-0.05***	-0.03**	-0.03**	-0.02		-0.01	0.00
	(0.01)		(0.01)	(0.01)	(0.01)	(0.02)		(0.02)	(0.02)
L4.dif. Unemployment rate			-0.49***	-0.11	-0.11	-0.55***		-0.15	-0.31
			(0.12)	(0.18)	(0.18)	(0.18)		(0.17)	(0.22)
L.dif. Involuntary PT workers		-0.67**	-0.29		-0.10	-0.04	-0.13		-0.33
		(0.27)	(0.22)		(0.22)	(0.38)	(0.21)		(0.39)
L4.dif. EA Unemployment rate				-0.67***	-0.64***		-0.96***	-0.81***	-0.67***
				(0.22)	(0.23)		(0.12)	(0.21)	(0.25)
L4.dif. EA Involuntary PT workers						-1.38**			-0.24
						(0.59)			(0.66)
L3.dif. German wage growth							0.34***	0.32***	0.33**
							(0.09)	(0.11)	(0.13)
L2.Expected inflation 1/	0.23	0.84***	0.33	0.42*	0.41*	0.24	0.69***	0.65***	0.45
	(0.26)	(0.27)	(0.23)	(0.22)	(0.22)	(0.32)	(0.18)	(0.22)	(0.31)
Constant	-0.44	-0.13	-0.83**	-0.17	-0.27	-0.84**	-0.63	-0.64*	-0.88*
	(0.38)	(0.46)	(0.38)	(0.34)	(0.41)	(0.40)	(0.39)	(0.36)	(0.49)
Sensitivity to long run level									
L4.Real Labor comp level	-0.16*	-0.07	-0.22**	-0.10	-0.12	-0.23**	-0.20**	-0.20**	-0.28**
	(0.09)	(0.10)	(0.08)	(0.08)	(0.09)	(0.09)	(0.08)	(0.08)	(0.11)
L4.Trend Productivity	0.13	0.04	0.22**	0.06	0.09	0.23**	0.17*	0.17*	0.24*
	(0.10)	(0.12)	(0.09)	(0.09)	(0.10)	(0.10)	(0.10)	(0.09)	(0.12)
Observations	71	71	71	71	71	61	71	71	61
R-squared	0.58	0.46	0.70	0.73	0.73	0.70	0.76	0.76	0.75

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

1/ lags on involunary PT workers, expected inflation, EA unemployment rate and EA involuntary PT workers across across specifications with the average lags listed in the table