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Quarterly Report on the Euro Area

Volume 19, No 2 (2020)

- **Consumption smoothing and the role of banking integration in the euro area** by Zenon Kontolemis, Eric Meyermans and Chris Uregian
- **Structural change in labour demand and skills mismatches in the euro area** by Daniel Alonso and Alkistis Zvakou
- **Taking stock of implicit pension liabilities** by Ben Deboeck and Per Eckefeldt

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European Commission
Directorate-General for Economic and Financial Affairs

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Table of contents

Editorial	5
I. Consumption smoothing and the role of banking integration in the euro area (by Zenon Kontolemis, Eric Meyermans and Chris Uregian)	7
I.1. Introduction	7
I.2. Risk sharing via the banking sector in the euro area	9
I.3. Some empirical evidence on cross-border risk-sharing	12
I.4. Private consumption and cross-border bank integration	13
I.5. Effectiveness of cross-border bank integration: illustrative simulations	17
I.6. Conclusions	21
II. Structural change in labour demand and skills mismatches in the euro area (by Daniel Alonso and Alkistis Zvakou)	27
II.1. Introduction	27
II.2. The skills mismatch: measurements and causes	29
II.3. Structural change in employment: measures and causes	30
II.4. Macroeconomic skills mismatch and structural change in labour demand	39
II.5. Conclusions	40
III. Taking stock of implicit pension liabilities (by Ben Deboeck and Per Eckefeldt)	43
III.1. Introduction	43
III.2. IPL: concepts, relation to government debt and use for fiscal sustainability analysis	44
III.3. The supplementary table on accrued-to-date pension entitlements in social insurance (“Table 29”)	50
III.4. Implicit pension liabilities derived from the long-term projections in the Ageing Report	52
III.5. Concluding remarks	55
Boxes	
I.1. Direct and indirect cross-border bank sector integration	11
I.2. Household consumption, financing gap and bank credit/deposit	22
I.3. A reduced form regression analysis	24
II.1. The task-based approach and classifying task content	29
II.2. Empirical analysis: The link between macroeconomic skill mismatches and structural change in labour demand	30



Maarten Verwey
Director-General

The COVID-19 pandemic represents a shock of unprecedented magnitude and intensity, with severe socio-economic consequences. The euro area economy is still operating well below full capacity and there is still considerable uncertainty about the recovery path. To fully recover from the pandemic and support sustainable growth and job creation, well-designed macroeconomic policies, underpinned by reforms that promote the well-functioning of markets and complete the EMU architecture, are needed at both the national and the European level.

This Quarterly Report on the Euro Area (QREA), planned before the onset of the current epidemic, assesses the benefits of cross border banking integration across the euro area, discusses structural changes in the labour market focusing on skill mismatches and describes a framework for assessing the future cost of current pension policies and their impact on fiscal sustainability. These issues, even though not related to the COVID pandemic, will become even more relevant, in the aftermath of this crisis.

The first section investigates the extent to which cross-border integration in the banking sector has helped to smooth private household consumption in the face of transitory shocks to household income since the launch of the euro. The analysis suggests that cross-border banking channels have provided a useful countercyclical impulse to consumption over the sample period thereby smoothing up to half the negative income shocks. Obviously, this smoothing effect depends heavily on the level of banking integration, which has ebbed in the wake of the Global Financial crisis. Such findings underscore the need to continue reforms that promote cross-border integration thus providing cross-border private risk sharing which is key in a monetary union.

The second section examines the effect of structural change in labour demand on skills mismatches across euro area Member States between 2002 and 2018. The empirical analysis suggests that the introduction of technologies that reduce the demand for workers performing routine tasks has increased skills

mismatches at the macroeconomic level. While most Member States are exposed to the impact of robotisation on skills mismatches, middle-income ones are more at risk because they have more routine work in their employment structures and could find it more difficult to meet the fast changing demand for more complex skills. In terms of policies, these findings underscore the importance of investing in education and training and creating conditions that foster labour mobility. In its 2021 Annual Sustainable Growth Strategy, the Commission strongly encourages Member States to include in their recovery and resilience plans the investment and reforms needed to facilitate the adaptation of education systems to support digital skills as well as to foster educational and vocational training for all ages.

The third section presents estimates of gross and net implicit pension liabilities under the new ESA structured statistical reporting of accrued-to-date unfunded public pension liabilities using the projections from the EC-EPC Ageing Report. The analysis provides a useful complement to conventional debt and deficit measures and helps to identify the future cost of current pension policies as well as the impact of pension reforms. As such, the proposed medium- and long-term indicators can complement conventional debt and deficit measures in their assessment of the future cost of current pension policies as well as the impact of pension reforms on the actuarial balance of the public pension scheme.

While the future remains uncertain, there is a real risk that the COVID-19 pandemic and its possible recurrence could inflict long-lasting scars on the euro area's growth potential and economic resilience. This issue of the QREA underscores the need for both national and EU-level reforms. With the support of the European Recovery strategy, and in particular of the Next Generation EU instrument, the Recovery and Resilience Facility as well as the European Investment Fund capital increase, this crisis could be an opportunity to relaunch these reform efforts and create economies that are greener, fairer and more resilient.

I. Consumption smoothing and the role of banking integration in the euro area

By Zenon Kontolemis, Eric Meyermans and Chris Uregian

Members of a currency union lose their capacity to adjust to idiosyncratic shocks via nominal exchange rate adjustments or monetary policy actions. However, a well-designed currency union strengthens their opportunities for cross-border private risk sharing. Depending on the nature of the shock, several private risk-sharing mechanisms exist, such as the cross-border flow of funds and income from assets held abroad.

This section investigates to what extent cross-border bank sector integration helped smooth private consumption in the face of transitory shocks to household income since the euro was launched. The empirical analysis makes a distinction between direct and indirect bank integration. The former relates to direct interaction between foreign banks and domestic households, the latter to the borrowing and lending between foreign and domestic banks (with only domestic banks interacting with domestic households). The econometric analysis suggests that cross-border banking channels provided a useful countercyclical impulse to consumption over the sample period, smoothing up to half the negative income shocks. This smoothing effect, which can be large in principle, depends on the level of banking integration, which has declined in the wake of the global financial crisis. These findings provide useful policy lessons and underscore the need for further reforms to complete the economic and monetary union (EMU) architecture. This could give cross-border private risk sharing a more sustainable footing (1).

I.1. Introduction

Deep recessions can have a direct negative impact on a country's economy and citizens' welfare as they adversely affect key macroeconomic aggregates such as consumption and investment. While a small economy with its own currency can absorb part of an idiosyncratic shock through nominal exchange rate adjustments and monetary policy actions (2), these specific adjustment channels are not available to an economy that is part of a currency union (3).

However, given the high degree of integration across the members of the currency union, cross-border risk sharing is one of the channels via which they can strengthen their capacity to absorb and recover from (idiosyncratic) shocks. For instance,

the high degree of inter-state risk sharing in the United States of America is widely credited as being central to its success as a monetary union (4).

This is precisely the reason why the Five Presidents' Report of June 2015 (5) called for the shock absorption and recovery capacity of the euro area to be improved by strengthening cross-border risk-sharing channels. This is in addition to the role that the domestic banking system plays in absorbing shocks. As is well documented, the role of the banking system is much more prevalent in the euro area compared with the USA (6).

Cross-border risk sharing (7) can take many forms, including market mechanisms such as the cross-border flow of saving and borrowing - the credit

(1) The authors wish to thank Ulrich Clemens, Roman Garcia, Daniel Monteiro, Plamen Nikolov, Virgilijus Rutkauskas, Matteo Salto, Borek Vasicek and an anonymous reviewer for useful comments. This section represents the authors' views and not necessarily those of the European Commission.

(2) See for instance Friedman M. (1953), 'The Case for Flexible Exchange Rates', *Essays in Positive Economics*, Chicago University Press studying the case of idiosyncratic shocks. However common shocks, such as the COVID-19 pandemic in 2020 saw small countries with their own currency experience strong foreign exchange volatility and risks of foreign funding.

(3) For Member States that are part of a currency union, external adjustment occurs via internal devaluation, e.g. lowering labour costs or cutting domestic aggregate demand, e.g. fiscal contraction.

(4) Sala-i-Martin, X., and J. Sachs (1992), 'Fiscal federalism and optimum currency areas: Evidence for Europe from the United States', in Canzoneri, M., Masson, P. and V. Grilli (eds., 1992), *Establishing a Central Bank: Issues in Europe and Lessons from the U.S.*, Cambridge University Press: London.

(5) See Juncker, J.-C., Tusk, D., Dijsselbloem, J., Draghi, M. and M. Schulz (2015), *Completing Europe's Economic and Monetary Union*, European Commission. European Commission (2017), 'Reflection Paper on the Deepening of the Economic and Monetary Union' illustrates possible ways forward for deepening and completing the Economic and Monetary Union up until 2025.

(6) See references in sub-section I.3.

(7) A common definition of risk sharing used in this section refers to the capacity of firms and households to smooth their investment and consumption during economic shocks.

channel) ⁽⁸⁾ - and the cross-border flow of income from assets held abroad (i.e. the capital market channel) ⁽⁹⁾ ⁽¹⁰⁾ as well as public mechanisms such as cross-border fiscal transfers.

This section focuses on the credit channel and investigates to what extent cross-border bank sector integration helped smooth private consumption in the euro area ⁽¹¹⁾. It builds on the recent literature on risk sharing in monetary unions and makes use of the European Central Bank's (ECB) financial integration indicators.

Compared to the more general assessments of risk sharing in the literature ⁽¹²⁾, this section takes a narrow and more focused approach. It examines to what extent bank credit is used to finance temporary deviations of income from permanent income, while also making a distinction between direct and indirect bank integration. The other important macro-economic variable to consider is investment by non-financial corporations. However, such analysis is beyond the scope of this section.

The section starts with a brief description of cross-border integration since the euro was launched and reviews the literature on risk sharing. It then investigates from an econometric viewpoint the impact of cross-border bank integration on consumption smoothing in the euro area, i.e. ex-post risk sharing ⁽¹³⁾. In this econometric exercise, cross-border bank sector integration in the euro area is measured by a set of outcome indicators that are directly related to market integration, such as the amount of cross-border credit flows and

cross-border price dispersions in the banking sector ⁽¹⁴⁾. The final section concludes with some policy implications.

The empirical results suggest that although cross-border bank integration has had a countercyclical impact on private consumption, there is still considerable room to strengthen its potential. From this perspective completing the banking union could help spread country-specific risks across the euro area. However, further bank integration should not be seen in isolation but as part of a holistic approach aimed at completing the EMU architecture. This includes completing the capital markets union and establishing a common fiscal stabilisation mechanism.

While further bank integration may strengthen the efficiency and resilience of Europe's banking sector, this section does not provide an assessment of cross-border contagion risks and their potential costs which can be particularly high if cross-border banking becomes excessive ⁽¹⁵⁾. It also does not analyse possible complementarities with other forms of private risk sharing ⁽¹⁶⁾ or public risk sharing, ⁽¹⁷⁾ or the impact of further financial integration on the banking sector's profitability. In addition, while other studies focus on the stabilising impact of credit aggregates that cover credit to households as well as to firms, this section focuses specifically on the impact of bank lending on private consumption.

⁽⁸⁾ The cross-border credit channel decouples the domestic credit supply from local banks' lending capacity, which makes domestic credit volumes less sensitive to idiosyncratic shocks that adversely affect the capital base of local banks or the solvability of loans.

⁽⁹⁾ The cross-border capital market channel allows the private sector to hold a diversified portfolio of assets that generates an income stream less dependent on adverse idiosyncratic shocks.

⁽¹⁰⁾ Cross-border labour mobility is another market channel, but the available empirical evidence suggests that the impact of labour mobility is limited. For instance, within the limits set by data availability, Alcidi, C. and G. Thirion (2016), 'Assessing the Euro Area's Shock-Absorption Capacity Risk sharing, Consumption Smoothing and Fiscal Policy.', *CEPS Special Report* No. 146 estimate that labour mobility in the euro area absorbs around 0.08% of a 1% shock to GDP.

⁽¹¹⁾ As such, this section does not cover other channels of risk sharing such as remittances from abroad.

⁽¹²⁾ See for instance Asdrubali F., B. Sorensen and O. Yosha (1996), 'Channels of interstate risk sharing: United States 1963-1990', *The Quarterly Journal of Economics*, Vol. 111, No. 4, pp 1081-1110.

⁽¹³⁾ It does not examine the impact of ex ante risk sharing via for instance the holding of diversified financial portfolios, which may limit fluctuations in permanent disposable income.

⁽¹⁴⁾ The law of one price (of bank instruments and services) will prevail in fully integrated markets, and there will be no home bias in economic agents' portfolios of bank related assets and liabilities.

⁽¹⁵⁾ Nevertheless, cross-border banking makes domestic banks and households more vulnerable to external shocks. This may then have a destabilising effect for the domestic economy if cross-border bank integration has taken an excessive form. See for instance Allen, F, T Beck, E Carletti, P R Lane, D Schoenmaker, and W Wagner (2011), *Cross-Border Banking in Europe: Implications for Financial Stability and Macroeconomic Policies*, Centre for Economic Policy Research. Schoenmaker, D. and W. Wolf (2011), 'The Impact of Cross-Border Banking on Financial Stability', *Tinbergen Institute Discussion Paper*, No. 11-054/2/DSF18. Moreover, faced with large common shocks the benefits of diversification can break down. See for instance Draghi (2018), 'Risk-reducing and risk-sharing in our Monetary Union', speech delivered at the European University Institute, Florence, 11 May 2018.

⁽¹⁶⁾ Such as ex-ante risk sharing via capital markets or cross-border labour mobility.

⁽¹⁷⁾ For instance, Draghi (2018), 'Stabilisation policies in a monetary union', speech delivered at the Academy of Athens, argues that there is a strong complementarity between private and public risk sharing – private risk sharing emerges from deep and resilient financial integration, which only arises in the shelter of public risk-sharing, such as strong backstops and deposit insurance schemes.

Importantly, this section covers the period before the outbreak of the COVID-19 pandemic and does not provide estimates of the pandemic's impact on cross-border bank lending that would require a separate analysis once sufficient data are available.

I.2. Risk sharing via the banking sector in the euro area

I.2.1. Shocks and their impact

The effectiveness of capital markets and banks to withstand shocks depends on the nature of the shock. Permanent shocks require allocative transformations and sizeable investments and cannot be offset easily. Capital markets and cross-country equity ownership can help absorb such shocks as they provide a diversified income stream and diversified source of foreign direct investment. The role of the banking system in such transformations may be considered more long-term and comes in the form of investment financing.

Conversely, the banking sector can provide short-term financing to financially viable households and corporates during temporary shocks. However, if credit would only be provided through the domestic banking sector, the credit supply would be constrained by domestic conditions⁽¹⁸⁾.

Financial integration and competition among financial institutions support both the capital and credit market channels. However, this does not mean that all types of financial integration improve risk sharing. While cross-border asset holdings, notably various forms of equity holdings, are found to have strong risk-sharing properties, debt instruments are found to have less so⁽¹⁹⁾. Moreover, while direct cross-border bank lending to firms and households is considered supportive of risk sharing, empirical evidence shows that cross-border interbank lending is not conducive to risk-sharing⁽²⁰⁾.

⁽¹⁸⁾ Nevertheless, foreign lending may be more sensitive to negative information. As such, the European Bank Coordination 'Vienna' Initiative was launched in January 2009 to help ensure that large banks commit to maintaining exposure to subsidiaries and recapitalising them. See <http://vienna-initiative.com/>

⁽¹⁹⁾ Artis, M. J. and Hoffmann, M., "The Home Bias, Capital Income Flows and Improved Long-Term Consumption Risk Sharing between Industrialized Countries", *International Finance*, Vol. 13(3), 2012, pp. 481-505.

⁽²⁰⁾ Allen et al. (2011), *op. cit.*

I.2.2. Slow progress towards a complete Banking Union

While completion of the Single Market in banking and other financial services is crucial for private risk sharing, progress towards a complete Banking Union has been slow – both in terms of the institutional reforms needed to complete a Banking Union⁽²¹⁾ as well as changes in market behaviour.

For instance, Graph I.1 shows that banking sector integration⁽²²⁾, based on a price-dispersion indicator published by the ECB, peaked in the euro area by late 2006-early 2007⁽²³⁾. However, in the wake of the subprime mortgage crisis and Lehman Brothers collapse, the banking sector seems to have fragmented considerably, with integration reaching a low by mid-2012.

Overall, this development reflects the lack of a solid foundation to absorb shocks, especially in the earlier period, with uncoordinated national responses that adversely affected the banking market integration process⁽²⁴⁾.

Financial integration received a new and more sustainable impetus with the agreement between EU Heads of State and Government to create the European banking union in June 2012 and the announcement of the ECB's Outright Monetary

⁽²¹⁾ Such as a European Deposit Insurance Scheme (EDIS). See for instance Grochowska, A. and A. Hild (2019), 'Financial Union: Integration & Stability', *Quarterly Report on the Euro Area*, Vol. 18, No 2, pp. 7-23.

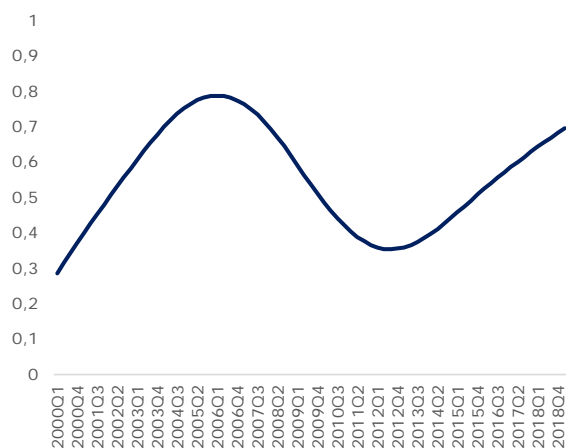
⁽²²⁾ Generally speaking, a market for specific financial instruments or services is fully integrated if all potential market participants "(i) are subject to a single set of rules when they decide to deal with those financial instruments or services, (ii) have equal access to this set of financial instruments or services, and (iii) are treated equally when they operate in the market." See for instance Trichet, J-C (2008), keynote speech at the Second Symposium of the ECB-CFS research network on "Capital Markets and Financial Integration in Europe", Frankfurt am Main.

⁽²³⁾ For more details on this indicator, see for instance, Hoffmann, P., M. Kremer and S. Zaharia (2019), 'Financial integration in Europe through the lens of composite indicators', *ECB Working Paper* No 2319.

⁽²⁴⁾ For instance, European Commission (2012), *European Financial Stability and Integration 2011 Report* argues that the state aid interventions by national governments in 2008 and 2009 aimed at rescuing domestic banks differed in magnitude and design, thereby distorting the level playing field in the banking sector across the euro area. See also Grochowska, A. and A. Hild, (2019), 'Financial Union: Integration and Stability', *op. cit.* for a comparison with overall financial market integration.

Transactions programme ⁽²⁵⁾ – as can be seen in Graph I.1.

Graph I.1: **Bank integration in the euro area**



(1) Normalised indicator (with value between 0 and 1) based on price dispersion, with higher price dispersion values tending to indicate a lower degree of banking integration. Original ECB series HP-filtered ($\lambda=1600$).

The price-based composite indicator aggregates 10 indicators for money, bond, equity and retail banking markets: money markets 17%, bond markets 36%, equity markets 15% and banking markets 32%. For more details, see Hoffmann, Kremer and Zaharia (2019), op.cit.

Source: European Central Bank

Nevertheless, it is widely accepted that the banking union remains incomplete, with several key steps still pending, including a common deposit insurance scheme and common resolution fund ⁽²⁶⁾.

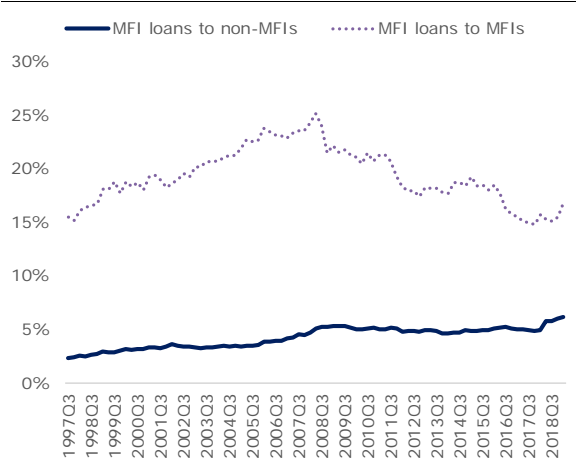
I.2.3. Different paths for direct and indirect cross-border credit channels

On a more disaggregated level, the reversal in bank integration after the crisis was particularly stark in terms of cross-border interbank lending (the indirect channel) after 2008 and intensified subsequently by deteriorating asset quality – see Graph I.2 as well as the graphs presented in Box I.1 ⁽²⁷⁾. While interbank cross-border lending rose

steadily as a share of total interbank lending from 1997 to 2008, it has since fallen almost consistently. In September 2018 it was at the same level as September 1997, – before the start of the third phase of EMU – and before rising slightly in March 2019. Following the Lehman Brothers shock, the interbank channel was effectively shut for a considerable period as banks refused to provide any financing (on-shore or cross-border) through these channels.

The picture for the direct channel (i.e. cross-border lending from foreign financial institutions to domestic non-financial corporations) is completely different. The share of cross-border MFI loans to non-MFIs rose steadily from September 2007 – albeit from a very low base – remained stable following the crisis in 2008, and has started to increase again in the last 18 months ⁽²⁸⁾.

Graph I.2: **Cross-border lending as a share of total lending**



(1) MIF: monetary financial institution

Source: European Central Bank

retrenchment in the wake of the crisis was to a large extent driven by poor asset quality at home in the EU.

⁽²⁸⁾ Graph E of Box I.1 reveals a similar development, displaying an aggregate indicator of direct cross-border lending. However, this aggregate indicator also includes a measure of interest rate dispersion, which decreased mechanically as nominal interest rates were converging to their effective lower bound in the wake of the global financial crisis.

⁽²⁵⁾ As argued in, for instance, Hoffmann, P., M. Kremer and S. Zaharia (2019), 'Financial integration in Europe through the lens of composite indicators', *ECB Working Paper Series* No 2319.

⁽²⁶⁾ See European Commission (2017), Reflection Paper on the Deepening of the Economic and Monetary Union, and European Commission (2017), Communication on completing the Banking Union, COM(2017) 592 final.

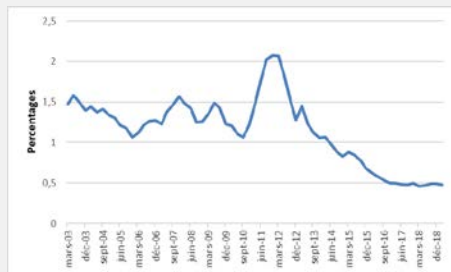
⁽²⁷⁾ See for instance Emter, L., Schmitz, M. and M. Tirpák (2018), 'Cross-border banking in the EU since the crisis: what is driving the great retrenchment?', *ECB Working Paper Series* No 2130. Their econometric analysis suggests that cross-border banking

Box I.1: Direct and indirect cross-border bank sector integration

This section makes a distinction between direct and indirect bank integration. The former relates to direct interaction between foreign banks and domestic households, the latter to borrowing and lending between foreign and domestic banks that interact with domestic households. Complementing the indicators shown in Graph I.3 of the main text, this box first depicts additional indicators for direct and indirect cross-border lending. It then shows two aggregate indicators referring to the direct and indirect credit channel.

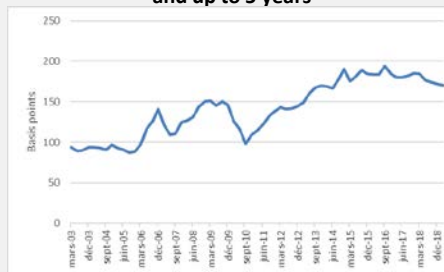
Graph A shows the standard deviation of interest rates on monetary financial institutions (MFI) deposits from households in the euro area, while Graph B shows the standard deviation of interest rates on consumer credit over 1 year and up to 5 years. Full cross-border bank integration would imply that these measures would be equal to zero – if there would be, for instance, no difference in risk preferences between consumers ⁽¹⁾. These indicators are related to the direct cross-border channel. Graphs C and D show respectively MFI holdings of securities issued by MFIs from other euro area countries and MFI deposits from MFIs from other euro area countries. These indicators are related to the indirect cross-border channel.

Graph A: Cross-country standard deviation of interest rates on MFI deposits from households



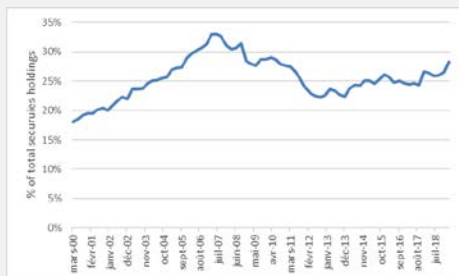
Source: ECB

Graph B: Cross-country standard deviation of interest rate on consumer credit: over 1 year and up to 5 years



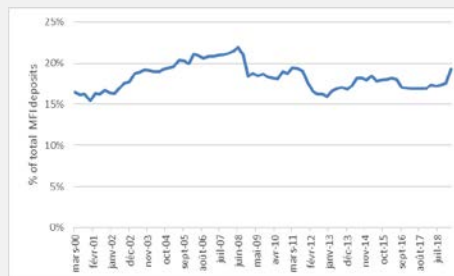
Source: ECB

Graph C: MFI holdings of securities issued by MFI from other euro area Member States



Source: ECB

Graph D: MFI deposits from MFIs from other euro area Member States



Source: ECB

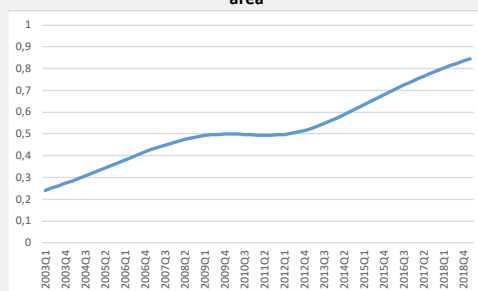
⁽¹⁾ It should be noted that different interest rates between Member States might also reflect different levels of credit risk. This could well be the case even with full banking sector integration, when banks discriminate against borrowers based on where they reside.

(Continued on the next page)

Box (continued)

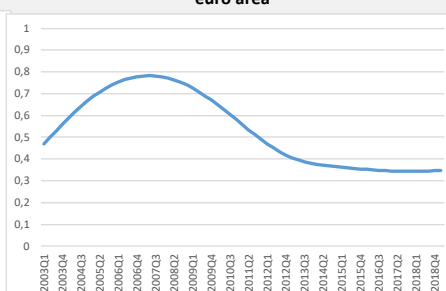
Aggregating several ECB sub-indicators ⁽²⁾, Graph E suggests that the direct bank channel ⁽³⁾ improved steadily after the euro was launched but stalled at the height of the global financial crisis and regained momentum as of 2014. Graph F suggests that the indirect bank channel (or bank-to-bank lending) ⁽⁴⁾ increased notably after the euro was launched but weakened dramatically during the global financial crisis, lacking growth momentum afterwards.

Graph E: Direct cross-border bank integration in the euro area



Note: Authors' estimate based on ECB indicators of financial integration S26 and S34
Note: A rise indicates an increase in direct cross-border bank integration

Graph F: Indirect cross-border bank integration in the euro area



Note: Authors' estimate based on ECB indicators of financial integration S27, S28 and S29
Note: A rise indicates an increase in direct cross-border bank integration

- ⁽²⁾ In this section, both price and quantity indicators have been used to monitor financial market integration and construct aggregates used in the econometric analysis. No absolute preference should be given to either quantity-based or price-based indicators as both have their specific advantages and shortcomings. See for instance Adam, K., Menichini, A., Padula, M. and M. Pagano (2002), 'Analyse, Compare, and Apply Alternative Indicators and Monitoring Methodologies to Measure the Evolution of Capital Market Integration in the European Union' and Hoffman et al. (2019), *op. cit.*
- ⁽³⁾ Making use of the ECB Financial Integration Indicators database, direct bank integration is approximated by the average of the normalised sub-indicator S26 measuring loans by domestic MFI to non-MFIs in the rest of the euro area (as a percentage of their total outstanding amount to non-MFIs) and sub-indicator S34 measuring cross-country dispersion interest rates on MFI deposits from households in the euro area. For sub-indicator S26 a rise indicates increased integration, whereas for sub-indicator S34 a rise indicates decreased integration. As such, in the aggregation the S34 series has been multiplied by -1. The aggregate is normalised to a Hodrick-Prescott filtered indicator ranging between 0 and 1, i.e. a transformation such as $1 - 1 / (1 + \exp(x))$ with X the untransformed series. As such, a higher value indicates stronger bank integration.
- ⁽⁴⁾ An aggregate of ECB sub-indicators S27 measuring loans by domestic MFIs to MFIs in the rest of the euro area (as a percentage of their total outstanding amount to MFIs), S28 measuring holdings by domestic MFIs of securities issued by MFIs in the rest of the euro area (as a percentage of their total outstanding amount) and S29 measuring MFI deposits from MFIs in the rest of the euro area (as a percentage of their total outstanding amount).

All in all, these stylised facts provide further evidence of the fact that direct bank-to-non-bank lending is more resilient as a risk-sharing mechanism than indirect bank-to-bank lending ⁽²⁹⁾.

1.3. Some empirical evidence on cross-border risk-sharing

Several studies highlight the stabilising effect of private risk sharing via the banking sector. Typically, these studies examine the aggregate impact on inter-state GDP without making a distinction between credit to households and firms. The analysis in the following sub-section focuses on the impact of bank credit on private consumption only.

⁽²⁹⁾ See for instance Hoffmann, M., Maslov, E., Sørensen, E.B., and I. Stewen (2019), 'Channels of Risk Sharing in the Eurozone: What Can Banking and Capital Market Union Achieve?', *IMF Economic Review*, No 67, pp. 443–495.

One of the first econometric analyses of risk sharing provided by the banking sector via credit markets was undertaken for the United States ⁽³⁰⁾. This study reported that between 1963-1990, inter-state shocks to the per capita state gross product were smoothed as follows: 13% by the federal tax transfer and grant system, 39% by insurance or cross-ownership of assets, and 23% by borrowing or lending via cross-border banking ⁽³¹⁾.

This analysis was updated with data up to 2013 for the United States and extended to include the euro

⁽³⁰⁾ See for instance Asdrubali, Sørensen and Yosha (1996), *op. cit.* This was based on a cross-sectional variance decomposition of shocks to GDP.

⁽³¹⁾ Nevertheless, Dullien, S. (2017), 'Risk Sharing by Financial Markets in Federal Systems: What Do We Really Measure?', *FMM-Working Paper*, No. 2 argues that the methodology proposed by Asdrubali et al. (1996), *op. cit.* may overestimate income smoothing through credit markets as their estimates also cover effects that are purely domestic and have nothing to do with cross-border risk-sharing and cross-border income smoothing.

area for 1999–2015. It found that risk sharing via credit markets in the USA was equal to 26.7% of shocks, while in the euro area it was 18%⁽³²⁾.

The comparatively low levels of risk sharing for credit markets in the euro area compared to the United States reflect the different levels of banking sector integration. In the United States, the removal of barriers to entry for out-of-state banks started in 1978 and accelerated banking integration: for example, while the average share of total bank assets in each state that was held by cross-border banks was under 10% in the 1970s, it rose to around 60% by the mid-1990s.

In the euro area, the equivalent metric was 9.8% in 2018, around the level seen in the United States before banking integration began⁽³³⁾. This increase in banking integration has contributed to an increase in access to finance, in particular for small firms, and to lower state-level business cycle volatility⁽³⁴⁾ as well as better and more resilient inter-state risk sharing⁽³⁵⁾.

Other research has reaffirmed that the effectiveness of risk-sharing mechanisms in the euro area is significantly lower than in existing federations such as the USA⁽³⁶⁾ and Germany⁽³⁷⁾.

However, while in the early years of EMU only around a third of idiosyncratic output shocks were smoothed, this share increased to almost 60% in the aftermath of the European sovereign debt crisis. This outcome can be attributed to stronger financial integration as well as to the provision of

public financial assistance to countries under stress since 2010⁽³⁸⁾. Nevertheless, while the direct credit channel⁽³⁹⁾ together with public financial assistance helped absorb shocks in the euro area, cross-border interbank lending tended to be ineffective⁽⁴⁰⁾.

Available studies also highlight that the deleveraging from interbank loans in euro area banks' credit portfolios increased significantly in the wake of the 2007–08 global financial crisis⁽⁴¹⁾. This retrenchment was mainly driven by source country factors, such as poor asset quality at home⁽⁴²⁾. Furthermore, it is also reported that credit markets' effectiveness in smoothing shocks decreases with the persistence of the shock⁽⁴³⁾.

Research also suggests that the effectiveness of financial market risk depends on the existence of fiscal insurance mechanisms. This is because market and fiscal insurance react upfront to disequilibria in different markets and crises in different parts of the economy (real economy versus financial/banking markets)⁽⁴⁴⁾.

I.4. Private consumption and cross-border bank integration

This sub-section establishes the analytical framework to investigate the impact of transitory income fluctuations⁽⁴⁵⁾, financing gaps⁽⁴⁶⁾ and

⁽³²⁾ Nikolov, P. (2016), 'Cross-border risk sharing after idiosyncratic shocks: evidence from the euro area and the United States.', *Quarterly Report on the Euro Area*, Vol. 15, No. 2, pp. 7–18.

⁽³³⁾ ECB financial integration indicators (sub indicator 30) June 2019

⁽³⁴⁾ Morgan, D P, B Rime, and P E Strahan (2004), "Bank integration and state business cycles", *The Quarterly Journal of Economics*, Vol. 119, No. 4, pp. 1555–1584.

⁽³⁵⁾ Demyanyk, Y, C Ostergaard, and B E Sorensen (2007), 'US banking deregulation, small businesses, and interstate insurance of personal income', *The Journal of Finance*, Vol. 62, No. 6, pp 2763–2801. Hoffman M. and I. Shcherbakova-Stewen (2011), 'Consumption risk sharing over the business cycle: The role of small firms' access to credit markets', *Review of Economics and Statistics*, Vol. 93, No. 4, pp 1403–1416.

⁽³⁶⁾ See for instance Furceri, D and A. Zdzienicka (2015), 'The Euro area crisis: Need for a supranational fiscal risk sharing mechanism?', *Open Economies Review*, Vol. 26, pp. 683–710, using an unbalanced panel of 15 euro area countries over 1979–2010.

⁽³⁷⁾ Hepp and von Hagen (2013), 'Interstate risk sharing in Germany: 1970–2006', *Oxford Economic Papers*, Vol. 65, pp. 1–24 estimate that in Germany before reunification, 19% of a shock was smoothed by private factor markets, 50% was smoothed by the German government sector, and a further 17% was smoothed through credit markets

⁽³⁸⁾ See Cimadomo, J., Ciminelli, G., Furtuna O. and M. Giuliodori (2020), 'Private and public risk sharing in the euro area', *European Economic Review*, Vol.121, pp. 1–20. This study covers 11 euro area countries over 2001–2017.

⁽³⁹⁾ Credit to households and firms together.

⁽⁴⁰⁾ See Cimadomo et al. (2020), *op. cit.*

⁽⁴¹⁾ Using highly disaggregated bank-firm data covering credits above €30 000 n Italy from the last quarter of 2006 until the last quarter of 2010, Albertazzi, U. and M. Bottero (2014), 'Foreign bank lending: Evidence from the global financial crisis', *Journal of International Economics*, Vol. 92, Supplement 1, pp. S22–S35, report that foreign lenders restricted credit supply (to the same firm) more sharply than their domestic counterparts.

⁽⁴²⁾ See for instance Schmitz, M. and M. Tírpák (2017), 'Cross-border banking in the euro area since the crisis: what is driving the great retrenchment?', *ECB Financial Stability Review* November 2017 – Special features, pp. 145–157. Emter, L, M Tírpák, and M Schmitz (2018), 'Cross-border banking in the EU since the crisis: What is driving the great retrenchment?', *ECB Working Paper Series* WP 2130.

⁽⁴³⁾ As foreign lenders may be more reluctant to provide credit in the face of a long-lasting recovery period. See for instance Furceri and Zdzienicka (2015), *op. cit.*

⁽⁴⁴⁾ See Alcidi and Thirion (2016), *op. cit.*

⁽⁴⁵⁾ Transitory income fluctuations refers to changes in income that are not permanent, i.e. mainly the cyclical fluctuations in income. Box I.3 explains how these transitory income fluctuations have been estimated.

cross-border bank integration on private consumption smoothing. The next sub-section briefly describes the econometric results, while the subsequent sub-section presents simulation results based on the estimates obtained.

I.4.1. Financing gap

Households prefer to smooth consumption evenly over time, consistent with their expected long-term average income, i.e. permanent income. For each period, consumption has to be paid for in cash or another liquid asset. When current income falls temporarily below permanent income, households face a financing gap, and they will have to apply for credit⁽⁴⁷⁾ or draw from their deposits in order to keep their consumption in line with permanent income. In the same way, households will deposit money with banks (including banks abroad) if they overshoot their permanent income temporarily or want to engage in precautionary saving⁽⁴⁸⁾.

While the available literature on private consumption makes a distinction between permanent and transitory income, it often ignores barriers to financing such expenditures –it assumes perfect credit markets. In this section, a consumption function is estimated whereby consumption growth is conditioned by the permanent and transitory component of current income, as well as by households' access to bank credit. Box I.2 at the end of this section tackles the issue in a more formal way.

Households obtain bank credit (deposits) from domestic or foreign sources. Cross-border bank

lending flows to domestic consumption via a direct or indirect channel. Under the direct channel, foreign banks provide funds directly to domestic households. Under the indirect interbank channel, foreign banks lend to domestic banks, which in turn lend to domestic households. However, access to these channels may vary over time – as discussed in sub-section 2.

The impact of direct and indirect cross-border bank integration on consumption smoothing is captured by interacting the level of integration with the transitory income component. Specifically, the regression analysis makes a distinction between the domestic bank channel, direct cross-border bank integration and indirect cross-border bank integration – with these indicators described and measured in Box I.3.

Moreover, available evidence suggests that wealth factors such as changes in the prices of residential buildings also affect private consumption⁽⁴⁹⁾. In several Member States, there have been strong fluctuations in residential real estate prices since the launch of the euro (see Graph I.3).

The subsequent econometric analysis assumes that changes in residential real estate prices affect consumption via two channels. First, fluctuations in residential real estate prices relative to consumer prices have an autonomous impact on consumption, whereby the representative household consumes more (or less) when residential real estate prices increase at a stronger (or weaker) pace than consumer prices. This is known as the 'house price effect'⁽⁵⁰⁾.

⁽⁴⁶⁾ The difference between the amount of money earned in the period and the amount of money needed to finance the consumption in line with permanent income.

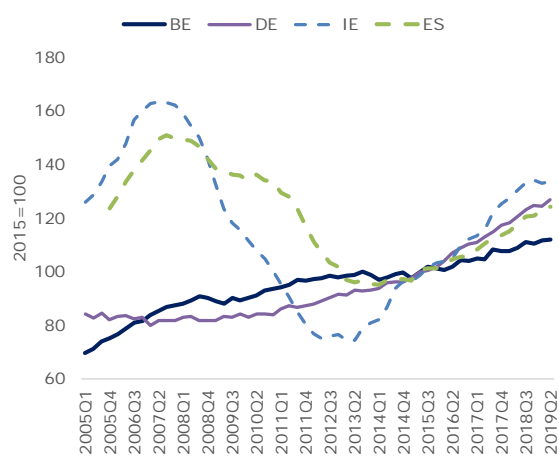
⁽⁴⁷⁾ To be paid back at a later date. Households are able to pay back what they borrow as up and down deviations from permanent income are on balance zero over the lifecycle. Implicitly no collateral has to be deposited to get this credit as it is assumed that temporary deviations above or below permanent income cancel each other out so there is not solvency problem getting credit to finance a temporary bank credit.

⁽⁴⁸⁾ This section focuses on the former effect. For instance, Lugilde, A., Bande, R. and D. Riveiro (2017), 'Precautionary Saving: a review of the theory and the evidence', MPRA Paper No. 77511, report that the empirical results on precautionary saving are inconclusive, and that there is neither consensus on the intensity of the motive for saving, nor on the most appropriate measure of uncertainty. However, available estimates in the literature suggest that forced savings seem to be the main driver of the spike in household savings during the first months of the COVID-19 pandemic. See for instance Dossche, M. and S. Zlatanos (2020), COVID-19 and the increase in household savings: precautionary or forced?, ECB Economic Bulletin, Issue 6/2020. This period is not covered by this section.

⁽⁴⁹⁾ See for instance Contreras, J. and J. Nichols (2010), 'Consumption Responses to Permanent and Transitory Shocks to House Appreciation', *Federal Reserve Board Finance and Economics Discussion Papers* No. 2010-2032

⁽⁵⁰⁾ Houses play a dual role in the economy: they provide house services and they are a durable asset that affects the wealth of the household. When residential real estate prices increase (while other prices remain constant) two effects emerge: (i) a relative price effect that decreases the consumption of house services but increase the consumption of goods, and (ii) a wealth effect that raises the demand for goods and services as it increases the value of residential real estate. In this reduced-form regression analysis, 'house price effect' refers to both effects - which point in the same direction in terms of consumption.

Graph I.3: Residential real estate prices
House prices



(1) 2015=100

Source: Eurostat

Second, deviations of residential real estate prices from their trend level⁽⁵¹⁾ affect the marginal propensity to spend out of transitory income as households feel less (or more) inclined to make precautionary savings out of their current income when residential real estate prices increase (or decrease). This is known as the ‘precautionary wealth effect’.

I.4.2. Econometric results

Following the above theoretical framework in the econometric analysis, private consumption growth is regressed on a set of macroeconomic factors such as permanent income component YP⁽⁵²⁾, transitory income component YT⁽⁵³⁾, the nominal interest rate LI, inflation INFL, and the price of residential real estate, PH, relative to the harmonised index of consumer prices HICP. In addition, the transitory income component is

⁽⁵¹⁾ The trend level is estimated by applying a Hodrick-Prescott filter, i.e. a series filtered from its cyclical component.

⁽⁵²⁾ Permanent income in the strict sense refers to the discounted income stream arising from both human and capital wealth including houses. In the subsequent empirical analysis, deviations from permanent income refer to deviations of contemporaneous labour income from permanent labour income. In the reduced from regression specification below, the other components of permanent income are approximated by residential real estate prices relative to HICP. As discussed in Box I.3 permanent income is estimated by regressing the total wage bill (per employed person) on trend price level, trend productivity, trend unemployment rate and a deterministic trend. Box I.3 also provides a robustness test by explicitly taking into account possible measurement errors in the estimated, unobservable permanent income. It suggests that the obtained point estimates are fairly stable.

⁽⁵³⁾ Current income is equal to permanent income plus transitory income.

interacted with an indicator measure of the domestic bank channel (dom BI)⁽⁵⁴⁾, as well as with indicators measuring direct (EA DIR) and indirect (EA INDIR) cross-border bank integration⁽⁵⁵⁾. The regression also includes the lagged error correction term ECT, which measures past deviations of actual consumption from equilibrium consumption⁽⁵⁶⁾. The sample covers the first quarter of 2016 to the first quarter of 2019. Box I.3 contains a brief description of the specification and data, as well as a more detailed discussion of the estimation results including robustness tests.

These robustness tests include regressions with (i) the short-term interest rate instead of the long-term interest rate, (ii) residential real estate prices instrumentalised as these prices may also be affected by random shocks to consumption,⁽⁵⁷⁾ (iii) permanent income instrumentalised to deal with possible ‘measurement problems’ as permanent income cannot be observed directly, (iv) the income tax rate as additional explanatory variable, (v) the direct and indirect cross-border bank integration indicators interacting with a dummy for each of the programme countries in the sample, and (vi) a regression with an autoregressive error term.⁽⁵⁸⁾ These tests suggest that the point estimates of the baseline specification are fairly stable.

Overall, the results show that most explanatory variables are significant and have the expected sign. However, the indirect cross-border bank channel

⁽⁵⁴⁾ The domestic bank channel is approximated by a Bank for International Settlements (BIS) indicator measuring domestic credit to private non-financial sector as a percentage of GDP.

⁽⁵⁵⁾ As discussed in Box I.1 the indicators measuring bank integration are Hodrick-Prescott filtered and are therefore not correlated with any cyclical fluctuations in consumption or the other explanatory variables. With an unconditional correlation between EA-DIR and EA-INDIR equal to -0.7 inefficiency in the point estimates (i.e. high standard errors and low t-statistics for the point estimates) seems to be limited.

⁽⁵⁶⁾ Equilibrium consumption is determined by permanent income, the nominal interest rate, the inflation rate and residential real estate prices. It assumes that preference ordering (i.e. utility function) does not change.

⁽⁵⁷⁾ A simultaneity bias may arise if the correlation between residential real estate prices and the random term of the regression equation has an expected value different from zero.

⁽⁵⁸⁾ Ireland, Spain and Portugal. Note that a programme also tempers the transitory income shock which is a predetermined variable in the regression analysis. This transmission channel is not studied in this section.

Table I.1: Short-term consumption (semi-)elasticities

		Constant elasticities					
		Permanent income	House price /HICP	Interest rate	Inflation		
		0,39	0,09	-0,1	0,14		
		Decomposition of variable elasticities w.r.t. transitory income					
Strength of integration	Net transitory income	Domestic BI	Domestic BI * PROG	EA BI DIRECT	EA BI INDIRECT	House price	constant transitory income
weakest	0,79	-0,84	0,07	-0,25	-0,05	-0,08	1,94
average	0,42	-0,92	0,07	-0,54	-0,13	0,00	1,94
strongest	0,04	-0,96	0,07	-0,87	-0,20	0,06	1,94

(1) Constant elasticities are the values of the point estimates under variant V4 – all effects significant except the euro area indirect cross-border bank integration and interest rate. Variable elasticities are equal to the point estimate multiplied by the value of the indicator, measuring the domestic bank sector channel, direct and indirect cross-border direct bank integration respectively, as well as residential the real estate price deviation from the trend residential real estate prices. (2) The value of the variable elasticities vary over time. ‘Weakest’ evaluates the elasticity for the lowest value (i.e. lowest level of bank integration) observed over the period the data are available, while the ‘strongest’ evaluates the elasticity for the highest value observed. The ‘average’ evaluates the elasticity for the average value of the indicator. The highest level of direct and indirect euro area bank integration was reached in the first quarter of 2019 and second quarter of 2007 respectively, while the lowest level was reached in the first quarter of 2003 and the fourth quarter of 2017 respectively. See also Box I.1. (3) While the indicators measuring direct and indirect cross-border bank integration have the same value for all Member States, the indicators for the domestic bank channel and residential real estate prices vary across Member States. The estimates in this table are the country average.

Source: Authors’ estimate based on variant V4 in Table A of Box I.3

(i.e. interbank lending) does not appear to be statistically significant ⁽⁵⁹⁾.

The negative point estimates for the domestic and direct cross-border channel imply a countercyclical response by the banking system. Put simply, when there is a large deviation from permanent income, the banking system helps to absorb part of the shock. In the Member States under an economic adjustment programme, the domestic credit channel lost some of its countercyclical impact as the banking system was deleveraging due to the deterioration of its domestic assets (loans to non-financial corporation or public sector bonds).

I.4.3. Elasticities

Table I.1 summarises the point estimates ⁽⁶⁰⁾ by showing the responsiveness of consumption to a unit change in each of the explanatory variables ⁽⁶¹⁾.

⁽⁵⁹⁾ In assessing the effectiveness of these channels it should be noted that interbank lending may have an impact on the capacity of domestic banks to lend to domestic consumers. Moreover, the ECB’s Asset Purchase Programme in the wake of the global financial crisis provided ample Eurosystem liquidity, which reduced the need for interbank lending. As such, the significance of the indirect channel may be low as the reduced from regression specification does not allow these channels to be captured explicitly.

⁽⁶⁰⁾ Based on variant V4 in Table A of Box I.3.

⁽⁶¹⁾ A 1% change in permanent and transitory income, and a 1 percentage point change in the interest rate and inflation rate.

The elasticities of consumption with regard to permanent income and residential real estate prices (relative to the HICP) as well as the interest rate and inflation rate have the expected sign and are significant – except for the nominal interest rate ⁽⁶²⁾. The first row of Table I.1 shows these elasticities.

The elasticity of consumption with regard to transitory income is broken down into six sub-parts (columns two to six). As this is based on interaction terms, its value is always conditional on the value of the other variables, which tend to vary over time – for example, in line with the level of bank integration ⁽⁶³⁾.

The estimated elasticities are as follows (second part of Table I.1): the constant (or time-invariant) part of the elasticity of consumption with regard to the transitory income is positive and large: a 1% fall in transitory income will induce a 1.94% fall in consumption (last column). This ‘gross’ effect of transitory income is tempered in varying degrees by the domestic bank channel (second column), cross-border direct bank integration (fourth column) and indirect bank integration (fifth column). Their elasticities are consistently *negative* as expected,

⁽⁶²⁾ The low significance of the interest rate is partly due to the low variability in the time series in particular from 2008. However, in the estimated long-run equation V0, the interest rate is significant.

⁽⁶³⁾ As discussed in sub-section 2 above.

providing a *smoothing or countercyclical* effect on consumption after a transitory income shock ⁽⁶⁴⁾.

Moreover, these elasticities vary over time as the level (of different types) of bank integration vary over time. Table I.1 (rows two to four) summarises this variability by showing the elasticities for the lowest ⁽⁶⁵⁾, average and highest bank integration level observed over the sample period. The first column shows the net effect ⁽⁶⁶⁾, taking into account the different smoothing channels.

With a high level of bank integration a 1% change in transitory income is associated with a very small 0.04% net impact on consumption – i.e. 96% of the transitory income shock is smoothed by the banking system (domestic and cross border). By contrast, with a low level of bank integration a 1% change in transitory income leads to a 0.79% change in consumption, implying only 21% of the transitory income shock is absorbed. On average, a 1% transitory income shock results in a 0.42% change in consumption, implying 58% ⁽⁶⁷⁾ of the impact of the shock was smoothed.

The domestic banking system (second column) appears to have the largest countercyclical effect following a transitory income shock, with an elasticity of between -0.84 and -0.96. Direct cross-border integration has the second largest countercyclical effect, with elasticities ranging from -0.25 to -0.87.

All in all, this econometric analysis offers two important messages: first, that the cross-border direct banking channel can be as important as the domestic bank channel for consumption smoothing; second, that the cross-border smoothing effect is *volatile*, reflecting the trends observed in bank integration over the last two

decades, suggesting the need to deepen cross-border bank integration in a sustainable way. Indirect cross-border bank integration also has a countercyclical effect, but the elasticity is significantly smaller (-0.05 to -0.2) than direct cross-border bank integration.

The following sub-sections discuss how the various factors affected consumption at country level between 2008 and early 2019.

I.5. Effectiveness of cross-border bank integration: illustrative simulations

This sub-section uses the estimation results presented in Box I.3 to simulate the banking sector's impact on private consumption variability in the euro area countries for which the data are available ⁽⁶⁸⁾. The intensity at which these channels operate depends on the level of cross-border bank integration in each of these segments.

The following simulations distinguish between two episodes: a recession and subsequent recovery period. During the first period (2008) income was on average well below trend income across the euro area countries. During the second period (2012-2019) income was on average in sync or above trend income.

I.5.1. Recession

Graph I.4 shows how several factors affected private consumption growth across the euro area ⁽⁶⁹⁾ over 2008-2012. Making a distinction between effects stemming from income fluctuations, residential real estate price fluctuations and other factors, the simulation results should be interpreted as follows.

Each period households earn current income that is equal to permanent income adjusted for a transitory component. While they both affect current income, they have a different impact on consumption.

⁽⁶⁴⁾ By contrast, as expected the elasticity of the domestic bank channel in cases where a country is under a financial assistance programme (third column) is positive, which indicates that the countercyclical effect of the domestic bank channel weakens.

⁽⁶⁵⁾ Assuming a scenario in which all types of bank integration would have been at their weakest level (observed over the sample period) and a scenario in which they would have been at their highest level. It is worth noting that the different types of bank integration recorded different developments with direct cross-border bank integration reaching its peak at the end of the sample and its low at the beginning of the sample. Indirect cross-border bank integration peaked in the second quarter of 2007 and reached its lowest at the beginning of the sample period. See Box I.1

⁽⁶⁶⁾ The sum of the variable elasticities (broken down in sub-parts) with regard to transitory income.

⁽⁶⁷⁾ The difference between two elasticities 1-0.42.

⁽⁶⁸⁾ By calculating the fitted value on the basis of the point estimates of variant V4 in Table A of Box I.3 and the observed values of the explanatory variables for the period under investigation.

⁽⁶⁹⁾ Covering 11 euro area countries for which all data are available: Belgium, Germany, Ireland, Spain, France, Italy, Luxembourg, the Netherlands, Austria, Portugal and Finland.

Illustrative case: Spain

During this period permanent income decreased in Spain by almost 2% per year. If this would have been the only shock, disposable income would have decreased by the same amount and consumption would have fallen by almost 1% per year on average (purple bar).

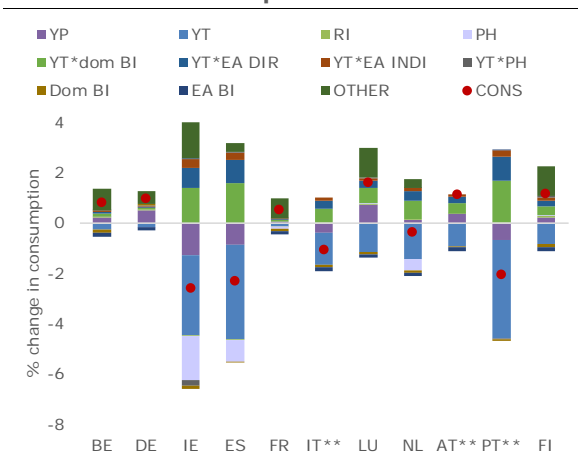
However, current income fell below permanent income, causing consumption growth to fall by 3.8% per year on average (light blue bar).

The effects of this temporary income drop was nonetheless tempered by bank credit. More specifically, domestic bank credit reduced the fall in consumption associated with the negative transitory component by 1.6% on average (light green bar), and direct cross-border credit by 0.9% on average (dark blue bar). The tempering effect of cross-border indirect credit was negligible.

Residential real estate prices also affected consumption. Their sharp fall (relative to consumer prices) induced a strong negative wealth effect, reducing consumption by an additional 0.9% per year on average (light purple bar). However, the impact of the residential real estate price fall on households' propensity to spend less from their transitory income⁽⁷⁰⁾ was negligible (dark grey bar)⁽⁷¹⁾.

All in all, the net effect of all factors combined lowered consumption by around 2% per year on average (red bullet).

Graph I.4: Factors affecting private household consumption –2008Q1-2012Q1



(1) CONS: private consumption, YP: permanent income component, YT: transitory income component, RI: real interest rate, PH: price of residential real estate relative to the harmonised index of consumer prices, DOM BI: domestic credit channel; EA DIR: direct cross border credit channel, EA INDI: indirect cross-border credit channel, EA BI aggregate of direct and indirect cross-border credit channel.

(2) Member States marked with ** to denote that the effect of residential real estate price changes is not shown explicitly but included in the term others (due to missing data for that specific period).

(3) While Table I.1 shows elasticities evaluated for specific periods in time (i.e. lowest, highest and average level of bank integration), the bars in the graphs show the elasticities measured for the specified period multiplied by the changes in the explanatory variables over that period.

Source: Authors' estimates.

General empirical findings

In summary, the simulation results in Graph I.4 show that

- trend income declined in several Member States, especially in Ireland and Spain, triggering a fall in consumption by 1.3% per year on average in Ireland, 0.9% in Spain and 0.7% in Portugal;
- current income fell below trend income in all Member States, with the sharpest fall in Ireland, Spain and Portugal, triggering an additional drop in consumption in these three Member States, by 3.2%, 3.8% and 3.9% respectively per year on average;
- residential real estate prices decreased sharply in Ireland and Spain and to a lesser extent in the Netherlands, triggering a further fall in consumption, in these three member States, by

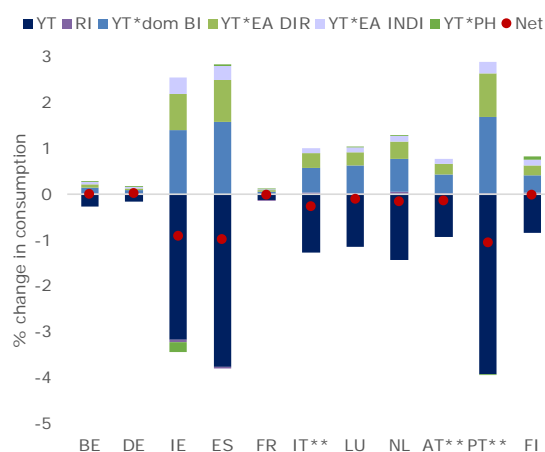
⁽⁷⁰⁾ The precautionary wealth effect discussed in sub-section I.1.4.

⁽⁷¹⁾ Across the sample, this channel only had a significant impact in Ireland.

1.7% in Ireland and 0.9% in Spain ⁽⁷²⁾ on average; and

- falling interest rates and inflation provided only limited stimulus ⁽⁷³⁾.

Graph I.5: **Impact of bank sector on transitory income fluctuations –2008Q1-2012Q1**



(1) See notes in Graph I.4.

Source: Authors' estimates.

At the same time, bank credit allowed households to absorb a sizeable part of the fall in private consumption that was triggered by temporary income fluctuations ⁽⁷⁴⁾. However, this stabilisation occurred with a varying degree of effectiveness between the three bank credit channels ⁽⁷⁵⁾ as well as over time ⁽⁷⁶⁾. More specifically, Graphs I.4 and I.5 suggest that:

- The domestic banking sector had the strongest impact in tempering the temporary income fluctuations in all euro area countries (included in the sample), offsetting 40-50% of the income shock. For instance, the domestic banking channel raised consumption by 1.8% in

Portugal, 1.7% in Spain and 1.5% in Ireland, partially offsetting the large transitory income shocks in these countries;

- The *direct cross-border channel* also helped to stabilise consumption, but its impact was around half of that from the domestic banking system, offsetting around 25% of the income shock. For instance direct cross-border banking boosted consumption by 1.0% in Portugal, 0.9% in Spain and 0.8 % in Ireland on average ⁽⁷⁷⁾;
- However, the *indirect cross-border channel* does not seem to have provided much stabilisation ⁽⁷⁸⁾.

These are sizeable effects. However, it is worth pointing t out that in the event of an idiosyncratic shock affecting one country, the domestic credit channel is likely to be somewhat muted. The potency of this **direct cross-border channel** is therefore key in helping smooth consumption.

I.5.2. Recovery and growth

The recovery period was characterised by an overall increase in economic activity which in turn brought current income closer to permanent income, and gave also rise to permanent income.

Illustrative case: Germany

Once again, the simulation results make it possible to distinguish the impact of the various factors. For instance, the simulation results suggest that in Germany, the increase in permanent income would have increased consumption, on average, by around 1% per year (purple bar) - if other factors would not have changed.

However, at the same time, a positive transitory income shock raised consumption even further, i.e., on average, by almost 0.5 percentage points (ppt) per year (light blue bar), while the increase in

⁽⁷²⁾ No data on residential real estate prices available for Portugal for that period.

⁽⁷³⁾ Robustness tests do not show a significant difference when using a short-term interest rate (less than 1 year).

⁽⁷⁴⁾ Here it is worth remembering that credit markets are unsuited to absorbing persistent idiosyncratic shocks such as a shock to permanent income. Such shocks have to be absorbed via capital markets (by holding a diversified portfolio of domestic and foreign assets) or by (permanent) cross-border labour mobility.

⁽⁷⁵⁾ The domestic channel as well as direct and indirect cross-border credit channel.

⁽⁷⁶⁾ As discussed in sub-section 2, the level of bank integration changed over time, i.e. a deterioration during the crisis years and a gradual recovery in recent years, so that part of the stabilisation capacity of cross-border integration was lost at the height of the crisis.

⁽⁷⁷⁾ The robustness check (variant V9 in Box I.3) suggests that the direct and indirect cross-border banking channels had a consistently smaller countercyclical impact on consumption in countries like Spain, Portugal and Ireland (that had financial assistance programmes) than in other countries - although the point estimates are only significant in the case of Portugal for the direct channel and Spain for the indirect channel. In other words, these estimates should be interpreted as upper-limits.

⁽⁷⁸⁾ No significant point estimate for the indirect cross-border channel. As argued above, this insignificance may be partly associated with the ECB's Asset Purchase Programme and the interaction between domestic bank lending and interbank lending.

residential real estate prices raised consumption, on average, by around 0.35 ppt (light purple bar) ⁽⁷⁹⁾.

At the same time, as current income grew at a stronger pace than permanent income, part of this increase was used to increase deposits by domestic and foreign banks, thereby tempering consumption growth, on average, by respectively, 0.18 ppt (dark blue bar) and 0.15 ppt (red bar). Again, residential real estate price developments had a negligible impact on households' propensity to spend less from their transitory income (dark grey bar) ⁽⁸⁰⁾.

General empirical findings

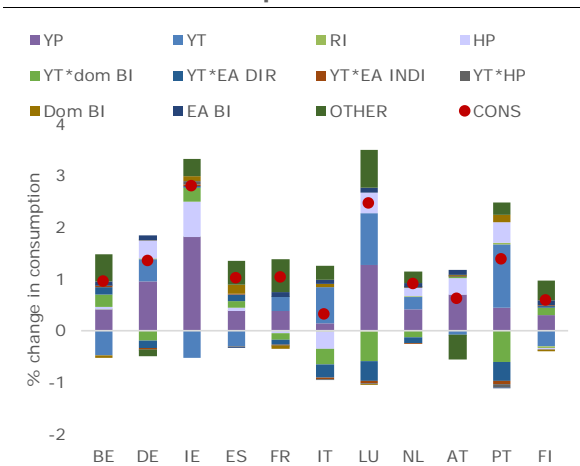
Graph I.6 shows the results for a period characterised by recovery and growth (in this section referring to the period from 2012 until early 2019). During this period:

- increased trend income was an important driver of consumption growth, especially in Ireland (raising consumption by 1.8% per year on average), Germany (by 1.0%) and Luxembourg (by 1.3%);
- residential real estate price developments ⁽⁸¹⁾ had a further positive impact on private consumption in most euro area countries, except Italy (inducing a 0.3% drop in private consumption on average);
- growth of the transitory disposable income component recorded in several Member States, especially in Luxembourg, Italy and Portugal giving rise to an increase in private consumption by 1.0%, 0.7% and 1.2% respectively per year on average;
- however, in several other Member States disposable income fell below trend income, putting downward pressure on private consumption, this was especially the case in Belgium (by 0.5% per year on average), Ireland (by 0.5%), Spain (by 0.3%) and Austria (by 0.1%) ⁽⁸²⁾.

Overall, the credit channel provided a countercyclical smoothing, with the strongest contribution stemming from the domestic credit channel, lowering private consumption (as some of the excess income was saved in deposits) by 0.2% on average in Germany and 0.6% in Luxembourg ⁽⁸³⁾. See graphs I.6 and I.7.

The same channel (but then in the opposite direction as income underperformed relative to trend income) increased consumption in Belgium (by 0.2%) Ireland (0.3%), Spain (0.1%) and Finland (0.1%).

Graph I.6: Factors affecting private household consumption –2012Q1-2019Q1



(1) See notes in Graph I.4.

Source: Authors' estimates.

All in all, despite the (gradual) improvement in cross-border bank integration, the cross-border effects have been rather modest – mainly reflecting the fact that in this period, temporary income was closer to trend income than during the crisis years.

⁽⁷⁹⁾ The residential real estate price effect discussed in sub-section I.4.1.

⁽⁸⁰⁾ The precautionary wealth effect discussed in sub-section I.4.1.

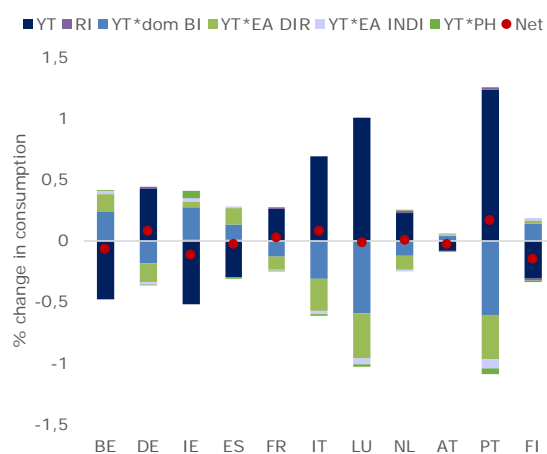
⁽⁸¹⁾ The residential real estate price effect as discussed in sub-section 4.

⁽⁸²⁾ Current income is equal to permanent income plus the transitory income component, which can be negative or

positive. In the former case, it gives rise to bank credit or the drawing down of existing deposits, while in the latter case it gives rise to bank deposits or paying off credit early. See equation (2) in Box I.2.

⁽⁸³⁾ Bank credits are only provided to bridge the gap between current and potential income. They do not cover falls in permanent income, which are of a more structural nature and can not be remedied by credit flow.

Graph I.7: **Impact of bank sector on transitory income fluctuations – 2012Q1-2019Q1**



(1) See notes in Graph I.4.

Source: Authors' estimates.

I.6. Conclusions

The 2008-2012 crisis in the euro area and available literature highlight the importance of cross-border risk-sharing in a monetary union with a single monetary policy that cannot directly address idiosyncratic shocks in specific Member States.

This section provided an econometric analysis of the effects of income shocks on private consumption in open economies and the degree to which foreign banks provide financial services (via lending or deposits) to domestic households to help them smooth the impact of these shocks.

The empirical analysis points out the important countercyclical impact of credit on consumption and suggests that cross-border bank integration plays a particularly important role in that respect.

However, this impulse depends on the type and level of bank integration. Direct cross-border bank integration appears to offset around a quarter of the transitory income shock on consumption. This contributed, on average, to around half of the

stabilisation seen during 2008-2012, while indirect cross-border credit channels provided only limited stabilisation. The significant countercyclical impact of direct cross-border banking is notable because the level of direct bank integration in the euro area was still quite limited in 2007 prior to the global financial crisis. By contrast, indirect bank integration was quite developed in 2007, although much of its countercyclical or smoothing properties were more volatile and continue to be so over time.

Completing the Banking Union can help deliver stable, cross-border bank intermediation over time, particularly through the direct channel (bank to household) ⁽⁸⁴⁾. Key reforms are being pursued, including common deposit insurance, improving the resolution framework and addressing the 'home-host' supervisory regimes, notably with regard to the restrictions on intra-group liquidity and capital ⁽⁸⁵⁾. Well-coordinated macro-prudential policy can also be a useful tool to prevent contagion across borders.

At the same time, completing the capital markets union may improve risk diversification and optimal allocation of investments. This is key to enabling conditions to boost M&A banking activity and increase cross-border banking investments.

Although the analysis in this section suggests that further bank integration strengthens consumption stability, there is still a need to complement it with other risk-sharing mechanisms. These include a well-designed common fiscal stabilisation scheme and the development of Europe-wide capital markets that strengthen private sector risk sharing.

Moreover, well-designed regulation is also needed to address possible risks associated with further bank integration, such as larger systemic or contagion risks and the reduction in competition in the sector. These could lead to an increase in financial service prices, which would also affect consumption.

⁽⁸⁴⁾ A mechanical extrapolation of the estimates deriving from the analysis suggests that a complete direct Banking Union would smooth around 50% of a transitory income shock. However, such extrapolation is only by way of an example as these estimates pertain specifically to the sample analysed during a specific period.

⁽⁸⁵⁾ "Deepening Europe's Economic and Monetary Union: Taking stock four years after the Five Presidents' Report- European Commission's contribution to the Euro Summit" 21 June 2019

Box 1.2: Household consumption, financing gap and bank credit/deposit

The analysis makes the following assumptions: i) households maximise an intertemporal utility function that depends on current and future consumption, ii) the present discounted value of consumption expenditures must equal the present discounted value of income, iii) each period the representative household earns an income that has a permanent and transitory component, iv) consumption is financed from current income and bank credit/deposits.

The intertemporal utility function U reads as

$$(1) U = \log c_1 + \beta \log c_2$$

with c_i consumption in period $i=1,2$ and β the discount rate. The current nominal income Y in period 1 is ⁽¹⁾

$$(2) Y_1 = YP P_1 + YT$$

while in period 2

$$(3) Y_2 = YP P_2$$

with YP the real permanent income component earned in periods 1 and 2, YT the nominal transitory income component earned in period 1, P_i the consumer price in period $i=1,2$.

Optimising behaviour implies that in the absence of frictions, the propensity to spend

permanent income on consumption is $\sigma = \frac{1 + \frac{1}{(1+r)\left(\frac{P_1}{P_2}\right)}}{1+\beta}$ with r the nominal interest rate.

In this section, we assume that bank credit/deposits are needed to cover the financing gap, FG , between current income, Y_1 , and desired consumption (based on permanent income), $\sigma P_1 YP$, i.e.

$$(4) FG = Y_1 - \sigma P_1 YP$$

or on making use of (2)

$$(5) FG = YT - (\sigma - 1)P_1 YP$$

if $\sigma = 1$ ⁽²⁾, the financing gap is equal to the transitory income, i.e.

$$(6) FG = YT.$$

The financing gap is (partly) closed with bank credit BC ,

$$(7) BC = BI FG$$

with $0 \leq BI \leq 1$ measuring the fraction of the financing gap that can be borrowed or deposited ⁽³⁾, and with an interest rate r paid on the credit. $BI=0$ when the household does not have access to credit and $BI=1$ when all its credit needs are met.

⁽¹⁾ For analytical simplicity it is assumed that there is no shock in period 2.

⁽²⁾ This is the case if the real interest rate equals the discount rate, i.e. $\beta = \frac{1}{(1+r)\frac{P_1}{P_2}}$.

⁽³⁾ In the empirical analysis, where a distinction is made between domestic, as well as direct and indirect cross-border lending, this 'access' parameter varies over time and is measured by an ECB indicator.

(Continued on the next page)

Box (continued)

With access to credit markets, the intertemporal budget constraint reads as

$$(8) P_1 C_1 + \frac{P_2 C_2}{1+r} = [Y_1 + BC] + \left[\frac{Y_2}{1+r} - (1+r)BC \right]$$

with the first bracket on the right-hand side the cash flow in period 1, and the second bracket the cash flow in period 2.

Equation (8) can be written as

$$(9) P_1 C_1 + \frac{P_2 C_2}{1+r} = Y_1 + \frac{Y_2}{1+r} - r BC$$

Inserting (2), (3) and (6) into (9) and rearranging terms, the intertemporal budget constraint reads as

$$(10) P_1 C_1 + \frac{P_2 C_2}{1+r} = \left(1 + \frac{\left(\frac{P_2}{P_1}\right)}{1+r} \right) P_1 YP + (1-r BI) YT$$

Maximising (1) subject to (10) provides an Euler equation

$$(11) C_2 = \beta (1+r) \frac{P_1}{P_2} C_1$$

inserting (11) in (10) yields

$$(12) C_1 = \frac{1}{(1+\beta)} \left(1 + \frac{\left(\frac{P_2}{P_1}\right)}{1+r} \right) YP + \frac{1}{(1+\beta)} \frac{YT}{P_1} - \frac{r}{(1+\beta)} BI \frac{YT}{P_1}$$

i.e. private consumption is equal to its desired level (in the absence of a shock) adjusted for a temporary deviation of income from permanent income and the availability of credit.

Taking first differences of equation (12), dividing both sides by C and remembering that $d \ln(x) = 1/x dx$,

$$(13) d \ln(C_1) = \rho_1 d \ln(YP) + \rho_2 d \ln\left(\frac{YT}{P_1}\right) - \rho_3 \left[BI d \ln\left(\frac{YT}{P_1}\right) \right] - \rho_4 dr - \rho_5 dBI$$

with the values of the parameters $\rho_i > 0$ for $i=1, \dots, 5$ set by the structural parameters of the model and point of linearization. Equation (13) shows how contemporary consumption growth is conditioned by the permanent and transitional component of current income, as well as the bank credit flowing to households.

Box 1.3: A reduced form regression analysis

A. Specification

With the difference operator Δ measuring the change between a quarter and the same quarter in the previous year, the error correction mechanism is specified as:

$$\begin{aligned} (1) \Delta \ln(C_{it}) = & \alpha_i + \beta_1 \Delta \ln(YP_{it}) + \beta_2 \Delta \ln(YT_{it}) + \gamma_1 \Delta(LI_{it}) + \gamma_2 \Delta(INFL_{it}) \\ & + \gamma_3 \Delta \ln(PH_{it}/HICP_{it}) + \rho_1 DB_t \Delta \ln(YT_{it}) + \rho_2 BI_DIR_t \Delta \ln(YT_{it}) + \rho_3 BI_INDIR_t \Delta \ln(YT_{it}) \\ & + \rho_4 \ln(PH_{it}/\overline{PH_{it}}) \Delta \ln(YT_{it}) + \theta_1 \Delta(DB_{it}) + \theta_2 \Delta(BI_DIR_t) + \theta_3 \Delta(BI_INDIR_t) \\ & + \mu ECT_{it-4} + u_{it} \end{aligned}$$

with ECT referring to the error correction term measuring disequilibrium in the past, u referring to a stochastic term, and parameter α_i capturing country fixed effects⁽²⁾. The indices i and t refer to the country and the period respectively ⁽³⁾.

The parameters related to the variables other than the bank sector are expected to have the following signs: $\beta_1, \beta_2, \gamma_2, \gamma_3 > 0$ and $\gamma_1 < 0$. For the bank sector channels it is expected that $\rho_1, \rho_2, \rho_3 < 0$, indicating that when access to the bank sector (i.e. credit and deposits) improves, the negative (positive) impact of a deviation in actual income is tempered. The parameters $\theta_1, \theta_2, \theta_3 > 0$ indicate that on their own the improvements in cross-border banking have a positive impact on private consumption.

B. Data

The unbalanced data set covers quarterly data for 11 Member States⁽⁴⁾ from the first quarter of 2006 to the first quarter of 2019. The data have been retrieved from various sources, including Eurostat, the (ECB) and the Bank for International Settlements (BIS).

As harmonised quarterly data on disposable household income is not available in the Eurostat database, this variable has been approximated by using the wage bill. The temporary deviation from permanent income is estimated by regressing the total wage bill (per employed person) on trend price level, trend productivity, trend unemployment rate and a deterministic trend, whereby the trend values are obtained by applying a Hodrick-Prescott filter (with $\lambda=1600$). Permanent income is the fitted value of this regression.

The data for the direct and indirect cross-border bank sector integration are presented in Box 1. At the domestic level, the banks' capacity and willingness to lend and borrow is proxied by the Hodrick-Prescott filtered BIS series. 'Credit to private non-financial sector from all sectors

⁽²⁾ Capturing all time-invariant institutional and economic features that affect consumption.

⁽³⁾ Underpinning such reduced form specification is an intertemporal utility maximisation problem as described in Box I.2.

⁽⁴⁾ Belgium, Germany, Ireland, Spain, France, Italy, Luxembourg, the Netherlands, Austria, Portugal and Finland.

(Continued on the next page)

Box (continued)

at market value - Percentage of GDP - Adjusted for breaks' is used to approximate the stance of this domestic bank channel ⁽⁵⁾.

C. Estimation results

The estimation of equation (1) is based on the two-step Engle-Grange procedure. Variant V0 in Table A shows the estimation results for the long-run consumption (co-integration) relationship after pooling the data for the Member States for which data are available. The point estimates have the expected sign, with an increase (decrease) in consumption when permanent income and inflation increase (decrease) and a decrease (increase) when the interest rate increases (decreases) ⁽⁶⁾.

Focusing on the short to medium run, various variants of the error correction mechanism have been estimated with generalised least squares ⁽⁷⁾ using a pool of demeaned variables ⁽⁸⁾. Variant V1 shows the estimation results for the error correction mechanism without the banking sector. All point estimates of the macro-economic variables have the expected sign and are significant. The next three variants show the estimation results for alternative specifications for the bank sector interaction ⁽⁹⁾.

Variant V2 presents estimation results of the interaction of the temporary income deviation with the domestic banking sector capacity as well as an aggregate indicator of cross-border bank sector integration ⁽¹⁰⁾. Both interactions show a negative point estimate and are significant; this suggests a countercyclical effect, i.e. a fall (rise) in actual income below permanent income, putting downward (upward) pressure on consumption, is tempered by bank credit (deposits). However, the countercyclical effect of the domestic bank interaction channel appears weaker during the periods when the country was under a programme ⁽¹¹⁾.

Variants V3 and V4 show estimation results after disaggregation of the aggregate indicator of cross-border bank sector integration into its direct and indirect channel. In both variants the domestic and direct cross-border channel interacting with temporary income deviation have the expected negative sign. However, the indirect channel is insignificant.

⁽⁵⁾ Other variables included in the regression analysis are the ECB MFI interest rate statistics (the interest rate over one year to households), Eurostat's house price index (tipsho40), Eurostat National Accounts the final consumption expenditure of households (namq_10_gdp), wages and salaries (namq_10_gdp) and HICP (prc_hicp_midx). Data are seasonally and calendar adjusted data.

⁽⁶⁾ These estimates allow us to estimate the error correction term used in variants 1 to 4.

⁽⁷⁾ This allows for correlation between the random components across Member States.

⁽⁸⁾ For each Member State the variables have been demeaned by subtracting the Member State's sample mean from the observed value. When the data are centred, the addition of interaction terms does not affect the point estimates of the main effects. Centring also reduces collinearity between explanatory variables. See for instance Aiken, L. and S. West (1991), *Multiple Regression: Testing and Interpreting Interactions*.

⁽⁹⁾ Comparing the R-squared diagnostic statistics – which is a measure of how much variation of a dependent variable is explained by the independent variables – it is worth remembering that the variants V2, V3 and V4 differ from each other in terms of the specific type of interaction variable, i.e. the aggregate, a disaggregate in direct and indirect effect – which are strongly correlated with each other.

⁽¹⁰⁾ Capturing direct and indirect channel in one indicator as is the case for the ECB price-based financial integration composite sub-indicator for the banking market. For more details on this ECB indicator, see https://www.ecb.europa.eu/stats/financial_markets_and_interest_rates/financial_integration/html/index.en.html

⁽¹¹⁾ In the regression captured by the term interacting with the programme dummy, which is equal to 1 if the Member States is under a programme and 0 if not under a programme.

(Continued on the next page)

Box (continued)

Variant V3 and V4 differ from each other as to how the stand-alone impact of cross-border bank integration is specified. Variant 3 uses the direct and indirect indicators, while variant V4 makes a distinction between the Member States that were under programme during the sample period and those that were not ⁽¹²⁾. The point estimates of variant V4 are used to assess the effectiveness of cross-border bank integration in tempering fluctuations in private consumption.

Comparing variant V4 with variants V5 (i.e. V4 with short-term interest rate instead of long-term interest rate), V6 (i.e. V4 with residential real estate prices instrumentalised using lagged and trend residential real estate prices to deal with possible simultaneously bias), V7 (i.e. V4 with income tax rate ⁽¹³⁾ as additional explanatory variable), V8 (i.e. V4 with permanent income instrumentalised to deal with possible “measurement problems”) ⁽¹⁴⁾, V9 (i.e. V4 with the direct and the indirect cross-border bank integration variables also interacting with a dummy for each of the programme countries in the sample) and V10 (i.e. V4 with an autoregressive error term) suggests that point estimates of baseline V4 are fairly stable.

Table A: Private consumption – estimation results

Dependent: Growth in household consumption at constant prices											
	V0	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10
Permanent income	0.64***	0.39***	0.41***	0.39***	0.39***	0.40***	0.39***	0.38***	0.40***	0.43***	0.43***
	(26.12)	(14.15)	(11.26)	(13.54)	(12.97)	(13.03)	(11.39)	(13.35)	(8.48)	(13.40)	(17.72)
House price /HICP	0.00	0.10***	0.08***	0.09***	0.09***	0.09***	0.09***	0.10***	0.12***	0.08***	0.07***
	(0.08)	(9.61)	(6.97)	(8.72)	(8.63)	(8.49)	(5.71)	(9.11)	(10.70)	(7.39)	(6.54)
Interest rate	-0.91***	-0.16**	-0.10	-0.09	-0.10	-0.05	-0.09	-0.14**	-0.04	-0.18**	-0.31***
	(-7.82)	(-2.46)	(-1.27)	(-1.30)	(-1.42)	(-0.74)	(-1.26)	(-1.98)	(-0.61)	(-2.40)	(-4.48)
Inflation	0.15*	0.15***	0.16***	0.13***	0.14***	0.14***	0.13***	0.14***	0.20***	0.14***	0.13***
	(1.67)	(4.83)	(4.71)	(3.75)	(4.03)	(3.94)	(3.51)	(4.32)	(5.95)	(3.81)	(3.72)
Transitory income	0.32***	1.32***	1.70***	1.94***	1.96***	1.98***	1.85***	1.64***	2.10***	2.06***	2.06***
	(14.61)	(5.01)	(4.72)	(5.27)	(5.39)	(4.31)	(5.02)	(4.45)	(4.25)	(5.34)	(5.34)
Temporary income*House price	0.79***	1.29***	1.04***	1.16***	1.17***	1.20	1.16***	1.94***	0.57	0.65	0.65
	(2.32)	(3.54)	(2.50)	(2.78)	(2.72)	(1.18)	(2.81)	(4.39)	(1.05)	(1.40)	(1.40)
Average income tax rate							0.06***				
							(3.55)				
Autoregressive error term											-0.29***
											(-6.64)
Error correction term	-0.33***	-0.39***	-0.33***	-0.32***	-0.32***	-0.32***	-0.33***	-0.29***	-0.32***	-0.30***	-0.30***
	(-14.61)	(-11.95)	(-11.95)	(-13.74)	(-13.69)	(-13.11)	(-14.21)	(-13.01)	(-13.15)	(-15.23)	(-15.23)
Transitory income interacting with											
Domestic BI	-0.96***	-0.98***	-1.09***	-1.11***	-1.10***	-1.05***	-0.99***	-1.19***	-0.90***	-0.90***	-0.90***
	(-3.29)	(-3.27)	(-3.61)	(-3.69)	(-3.64)	(-3.48)	(-3.76)	(-3.31)	(-2.80)	(-2.80)	(-2.80)
Domestic BI * programme	0.07**	0.07**	0.09**	0.08**	0.08**	0.09**	0.10**	0.11*	-0.12	0.04	0.04
	(2.09)	(2.07)	(2.49)	(2.13)	(2.37)	(2.69)	(1.72)	(1.44)	(1.08)	(1.08)	(1.08)
EA BI aggregate	-0.37**										
	(-2.26)										
EA BI DIRECT	-0.86***	-1.03***	-1.02***	-1.05***	-0.92***	-0.92***	-1.16***	-1.52***			
	(-2.80)	(-3.19)	(-3.17)	(-2.64)	(-2.87)	(-2.60)	(-2.94)	(-4.76)			
EA BI DIRECT* programme IE								0.18			
								(0.72)			
EA BI DIRECT* programme ES								0.03			
								(0.43)			
EA BI DIRECT* programme PT								0.34***			
								(2.83)			
EA BI INDIRECT	-0.14	-0.26	-0.26	-0.26	-0.26	-0.25	-0.23	-0.23	-0.13		
	(-0.68)	(-1.25)	(-1.21)	(-0.84)	(-1.23)	(-1.00)	(-0.89)	(-0.64)			
EA BI INDIRECT* programme IE								0.05			
								(0.22)			
EA BI INDIRECT* programme ES								0.18**			
								(2.14)			
EA BI INDIRECT* programme PT								0.15			
								(0.80)			
Stand-alone effects											
Domestic BI	-0.20**	-0.11	-0.16	-0.14	-0.16	-0.15	0.01	-0.03	-0.14		
	(-2.15)	(-1.43)	(-1.52)	(-1.37)	(-1.46)	(-1.43)	(0.05)	(-0.40)	(-1.39)		
EA BI Direct	0.00										
EA BI Indirect											
EA BI no program MS				0.02**	0.02**	0.02**	0.02**	0.01	0.02***	0.03***	
				(2.38)	(2.50)	(2.33)	(2.28)	(1.34)	(2.68)	(5.62)	
EA BI program MS				-0.00	0.00	-0.00	-0.01	0.03	0.04	-0.01	
				(-0.23)	(0.04)	(-0.14)	(-0.31)	(1.57)	(0.85)	(-0.42)	
Adjusted R-squared	0.721976	0.733239	0.736960	0.740438	0.739616	0.740163	0.739769	0.721638	0.745376	0.749145	
Number of observations	573	520	520	520	520	520	520	520	509	476	
Number of explanatory variables	15	7	22	14	14	14	15	14	20	15	

Note: Permanent and actual income, house price relative to HICP in first differences of natural logarithm in variants V1 to V4; in log levels for variant V5 showing the long-run equilibrium relation. Note: sample size 2006Q1-2019Q4; * indicates between brackets; **p<0.05; ***p<0.01 and ***p<0.001. Dependent and explanatory variables demeaned. Note: BI short for bank integration, EA BI aggregates. DIRECT and INDIRECT cross-border credit channel. Note: V5, V4 with short-term interest rate instead of long-term interest rate, V6, V4 with house price instrumentalised, V7, V4 with income tax rate, V8, V4 with permanent income instrumentalised, V9, V4 with additional interaction dummies, V10, V4 with autoregressive error term.

⁽¹²⁾ Multiplying the ECB price-based financial integration composite sub-indicator for the banking market with a dummy that is equal to 1 if the Member State was under a programme during the sample period, and equal to 0 otherwise.

⁽¹³⁾ Annual data retrieved from the OECD database, and interpolated to quarterly data.

⁽¹⁴⁾ Permanent income YP cannot be observed directly and had to be estimated – which may entail a random measurement error. Instrumental variables provide consistent point estimates of parameters in linear regression models with independent additive measurement errors. See for instance Chen, X., H. Hong and D. Nekipelov (2007), ‘Measurement Error Models’. The instruments used are the Hodrick-Prescott filtered series of the total wage bill (per employed person), which is subject to a measurement error not correlated with the measurement error of the original YP variable or random component of equation (1).

II. Structural change in labour demand and skills mismatches in the euro area

By Daniel Alonso and Alkistis Zavanou

Skills mismatches, i.e. discrepancies between the skills that employers are looking for and the skills that the workforce have, remain high in many Member States. This may be temporary, due to labour market friction and the business cycle, or more persistent, due to structural imbalances between the supply and demand of skills.

At the same time, technological change (along with globalisation and demographic change) is having a structural impact on the demand (and on the supply) of skills, which may exacerbate the skills-to-job mismatch. In terms of demand, the structure of employment is largely shifting from routine to non-routine occupations in the euro area as a whole.

Only a few studies have so far tried to assess the link between the change in the task content of jobs and skills mismatches. This section investigates this link. The analysis suggests that new technologies that reduce the demand for workers performing routine tasks have increased skills mismatches. This is consistent with the phenomenon of technological change driving permanent shifts in the demand for labour, which lead to imbalances between supply and demand.

The increasing demand for highly skilled tasks along with the decline in demand for routine tasks have increased skill mismatches in the euro area. Although this may be partly offset by improvements in economic conditions, unless there is a suitable policy response, the labour market trends are set to result in higher skill mismatches, in particular during a downturn in the economy. In this regard, the Recovery and Resilience Facility as well as the revised Skills Agenda provide Member States key tools to facilitate the adaptation of education and training systems to support digital skills as well as to foster educational and vocational training for all ages. ⁽⁸⁶⁾

II.1. Introduction

While the structural change in employment is well documented, little is known about its impact on skills mismatches. Recent research highlights a progressive shift of employment from middle-skilled jobs towards low- and high-skilled jobs in many countries around the world, a phenomenon known as job polarisation. ⁽⁸⁷⁾ A large strand of literature has focused on the causes of this phenomenon, identifying technology and globalisation as the main drivers of the decline in the share of middle-wage (mid-skill) jobs. Less is

known, however, about its consequences and more precisely its impact on skills and skills mismatches. Technology can replace workers in routine tasks that are easy to automate and it can complement workers in tasks that require creativity, problem solving and cognitive skills. As machine learning and artificial intelligence advance in many sectors, a growing number of workers may need to move from occupations in decline (concentrated in routine tasks) to growth sectors (which require non-routine cognitive skills).

All EU Member States have experienced a sharp decline in the relative share of mid-skill jobs compared to low- and high-skill ones over the past two decades, though unevenly. Compared to the pre-financial crisis period, the proportion of workers in middle-paid and mid-skill jobs is shrinking in all EU Member States, albeit to different degrees. In countries that experienced a late shift of employment from agriculture and manufacturing to service sectors, such as southern and central European countries, the decline in mid-skill occupations seen at national level may have occurred due to employment reallocations, both

⁽⁸⁶⁾ This section was prepared by Daniel Alonso and Alkistis Zavanou (DG Employment and Social Affairs and Inclusion). It draws on earlier work, see: *The relationship between polarisation and skills mismatches: evidence for the EU*, Labour Market and Wage Developments in Europe, 2019. The authors wish to thank an anonymous reviewer for useful comments.

⁽⁸⁷⁾ See, for instance, Acemoglu, D. and D. Autor (2011), "Skills, Tasks and Technologies: Implications for Employment and Earnings", in *Handbook of Labor Economics*; Autor, D. (2014). Skills, education, and the rise of earnings inequality among the "other 99 percent". *Science* (New York, N.Y.). 344. 843-51; Michaels, Guy, Natraj, Ashwini and Van Reenen, John (2014) Has ICT polarized skill demand? Evidence from eleven countries over 25 years. *Review of Economics and Statistics*, 96 (1). pp. 60-77.

between and within sectors. This shift is expected to affect both the demand and the supply of skills: the type of tasks carried out in jobs as well as the type of professions and occupations required in the labour market.

Skills mismatches remain high. Today, over 60 million adults in the EU lack necessary literacy, numeracy and digital skills. Digital technologies are increasingly used in workplaces across Europe and nowadays most jobs require basic digital skills. In 2017, almost half of the EU population (43%) had basic or below basic digital skills, with the share rising only slightly since 2015. 38% of employers reported that the lack of digital skills had an impact on their performance, notably through productivity losses.

In this context, it is relevant to examine whether structural changes in demand for labour have affected skills mismatches and, if so, to what extent. Both topics have received increasing policy attention. On the one hand, technological progress and automation are offered as explanations for structural change in labour demand. On the other hand, there is substantial evidence that skills mismatches are having negative effects on wages and job satisfaction, but also on productivity and output.⁽⁸⁸⁾ By contrast, the effect of recent changes to the structure and content of employment on skills mismatches has been much less analysed, although the literature on job polarisation suggests there is such a link.⁽⁸⁹⁾

From a theoretical point of view, the effect of structural change in the demand for skills mismatches is ambiguous. Starting from a hypothetical situation in the labour market, in which the supply of skills perfectly matches demand and adequately trained workers fill all jobs, a structural change in employment could increase different aspects of the skills mismatch. In the

absence of a supply response, it could increase macroeconomic skills mismatches, as it would result in a fall in demand for middle-skilled workers and a rise in demand for high- and low-skilled workers. It could also increase labour shortages for those two groups. Furthermore, under-qualification could rise among workers moving to the growing share of high-skill jobs, while over-qualification would rise for those in low-skill jobs, if workers previously employed in middle-skill jobs take up these jobs. Whether these effects will materialise is uncertain for at least three reasons. First, the supply of skilled workers is increasing in many EU countries, though this may or may not be in step with the increasing share of high-skill jobs. Secondly, labour markets tend to have a degree of skills mismatches and the different starting positions in terms of the level and type of mismatches will clearly change how polarisation shapes them. In a country with a high rate of under-skilling, for example, job polarisation could even reduce under-skilling, if it results in medium-skilled workers shifting from medium- to low-skilled jobs. Lastly, job polarisation may interact with unemployment (i.e. the workers previously employed in middle-skill occupations might become unemployed instead of moving immediately to low-skill and/or high-skill occupations). If so, it may not affect skills mismatches at all. In sum, this illustrates that the relationship between job polarisation and skills mismatches is not straightforward, but rather ambiguous.

This section examines the relationship between structural changes in employment and skills mismatches and the main causes of skills mismatches across the Member States. It is structured as follows: first, we review the literature on the determinants of skills mismatches. Then we give an overview of the main concepts and aspects of skills mismatches and structural changes in employment described in the literature and the indicators used to track these phenomena in operational terms, their pros and cons, how it has changed over time in the Member States and some illustrative statistics. We then estimate the effect of structural change in labour demand on skills mismatches across euro-area countries between 2002 and 2018, presenting empirical findings. The section concludes by setting out some policy recommendations.

⁽⁸⁸⁾ See, for instance, Mavromaras, K., S. McGuinness and Y.K. Fok (2009), “Assessing the incidence and wage effects of overskilling in the Australian labour market”, *Economic Record*, Vol. 85, No 268, pp. 60-72; European Commission (2015), “Employment and Social Developments in Europe – Annual review 2015”, Directorate-General for Employment, Social Affairs and Inclusion; Bennett, J. and S. McGuinness (2009), “Assessing the impact of skill shortages on the productivity performance of high-tech firms in Northern Ireland”, *Applied Economics*, Vol. 41, No 6, pp. 727-37.

⁽⁸⁹⁾ Goos, M., A. Manning (2007), Lousy and Lovely Jobs: The Rising Polarization of Work in Britain, *The Review of Economics and Statistics*, 89, issue 1, p. 118-133.

II.2. The skills mismatch: measurements and causes

Skills mismatches are discrepancies between the demand and the supply of skills in the labour market, where the skills that employers are looking for are different from the skills offered by workers. Although skills mismatch is a broad, umbrella term, this section focuses on the macroeconomic skills mismatch, which captures the gap between the skills of the working-age population and the skills needed in the economy.

The macroeconomic skills mismatch shows a relative dispersion of employment rates across population groups with different educational attainment. Although the term “macroeconomic skills mismatch” is widely used in literature, the term “macroeconomic qualifications mismatch” would arguably be more accurate as the indicator used to track this phenomenon in operational terms is qualifications. If data are available, it is possible to directly compare the profile of job vacancies (in terms of qualification levels) with the profile of (un)employment.⁽⁹⁰⁾ Nevertheless, as reliable data on vacancies at EU level are hard to obtain, simplified measures can be used to compare the composition of employment in terms of qualifications (as a proxy for labour demand) with that of the working-age population (as a proxy for supply). Alternatively, it is possible to compare the profile of unemployment (as a proxy for the lack of demand) with the qualifications profile of the labour force (as a proxy for supply). Thus, in the absence of reliable data on job vacancies, the macroeconomic skills mismatches indicator is defined as the relative dispersion of employment rates across three population groups with different levels of educational attainment: the low, middle and high skilled.⁽⁹¹⁾ In general, macroeconomic

skills mismatches are high if the employment rates of low- and/or middle-skilled workers are lower than those of high-skilled workers and when the former make up a substantial share of the working-age population.⁽⁹²⁾

The causes of macroeconomic skills mismatches can be both cyclical and structural. On the one hand, as low-skilled employment tends to be more cyclical than high-skilled employment, the difference in employment rates between qualification groups typically increases in economic downturns. As a result, macroeconomic skills mismatches typically increase during an economic downturn and fall again during the recovery. Nevertheless, changes in the index could also be due to structural factors, such as technological, occupational or demographic changes or differences in the impact of changing institutional settings and of demographics across education groups (e.g. if the increasing generosity of benefit systems affects low-qualified workers more than highly-qualified ones). Some skills mismatches are inevitable in dynamic, continuously changing economies, as there are always some unfilled positions, despite a degree of unemployment. Moreover, some people are in jobs that do not fully match their skills profile. Even when an economy is “in equilibrium”, less-skilled workers are likely to experience higher unemployment rates than the highly skilled.⁽⁹³⁾ Nevertheless, high and persistent macroeconomic skills mismatches are costly for firms, workers, the society and the economy as a whole.⁽⁹⁴⁾

Over the last decade, the macroeconomic skills mismatch has tended to follow a countercyclical pattern in the euro area. It increased during the financial crisis and recession and fell again during

⁽⁹⁰⁾ See Şahin, A., J. Song, G. Topa and G.L. Violante (2014), “Mismatch unemployment”, *The American Economic Review*, Vol. 104, No 11, pp. 3529-64

⁽⁹¹⁾

$$SMI = \sum_{i=L,M,H} \left| \frac{E_i}{E_t} - \frac{P_i}{P_t} \right| = \frac{1}{e_t} \sum_{i=L,M,H} \left| \frac{P_i}{P_t} (e_i - e_t) \right|$$

where i equals the three different qualification groups (*low-skilled*, *middle-skilled* and *high-skilled*), E_i , P_i and e_i equal the total employment, the working age population and the employment rate of group i respectively; and E_t , P_t and e_t equal the aggregate employment, the aggregate population and the aggregate employment rate respectively. This indicator has been calculated by Esteveo and Tsounta (2011) for US states, by the ECB (2012) for the euro area as a whole and by European Commission (2013b) and Arpaia et al. (2014) for all EU Member States. The use of dispersion indicators to measure mismatch in the labour market dates back to Lipsey (1960).

⁽⁹²⁾ This measure ranges from 0 and 2. It equals 0 if the employment rates of all skill groups are equal to each other and hence to the aggregate employment rate. It equals 2 if the employment rate is extremely low (0%) in two out of three skill groups, and extremely high (100%) in the third group, and if the size of the former two is sufficiently high. For a detailed description of the indicator, see Kiss and Vandeplas (2015).

⁽⁹³⁾ See Layard, R., S. Nickell and R. Jackman (2005), *Unemployment: Macroeconomic Performance and the Labour Market*, 2nd Edition, Oxford University Press, Oxford.

⁽⁹⁴⁾ See, for example, Velciu M. (2017), “Job Mismatch – Effects On Work Productivity”, *SEA - Practical Application of Science*, No 15, pp. 395-398, Fundația Română pentru Inteligența Afacerii, Iasi; LaRochelle-Côté, S. and D. Hango (2016), “Overqualification, skills and job satisfaction. Insights on Canadian Society”, *Catalogue*, No 75-006-X, Statistics Canada.

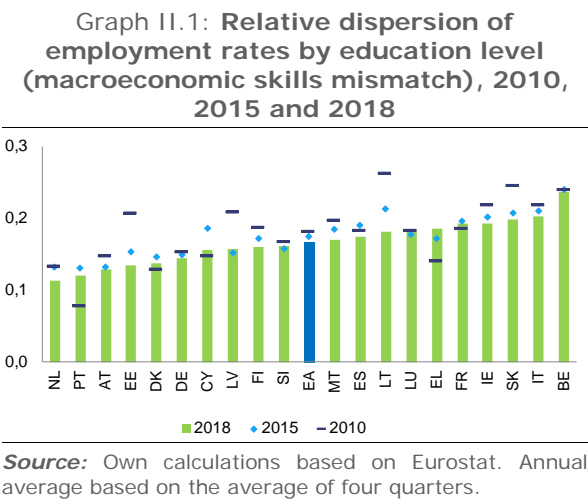
the recovery (2011-2018), although there are considerable differences among Member States. Graph II.1 illustrates the changes in macroeconomic skills mismatches across euro area countries. In 2018, the highest rates were recorded in Belgium, Italy, and Slovakia with differences in employment rates among skill groups of above 18%. These countries generally combine substantial employment gaps (between low- and highly-qualified workers, and/or between medium- and highly-qualified workers) with substantial shares of low- and/or medium-qualified workers in their population. The lowest macroeconomic skills mismatches were in the Netherlands (11%) followed by Portugal (12%). In the recovery, most countries saw a reduction in the skills mismatch. The largest falls were in Lithuania, Cyprus, and Estonia. In these countries, the employment rate of medium- and high-qualified workers have been converging to the aggregate employment rate for decades, with the latter increasing as a share of the working-age population. The opposite applies to the employment rate of low-qualified workers, who, however, made up a shrinking part of the working-age population. By contrast, skills mismatches increased during the recovery in some of the countries hit particularly hard by the economic crisis (namely Greece and Portugal).

(96) The rapid pace of technological change may require skills and qualifications higher than the skills the workforce can offer. It changes the demand for skills between sectors, occupations and firms. Technological change can lead to skill shortages by creating the need for new skills that are not immediately available on the labour market, until the broader education system (including employer training) is able to meet the demand for new skills. In addition, firms may wish to hire high-skilled workers as they can adapt at a lower cost relative to unskilled workers. (97) Demographic trends are another structural factor that can compound skill shortages by having an impact on the size, age and profile of the labour force. Demographic change also affects the demand for goods and services, and hence the demand for the skills required to provide them (e.g. medical services and personal care). A shift in the demand for labour towards more skilled jobs and an ageing workforce – a long-term feature of European economies – can result in skill shortages and mismatches, as older workers have skills that do not necessarily match closely the skills required by the process of digitalisation of modern economies.

II.3. Structural change in employment: measures and causes

II.3.1. Labour market polarisation in the euro area

Over the last few decades, the labour markets in most developed countries have undergone substantial change. Since the middle of the twentieth century, structural changes have occurred as labour has moved out of manufacturing and into the service sectors. One of the key explanations for structural transformation is differential productivity growth – or biased technological progress – across sectors, combined with complementarity between the goods and services produced by different sectors. (98) In terms of the effects on jobs, several papers have documented the polarisation of labour markets in the United States and in several European countries since the 1980s: employment



Although there is evidence that skills mismatches are at least partly cyclical, there are also significant structural causes. (95) One is technological change.

(95) Vandeplas, A, Thum-Thysen, A 2019, 'Skills mismatch and productivity in the EU', European economy discussion papers, no. 100, July 2019, Publications Office of the European Union, Luxembourg.

(96) See Di Pietro, G. 2002. "Technological change, labor markets, and 'low-skill, low-technology traps'", *Technological Forecasting and Social Change*, Vol. 69, No. 9, pp. 885-895.
 (97) See Desjardins, R. and K. Rubenson (2011), "An Analysis of Skill Mismatch Using Direct Measures of Skills", *OECD Education Working Papers*, No 63, OECD Publishing, Paris
 (98) See Ngai, L., Rachel, and Christopher A. Pissarides. 2007. "Structural Change in a Multisector Model of Growth." *American Economic Review*, 97 (1): 429-443.

has shifted out of middle-earning routine jobs to either low-earning manual or to high-earning abstract jobs.

Although evidence of this job polarisation has been found for a number of countries ⁽⁹⁹⁾, differences in methodology and/or data sources lead to different and sometimes contradictory results. ⁽¹⁰⁰⁾ The key differences stem from three factors.

First, when defining jobs, some studies use only the two-digit ISCO occupational codes, while others take an occupation-industry matrix approach. Second, a key component of the jobs-based approach is that the jobs are ranked by median hourly wages (then used to construct job quality tiers). Some studies rank jobs based on each country's median hourly wage. ⁽¹⁰¹⁾ Others use country-specific wage levels to rank jobs by quality.

Third, although some studies classify jobs into three categories, which may have very uneven sizes in terms of number of occupations and in terms of share of employment, other studies classify jobs into equal-sized groups ranked by median hourly wage.

To establish the extent of job polarisation in European economies, this section follows the methodology suggested by Goos et al. (2014). ⁽¹⁰²⁾ We grouped jobs according to mean wages in low, middle, and high-income occupations. ⁽¹⁰³⁾ On average, over the period 2002-2018, the share of middle-paid jobs fell in the euro area ⁽¹⁰⁴⁾ by about 13 pps, while the share of both low- and high-income jobs rose by 5 and 8 pps respectively (Graph II.2). However, this masks significant differences across Member States. While there is a clear hollowing-out of middle-paid jobs across the EU, the pace of this process differs by country.

⁽⁹⁹⁾ These include the United States (Acemoglu and Autor, 2011; Autor and Dorn, 2013; Autor, 2014), the UK (Goos and Manning, 2007; Salvatori, 2018), Germany (Spitz-Oener, 2006; Dustmann et al., 2009; Kampelmann and Rycx, 2011), Sweden (Adermon and Gustavsson, 2015) and France (Harrigan, Reshef and Toubia, 2016).

⁽¹⁰⁰⁾ Some authors find different results and conclude that there is no clear pattern of pervasive polarisation. See Oesch, D., R. J. Menes (2011). Upgrading or polarization? occupational change in Britain, Germany, Spain and Switzerland, 1990-2008. *Socio-Economic Review*, 9(3); Fernández-Macías, E. (2012). Job Polarization in Europe? Changes in the Employment Structure and Job Quality, 1995-2007. *Work and Occupations*, 39(2), 157-182; Eurofound (2017), *Employment transitions and occupational mobility in Europe: The impact of the Great Recession*, Publications Office of the European Union, Luxembourg.

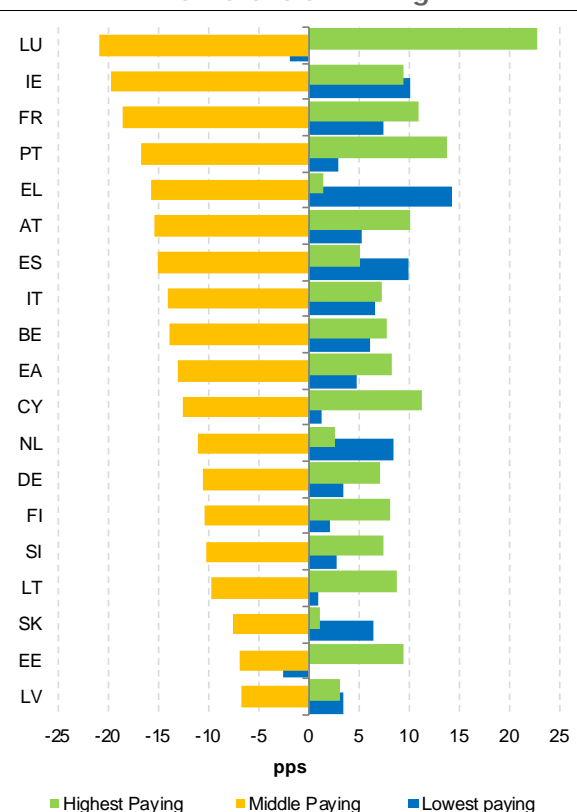
⁽¹⁰¹⁾ See, for example, Goos, M., A. Manning (2007), Lousy and Lovely Jobs: The Rising Polarization of Work in Britain, *The Review of Economics and Statistics*, 89, issue 1, p. 118-133.

⁽¹⁰²⁾ Goos, M., A. Manning and A. Salomon (2014), "Explaining job polarization: routine-biased technological change and offshoring", *American Economic Review*, Vol. 104, No 8, pp. 2509-26. This methodology relies on the assumption that wages perfectly correlate with occupational skills requirements. This is common in the literature (e.g. Goos et al. 2009, Autor and Dorn 2013). However, an important caveat is that some jobs that require lower skill levels are paid better because of higher unionisation, collective agreements, social norms, etc.

⁽¹⁰³⁾ The three categories are defined as follows. **High-income occupations:** Corporate managers; Physical, mathematical, and engineering professionals; Life science and health professionals; Other professionals; Managers of small enterprises; Physical, mathematical and engineering associate professionals; Other associate professionals, life science and health associate professionals. **Middle-income occupations:** Stationary plant and related, stationary plant and related operators; Metal, machinery and related trade work; Drivers and mobile plant operators; Office clerks; Precision, handicraft, craft printing and related trade workers; Extraction and building trades workers; Customer service clerks; Machine operators and assemblers; Other craft and related trade workers. **Low-income occupations:** Labourers in mining, construction, manufacturing and transport; Personal and protective service workers; Models, sales persons and demonstrators; Sales and service elementary occupations.

⁽¹⁰⁴⁾ Malta is not included due to data limitations.

Graph II.2: The proportion of middle-wage workers is shrinking

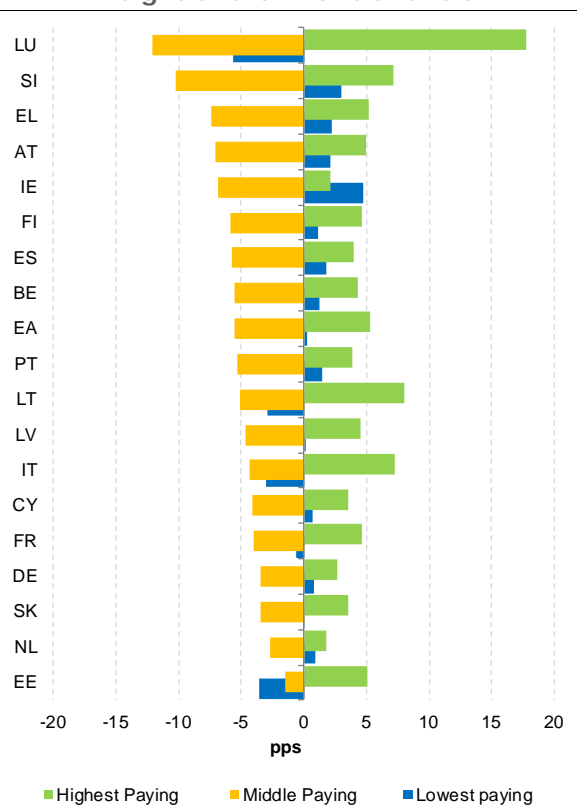


High, middle and low-income jobs in the euro area change from 2002 to 2018 in pps.

Source: Own calculations based on Labour Force Survey (LFS).

The differences are not only between countries, but also over time. Splitting the period 2002-2018 into two halves (2002-2010 and 2011-2018) shows that, although the share of middle-income jobs fell in both periods in most countries, the fall sloped off significantly after the financial crisis of 2007-2008. More interestingly, since 2011 only Luxembourg, the Netherlands, Italy and Finland continue to show effects of polarisation (Graph II.4). Some countries (Slovenia, Greece and Latvia) even experienced an increase in middle-income jobs (“de-polarisation”). These countries may be benefiting from offshoring within the single market. Thus, less polarisation in these countries means job creation in routine occupations. Conversely, more polarisation in high-income countries may be the consequence of middle-income jobs shifting to certain middle-income countries.

Graph II.3: Polarisation peaked at the height of the financial crisis



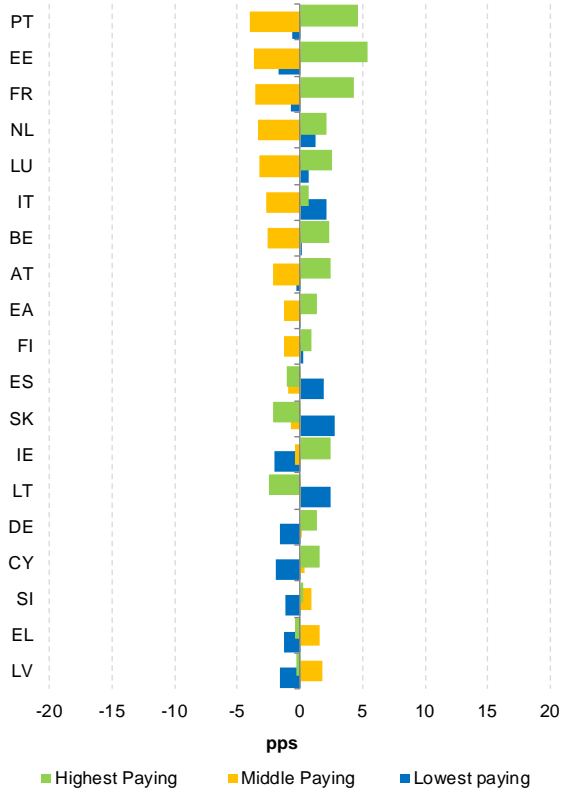
High, middle and low-income jobs in the euro area - change from 2002 to 2010 in pps.

Source: Own calculations based on LFS.

The shift in employment away from middle-skill jobs can occur in two ways. On the one hand, the factors underlying job polarisation may contribute to a shift of employment within an industry, as middle-skill jobs decline and the share of high- and low-skill jobs increases. Technological advances tend to be the main drivers of this aspect of job polarisation, as middle-skill jobs become obsolete.⁽¹⁰⁵⁾ On the other hand, employment may shift between industries when some industries experience rising demand for their products and respond by hiring workers, while other industries contract as demand for their products weakens. This reallocation of workers increases job polarisation if the industries in decline have a larger share of middle-skill jobs and the growth industries have a larger share of low- or high-skill jobs.

⁽¹⁰⁵⁾ OECD (2017), “OECD Employment Outlook 2017”, OECD Publishing, Paris.

Graph II.4: After the financial crisis, the rate of polarisation sloped off



High, middle and low-income jobs in the euro area - change from 2011 to 2018 in pps.

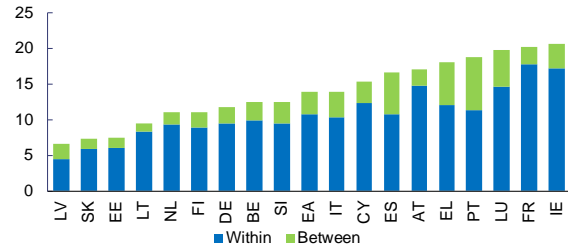
Source: Own calculations based on LFS.

To understand the relative importance of cross-industry and intra-industry effects, it is useful to break down the change in overall polarisation over the period analysed by cross-industry and intra-industry components.⁽¹⁰⁶⁾ Graph II.5 shows that the prevalence of intra-industry polarisation is a pattern observed in all euro area countries. However, in some countries such as Spain, Portugal and Greece, the decline of specific sectors has also played a significant role, suggesting that jobs have shifted towards industries with higher degrees of polarisation, in particular from

⁽¹⁰⁶⁾ See Goos, M., A. Manning and A. Salomon (2014), "Explaining job polarization: routine-biased technological change and offshoring", *American Economic Review*, Vol. 104, No 8, pp. 2509–26. Overall polarisation is the sum of high- and low-paid workers over total employment. Within-sector polarisation is the increase in the share of high- and low-income jobs within an industry; between-sector polarisation is the reallocation of employment towards more highly polarised industries. Within-industry polarisation is the change in polarisation by industry over the time period, multiplied by the average share of employment of that industry. Inter-industry polarisation is the change in the employment share of an industry over the time period, multiplied by the average level of polarisation in that industry.

agriculture to services, reflecting structural changes in the labour market.

Graph II.5: In all countries, polarisation has largely reflected intra-sector dynamics



Percentage-point change in polarisation between 2000 and 2018.

Source: Own calculations based on LFS.

The main drivers behind job polarisation are still subject to some debate, but almost all explanations focus on the disappearance of “routine” occupations and are based on demand-side factors. Two factors emerge in particular: globalisation and technology.

Globalisation has an impact on the number of routine jobs via offshoring. Technology, however, affects job polarisation in two ways: i) by reducing employment in routine manual and cognitive tasks, moving displaced workers to less-routine jobs at the lower end of the skills spectrum; and ii) by increasing demand for workers in higher-skilled and (to a lesser extent) lower-skilled occupations, leading to growth at the upper and lower ends of the skills range.⁽¹⁰⁷⁾ This process, called Routine-Biased Technological Change explains the lower demand for middle-skill jobs relative to both high- and low-skill ones, giving rise to the polarisation of occupational structures documented in advanced countries.⁽¹⁰⁸⁾

Although this section focuses on structural change in the profile of jobs on the demand side, there is also some evidence that changes in skills and task structures in employment may be driven by supply-

⁽¹⁰⁷⁾ Blinder, Alan, (2009), How Many US Jobs Might be Offshorable?, *World Economics*, 10, issue 2, p. 41-78.

⁽¹⁰⁸⁾ RBTC was first formulated by David H. Autor & Frank Levy & Richard J. Murnane, 2003. "The Skill Content of Recent Technological Change: An Empirical Exploration," *The Quarterly Journal of Economics*, Oxford University Press, vol. 118(4), pages 1279-1333. For a discussion of how technological transformations are shaping the European labour market see European Commission (2018), "Employment and Social Developments in Europe – Annual review 2018", Directorate-General for Employment, Social Affairs and Inclusion.

side changes.⁽¹⁰⁹⁾ Nevertheless, supply and demand changes are closely intertwined and it is difficult to disentangle their effects on polarisation. This issue merits further research.

The analysis was carried out at job level and looks at the task content of a specific occupation over time. It does not account for potential changes to the task content of specific occupations or jobs. As the literature suggests that the task content of jobs is also shifting towards less-routine tasks, the analysis may therefore underestimate the extent of the ‘de-routinisation’ shift.

II.3.2. The shift away from routine work in the euro area

This section follows the task-based approach to show the overall change to the task content of jobs in Member States.⁽¹¹⁰⁾ Graph II.6 shows that the EU as a whole has experienced a significant growth in non-routine cognitive tasks (high-skilled tasks) and a steep decline in routine tasks (middle-skilled tasks), while non-routine manual tasks (low-skilled tasks) remain constant. Thus, if the assumed correspondence between routine and skill content of jobs is correct, the euro area seems to be undergoing a process of upskilling rather than a true polarisation phenomenon.⁽¹¹¹⁾

Although almost all countries have experienced a steep decline in routine tasks, few countries have experienced a simultaneous growth in high- and low-skilled tasks (true polarisation). Only Belgium, Estonia, Finland, Ireland and to a lesser extent Italy seem to be experiencing a true polarisation process, based on changes to the task content of jobs. However, several countries have experienced an increase in high-skilled tasks relative to middle- and low-skilled tasks (upskilling).

⁽¹⁰⁹⁾ See Andrea Salvatori, 2018. "The anatomy of job polarisation in the UK," *Journal for Labour Market Research*, Springer Institute for Employment Research/ Institut für Arbeitsmarkt- und Berufsforschung (IAB), vol. 52(1), pages 1-15, December; Oesch, Daniel. (2013). *Occupational Change in Europe: How Technology and Education Transform the Job Structure*.

⁽¹¹⁰⁾ This section follows closely the methodology in Acemoglu, D. and D. Autor (2011), "Skills, Tasks and Technologies: Implications for Employment and Earnings", in *Handbook of Labor Economics*. See Box II.1 for more details on the methodology.

⁽¹¹¹⁾ There is one caveat to add on the interpretation of routine tasks as medium-skilled: while this may be (to some extent) arguable when it comes to routine cognitive tasks; empirical evidence presented in Acemoglu and Autor (2011: p.1080) find that manual tasks are monotonically decreasing with skills levels, and that this applies both to routine and non-routine manual tasks (for more evidence on this, see Figure 11 in Górká et al. (2017))

II.3.3. Offshoring in the euro area

In addition to the de-routinisation of the economy, another structural cause of job polarisation emphasised by the literature is offshoring, which results in routine activities moving to countries with lower labour costs.⁽¹¹²⁾

Technological progress, particularly information and communication technologies, has made it easier to outsource tasks previously performed by middle-skilled workers. In particular, jobs that require little face-to-face interaction, or other on-site requirements, are more at risk of outsourcing. As a result, offshoring has been shifting domestic labour demand towards non-routine occupations (both low-skilled and high-skilled) for the last three decades. However, while offshoring has contributed to relative employment gains among high-skilled and relative losses in middle-skilled workers, it has not been the main factor contributing to polarisation.⁽¹¹³⁾

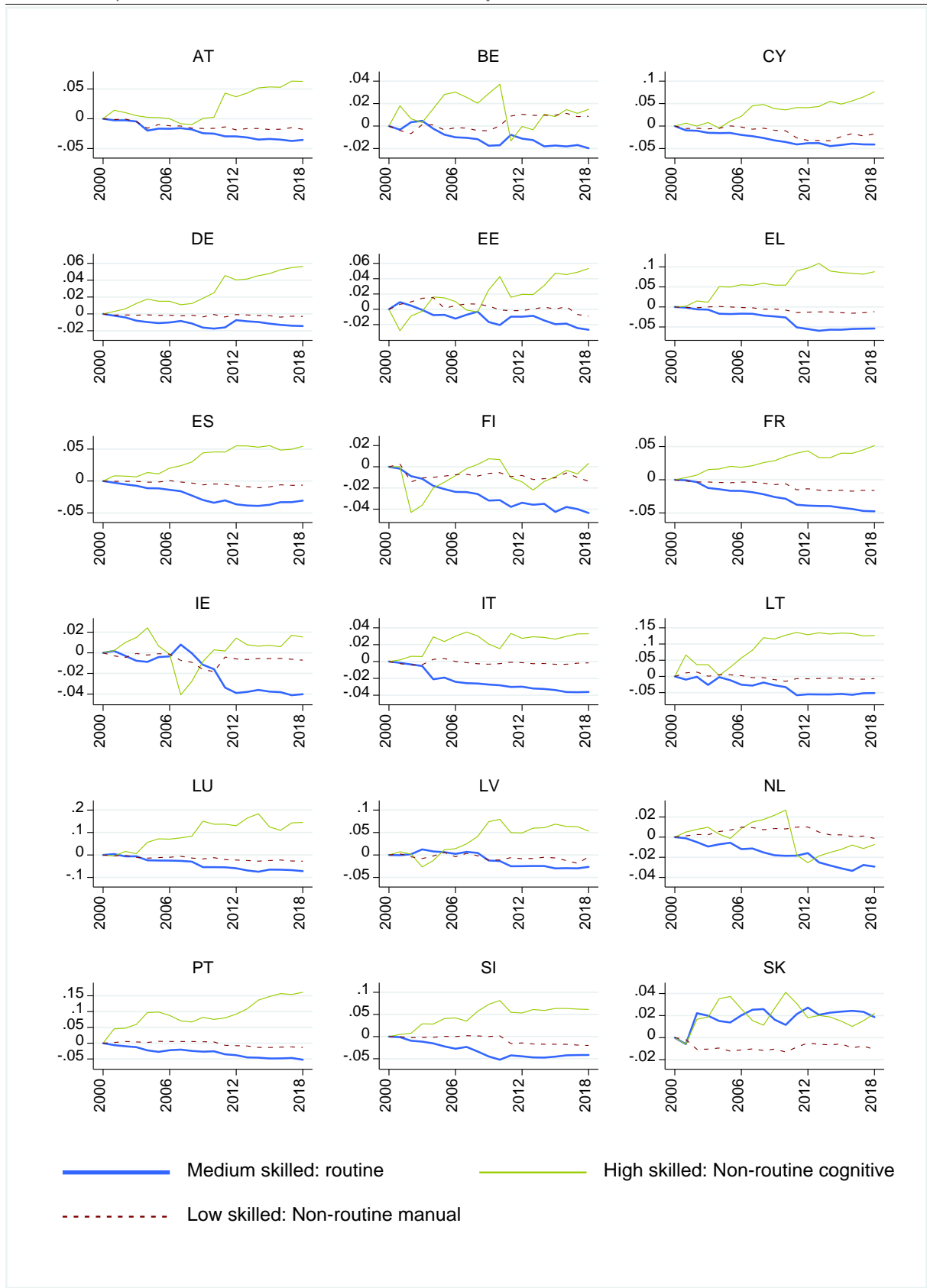
Offshoring is conceptually distinct from, though related to, the degree of routine work in a job.⁽¹¹⁴⁾ On the one hand, jobs that can be broken down into simple, routine tasks are likely to be easier to offshore than jobs requiring complex thinking, judgement, and human interaction. On the other hand, a wide range of complex tasks that involve high levels of skill and human judgement can also be offshored via telecommunication devices.

⁽¹¹²⁾ See Autor, David H., and David Dorn (2013). "The Growth of Low-Skill Service Jobs and the Polarization of the US Labor Market." *American Economic Review*, 103 (5): 1553-97; Autor, D.H., D. Dorn and G.H. Hanson (2015), "Untangling trade and technology: evidence from local labour markets", *The Economic Journal*, Vol. 125, No 584, pp. 621–46.

⁽¹¹³⁾ See Oldenski, L. (2014). Offshoring and the Polarization of the U.S. Labor Market. *ILR Review*, 67(3_suppl), 734–761; Goos, M., A. Manning and A. Salomon (2014), "Explaining job polarization: routine-biased technological change and offshoring", *American Economic Review*, Vol. 104, No 8, pp. 2509–26.

⁽¹¹⁴⁾ Blinder A.S., A. B. Krueger (2013) "Alternative Measures of Offshorability: A Survey Approach," *Journal of Labor Economics*, University of Chicago Press, vol. 31(S1), pages S97 - S128.

Graph II.6: Almost all countries have experienced a decline in routine tasks



(1) To make the results comparable the task indices were re-scaled to give an initial value of 0.

Source: Own calculations based on LFS and Occupational Information Network (O*net) data.

Box II.1: The task-based approach and classifying task content

Studies following this approach are typically based on the job skill measurements created by Acemoglu and Autor (2011). They combine occupational databases or workers' surveys as a source of information on the task content of occupations with country-specific labour force survey data to analyse changes in task content of jobs over time. Although few studies use workers' surveys like the OECD Program for the International Assessment of Adult Competencies (PIAAC) or the European Working Conditions Survey (EWCS), many authors use an occupational database, in particular the Occupational Information Network dataset (ONET). Both alternatives, workers' surveys and occupational databases, have advantages and disadvantages in inferring the task content of jobs and occupations. On the one hand, using workers' surveys enables the study of variability in task content within each occupation or job type. However, collecting information on tasks from workers does introduce a potential bias in measurement, since their answers may be subjectively biased or indeed wrong (dissatisfied workers may exaggerate the level of routine work in their jobs, or new recruits may not be able to answer). Furthermore, there can be inconsistencies in the classification of workers across occupational levels and sectors. On the other hand, the Occupational Information Network dataset (ONET) is generally rather detailed in its measuring task content. However, it is only available for the US and although the task content of occupations should (in principle) be roughly the same across similarly developed economies, certain institutional and socioeconomic factors differ across countries, which could have an impact on the results, even at the level of task content.

This section follows the standard approach of combining the Occupational Information Network (O*NET) database as a source of information on the task content of occupations with the EU Labour Force Survey (EU-LFS) to analyse changes in the task content of jobs over time. Using the Acemoglu and Autor (2011) methodology, it creates six categories of task content: non-routine cognitive analytical, non-routine cognitive interpersonal, routine cognitive, routine manual, non-routine manual physical and non-routine manual personal.⁽¹⁾ Each of these categories was created by adding up the standardised task items (listed in Table 1). They can be further classified into three broad groups: non-routine cognitive, routine and non-routine manual, which approximate the top, middle and lower ends of the labour market respectively. Lastly, we standardised the task content measurements over time using the survey weights for each country separately so that the task indices give the overall intensity in the use of each task by country and year.

Table 1 displays the six task indices, paired by skill level, corresponding tasks and an example of occupation that requires high levels of each index.

Skill level	Task content measure	Tasks	Example
High skilled: non-routine cognitive tasks	Non-routine cognitive analytical	Analysing data/information Thinking creatively Interpreting information for others	Mathematicians, Actuaries and Statisticians
	Non-routine cognitive interpersonal	Establishing and maintaining personal relationships Guiding, directing and motivating subordinates Coaching/developing others	Managing Directors and Chief Executives
Medium skilled: routine tasks	Routine cognitive	The importance of repeating the same tasks The importance of being exact or accurate Structured vs. unstructured work	Cashiers and ticket clerks
	Routine manual	Pace determined by the speed of equipment Controlling machines and processes Spending time making repetitive motions	Rubber, plastics and paper products machine operators
Low skilled: non-routine manual tasks	Non-routine manual physical	Operating vehicles, mechanized devices, or equipment Spending time using hands to handle, control or feel objects, tools or controls Manual dexterity Spatial orientation	Heavy truck and bus drivers
	Non-routine manual personal	Social Perceptiveness Face-to-face discussions Assisting and Caring for Others	Hairdressers, beauticians, and related workers

Source: Own classification based on Acemoglu and Autor (2011).

⁽¹⁾ The category of non-routine manual personal is not part of Acemoglu and Autor's 2011 handbook paper, but it is available in their online data programmes used for the paper.

II.3.4. Individual measurements tracking labour market polarisation, the shift away from routine work and offshoring

Studies of this phenomenon do not typically provide a single measurement to track polarisation. An exception is the Job Polarisation Index (JPI).⁽¹¹⁵⁾ The JPI tracks what it classes as “medium-level” jobs and measures what can be called imbalanced polarisation. The index tracks higher polarisation when and if the proportion of “medium-level” jobs, relative to its average in previous years, falls (and vice versa). The index also registers changes in the proportion of medium-level jobs that come about in a very imbalanced manner, e.g. if there is a major change to either low- or high-level jobs. Such imbalances would inflate the JPI.

This JPI comprises two measurements. The first tracks growth in the share of “low-level” and “high-level” jobs (the outflow from medium-level jobs). The second tracks the degree of imbalance, which rises as the change in the proportions of low and high level jobs increases relative to each other:

$$JPI = \frac{1}{2} \times (\overline{\Delta_2 l} + \overline{\Delta_2 h}) \times (1 + |\overline{\Delta_2 l} - \overline{\Delta_2 h}|) \times 100$$

$\Delta_2 l$ and $\Delta_2 h$ are the change in the proportion of low-level and high-level jobs in year t compared with the average level of the previous two years. Hence, the value of the index is zero if the proportion of medium-level jobs has not changed from its reference value. The JPI distinguishes two situations where the share of medium-level jobs declines in both:

1. True polarisation: the proportion of both low-level and high-level jobs increases (first bracket);
2. Skills or wage upgrading: only the proportion of high-level jobs increases (second bracket).

The equivalent task-based single measurement of polarisation is the Routine Task Intensity Index (RTI), which is considered the best way to capture the impact of recent technological progress. The

RTI index has become the standard measurement to track the task content of occupations.⁽¹¹⁶⁾ Routine tasks consist of a repeated sequence of actions and are more easily replaceable by technological innovations. A higher RTI score thus indicates that an occupation is more ‘routine-task intensive’ and thus can more readily be automated. The RTI is calculated for each occupation as a relative intensity of routine tasks.⁽¹¹⁷⁾ It is defined as the difference between the intensity of routine tasks (medium skill) and the intensity of non-routine tasks (analytical and personal):

$$RTI = \ln(rcog + rman) - \ln(nranalytical + nrpersonal)$$

Lastly, measurements tracking offshoring potential can vary widely and there is no consensus on the ideal measurement.⁽¹¹⁸⁾ To investigate the impact of offshoring on skills mismatches, this section uses one of the standard measurements used in literature.⁽¹¹⁹⁾

Table II.1 illustrates the link between these three measurements relate in the euro area, with one direct measurement of polarisation (JPI index) and two measurements tracking the causes (RTI and offshoring indices). Overall, there seems to be a negative link between JPI and RTI indices, but a positive link between JPI and offshoring indices.

Table II.1: Correlations between JPI, RTI and offshoring indices

	JPI	RTI	Offshorability
JPI	1		
RTI	-0.1107*	1	
Offshorability	0.1625*	-0.0395	1

Source: Own calculations based on EU-LFS and O*net

⁽¹¹⁵⁾ This section follows the index developed by Sparreboom, T., A. Tarvid (2016), Imbalanced Job Polarization and Skills Mismatch in Europe, Journal for Labour Market Research, 49, issue 1, p. 15-42. However, it applies the index to occupational groups classified by pay level instead of by skill level.

⁽¹¹⁶⁾ Goos, M., A. Manning and A. Salomon (2014), “Explaining job polarization: routine-biased technological change and offshoring”, *American Economic Review*, Vol. 104, No 8, pp. 2509–26.

⁽¹¹⁷⁾ See Autor, David H., and David Dorn (2013). “The Growth of Low-Skill Service Jobs and the Polarization of the US Labor Market.” *American Economic Review*, 103 (5): 1553-97.

⁽¹¹⁸⁾ See for example, Blinder A.S., A. B. Krueger (2013) “Alternative Measures of Offshorability: A Survey Approach,” *Journal of Labor Economics*, University of Chicago Press, vol. 31(S1), pages S97 - S128. Firpo, Sergio & Fortin, Nicole M. & Lemieux, Thomas, 2011. “Occupational Tasks and Changes in the Wage Structure,” IZA Discussion Papers 5542, Institute of Labor Economics (IZA).

⁽¹¹⁹⁾ In particular this section applies the measurement of offshorability created by Acemoglu, D. and D. Autor (2011), “Skills, Tasks and Technologies: Implications for Employment and Earnings”, in *Handbook of Labor Economics*, to the EU-LFS data set using the same methodology as for the RTI.

Box 11.2: Empirical analysis: The link between macroeconomic skill mismatches and structural change in labour demand

The empirical model to study the links between macroeconomic skill mismatches and structural change in labour demand in the euro area is based on a fixed-effects panel regression to control for unobservable country-specific factors. It is estimated for each structural change-related measurement (JPI, RTI and offshoring indices), according to the following formula:

$$SMM_{it} = u_{it} + \alpha_1 P_{it} + \beta C_{it} + \varepsilon_{it} \quad (1)$$

Whereby:

SMM_{it} is the macroeconomic skill mismatch indicator during the period $t \in T$ in country $i \in C$, where C is the set of countries and $T = \{2012, \dots, 2018\}$;

α_1 is the estimated coefficient for the structural change-related measure (P);

P_{it} is one of the individual measurements of polarisation, routine task intensity or offshoring in country i and time t ;

β is a vector of the estimated coefficients for the control variables (C);

C_{it} is a vector of controls in country i and time t ;

u_{it} is the unknown intercept for each country i .

ε_{it} is the error term for country i and time t .

Variables used in the analysis:

- JPI, RTI and offshoring indices
- Unemployment rate
- GDP per capita, in log.
- Ageing is captured by the average age of the workforce.

To delve further into factors driving change in macroeconomic skill mismatches, the contributions made by selected explanatory variables to the total change in the macroeconomic skill mismatch indicator between 2002 and 2018 are estimated. Given C is the set of countries, the change in skill mismatch indicator may be approximated by the formula below:

$$\forall_{i \in C} S_i^{2018} - S_i^{2002} \approx \widehat{\beta}_1 \Delta U_i + \widehat{\beta}_2 \Delta G_i + \widehat{\beta}_4 \Delta A_i + \widehat{\beta}_5 \Delta R_i \quad (2)$$

Whereby:

S_i^{2018} and S_i^{2002} are the macroeconomic skill mismatch indicators in 2018 and 2002, respectively;

$\widehat{\beta}_k$ are the estimated coefficients for independent variables ($k=1,2,3$) from equation 1;

ΔU_i is the change in unemployment rate in country i between 2002 and 2018;

ΔG_i is the change in log of GDP per capita in country i between 2002 and 2018;

ΔA_i is the change in the average age of the workforce in country i between 2002 and 2018;

ΔR_i is the change in the routine task intensity index in country i between 2002 and 2018.

II.4. Macroeconomic skills mismatch and structural change in labour demand

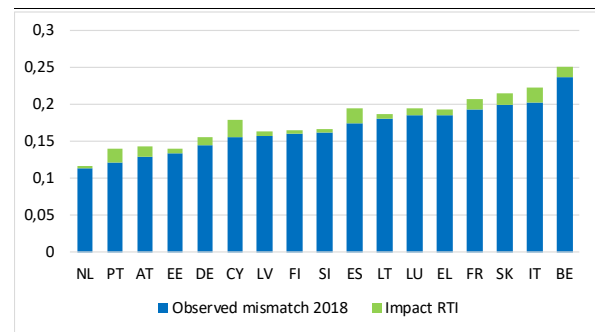
To formally test the link between structural change in employment and skills mismatches, this section analyses the impact of different structural change-related measurements on the macroeconomic skills mismatches indicator (Table II.2).⁽¹²⁰⁾ Of the three measurements, only the RTI index seems to have a significant and negative link with skills mismatches in the euro area. This means that an increasing shift away from routine jobs is associated with an increase in skills mismatches. Technological change increases polarisation by reducing routine jobs, and this is associated with an increase in macroeconomic skills mismatches. Routine jobs are also more cyclical than non-routine jobs, which reinforces the correlation between both measurements (during an economic uptick, the skills mismatch will fall while routine jobs increase).⁽¹²¹⁾

To better explain the impact of technology-driven changes in employment structures, Graph II.7 plots the current level of skills mismatches and the predicted impact of a process of shifting away from routine work that would bring the degree of routine work in all euro-area Member States to the level currently observed in Ireland, which is the country with the lowest level of RTI in the euro area. The graph suggests that, with the exception of the Netherlands, which has a structure of employment similar to that of Ireland, most Member States would experience a rise in skills mismatches, as there is room for a further shift away from routine work. However, climate change policies might mitigate this process by adding middle-skilled, middle-income jobs.⁽¹²²⁾

Table II.2 and graph II.8 suggest that the declining share of routine tasks in jobs has been associated with an increase in macroeconomic skills mismatches. Due to technological change, the skills demand is shifting towards higher skills and qualifications. In addition, there is increasing demand for highly educated workers, even in low-income jobs, and this demand might not be met fully and immediately by the skills available on the

labour market, as it takes time for the education system and for adult learning to adapt. This is more apparent in middle-income countries, while in high-income countries, the increase in the supply of high-skill workers may have helped mitigate the effects of changes to the highest skills content in jobs.

Graph II.7: Current and predicted macroeconomic skills mismatches if countries reach the level of shift away from routine work seen in Ireland



Source: Own calculations using LFS and O*net data.

The impact of this shift away from routine work (measured by RTI) on skills mismatches seems to be greater in middle-income Member States (Table II.2).⁽¹²³⁾ Fast-changing technology accelerates the demand for different skills and creates mismatches unless supply keeps step. At the same time, technology replaces more routine jobs and makes it easier to outsource middle-skilled ones. Lastly, an ongoing process is taking place, in which employment is shifting from sectors with more routine-intensive jobs (e.g. manufacturing) to sectors with less-routine-based jobs (e.g. services), particularly in middle-income countries as high-income countries have largely completed this process. As a result, the shift away from routine work in middle-income countries might be faster and more intense, potentially increasing the skills mismatches as labour supply in these countries might find it more difficult to meet the fast-changing labour demand.

Graph II.8 shows how selected variables contributed to the total change in the macroeconomic skill mismatch indicator between 2002-2018. Though the shift away from routine work in the economy and the increasing age of the workforce were set to increase skill mismatches,

⁽¹²⁰⁾ See Box II.2 for details on the empirical strategy.

⁽¹²¹⁾ C.L., Ryan, R.W. (2014) Labour market polarization over the business cycle. NBER Macroeconomics Annual, 29: 371-413.

⁽¹²²⁾ European Commission (2019), "Employment and Social Developments in Europe – Annual review 2019", Directorate-General for Employment, Social Affairs and Inclusion.

⁽¹²³⁾ Middle-income countries are defined as those with a GDP per capita that is below the EU average.

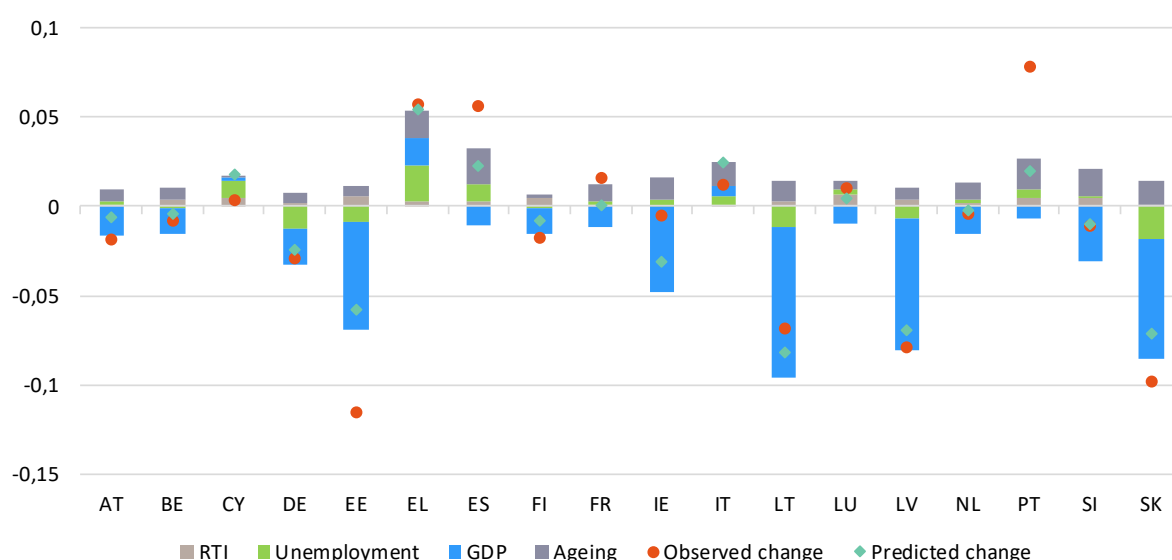
Table II.2: **Determinants of macroeconomic skills mismatches in the euro area, 2000-2018**

VARIABLES	Euro area			High-income countries			Middle-income countries		
	JPI	Off-shorability	RTI	JPI	Off-shorability	RTI	JPI	Off-shorability	RTI
Structural change measure	0.0002 (0.0015)	-0.1672 (0.1112)	-0.0727*** (0.0193)	0.0009 (0.0012)	-0.0472 (0.0859)	-0.0522*** (0.0173)	0.0004 (0.0027)	-0.3325 (0.2016)	-0.0902*** (0.0302)
Unemployment rate	0.0016*** (0.0004)	0.0020*** (0.0004)	0.0017*** (0.0003)	0.0024*** (0.0005)	0.0029*** (0.0005)	0.0027*** (0.0004)	0.0013** (0.0005)	0.0020*** (0.0005)	0.0015*** (0.0005)
Ingdp	-0.1203*** (0.0117)	-0.1037*** (0.0120)	-0.1190*** (0.0112)	-0.0570*** (0.0179)	-0.0372** (0.0174)	-0.0456*** (0.0168)	-0.1312*** (0.0162)	-0.1097*** (0.0168)	-0.1334*** (0.0150)
Average age of the workforce	0.0076*** (0.0019)	0.0071*** (0.0018)	0.0088*** (0.0018)	0.0041 (0.0026)	0.0013 (0.0025)	0.0032 (0.0025)	0.0076*** (0.0028)	0.0073*** (0.0025)	0.0093*** (0.0025)
Observations	310	321	321	136	141	141	174	180	180
R-squared	0.5490	0.5449	0.5624	0.4094	0.3808	0.4204	0.5759	0.5789	0.5938
Countries	18	18	18	8	8	8	10	10	10
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

(1) Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Source: Own calculations using LFS, O*net and AMECO.

Graph II.8: **Breakdown of changes in macroeconomic skills mismatches, 2002-2018**



Source: Own calculations based on LFS and O*net

these changes were compensated by other factors. In particular, the rise or fall in macroeconomic skill mismatches was largely driven by changes in the general economic conditions, particularly in middle-income Member States. General economic conditions are measured here by unemployment and GDP per capita.

II.5. Conclusions

This section examines the changes as well as the relationship between the well-documented process of structural change in labour demand and skills mismatches. It looks at multiple concepts and measurements of skills mismatches and structural change. The analysis yields a number of interesting results and new insights. Firstly, the level of skills mismatches fell during the recovery but there are

significant differences across euro area Member States in both the level and the trend over time. Structural change in labour demand is also evident in most countries going through a process of shifting away from routine work and of decline in the share of middle-income occupations.

Current euro-area labour market trends hinder the process of reducing skills mismatches. Labour demand for skills is shifting towards higher skills and qualifications. Fast-changing technology is accelerating the demand for different skills, particularly more complex skills that can complement technology. At the same time, technology is replacing more routine work and makes it easier to outsource middle-skilled jobs. Results suggest that the declining share of routine

tasks in jobs is linked to an increase in macroeconomic skills mismatches.

Although most Member States are exposed to the impact of the shift away from routine work and offshoring on skills mismatches, middle-income countries are more at risk. First, the shift away from routine work in middle-income countries might be more intense as they have more routine employment structures, potentially leading to more skills mismatches. Moreover, although in the short-term, certain middle-income countries may potentially benefit from job creation in routine occupations outsourced from high-income Member States, this will leave these countries more vulnerable to technology displacing routine work. Lastly, middle-income countries might find it more difficult to meet the fast-changing labour demand for more complex skills, as it takes time to upskill their workforces.

A policy response to address the consequences of this structural transformation can help reduce skills mismatches, increase productivity and improve the overall performance of labour markets. Hence, countries should put in place a comprehensive package of policies covering skills, lifelong learning, labour markets, social protection, as well as research and innovation.

As technology advances, and given the importance of certain jobs in the labour market, governments will need to promote flexibility and labour mobility as well as invest in education and training. This could enable workers to change jobs or even occupation, equipping them to be able to seize new opportunities and reduce the risk of job loss.

COVID-19 effects are further exposing these trends and will likely spur digital transformation of work and the workplace. Hence, in the current context, it is even more important that policy makers adopt appropriate policy strategies and options to help mitigate the impact of the postcrisis structural changes. In this regard, the Commission recently launched the Recovery and Resilience Facility and the new Skills Agenda, which should become key tools to facilitate the adaptation of education and training systems to support digital skills as well as to foster educational and vocational training for all ages.

III. Taking stock of implicit pension liabilities

By Ben Deboeck and Per Eckefeldt

The vast majority of public pension schemes in the euro area have a pay-as-you-go set-up and are therefore unfunded by design, with current contributions being used to pay current benefits. Implicit pension liabilities (IPL) measure governments' long-term commitments. While IPL and conventional, explicit government debt differ significantly, in some situations the implicit liabilities can convert into explicit debt. This is the case when structural shortfalls arise within the pension system, which require financing. Accrued-to-date gross IPL estimates will yield large, positive values for all countries with pay-as-you-go systems – even those with perfectly balanced schemes. Accrued-to-date IPL are therefore not a measure of fiscal sustainability. In contrast, net IPL estimates that include both future rights and contributions to the scheme are better suited for sustainability analysis. We calculate both gross and net IPL estimates under such open system approach based on the long-term projections of the Ageing Report. The net variant provides insights into the extent to which pension systems can be considered underfunded given current policies. The analysis of IPL can help identify the future cost of current pension policies as well as the impact of pension reforms. They can also complement conventional debt and deficit measures, provided such analysis is part of a comprehensive fiscal sustainability assessment.

III.1. Introduction

The vast majority of public pension schemes in the euro area have a pay-as-you-go set-up and are therefore unfunded by design, with current contributions being used to pay current benefits. Working households accrue pension rights, but also pay contributions, allowing authorities to redeem their liabilities to retirees. As a result - and in contrast with a typical private pension scheme - no assets are accumulated within public pension schemes.

Contrary to government debt, there are generally no explicit legal or contractual obligations linked to public pension schemes. There are nevertheless strong societal expectations that accrued rights will be redeemed, based on the 'social contract' underlying public pensions⁽¹²⁴⁾. Therefore, unfunded pension liabilities are referred to as 'implicit pension liabilities' (IPL). Other differences with conventional debt are discussed in Section III.2.

As highlighted by Franco (1995), there is nothing inherently negative in the existence of unfunded pension liabilities⁽¹²⁵⁾. The matter should rather be judged in terms of the efficiency of pay-as-you-go schemes and their role in achieving society's equity objectives. However, the transient effect of retiring baby boomers between around 2010 and 2030

results in a strong influx into retirement that is not compensated by concurrent labour market inflows. This comes on top of the structural effect of rising longevity. Outlays will therefore overtake contributions in many Member States, putting public finances under pressure as governments have to make up for the shortfall, either through offsetting measures or by incurring higher debt. In the latter case, the rise in explicit government debt mirrors a gradual decrease in the IPL linked to past pension promises to generations that enter retirement.

IPL are calculated as the present value of pensions to be paid in future. They therefore represent the actuarial stock equivalent of the flow of pension benefits that will ensue in future. This underscores the importance of the discount rate assumption. Different concepts of IPL exist, depending on which rights are considered. The most restrictive concept measures all rights accrued up to a given point (accrued-to-date liabilities). In the broadest approach (open system liabilities), both current and future rights are included. Section III.2 discusses the different concepts and how they should be interpreted, as well as the methodological limitations of the IPL concept.

Until recently, there was no structured reporting of unfunded (or underfunded) pension liabilities in standard national accounts. Indeed, under the European System of Accounts of 1995 (ESA 95) only the obligations of funded pension schemes were considered to create liabilities for the employer and social security. This changed with the latest system (ESA 2010) which introduced an enhanced statistical reporting on pensions. Data

⁽¹²⁴⁾ Brixi, H.P. and A. Schick (ed.) (2002), 'Government at risk: contingent liabilities and fiscal risk', World Bank.

⁽¹²⁵⁾ Franco, D. (1995), 'Pension Liabilities – Their Use and Misuse in the Assessment of Fiscal Policies', DG ECFIN, Economic Papers No 110.

reporting by the Member States now covers all accrued-to-date employment-related pension liabilities, irrespective of whether they are funded or not, thus providing comparable data on unfunded general government pension schemes. Section III.3 discusses the results of the first data transmission, while Section III.4 presents IPL estimates for the open system based on the long-term pension projections in the 2018 Ageing Report.

III.2. IPL: concepts, relation to government debt and use for fiscal sustainability analysis

The concept of implicit pension liabilities (IPL) is not new, though it sometimes goes by different names, being also referred to as ‘implicit pension debt’ or ‘social debt’. In this paper, we will consequently refer to implicit pension *liabilities* to avoid confusion with explicit public *debt* (see below). Also ‘pension wealth’ and ‘social security wealth’⁽¹²⁶⁾ have been used when approaching the matter from a microeconomic point of view, namely the impact of anticipated future entitlements on individuals’ decisions on retirement and personal savings. In this sense it should be pointed out that ‘rights’ and ‘obligations’ as well as ‘entitlements’ and ‘liabilities’ can be used interchangeably as they reflect two sides of the same coin: the point of view of the household sector versus that of the government sector.

Estimates for individual countries were presented in Feldstein (1974) and Bohn (1992) for the US, in Hills (1984) for the UK and in Castellino (1985), Pench (1993) and Beltrametti (1993, 1994) for Italy⁽¹²⁷⁾. IPL estimates for broader sets of

countries were first done in Hagemann and Nicoletti (1989), van den Noord and Herd (1993) and Kuné et al. (1993)⁽¹²⁸⁾. Later estimates include Chand and Jaeger (1996), Kane and Palacios (1996), Frederiksen (2001) and Holzmann et al. (2004)⁽¹²⁹⁾.

As discussed in Franco et al. (2006), the estimates in these studies vary considerably as a result of different methodological approaches, databases and reference years⁽¹³⁰⁾. As a result, comparisons are not obvious. Estimates also vary because, for practical reasons, little attention was paid to complex country-specific pension designs such as statutory and early retirement ages, accrual rates or special arrangements for civil servants.

III.2.1. The different approaches for measuring implicit pension liabilities

The literature commonly distinguishes between three IPL concepts (Castellino, 1985; Franco, 1995): (i) accrued-to-date liabilities, (ii) closed system liabilities and (iii) open system liabilities. All three approaches include the liabilities that correspond to hitherto accrued pension rights, be it by pensioners or by current workers. The distinction between the concepts stems from the degree to which calculations include rights that will accrue in the future.

The literature commonly distinguishes between three IPL concepts (Castellino, 1985; Franco, 1995): (i) accrued-to-date liabilities; (ii) closed system liabilities; and (iii) open system liabilities. All three approaches include the liabilities that correspond to pension rights accrued up to that

⁽¹²⁶⁾ ‘Social security wealth’ (Feldstein, 1974) refers to the United States, as the federal public pension scheme is known as *Social Security*, a term that has a broader meaning in Europe.

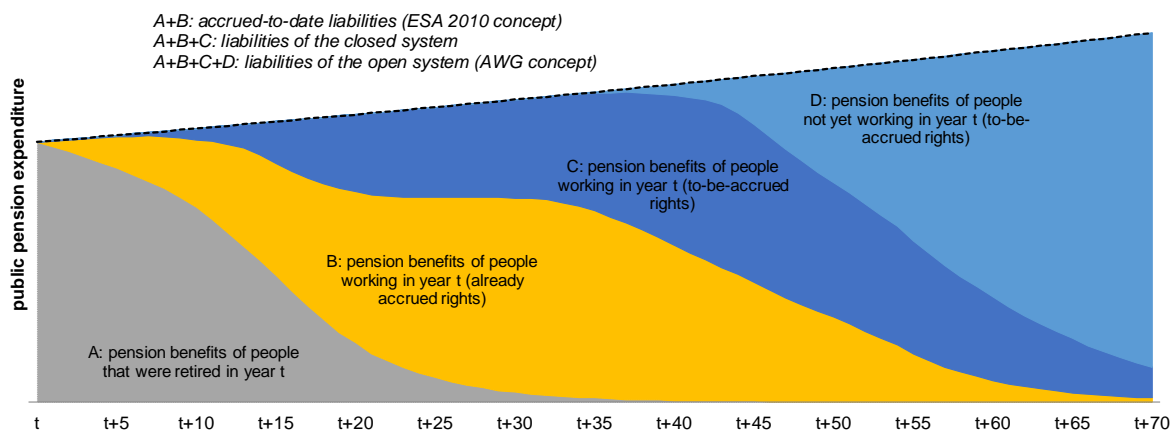
⁽¹²⁷⁾ Feldstein, M. (1974), ‘Social Security, Induced Retirement, and Aggregate Capital Accumulation’, *Journal of Political Economy*, September-October. Bohn, H. (1992), ‘Budget deficits and government accounting’, *Carnegie-Rochester Conference Series on Public Policy*, Vol. 37, pp. 1-84. Hills, J. (1984), ‘What is the Public Sector Worth?’, *Fiscal Studies*, Vol. 5, No. 1, pp. 18-31. Castellino, O. (1985), ‘C’e un secondo debito pubblico (piu grande del primo)?’, *Moneta e credito*, No. 149. Pench, L. (1993), ‘Debt, deficits and fiscal adjustment’ in ‘The economic and financial situation of Italy’, European Commission DG ECFIN, European Economy, Reports and Studies, No. 1. Beltrametti, L. (1993), ‘Una stima della ricchezza pensionistica per l’Italia (1951-1991)’, *Rivista internazionale di scienze sociali*, No. 1, pp. 3-15. Beltrametti, L. (1994), ‘Su alcuni effetti redistributivi della riforma del sistema previdenziale’, in Rossi, N. (ed.), ‘Una transizione equa, 1992-1993.’ Secondo rapporto CNEL sulla distribuzione e redistribuzione del reddito in Italia, Il Mulino.

⁽¹²⁸⁾ Hagemann, R. P. and G. Nicoletti (1989), ‘Ageing populations: economic effects and implications for public finance’, OECD Department of Economics and Statistics, Working Paper No. 61. van den Noord, P. and R. Herd (1993), ‘Pension liabilities in the seven major economies’, OECD Economics Department Working Papers, No. 142. Kuné, J., Petit, W. and A. Pinxt (1993), ‘The hidden liabilities of basic pension systems in the European Community’, CEPS Working Document, No. 80.

⁽¹²⁹⁾ Chand, S. and A. Jaeger (1996), ‘Aging populations and public pension schemes’, International Monetary Fund, Occasional Paper, No. 147. Kane, C. and R. Palacios (1996), ‘The implicit pension debt’, IMF, Finance & Development, June 1996. Frederiksen, N. K. (2001), ‘Fiscal sustainability in the OECD. A simple method and some preliminary results’, Finansministeriet, Working Paper 3/2001. Holzmann, R., Palacios, R. and A. Zvinienė (2004), ‘Implicit Pension Debt: Issues, Measurement and Scope in International Perspective’, World Bank, Social Protection Discussion Paper Series, No. 403.

⁽¹³⁰⁾ Franco, D., Marino, M. R. and S. Zotteri (2006), ‘Pension Expenditure Projections, Pension Liabilities and European Union Fiscal Rules’, *SSRN Electronic Journal*.

Graph III.1: IPL concepts



Abstraction is made of the possibility of partial retirement.

Source: Based on Eurostat (2012), 'Technical Compilation Guide for Pension Data in National Accounts (2011 edition)'.

point, be it by pensioners or by current workers. The distinction between the concepts stems from the degree to which calculations include rights that will accrue in the future.

Graph III.1 visualises the different (gross) concepts and how they relate to each other. In this graph, which assumes that total public pension expenditure will rise over time, pension benefits are divided over different population groups in function of their current status. The IPL estimate results from discounting the considered payment flows to the base year.

The graph demonstrates that the magnitude of IPL depends on the age distribution of the population: an older population implies there is a higher share of pensioners and workers close to retirement, and therefore a higher present value of accrued rights. Other determinants are the maturity of the system, the average benefit level, benefit indexation and the applied discount rate.

Accrued-to-date liabilities

'Accrued-to-date liabilities' (ADL) represent the present value of future pension benefits that result from rights accrued until the base year. The payment streams associated with those rights can be split into pensions of current retirees and those that will have to be paid to current workers on the basis of already accumulated rights. Rights accrued after the base year are therefore not considered. The ADL concept corresponds to the discounted value of areas A and B in Graph III.1. This is the approach under ESA 2010, as national accounts apply an accounting perspective: pension

entitlements accrued by the end of a reporting period (see Section III.3).

ADL can be interpreted as a 'termination liability' (Holzmann et al., 2004) in the sense that it provides a measurement of the budgetary cost of a termination of the public scheme, assuming authorities do not renege on accrued entitlements. ADL then represent the compensation pensioners and workers are entitled to. This would be the case when switching from a pay-as-you-go defined benefit scheme to a funded defined contribution scheme with workers' contributions fully paid into the new system from that point forward. Authorities would then have to finance the shortfall in the old scheme until the last retiree dies. In the absence of expenditure cuts or new revenues, the implicit liabilities of the old scheme are therefore gradually converted into explicit government debt. Alternatively, the scheme could be closed with immediate effective with all entitlements bought off upfront. In that case, there would be a one-off hike in government debt corresponding to the present value of all future entitlements, i.e. the ADL estimate.

In practice, however, the implicit liabilities incurred by mature public schemes will be so large that the instant shift to a fully funded system is not conceivable given the fiscal impact of such an operation. As a result, privatisations of public pension systems have occurred more gradually with part of workers' pension contributions diverted to the new second tier plans.

This is what several Member States did in recent decades: partly replacing the pay-as-you-go

schemes by usually mandatory, fully funded schemes⁽¹³¹⁾. In such cases, there is a transitional cost (equal to the decline in ADL, which is being ‘paid off’) until all retirees draw a pension from both pillars and balance in the public pillar is restored. Crucially, in most Member States, the size and the financing of the transitional costs of diverting part of the contributions to funded individual accounts did not play a major role in the public debate preceding the push for privatisation. As a result, the fiscal burdens associated with the reforms were generally ignored (OECD, 2003)⁽¹³²⁾.

For Hungary, a non-euro area country, Rocha and Vittas (2001) estimated the expected annual shortfall at an initial 0.8% of GDP, growing to 1.4% after 30 years. Conversely, the authors reckoned that after a decrease in the accrued-to-date IPL of the Hungarian state of 9 percentage points (pps) of GDP in 1997, it would rise to 40 pps of GDP in 2030⁽¹³³⁾. At the end of 2010, following annual transfers of between 1% and 1.4% of GDP to the social security system in 2005-2010 (Bielawska et al., 2017), Hungary decided to close the private pillar to new entrants and to appropriate the savings on most individual balances, virtually ending the private pillar (Mesa-Lago, 2014)⁽¹³⁴⁾. As a result, transitional costs in the form of transfers to the social security system fell to zero as of 2011 (Bielawska et al., 2017). Around 90% of the assets under management – representing about 11% of Hungarian GDP – were transferred to the central budget and used to reduce government debt. Freudenberg et al. (2016) estimated the ADL of the Hungarian state at 252% of GDP in 2010 before the return to the mono

pillar system⁽¹³⁵⁾. The switchback led to an increase in ADL by 13 pps of GDP.

The experience of the Central and Eastern European Member States shows that these transitional costs can be sizeable. It also shows that even though pension liabilities might be only implicit, they are very real - see Carone et al. (2016) for an overview of pension reforms in EU Member States⁽¹³⁶⁾. To cater for the budgetary impact of introducing ‘a multi-pillar system that includes a mandatory, fully funded pillar’, the 2005 revision of the Stability and Growth Pact included the stipulation that due consideration must be given to transition costs linked to pension reforms when assessing compliance with the deficit and debt criterion in the corrective arm of the pact. Under the preventive arm, Member States are allowed to temporarily deviate from their medium-term budgetary objective (MTO) or the adjustment towards it to take such adjustment costs into account⁽¹³⁷⁾.

The ADL approach to IPL is a gross concept given that, under the pay-as-you-go set-up, there usually are no assets as current scheme members’ past contributions were effectively used to pay for past pension benefits. Accrued-to-date assets are therefore zero. The exception in the euro area is Finland, whose defined benefit system is partly pre-financed. The pre-funded scheme covers about a quarter of earnings-related pension outlays in the private sector, the remainder being classic pay-as-you-go systems. Pension assets represented between 84% and 91% of GDP in 2014-2019 (see Section III.3). In Sweden, the fully funded defined contribution pension component is statistically classified as households’ savings and therefore falls outside the government sector⁽¹³⁸⁾.

⁽¹³¹⁾ This was the case in Hungary and Sweden (1998), Poland (1999), Latvia (2001), Bulgaria, Croatia and Estonia (2002), Lithuania (2004), Slovakia (2005), Romania (2008) and the Czech Republic (2013) with Slovenia being the only exception among the 11 Central and Eastern European countries that joined the EU since 2004.

⁽¹³²⁾ OECD (2003), ‘Reforming Public Pensions – sharing the experiences of transition and OECD countries’.

⁽¹³³⁾ Rocha, R. and D. Vittas (2001), ‘Pension reform in Hungary: A preliminary assessment’, World Bank, Policy Research Working Paper, No. 2631. The impact of other reform measures than the creation of the mandatory second pillar (e.g. increase in retirement ages and less favourable indexation rules) is not included in these numbers. The authors estimated the impact of those reforms on ADL at -68 pps. of GDP in 1997 and -124 pps. of GDP in 2030.

⁽¹³⁴⁾ Bielawska, K., Chłoi-Domińczak, A. and D. Stańko (2017), ‘Retreat from mandatory pension funds in countries of the Eastern and Central Europe in result of financial and fiscal crisis: causes, effects and recommendations for fiscal rules’, MPRA. Mesa-Lago, C. (2014), ‘Reversing pension privatization: the experience of Argentina, Bolivia, Chile and Hungary’, ESS Working Paper No. 44, International Labour Organization.

⁽¹³⁵⁾ Freudenberg, C., Berki, T. and A. Reiff (2016), ‘A Long-Term Evaluation of Recent Hungarian Pension Reforms’, MNB Working Paper 2016/2.

⁽¹³⁶⁾ Carone, G., Eckefeldt, P., Giamboni, L., Laine, V. and S. Pamies Sumner (2016), ‘Pension Reforms in the EU since the early 2000’s: Achievements and Challenges Ahead’, European Economy, Discussion Paper 42.

⁽¹³⁷⁾ See European Commission (2019), Vade Mecum on the Stability & Growth Pact (2019 edition), DG ECFIN, European Economy Institutional Paper No. 101. Thus far, Latvia and Lithuania have made use of the ‘pension reform clause’ in the Stability and Growth Pact.

⁽¹³⁸⁾ See country fiches of the 2018 Ageing Report, https://ec.europa.eu/info/publications/economy-finance/2018-ageing-report-economic-and-budgetary-projections-eu-member-states-2016-2070_en.

A particular, simplified method that allows ADL to be calculated for large subsets of countries with limited data availability is the ‘Freiburg model’. This model is based on a reduced version of the generational accounting methodology (Auerbach et al., 1994)⁽¹³⁹⁾. The model is restricted to public pension schemes and looks only at the generations included in the group of current pensioners and current contributors (Heidler et al., 2009)⁽¹⁴⁰⁾. Approaching IPL through the spectre of generational accounting provides a picture of the pension system’s intergeneration equity.

The closed system

The ‘**closed group**’ or ‘**closed system**’ concept⁽¹⁴¹⁾ defines IPL as the sum of all liabilities accrued up to that point and those that will be accrued in the future by *current workers*. Under this approach, the pension system is closed to new entrants and assumed to remain operational until the last current contributor dies. This constitutes a phasing-out of the current scheme over several decades.

The closed system is a broader concept than ADL and therefore results in a higher IPL estimate, given that current workers’ future pension rights are also included. The closed group approach corresponds to the benefits in areas A, B and C in Graph III.1. Beltrametti (1994) used the closed system to assess the impact of the 1992 Amato reform on Italy’s IPL. He estimated that in 1992, IPL decreased from 389% of GDP before the reform to 278% afterwards.

Considering that the closed group approach includes rights to be accrued in future, a net estimate can also be made. In this case, both future rights and contributions of current scheme members are considered, resulting in the net present value of future cash flows. This would correspond to what Feldstein (1974) called ‘net social security wealth’. Net implicit liabilities under the closed system concept could, for example, provide insights should the existing defined benefit

pension scheme be maintained for current workers, with new workers being obliged to switch to a notional defined contribution scheme designed to ensure actuarial neutrality. Net liability estimates would then give an idea of the size of the gap in the current system that would need to be covered by transfers from the general government budget.

The open system

The third and most comprehensive IPL concept is the ‘**open system**’ approach. It extends the current pension scheme to new entrants, including workers still to be born. In Graph III.1, liabilities under the open system concept equal the discounted value of areas A, B, C and D, i.e. all future benefits. While applying an infinite time horizon will provide the most complete estimate, the time period may need to be limited to several decades, due to the absence of very long-term projections and the uncertainty that surrounds such exercises. Moreover, the present value of rights claimable within 50 years or more should be limited.

Open system liabilities can also be estimated in net terms, thus deducting the present value of all future contributions. A positive net IPL would therefore signal future deficits in the public pension scheme and reveal a need for policy change, unless the public pension fund is big enough to cover the shortfalls (EP, 2011)⁽¹⁴²⁾. Section III.4 discusses estimates for the open system, both gross and net, based on the projections prepared by the Ageing Working Group for the triennial Ageing Report.

The above shows that there is no single best definition of implicit liabilities. The most suitable approach will depend on what one wants to analyse. In the case of moving from an unfunded to a funded pension system, the ADL (if only current rights are affected) or the closed system definition are the most relevant, as discussed above. The open system would be the most appropriate to assess the financial sustainability of a pension scheme (see below).

III.2.2. Usefulness and drawbacks of IPL

IPL estimates have the advantage of capturing future flows into one stock indicator, which might

⁽¹³⁹⁾ Auerbach, A., Gokhale, J. and L. Kotlikoff (1994), ‘Generational accounts: a meaningful way to evaluate fiscal policy’, *The Journal of Economic Perspectives*, 8 (1), pp. 73-94.

⁽¹⁴⁰⁾ Heidler, M., Müller, C. and O. Weddige (2009): ‘Measuring accrued-to-date liabilities of public pension systems: Method, data and limitations’, Discussion Paper No 37, Forschungszentrum Generationen-verträge (FZG), University of Freiburg.

⁽¹⁴¹⁾ This IPL concept also goes by the name of ‘current workers’ and pensioners’ liabilities’.

⁽¹⁴²⁾ European Parliament (2011), ‘Pension systems in the EU – contingent liabilities and assets in the public and private sector’, IP/A/ECON/ST/2010-26.

be more telling and allows for cross-country comparison as well as for comparing the situation in a country at different points in time. They summarise for example, in case of the open or closed system, the expected impact of phased-in pension reforms.

However, IPL estimates have a number of methodological drawbacks as discussed in Franco (1995). This is unsurprising considering that they require long-term simulations of pension systems, demographic changes and economic developments. For example, detailed, longitudinal information is required on the distribution of workers and pensioners according to age, sex, wage and contribution periods. Ideally, estimates fully consider the prevailing rules in every country and, if necessary, the rules that apply to each of the existing schemes. Consistent long-term projections on life expectancy, wage growth and inflation are also needed. Furthermore, assumptions on the applied discount rate can significantly affect the results. For example, with a discount rate of 3%, amounts due in 25 years are about halved in present value terms; whereas they are only around 30% when the discount rate is 5%.

For net IPL estimates, the contributory side also complicates calculations given the variety of ways in which pensions are financed across countries. In most of them financing comes from dedicated social security contributions. For others, financing comes partly from other sources, such as general tax revenues, while some countries levy a general social security contribution instead of a specific pension contribution (e.g. Belgium). Sometimes, contributions adjust automatically to ensure the financial sustainability of the public pension system (e.g. Germany). Another element to consider is whether pension benefits are subject to personal income taxes, and therefore flow back to the state coffers.

III.2.3. Implicit pension liabilities versus explicit public debt

As discussed above, implicit pension liabilities (IPL) can become explicit public debt when shortfalls arise in the pension system, which require financing, possibly leading to debt issuance. However, this does not mean that IPL should be simply equated to public debt, let alone that IPL should be added to the debt stock to obtain 'actual' debt. According to Franco (1995), accrued-to-date liabilities are the only pension liabilities that could,

in theory, be assimilated to conventional, explicit public debt. Indeed, the other IPL concepts discussed above also include potential liabilities based on pension rights that are still to accrue. In contrast, conventional public debt is backward-looking, similar to accrued-to-date liabilities (ADL). Moreover, ADL do not take account of the net present value of the future social security contributions that will be used (at least partly) to finance the pension outlays, making it a 'gross' concept. Accrued-to-date IPL are therefore not a measure of fiscal sustainability, as discussed below.

However, there are several ways in which even accrued pension rights differ in practice from conventional, explicit public debt. As mentioned above, the origin differs. Explicit claims such as government bonds are backed by a legal contract that fixes the repayment schedule. Implicit liabilities are moral obligations, rooted in a social contract, and their redemption schedule depends on many factors.

Because pension rights are not embodied in formal contracts, pension right holders are less protected than bondholders. Whereas defaulting on government debt results in market disruptions, in the case of pension liabilities the debtor can modify rights without giving rise to legal claims, as the sweeping reforms in several Member States over the past decade illustrate. However, there have been reversals of pension reforms as a result of court rulings⁽¹⁴³⁾. The 1992 Italian pension reform cancelled about 30% of the IPL (Beltrametti, 1994)⁽¹⁴⁴⁾. The annuity factors that characterise the notional defined contribution systems found in several Member States are examples of how, upon retirement, pension rights are unilaterally adjusted in function of a fictitious rate of return and estimated remaining life expectancy.

Another important difference concerns the way rights are created. While government bonds can be bought freely on the market, the acquisition of pension rights is generally compulsory and rights are not tradable. This means that there is no market price for pension liabilities and that one can only estimate the value of pension liabilities (Beltrametti, 1995)⁽¹⁴⁵⁾. It also implies that large

⁽¹⁴³⁾ This was the case for example in Portugal and in Greece.

⁽¹⁴⁴⁾ Sections III.3 provides a more recent example of reforms showing in IPL estimates.

⁽¹⁴⁵⁾ Beltrametti, L. (1995), 'On pension liabilities in Italy', *Rivista Economiche*, Vol. 4, No 4, pp. 405-428.

IPL do not lead to direct financial market pressure (Franco, 1995) and that they are automatically rolled-over to the extent that new contributions allow for the redemption of old liabilities but at the same time create new liabilities.

III.2.4. Implicit pension liabilities and sustainability

The non-inclusion of implicit pension liabilities in conventional debt indicators is justified considering the above listed dissimilarities from explicit public debt. For the same reason, IPL in themselves do not represent a full-fledged measurement of fiscal sustainability, they simply reflect different sizes of public PAYG schemes (Beltrametti and Della Valle, 2011)⁽¹⁴⁶⁾.

Still, IPL can enrich the sustainability assessment of pay-as-you-go public pension schemes and of public finances in general, provided the appropriate concept is used. Indeed, gross estimates such as accrued-to-date liabilities do not provide a correct picture of the future balance of the public pension scheme, as future contributions that will help finance these liabilities are not considered. As underlined by Franco (1995), for a given ratio of accrued-to-date liabilities to GDP, a country can be either on a sustainable or on an unsustainable path. All one can say is that the larger the ratio, the higher the share of future public resources committed to pension expenditure.

Open system net liabilities can be considered an appropriate tool to identify intertemporal fiscal gaps (Holzmann et al., 2004). In contrast to the backward-looking ADL, they apply a wide time horizon to assess whether under current legislation the pension system is in actuarial balance. There may, however, be simpler and more transparent indicators than IPL to assess the medium-term perspective of pension systems, such as the expenditure-to-GDP ratio and the contribution rate (Franco, 1995).

Moreover, if net IPL point to imbalances in the pension system, this does not imply the erosion of overall fiscal sustainability. The latter needs to be assessed at the level of the general government, considering all budgetary items. This is the case for the European Commission's comprehensive

medium and long-term fiscal sustainability analysis and the S1 and S2 indicators⁽¹⁴⁷⁾. Aside from the initial budgetary position and the explicit debt stock, both indicators account for the projected increase in ageing costs: pensions but also health care, long-term care, education and unemployment benefits. As with pensions, a future increase in (net) expenditure on these items can be considered as being due to the current stock of implicit liabilities becoming visible.

IPL are also incorporated into the EU fiscal framework in other ways. Since the 2005 reform of the Stability and Growth Pact, projected ageing costs help determine the medium-term budgetary objectives (MTOs)⁽¹⁴⁸⁾. These MTOs are the anchor point of fiscal surveillance and provide the structural balance targets towards which countries need to adjust. As a result, the EU fiscal framework partly accounts for implicit liabilities⁽¹⁴⁹⁾.

There are other examples of sustainability frameworks that consider IPL. 'Balance sheet analysis', an approach that has regained prominence in recent years, goes beyond the traditional analysis of debt stocks and government deficits. By compiling a complete balance sheet, including IPL, with an estimate of 'intertemporal net worth' as the balancing item, it provides a more nuanced and fuller picture of public finances⁽¹⁵⁰⁾. This method is also applied in Velculescu (2010)⁽¹⁵¹⁾. She also uses the Commission's S1 and S2 indicators to provide alternative intertemporal net worth estimates with finite and infinite horizons, respectively. These reflect the total net liabilities of the public sector (current and projected) under unchanged policies. The

⁽¹⁴⁶⁾ Beltrametti, L. and M. Della Valle (2011), 'Does pension debt mean anything after all?', MPRA Paper No. 29694.

⁽¹⁴⁷⁾ The S1 indicator shows the additional fiscal effort (improvement in the structural primary balance) required in the five years following the Commission forecast to reach, within 15 year, the 60% of GDP debt ratio target. The S2 indicator shows the upfront fiscal adjustment (improvement in the structural primary balance) required to stabilise the debt ratio over the infinite horizon. For details, see Annex 5 in European Commission (2020), 'Debt Sustainability Monitor 2019', DG ECFIN, European Economy Institutional Paper No. 120.

⁽¹⁴⁸⁾ The report of the 20 March 2005 Council states that "implicit liabilities (related to increasing expenditures in the light of ageing populations) should be taken into account" to determine MTOs.

⁽¹⁴⁹⁾ See European Commission (2019), 'Vade Mecum on the Stability & Growth Pact (2019 edition)', DG ECFIN, European Economy Institutional Paper No. 101, pp. 11-12.

⁽¹⁵⁰⁾ See, for example, European Commission (2019), Fiscal Sustainability Report 2018, DG ECFIN, European Economy Institutional Paper No. 094; IMF (2018), Fiscal Monitor: Managing Public Wealth, October 2018.

⁽¹⁵¹⁾ Velculescu, D. (2010), 'Some Uncomfortable Arithmetic Regarding Europe's Public Finances', IMF Working Paper, No. 177.

methodology used in Section III.4 to estimate gross and net IPL for the open system is similar to Velculescu (2010). Generational accounting also includes IPL. A recent example is Arevalo et al. (2019)⁽¹⁵²⁾.

III.3. The supplementary table on accrued-to-date pension entitlements in social insurance (‘Table 29’)

National accounts data on pensions present an accounting perspective whereby all liabilities arise from observed, past events. They show gross social insurance pension entitlements accrued at the end of a reporting period by the current workforce and retired people. Therefore, national accounts use the ADL approach. In the past, the standard accounting systems did not include the implicit liabilities accrued up to that point by the general government’s pay-as-you-go schemes (social security schemes and unfunded schemes for general government employees). Such data became available in the new ESA 2010 ‘Table 29’, in columns G and H, not included in the core national accounts. This section discusses the first data transmission for 2015 for these two categories⁽¹⁵³⁾.

The table provides the stock of pension entitlements at the beginning and at the end of a reporting period, as well as the flows causing the changes between both balances⁽¹⁵⁴⁾. These flows broadly cover: (i) increases in pension entitlements due to social contributions; (ii) reductions because of benefit payments; (iii) transfers between schemes; (iv) changes due to reforms; (v) revaluations (changes in discount rate, wage rate and inflation rate assumptions); and (vi) changes in the demographic assumptions used in the actuarial calculations.

The supplementary table presents the perspective of the debtor (the pension manager), showing liabilities or implicit liabilities, as well as that of the creditor (households), showing either assets or implicit assets. In principle, only old-age pensions are reported – including those pensions paid before the statutory retirement age, excluding assistance schemes. Survivor and disability pensions are included insofar they are an integral part of the pension scheme.

One key assumption is the discount rate used to determine the present value of future benefit flows. This actuarial assumption represents the cost of capital in the sense that governments need to provide financing for future pension benefits. All euro area Member States applied a fixed 5% nominal discount rate, in keeping with the recommended approach by Eurostat to align the Table 29 calculations with the interest rate assumptions of the Ageing Report (Eurostat, 2012)⁽¹⁵⁵⁾. To test for the responsiveness of the calculations to changes in the discount rate, two sensitivity scenarios are estimated, assuming discount rates to be 1 pp higher or lower (see *infra*).

Considering that public pension benefits are generally determined in function of the retiree’s wage (either final, an average or lifetime earnings), another important assumption is whether future wage growth is accounted for. There are two general approaches: ‘projected benefit obligation’ (PBO) versus ‘accrued benefit obligation’ (ABO). PBO fully accounts for future increases in income when determining accrued pension rights. The ABO approach disregards future wage increases, resulting in lower estimates in most cases (Eurostat, 2012). For public pension schemes, PBO is considered more suitable than ABO given that schemes are likely to exist until the end of a worker’s career and future wage growth is therefore relevant for the benefit calculation⁽¹⁵⁶⁾. In contrast to ABO, the PBO approach will also reflect pension reforms that alter, for example, the

⁽¹⁵²⁾ Arevalo, P., Berti, K., Caretta, A. and P. Ekefeldt (2019), ‘The Intergenerational Dimension of Fiscal Sustainability’, European Economy, Discussion Paper 112.

⁽¹⁵³⁾ This first data, reflecting the situation at end-2015, was disseminated by Eurostat in December 2019. It covered all Member States except for Greece and Luxembourg. It also covered the UK, Iceland, Norway and Switzerland. Some countries published data covering a longer period (see <https://ec.europa.eu/eurostat/web/pensions/information-member-states>). Updated information is due by the end of 2020 (balance sheets for 2016, 2017 and 2018).

⁽¹⁵⁴⁾ For a detailed overview of the supplementary table and its compiling methodology, see European system of accounts - ESA 2010, Chapter 17, paragraphs 17.121-17.183.

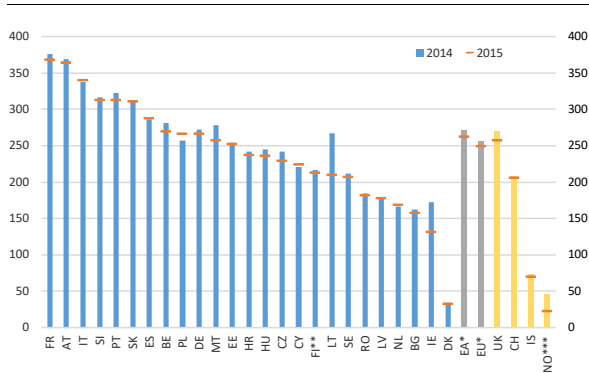
⁽¹⁵⁵⁾ Non-euro area countries deviated from the 5% in some cases. For Denmark, reported social security pension schemes (column H) only cover the early retirement scheme. As one can only receive early retirement benefits for 5 years, no discounting was applied. For Sweden, the discount rate is based on 10-year government bonds.

⁽¹⁵⁶⁾ The ABO method would be appropriate if one wants to estimate accrued-to-date liabilities as a termination liability (see Section III.2).

reference career in the pension formula (Eurostat, 2012).

Most countries apply the PBO method to estimate accrued-to-date liabilities, though some use ABO when this better reflects reality. Benefits are indexed in accordance with national rules and wage growth is generally based on the assumptions in the 2018 Ageing Report. In most cases, the demographic projections used for the Table 29 calculations are the same as those underpinning the latest Ageing Report, namely the ESSPOP2015 projections as prepared by Eurostat⁽¹⁵⁷⁾.

Graph III.2: **Accrued-to-date pension liabilities (%GDP)**



2014/2015 are the opening/closing balances for 2015. *no data for EL/LU; EU excluding DK; unweighted average. **Net of assets as Finland's statutory earnings-related pension scheme is partially funded. Gross accrued-to-date liabilities amounted to about 300% of GDP in 2014 and 2015. ***Net of assets accumulated in the Government Pension Fund Global. Gross accrued-to-date liabilities amounted to 251% of GDP in 2014 and 263% in 2015. **Source:** Calculations based on Eurostat, www.nbim.no and Finnish Centre for Pensions.

Given that public pension schemes in euro area Member States are nearly all unfunded, accrued-to-date IPL are considerable in terms of GDP, with a euro area average of 263% of GDP in 2015 and more than 200% of GDP for 19 of the 25 reporting EU Member States (see Graph III.2). As mentioned above, this measurement is gross of future social security contributions. Estimates for 2015 range from 369% of GDP in France to 32% in Denmark. The latter is a special case considering that Denmark's social security pension is mostly not covered by the supplementary table as it is considered to be 'social assistance'. As a result, figures for Denmark represent only the unfunded

civil servant scheme and the limited amounts linked to the early retirement scheme.

Compared to 2014, ADL estimates are rather stable for most Member States, as one would expect. The euro area average decreased from 272% to 249% of GDP. The largest changes were for Lithuania (56 pps of GDP), Ireland (-41 pps) and Malta (-20 pps-). For Ireland, this reflects a denominator effect due to revised GDP growth brought about by the relocation of intellectual property by multinational companies, which resulted in a one-off jump in GDP. The smaller impact in Malta was due to high GDP growth that resulted in a steady decline in the ADL estimate according to the longer time series (for 2012-2016) published by the Maltese National Statistics Office.

In the more interesting case of Lithuania, the downward shift reflects a broad reform package⁽¹⁵⁸⁾, which in itself reduced the present value of the accrued-to-date pension liabilities by 61 pps compared to 2014, while the country estimated ADL within the narrow range of 266-272% of GDP in 2012-2014. Also Belgium legislated a pension reform in 2015, increasing the statutory retirement age by 2 years by 2030. This reform reduced the IPL by an estimated 7 pps of GDP according to the reporting in the supplementary table. In the case of France, reform measures enacted in 2015 reduced the ADL figure by about 4 pps of GDP⁽¹⁵⁹⁾. These examples show how ADL estimates can be a tool for assessing pension reforms. An example of a reform with an increase of accrued-to-date pension liabilities is Latvia in 2017: changes in pension indexation caused a 13 pps rise of GDP compared to end-2016, according to the longer time series prepared by the Central Statistical Bureau.

As the current value of future entitlements is measured, estimates are very sensitive to the interest rate assumptions used. This is illustrated in Graph III.3, which shows the sensitivity scenarios that accompany the baseline Table 29 calculations and assume discount rates to be 1 pp lower and higher, i.e. 4% and 6% in nominal terms (2% and

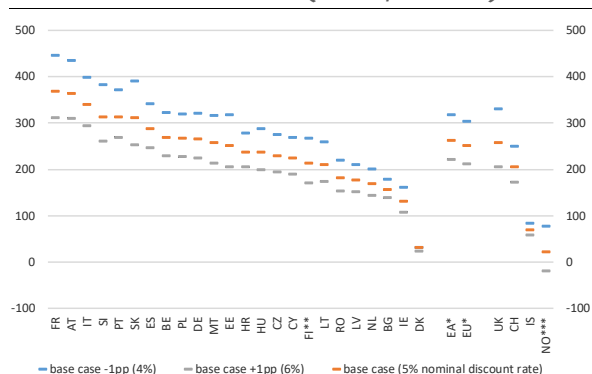
⁽¹⁵⁷⁾ See https://ec.europa.eu/eurostat/cache/metadata/en/nasa_10_pens_esms.htm#annex1555069671419 for methodological notes per country.

⁽¹⁵⁸⁾ Measures include the automatic indexing of pensions to the overall wage sum, the switch from a defined benefit system to a point system and an increase of the eligibility requirements for a full general pension component.

⁽¹⁵⁹⁾ These reforms concern the complementary Arrco and Agirc schemes: the amount of additional pension entitlements generated by every euro of social contributions was reduced, while yearly benefit increases became less generous.

4% in real terms). The lower discount rate results in the ADL estimate to rise by 56 pps on average for the euro area, to almost 320% of GDP, with a maximum increase of 77 pps for France. Of the 24 reporting EU Member States, 21 have estimated accrued-to-date liabilities of at least 200% of GDP under the lower discount rate scenario. Even the assumed lower interest rate appears to be on the high side in the current low interest rate environment, pointing to IPLs being higher still. Conversely, a higher discount rate brings down the ADL estimate, by 42 pps on average in the euro area.

Graph III.3: Accrued-to-date pension liabilities: sensitivity to lower/higher discount rates (2015, %GDP)



*no data for EL/LU/SE; EU excluding DK; unweighted average.

**Net of assets as Finland's statutory earnings-related pension scheme is partially funded.

***Net of assets accumulated in the Government Pension Fund Global.

Source: Calculations based on Eurostat, www.nbm.no and Finnish Centre for Pensions.

III.4. Implicit pension liabilities derived from the long-term projections in the Ageing Report

The long-term pension expenditure projections prepared by the Commission (DG ECFIN) and the Economic Policy Committee (Ageing Working Group) as published in the Ageing Report, make it possible to calculate implicit pension liabilities (IPL) for the open system. Indeed, as annual public pension expenditure is projected up to 2070, benefits include the four areas in Graph III.1, though with a finite horizon for to-be-accrued rights of current and future workers. The Ageing Report projections already incorporate assumptions on demographic and macroeconomic developments, the labour market response of future generations to changes in the pension law as

well as the consequences that legislated pension reforms may have on benefit levels.

In a first phase, gross IPL estimates are presented for the base year 2016 on the basis of the 2015 and 2018 Ageing Reports⁽¹⁶⁰⁾. In a second step, net estimates are calculated. Finally, based on some selected recent examples, the impact of reforms on the estimates is highlighted.

Gross IPL estimates for the open system

Under the open system, gross IPL in 2016 can be calculated as the present value of all future flows of pension expenditures:

$$gross\ IPL_{2016} = \frac{\sum_{i=2016}^{2060} \left(\frac{PE_i}{(1+r)^{i-2016}} \right)}{GDP_{2016}}$$

where PE refers to the projected pension expenditure in nominal terms and r to the fixed 5% discount rate. To allow comparison between Member States, estimates are expressed relative to the base year GDP. The base year for the calculations is 2016 and the end-point is 2060. The estimates include all pension expenditure items, going beyond the strictly earnings-related pension benefits to include, for example, minimum and disability pensions.

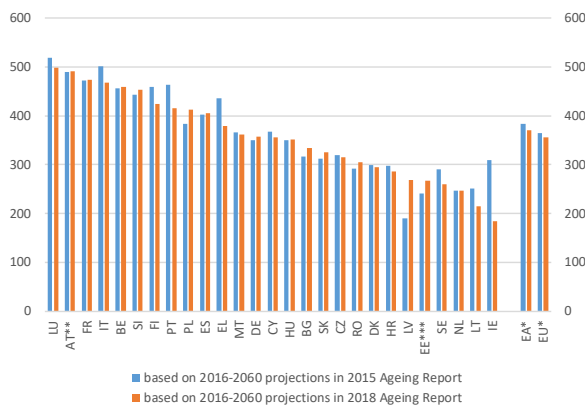
For the euro area, the estimated gross IPL was 371% of GDP in 2016 on the basis of the 2018 Ageing Report (383% on the basis of the 2015 Ageing Report) (see Graph III.4). Despite this broad stability at the aggregate level, there were notable changes in individual countries. Although the same period was considered, the macroeconomic and demographic assumptions underlying the reports often varied significantly and some countries adopted new reforms between the two reporting periods.

The estimates as shown in Graph III.4 do not allow for a detailed allocation of changes between new reforms and updated assumptions. The information in the Ageing Report nevertheless gives an idea about the drivers behind the biggest

⁽¹⁶⁰⁾ Economic Policy Committee and European Commission (2015), 'The 2015 Ageing Report – Economic and budgetary projections for the 28 EU Member States (2013-2060)', DG ECFIN, European Economy 3-2015. Economic Policy Committee and European Commission (2018), 'The 2018 Ageing Report – Economic and budgetary projections for the EU Member States (2016-2070)', DG ECFIN, Institutional Paper No. 79.

changes⁽¹⁶¹⁾. For example, in the case of Ireland (123 pps of GDP: 309% of GDP based on 2015 Ageing Report, 185% based on 2018 Ageing Report), it is clear that the substantial upward revision of the GDP is driving the changes. For Latvia (+79 pps-), the revisions of the demographic assumptions are the main cause. For Greece (56 pps-), the strong decline in GDP between the two projection exercises was more than offset by systemic reforms and policy measures to control expenditure growth. In the case of Portugal (48 pps), earlier reforms turned out to have a higher than previously anticipated impact. Finally, for Lithuania (-37 pps-), the reforms that also affected the ADL estimate (see Section III.3) more than compensated for the upward impact of changed assumptions.

Graph III.4: Open system implicit pension liabilities, gross (2016, %GDP): Ageing Report 2018 vs Ageing Report 2015



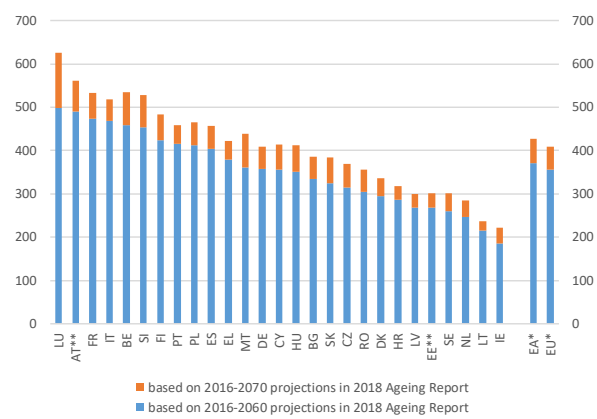
*unweighted average. **including Ausgleichszulagen and Rehabilitationsgeld. ***including work ability benefits.
Source: Calculations based on projections from 2015 and 2018 Ageing Reports (EPC-EC)

The horizon of the estimates in Graph III.4 is finite: 2060 is the end-point of the 2015 Ageing Report. However, in the 2018 Ageing Report, the projection horizon was extended until 2070. When calculating gross IPL for the open system including this additional 10 years, estimates obviously go up as more rights are included. Gross IPL increases by 54 pps on average (see Graph III.5). While the period under consideration lengthens by about 23%, gross IPL estimates rise by 15% on average as pension expenditure in 2060-2070 is largely

⁽¹⁶¹⁾ The country fiches accompanying the Ageing Report present a breakdown of the difference with the previous vintage in broad drivers. See https://ec.europa.eu/info/publications/economy-finance/2018-ageing-report-economic-and-budgetary-projections-eu-member-states-2016-2070_en.

discounted. The exception is Luxembourg, with an increase of 128 pps (+26%) under the horizon extension because pension expenditure would continue to rise considerably in the final decade, whereas for most countries pension expenditure is projected to decrease or stabilise towards the end of the exercise.

Graph III.5: Open system implicit pension liabilities, gross (2016, %GDP): 2016-2070 vs 2016-2060 horizon



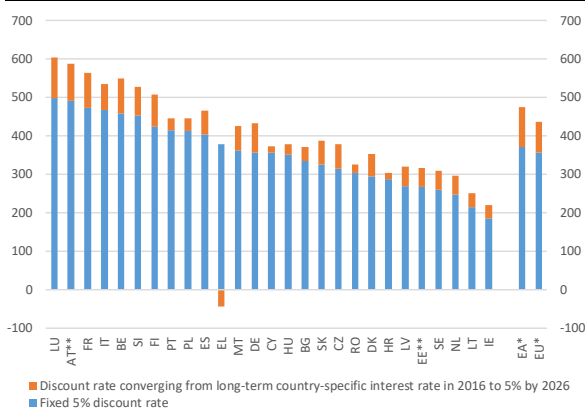
*unweighted average. **see notes Graph III.4.
Source: Calculations based on 2018 Ageing Report projections (EPC-EC).

Considering that the above estimates are based on a fixed discount rate of 5% for all countries for the entire period, observed differences between countries are not due to interest rates dynamics. While using a common discount rate improves consistency and cross-country comparability, a 5% cost of capital assumption could be considered high in the current low interest rate environment and risks underestimating the present value of pension entitlements. The Commission’s sustainability analysis therefore assumes that the long-term interest rate will converge from current levels to 5% over 10 years⁽¹⁶²⁾. Small changes in the discount rate can cause large compounded effects, as discussed in Section III.3.

When assuming that discount rates will converge from the country-specific long-term market interest rates in 2016 to 5% in 2026 and to stay at that level thereafter, gross IPL estimates go up by around 100 pps on average in the euro area (see Graph III.6). Only for Greece, the phasing-in results in lower IPL as the market reference rate exceeded 5% in 2016.

⁽¹⁶²⁾ See the 2018 Fiscal Sustainability Report.

Graph III.6: **Open system implicit pension liabilities, gross (2016, %GDP): Impact of discount rate**



*unweighted average. **see notes Graph III.4.
Source: Calculations based on 2018 Ageing Report projections (EPC-EC).

Net IPL estimates for the open system

By factoring in future pension contributions, the present value of future deficits or surpluses in the public pension system are obtained. When summed up, these provide an estimate of *net* IPL and of the sustainability of the public pension system as such. The applied formula then becomes:

$$net\ IPL_{2016} = \frac{\sum_{i=2016}^{2060} \left(\frac{PE_i - C_i}{(1+r)^{i-2016}} \right)}{GDP_{2016}}$$

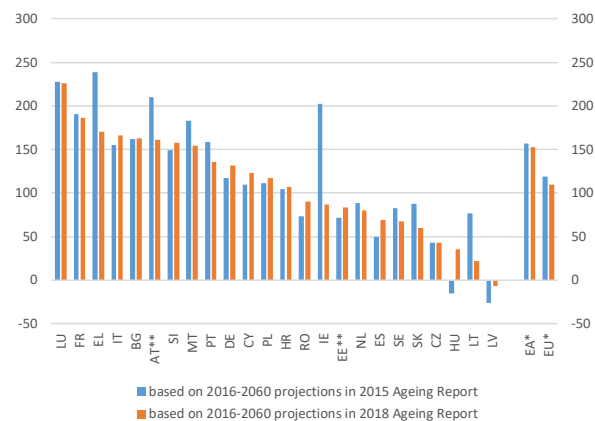
where C_i refers to the contribution projections (both employer and employee) in the Ageing Report and r remains fixed at 5%. A positive number for the net IPL estimate signals future deficits in the social security pension system and reveals a need for future policy action.

The net IPL estimates are shown in Graph III.7 for the available countries. For the euro area, taking account of the future pension contributions results in IPL in 2016 of around 150% of GDP⁽¹⁶³⁾. This is considerably lower than the gross IPLs above, although further adjustment (of pension payments of contributions) appear to be needed also for net IPLs to close the financing gap in most cases. Estimates based on the 2018 Ageing Report range from 226% of GDP for Luxembourg to -7% of GDP for Latvia. The slightly negative net present value implies that the overall Latvian pension

⁽¹⁶³⁾ If the projections up to 2070 set out in the 2018 Ageing Report are used, net IPL estimates increase by 24 pps of GDP on average.

system, with an NDC old-age component, is expected to be more or less actuarially balanced. Changes compared to the net estimate based on the 2015 Ageing Report are broadly similar with those for the gross IPL estimates discussed previously: reforms in the cases of, for example, Greece, Lithuania and Portugal, and the large denominator effect for Ireland.

Graph III.7: **Open system implicit pension liabilities, net (2016, %GDP): Ageing Report 2018 vs. Ageing Report 2015**



No net IPL estimate is provided for Belgium (no separate pension contribution exists), Denmark (the Danish pension system is quasi completely financed through general taxes) and Finland (contributions were reported in different ways in the 2015 and 2018 Ageing Reports).
 *unweighted average. **see notes Graph III.4.
Source: Calculations based on projections from 2015 and 2018 Ageing Reports (EPC-EC).

The impact of reforms on the gross/net IPL estimates for the open system: selected examples

Because all underlying assumptions are updated for each projection cycle, one cannot pinpoint the changes that are exclusively due to the reforms by comparing the gross and net IPL estimates from consecutive Ageing Reports. However, when significant pension reforms are legislated between two cycles, projections are updated on an ad hoc basis, using the underlying demographic and macroeconomic assumptions from the latest Ageing Report. Any change in the projections is then entirely due to the adopted pension reforms. Since the finalisation of the 2018 Ageing Report, projections were updated for a few countries.

A Slovakian reform adopted in 2019 removed the automatic adjustment of the statutory retirement age to changes in life expectancy, capping the retirement age at 64 years as of 2030. In addition,

women will be able to retire half a year earlier per child, with a maximum of 18 months. It also set the minimum pension, for those with at least 30 contributory years at 33% of the wage they received in their final two years.

According to the updated projections, the Slovakian reforms increase gross IPL by 72 pps of GDP (see Graph III.8). The increase in the net IPL estimate is higher, at 83 pps, as retirement ages are capped at 64 years instead of rising in line with life expectancy. This has the double effect of individuals receiving pension benefits for a longer period and contributing less.

As to non-euro area countries, there is the example of Romania. In 2019, the Romanian Parliament adopted a new pension law, changing several parameters of the public scheme, which applies a points system. Following ad hoc increases of pension points indexation in 2019-2021, indexation will remain based on inflation plus half of the wage growth, instead of converging to only inflation as previously legislated. As of 2021, the correction index to adjust the initial pension benefit in line with wage growth will be abolished. New pensions will be calculated based on a fixed contribution period of 25 years down from 35 years. Finally, the law makes some changes to the minimum, disability and survivor pensions.

Before the reform (i.e. in the 2018 Ageing Report), gross and net IPL were estimated at 356% and 109% of GDP in 2016, respectively (see Graph III.8). The reform led to an increase of 205 pps of GDP for the gross estimate and the net IPL almost doubled.

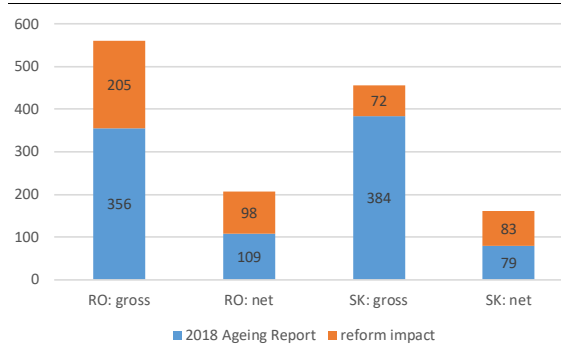
The analysis therefore provides interesting insights into the changes of the size of the IPLs, gross and net, as a result of parametric changes to the pension system.

III.5. Concluding remarks

The vast majority of public pension schemes in the euro area have a pay-as-you-go set-up and are therefore unfunded by design, with current contributions being used to pay current benefits. Implicit pension liabilities (IPL) measures existing commitments governments have made through public pension systems over the long-term. New structured statistical reporting of accrued-to-date unfunded public pension liabilities (ESA 2010)

enable them to be measured consistently. They also feature in social security policy discussions⁽¹⁶⁴⁾.

Graph III.8: **Open system implicit pension liabilities, gross & net (2016, %GDP): reform impact for Romania and Slovakia**



Based on 2016-2070 expenditure and contribution projections.

Source: Calculations based on 2018 Ageing Report (EPC-EC) and updated projections for RO and SK.

While IPL and conventional, explicit government debt differ significantly, in some situations the implicit liabilities can convert into explicit debt. This is the case when structural shortfalls arise within the pension system, which require financing. In the same way, gross estimates for accrued-to-date IPL give an idea of how costly it would be to liquidate (buy out) past pension promises in the hypothetical case the public scheme is terminated. It is worth stressing that accrued-to-date IPL estimates will yield large, positive values for all countries with pay-as-you-go systems, even those with perfectly balanced schemes. Accrued-to-date IPL are therefore not a measure of fiscal sustainability.

For these purposes, net IPL estimates for the open system – which also consider to-be-accrued rights and expected contributions to the scheme – are better suited. This article presented both gross and net IPL estimates under the open system approach that are consistent with the long-term Ageing Report projections. The net variant provides insights into the extent to which pension systems can be considered underfunded given current policies. The estimates are also useful for assessing the impact of policy changes, especially when the

⁽¹⁶⁴⁾ See, for example, Boeri, T. (2019), 'Debunking common knowledge to win the battle on welfare', SDA Bocconi School of Management.

underlying demographic and macroeconomic assumptions are similar⁽¹⁶⁵⁾.

Still, IPL calculations are rather sensitive to the interest rate assumptions, used as a discount factor, and to macroeconomic assumptions in general. In addition, they provide only a partial picture of fiscal sustainability, as developments for other expenditure and revenue items are not considered. For these reasons, one cannot draw firm policy conclusions from IPL calculations on fiscal sustainability. This is why the European Commission uses a set of standard indicators to assess Member States' overall fiscal sustainability.

The medium-term S1 and long-term S2 indicators include, for example, projected changes for all age-

related budget items. Moreover, they are expressed as the fiscal adjustment required to achieve sustainability. Such flow indicators are more straightforward to interpret than a present value stock indicators as they give a better idea of the magnitude of a country's actual budgetary challenge.

In conclusion, the analysis of implicit pension liabilities can help identify the future cost of current pension policies as well as the impact of pension reforms on the actuarial balance of the public pension scheme. It can also complement conventional debt and deficit measures, provided the analysis is embedded in a comprehensive fiscal sustainability assessment and the appropriate IPL concept is used.

⁽¹⁶⁵⁾ The impact of policy changes is fully captured when using the same set of underlying assumptions (demographic and macroeconomic).

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