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IRELAND

SELECTED ISSUES

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IRELAND

SELECTED ISSUES

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European Department

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BUSINESS CYCLE IN IRELAND: ACCOUNTING FOR OPEN LABOR MARKET AND MULTINATIONALS[1]

Assessing the business cycle in Ireland is complicated by the open character of its labor market and large presence of globally active multinationals. This chapter takes into account these features of the Irish economy when estimating potential output and the cyclical position. Results point to a strong recent rebound of potential growth as well as a currently advanced cyclical position, with a positive and widening output gap.

A. Introduction

1. This chapter estimates the cyclical position of the Irish economy. The recent publication of the GNI* and other related indicators, which help to identify the large global activities of multinationals and provide a better measure of the size of the domestic economy, has invited for a deeper analysis of the cyclical position of the Irish economy.[2] A better understanding of the cyclical position is essential for macroeconomic diagnostics, including assessing external sustainability and determining an appropriate fiscal policy stance.

2. Despite helpful supplementary data releases, several features of the Irish economy continue to pose challenges for business cycle identification. First, a large multinational sector, accounting for an important share of Irish GDP, tends to behave differently from the domestic economy and arguably it is not responsive to domestic demand management. Second, given the large trade with the United Kingdom, the headline inflation in Ireland often reflects movements in the Euro/Sterling exchange rate and thus does not provide a reliable measure of domestic inflation pressures as signs of slack in the economy. And finally, the usual cyclical signals from wage growth or the unemployment rate gap are likely to be often weakened by the very open and flexible character of the Irish labor market.

3. Given these challenges and general uncertainty around potential output estimates, a suite of adapted models has been employed for potential output estimation. Namely, univariate (HP) and multivariate filters, and the production function have been applied to the GNI* in constant prices.[3] The multinational sector has been assumed to continuously operate at

[1] Prepared by Jiří Podpiera. This version benefitted from comments and suggestions by the discussant Michael O'Grady and other participants at the Central Bank of Ireland's Workshop on May 8, 2018, in Dublin.

[2] The GNI* aims to measure primarily the domestic economy, however, it does so by an approximation: GNI* = GDP – (Net Factor Income) – (Factor Income of Re-Domiciled Companies) – (Depreciation on R&D-related IP imports) – (Depreciation on Aircraft Related to Leasing). Therefore, GNI* may still contain some activities of multinationals. In this chapter, we use GNI* as a proxy for the mostly-domestic part of the economy, henceforth referred to as 'the domestic economy'.

[3] The GNI* series is available only in nominal values and at annual frequency. The constant-prices, quarterly GNI* has been derived by applying the seasonality of modified domestic demand to GNI* and deflating by the deflator of real modified domestic demand.

full capacity and added to potential GNI* to derive potential GDP. The central element in the structural models is the labor market, namely the wage Phillips curve and Okun's law (multivariate filter), and potential employment growth (production function). Equilibrium in the labor market is estimated separately by factoring in the importance of migration in the Irish labor market.

4. The Irish economy is in the midst of a cyclical upswing. All methods suggest a positive output gap in 2017, while the labor market shows signs of upward wage pressures as net immigration has been weak so far. These signs are consistent with a cyclical upswing, amid strong estimated potential output growth, and point to risks of a boom-bust cycle, should the economy continue to push the growth momentum.

B. Equilibrium in a Small Open Labor Market

5. Labor market conditions in Ireland are affected by both internal and external job mobility. Wage dynamics, a yardstick for assessing the labor market cycle, is typically associated with the unemployment rate gap (through the Phillips curve), where a negative gap speeds up wage growth and *vice versa*.[4] However, this approach captures only internal job mobility, when most variation in the unemployment rate stems from changes in unemployment while the labor force is a steadily-moving variable. In Ireland, the labor force exhibits procyclical patterns due to migration swings, showing signs of a large external job mobility (Figure 1).

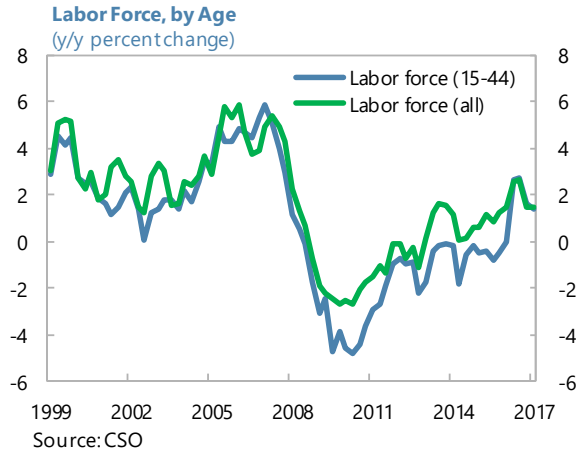
6. External job mobility is a particularly important element in the Irish labor market and may have effects on wage dynamics. As in other countries with small open labor markets (for instance Cyprus, Malta, and Luxembourg), the Irish labor market is prone to cyclical swings in the labor force (Figure 1). Labor force fluctuations have been driven by the age group of 14–44, that is, the age group of most net migrants. This can also be seen in the high correlation between changes in the labor force and net migration. In addition, the high correlation between changes in the labor force and employment reveals the jobs-driven nature of net migration, which also affects the overall labor participation rate (see also Byrne and O'Brien, 2016).[5, 6] And finally, native Irish account for an important part of labor force swings. These features suggest that a part of the labor market cycle is not captured by the unemployment rate (because the labor force and employment move jointly) and that the labor force cycle may have additional effects on wage dynamics, on top of the unemployment rate gap.

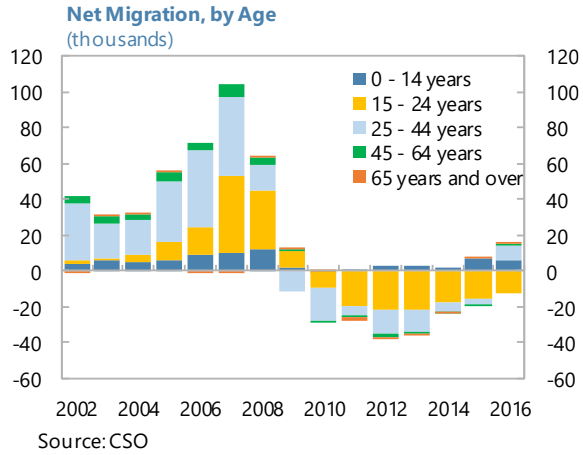
[4] The unemployment rate gap is the difference between the unemployment rate and the so called "non-accelerating wage rate of unemployment (NAWRU)". The underlying assumption behind this concept is that only cyclical unemployment affects labor cost developments.

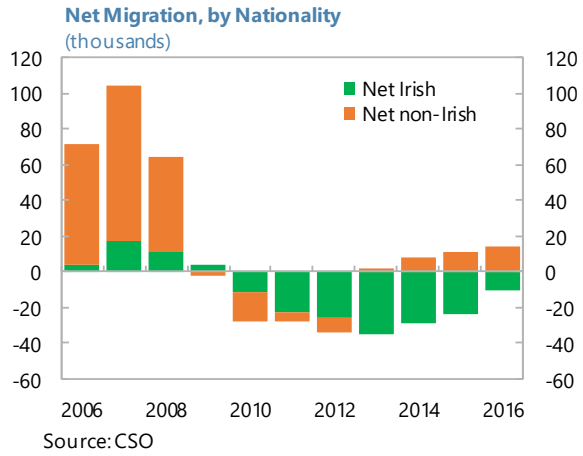
[5] The joint co-determination of the labor force participation rate, the labor force, and employment by net migration motivates modeling potential employment directly, rather than involving the working age population and the labor force participation rate.

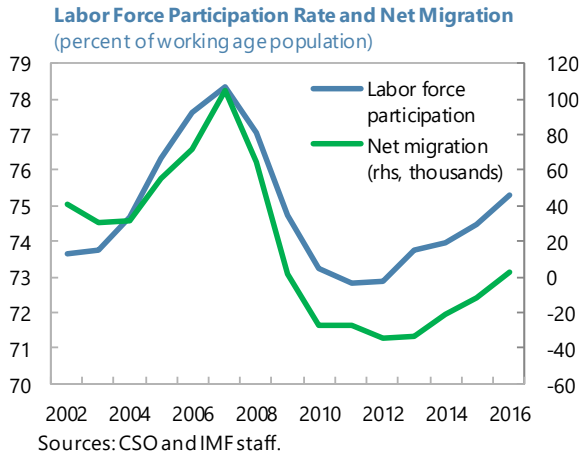
[6] The increase in the overall labor force participation rate during the 2000s has been in part due to one-time catchup in female labor force participation.

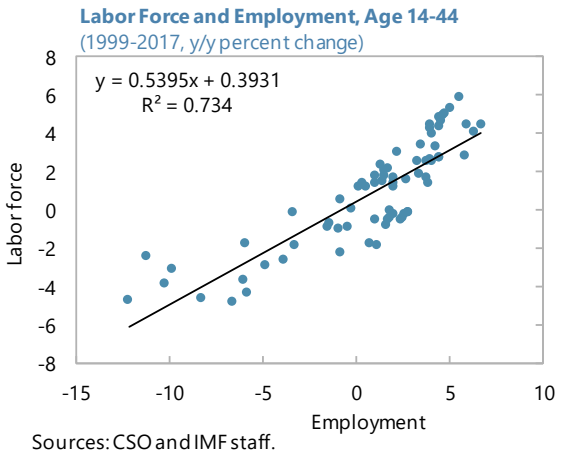
Figure 1. Labor Market

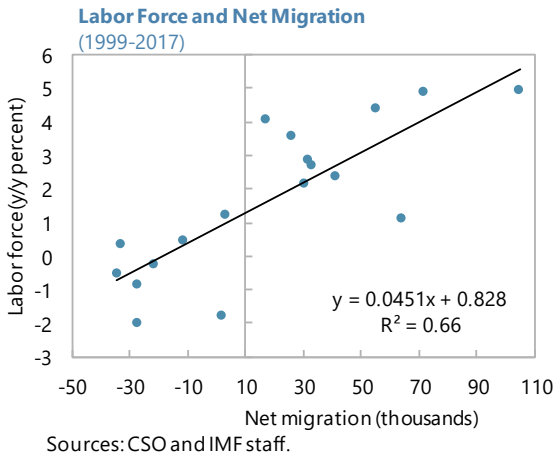






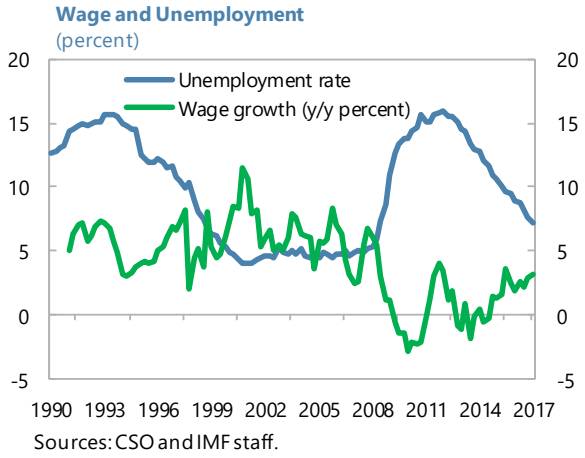


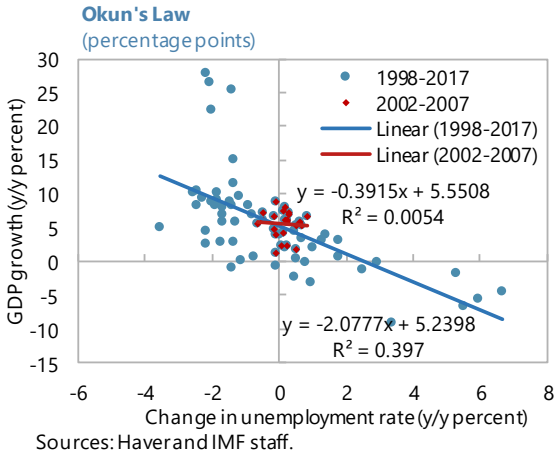




7. There are signs that the labor force cycle may have weakened the Phillips curve relationship, hereby suppressing wage signals about the labor market cycle. For instance, in the 1990s, wage growth accelerated only marginally when unemployment plummeted

Figure 2. Weakened Cyclical Signals





10 percentage points also due to outward migration.[7] In 1999-2000, wage growth accelerated strongly amid a rather steady unemployment rate. Reversely, wage growth has been trend decelerating during the early 2000s, while the unemployment rate stayed low and did not change much. Migration patterns also affect Okun's Law. During the early 2000s, especially after opening the labor market to new EU member states in 2004, GDP and employment growth has been strong while the unemployment rate was stable (Figure 2). As a result, although the labor market may not show wage pressures and declining unemployment, employment and GDP growth can be strong and may lead to unsustainable dynamics. [8, 9]

8. Extending the Phillips curve specification with the labor force cycle may account for the small open labor market in Ireland. Based on the premise that only the cyclical part of the unemployment rate affects the cycle in wage growth, a change in wage growth is modeled as a function of the unemployment rate gap, represented by the difference between the actual unemployment rate and the "non-accelerating wage growth rate of unemployment (NAWRU)" (see for instance Elmeskov and MacFarland, 1993). This concept has become a key element of estimation models (Blagrave, et al., 2015; Denis, et al., 2006). Nevertheless, such a specification is mostly applicable to a closed economy setting. Small, highly open labor markets with job-driven moves of the labor force across national borders calls for extending the Phillips curve with a labor force gap – the percentage deviation of the actual labor force from the "non-accelerating wage growth labor force growth (NAWLF)", to account for wage pressures stemming from swings in the labor force.

9. Estimating the NAWRU and NAWLF requires modeling the components of the unemployment rate, which needs an alternative estimation approach. The usual estimation of NAWRU (u_t^*) as a state variable using a standard structural Kalman filter does not provide a

[7] Wages per employee, using OECD data http://stats.oecd.org/Index.aspx?DataSetCode=EO#

[8] See, for instance, Lozej (2017) for evidence that migration increases business cycle fluctuations.

[9] See also Box 1, IMF Country Report No. 9/159.

theoretical base to assure consistency between the filtered NAWRU and its components, i.e., the trends in employment and the labor force. Moreover, as can be seen on an expanded Phillips curve model below, the need for modeling these trends inhibits application of the usual structural Kalman filter since the trends (state variables) enter the signal equation in a non-linear way (as a ratio $\frac{E_t^*}{LF_t^*}$), which is not permitted:

$$\Delta W_t = \alpha + \theta \Delta W_{t-1} - \beta\left(u_t - u_t^*\right) - \xi\left(\frac{LF_t}{LF_t^*}\right) + \varepsilon_t.$$

Noting that the unemployment rate gap (u_t - u_t*) is equal to ($\frac{E_t^*}{LF_t^*} - \frac{E_t}{LF_t}$), the Phillips curve model for wage *W* can be written as:

$$\Delta W_t = \alpha + \theta \Delta W_{t-1} - \beta\left(\frac{E_t^*}{LF_t^*} - \frac{E_t}{LF_t}\right) - \xi\left(\frac{LF_t}{LF_t^*}\right) + \varepsilon_t,$$

Where E and LF are employment and labor force, respectively, and ε is an i.i.d. error term. Therefore, an alternative multivariate Kalman filter model is needed.

10. The trend-cycle decomposition of employment and the labor force series is modeled using a simple, multivariate Kalman filter. Stochastic trends and cycles of employment (*E*) and the labor force (*LF*) are modeled using the Watson (1986) specification and extended to a multivariate Kalman filter setting by the assumption that the cycles in both series are co-determined by a common factor – net migration flows (*NM*) – and the estimated variance (σ) of the trends is assumed to be 500 times smaller than that of the cycles (similar to the noise-to-signal ratio in case of the Hodrick-Prescott filer). The model reads as follows:[10]

$$\begin{aligned} E_t &= E_t^* + E_t^c \\ LF_t &= LF_t^* + LF_t^c \end{aligned}$$

$$\begin{aligned} E_t^* &= \alpha + E_{t-1}^* + \varepsilon_t && \varepsilon \sim iid\, N(0, \sigma) \\ E_t^c &= \gamma E_{t-1}^c + \delta NM_t + \upsilon_t && \upsilon \sim iid\, N(0, \sigma^*500) \end{aligned}$$

$$\begin{aligned} LF_t^* &= \lambda + LF_{t-1}^* + \psi_t && \psi \sim iid\, N(0, \sigma) \\ LF_t^c &= \mu LF_{t-1}^c + \theta NM_t + \varphi_t && \varphi \sim iid\, N(0, \sigma^*500) \end{aligned}$$

Other estimated parameters: α, γ, δ, λ, μ, σ, and θ. Superscript *c* denotes cycle; * denotes trends.

11. Resulting trends represent sustainable paths in employment and the labor force (Table 1 and Figure 3). Plotted against the trends, actual values point to the cycle of the labor force and employment. The cycle turned out to be unsustainable during 2005–2008 and the subsequent correction in employment has undershoot the potential employment. The significant recent hiring brought employment back close to the sustainable trend.

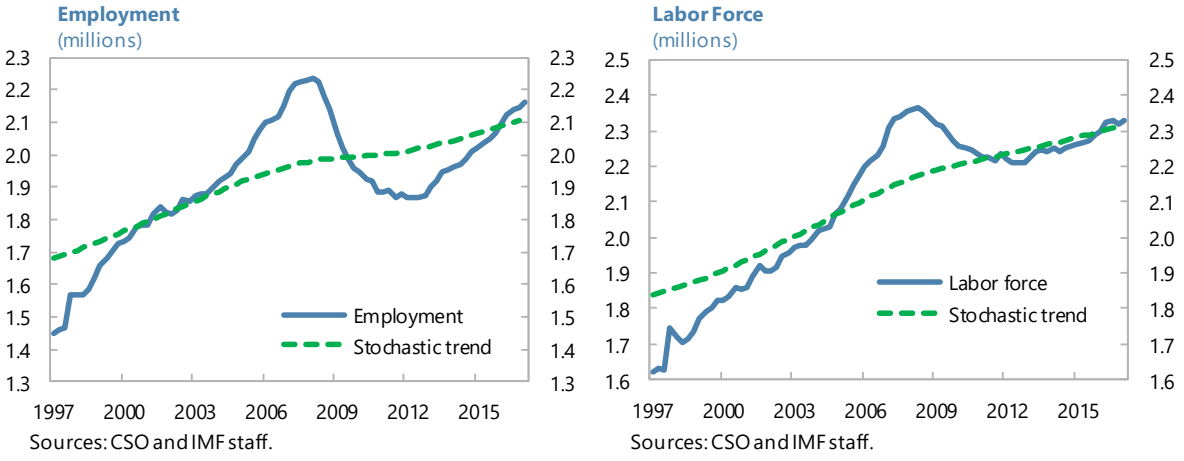
[10] Watson, M. W., 1986, "Univariate detrending methods with stochastic trends", *Journal of Monetary Economics*, Vol. 18, No. 1, pp. 49-75.

Table 1. Ireland: Trend and Cycle Estimation

	Employment		Labor force	
	trend	cycle	trend	cycle
Constant	49.1***		0.001	
	(0.2)		(0.001)	
Employment cycle $_{t-1}$		0.06***		
		(0.004)		
Labor force cycle $_{t-1}$				3.1***
				(0.01)
Net migration$_t$		-31***		25***
		(0.01)		(0.01)
σ	-0.35***			
	(0.001)			
No. of observations	84	84	84	84

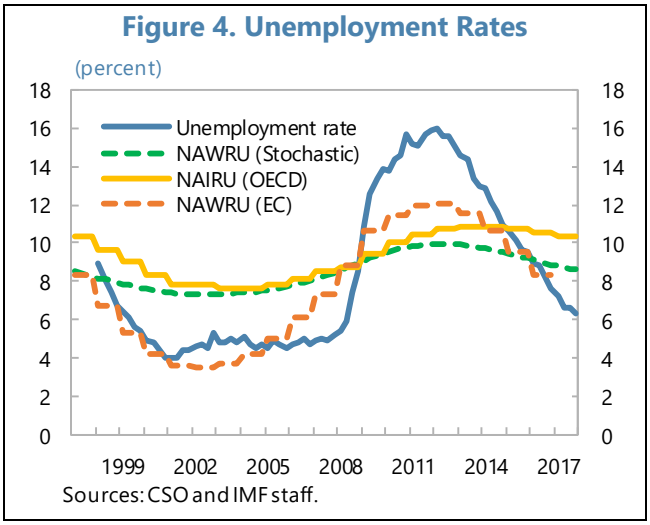
Source: IMF staff calculations.

Figure 3. Stochastic Trends

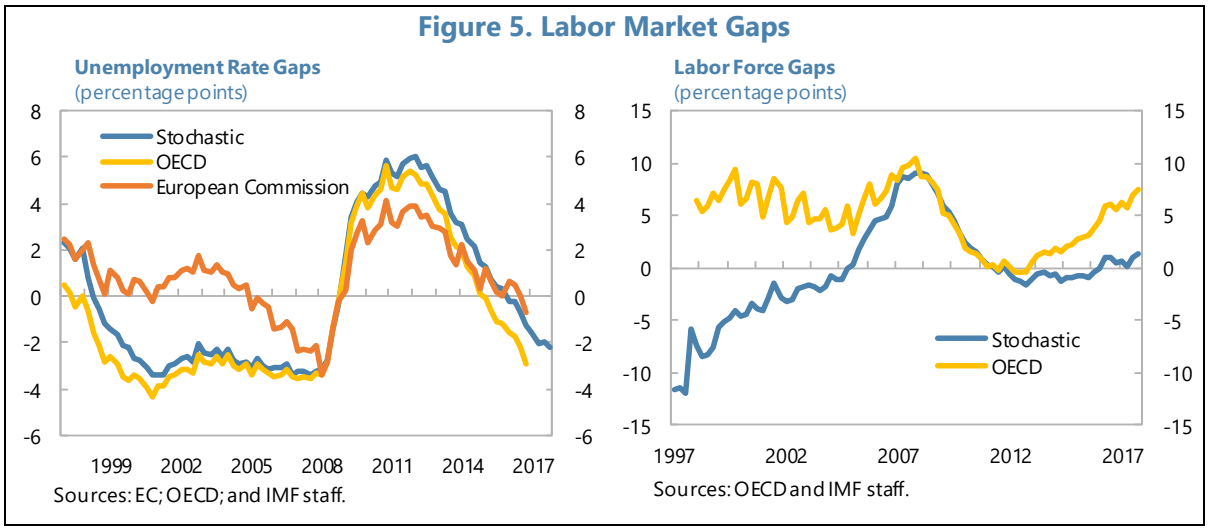


12. According to estimates, the equilibrium unemployment rate has been close to 9 percent over the last two decades (Figure 4). The derived stochastic trends of the labor force and employment determine the estimate of NAWRU = $1 - \frac{E_t^*}{LF_t^*}$. The estimated NAWRU's path of a mild decline during the boom of early 2000s and an increase during the crisis seems intuitive, as hiring less skilled workers during booms reduces structural unemployment, while layoffs during the crisis lead to gradual deterioration of skills of the unemployed and increase the equilibrium level of unemployment. In comparison to structural measures of unemployment, such as the non-employment index, the estimated NAWRU of 8 percent at end–2016 seems to

be a plausible estimate as it is close to the non-employment index of 9 percent.[11]



13. The plausibility of the implied unemployment rate gap and the labor force gap is tested in a Phillips curve estimation (Figure 5 and Table 2).[12] Using a standard wage Phillips curve, we test the unemployment rate gaps by OECD, EC, and the here derived stochastic gap. Gaps showing higher amplitudes tend to perform better than others and imply that the equilibrium level is likely sluggish. This is also intuitive as the Irish labor market is one of the most flexible in the euro area[13] and therefore would be expected to exhibit relatively large movements of unemployment compared to its equilibrium level. In addition, the Phillips curve extended with the labor force gap, shows a significant improvement in the Phillips curve specification[14] and allows separating the effects of the labor force cycle from the unemployment rate cycle.



[11] See Linehan et al. (2017).

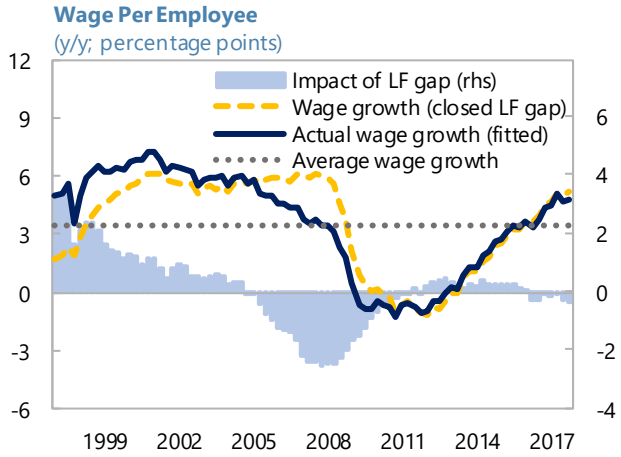
[12] Similar to testing of various unemployment gaps in Table 3 in K.L. Szeto, M. Guy, 2004 "Estimating New Zealand NAIRU", New Zealand Treasury, WP 04/10.

[13] See for instance Lawson and Bierhanzl (2004).

[14] This is not the case for the labor force gap of the OECD (Table 2, column IV.), perhaps due to an inconsistency between trend labor force and employment in the NAWRU estimation. The unemployment rate gap of the European Commission turns out to be statistically and economically insignificant (Table 2, column V.).

14. Wage pressures have been importantly affected by both the unemployment rate gap and swings in net migration. Based on the regression results (Table 2, column II), observed wage growth appears to be dwarfed by the large net immigration during the boom of 2005–08 (Figure 6). If the labor force would have grown at a sustainable pace (in line with the above derived stochastic trend), wage growth would have been higher during the boom, exceeding the in-sample average wage growth and in line with the positive unemployment rate gap. Similarly, in recent years, with a broadly closed labor force gap, rising wage pressures reflect the sharply falling unemployment rate gap.

Figure 6. Wage Growth Decomposition



Sources: Haver, OECD; and IMF staff.

Table 2. Ireland: Wage Phillips Curve Estimation

	Stochastic		OECD		EC
	I.	**II.**	III.	IV.	V.
Constant	0.011***	**0.015*** **	0.0078***	0.009*	0.0057*
	(0.003)	**(0.003)**	(0.0027)	(0.005)	(0.003)
Wage growth $_{t-1}$	0.69***	**0.571*** **	0.696***	0.705***	0.842***
	(0.078)	**(0.084)**	(0.078)	(0.083)	(0.06)
Unemployment gap (Stochastic) $_t$	-0.002***	**-0.0033*** **			
	(0.00076)	**(0.0008)**			
Unemployment gap (OECD) $_t$			-0.002**	-0.0026**	
			(0.0008)	(0.0013)	
Unemployment gap (EC) $_t$					-0.0007
					(0.001)
Labor force gap (Stochastic) $_t$		**-0.0012** **			
		(0.0004)			
Labor force gap (OECD) $_t$				-0.0005	
				(0.001)	
R^2 adj.	0.76	**0.78**	0.76	0.76	0.73
D.W. statistics	1.94	**1.86**	1.99	1.99	2.1
No. of observations	84	**84**	84	84	84
Long-term effects (in percent):					
The average wage growth rate	3.55	**3.49**	2.57	2.57	3.61
Unemployment rate gap elasticity	-0.65	**-0.77**	-0.66	-0.88	Insignificant
Labor force gap elasticity		**-0.28**		Insignificant	

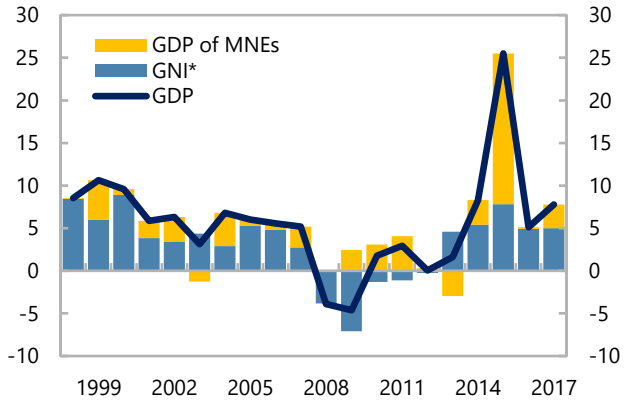
Note: Wage growth as dependent variable; using quarterly data series; OLS.
Source: IMF staff calculations.

C. Potential Output of a Globally-Integrated Economy

15. Potential output for Ireland is modeled as the sum of separately evaluated domestic and multinational parts. While the multinational sector is assumed to be continuously operating at full capacity (Figure 7), the usual methods to derive potential output – univariate and multivariate filters as well as the production function approach, are applied to the domestic economy, measured by GNI* in constant prices, in quarterly frequency. Given significant uncertainty surrounding potential growth estimates in general, the use of several methods should increase confidence in the estimates. The potential output (GDP^p) is therefore a sum of the potential output for the domestic economy (GNI^{*p}) and the multinationals (GDP^{MNE}):[15]

Figure 7. GDP Growth Contributions

(y/y percent change)



Sources: CSO and IMF staff.

$$GDP^p = GNI^{*p} + GDP^{MNE}.$$

16. The univariate filter (Hodrick-Prescott). The quarterly GNI* series in constant prices (see footnote 2) has been filtered with a smoothing parameter of 1600, commonly used for quarterly data. The choice of using quarterly data for estimation, while presenting annual series is likely to reduce the influence of the end-point biases of univariate filters on inference about potential growth.

17. The multivariate filter is an adapted model of the IMF's Research Department that relates the output gap to inflation and the unemployment rate gap (Blagrave, et al., 2015). The core of the model is the Phillips curve, relating the output gap (an unobservable variable y_t, assumed to follow a random walk) to observable data on wage inflation (π_t^w) instead of headline inflation, due to large external effects on headline inflation in the small open Irish economy. The specification is extended for the labor force gap (g_t) to account for the wage growth effects from labor force swings:

$$\pi_t^w = \rho\pi_{t-1}^w + \alpha g_t + \beta y_t + \varepsilon_t^\pi.$$

[15] Similar approach has been taken by the Irish Fiscal Advisory Council, see Working Paper 5, 2018, using the gross value added (GVA). Namely, splitting GVA into mostly domestic and mostly MNE parts; assuming that the mostly-MNE sector operates at full capacity at all times; and deriving overall potential output as the sum of the estimated potential output using the mostly-domestic GVA and the mostly-MNE's GVA.

Table 3. Ireland: Structural Multivariate Filter

	Phillips curve	Okun's law
Wage growth $_{t-1}$	0.68***	
	(0.07)	
Labor force gap $_{t-1}$	0.01***	
	(0.003)	
Unemployment rate gap $_{t-1}$		0.56***
		(0.08)
Output gap $_{t}$	0.18***	-31.9***
	(0.05)	(3.11)
No. of observations	84	84

Source: IMF staff calculations.

The Phillips curve is complemented with Okun's law, governing the relationship between the unemployment rate gap (u_t) and the output gap:

$$u_t = \theta u_{t-1} + \delta y_t + \varepsilon_t^u.$$

The unemployment rate gap is not an unobserved variable, but it is estimated separately (using the stochastic trend, derived in the previous section) and becomes an observed variable in the model. ε_t denotes random errors. The model uses quarterly data series. Table 3 shows the results of estimation.

18. The production function methodology uses the commonly applied Cobb-Douglass production function with capital and labor inputs. What remains unexplained after accounting for capital and labor inputs is attributed the total factor productivity B_t (the Solow residual). The specification for quarterly real output *Y (GNI*)* is as follows:

$$Y_t = B_t {K_t}^{(1-\alpha)} (EDU_t L_t)^{\alpha},$$

where $B_t = A_t {CU_t}^{(1-\alpha)} (AHW_t)^{\alpha}$. By accounting for the cyclical utilization of production factors pertaining to capital and labor, namely, capital utilization and average hours worked, we isolate the "structural" part of the total factor productivity A_t, and further:

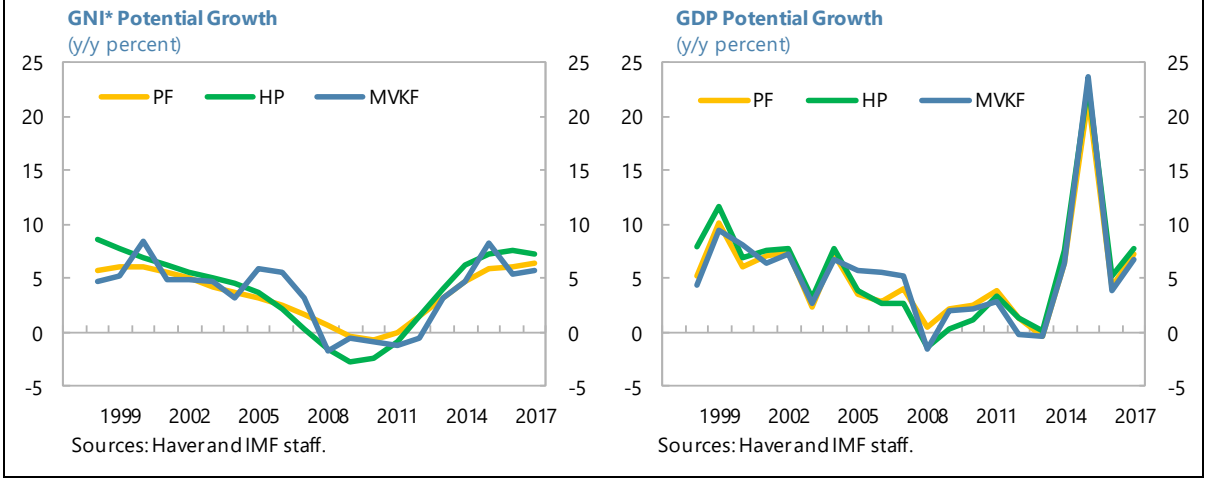
- *K* denotes the capital stock, derived using the usual perpetual inventory model (Epstein and Macchiarelli, 2010, and Teixeira de Silva, 2001) as $K_t = (1-\rho) K_{t-1} + I_t$, where ρ is the depreciation rate calibrated using the historical average (taken from Penn World Tables 9.0) and *I* stands for the modified real domestic investment, filtering out the investments of IP-related MNE investment. The capital stock of 1997 was taken as the initial capital stock, assuming that the capital stock then has not been affected by IP-related MNE investments.

- *L* denotes the number of employed persons, using the national accounts concept.
- *EDU* is the human capital index, taken from the Penn World Tables 9.0.
- *CU* stands for capacity utilization in manufacturing industry. It is a survey-based measure expressed as a balance of responses. Due to the lack of publicly available Ireland-specific series, it is approximated by the Euro Area average.[16]
- *AHW* stands for the average hours worked corresponding to national accounts.
- α stands for the labor share in the production function. The labor share has been calculated as the ratio of compensation of employees to gross value added, taken from the Penn World Tables 9.0.

Potential output has been derived using the calibrated labor share, smoothed trends in employment (that is, the stochastic trend derived in the previous section) and the total factor productivity *A* (by HP filter with smoothing factor 1600), and the actual capital stock. The average hours worked and capital utilization were assumed to be at their long-term values.

19. Estimated potential output growth has recovered to its pre-crisis rate. All methods point to a strong recovery of potential GNI* growth in the post-crisis period (Figure 8). The GDP potential growth remained positive even during the crisis, thanks to the positive effects of the multinational sector. Current rates of potential GNI* growth are strong and comparable to those recorded during the 1990s, when Ireland was dabbed "The Celtic Tiger" (Dermot McAleese, 2000).

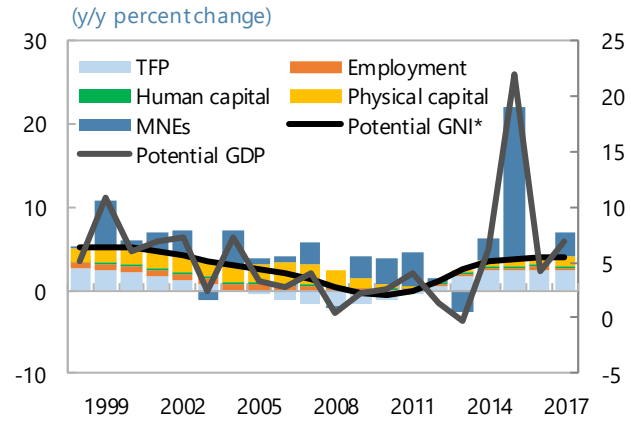
Figure 8. Potential Growth



[16] The choice of the proxy for capacity utilization may somewhat alter results of the output gap decomposition. Alternative proxies used include the Purchasing Managers' Index (in Clancy, 2013) and the Irish capacity utilization measure produced by a proprietary Markit® Economics database (used by the Central Bank of Ireland).

20. The rebound in potential growth has been driven by gains in productivity and investment. Using the production function method, which allows a decomposition into factors, the major drivers of potential GNI* growth in recent years were increases in total factor productivity and non-MNE's related capital accumulation (Figure 9). The MNE sector has been consistently adding momentum to potential GDP growth, particularly helpful in smoothing the impact of the crisis.

Figure 9. Potential Growth Decomposition

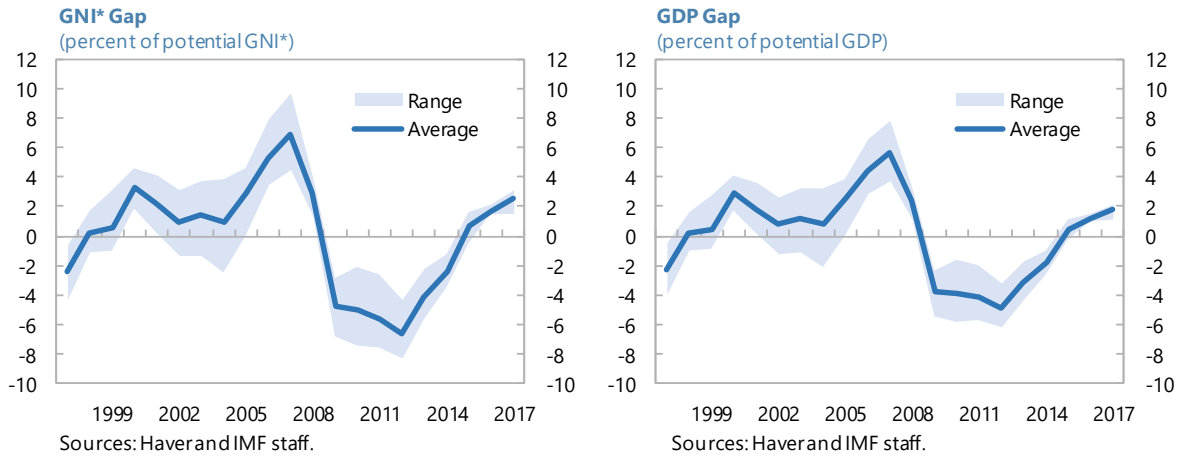


Sources: Haver, Penn World Table 9.0; and IMF staff.

D. The Implied Business Cycle Position

21. Despite the strong potential growth in recent years, the output gap has become positive. Figure 10 shows the average and the range of the output gap for GNI* and GDP, as implied by the three methods employed for the potential output estimation. While potential growth has rebounded strongly, the output gap switched from negative to positive in 2015. The output gap for the domestic economy (GNI*) tends to be more volatile compared to that for GDP, since the multinationals are assumed to continuously operate with a closed output gap.

Figure 10. Output Gap Estimates



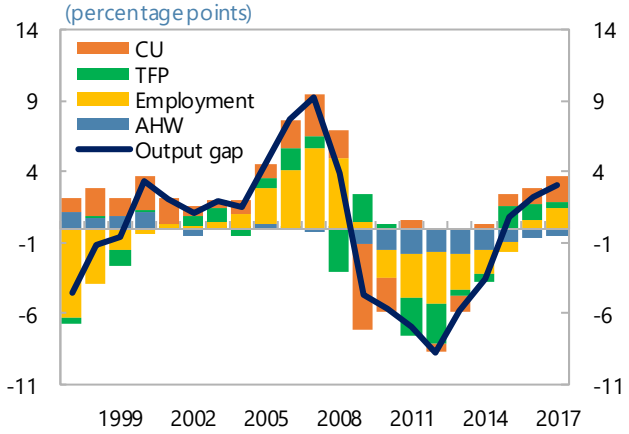
Sources: Haver and IMF staff.

Sources: Haver and IMF staff.

22. Changes in the output gap are driven by cyclical employment and capacity utilization. According to the decomposition of the output gap for GNI*, derived through the production function approach, the major drivers of the recently positive and widening output

gap are cyclical employment and stretched capacity utilization (Figure 11). These factors were also behind the boom-bust cycle of late 2000s. Average hours worked gradually approach long-term values and reduce the drag on the output gap as well.

Figure 11. Output Gap Decomposition



Sources: IMF staff.

23. These results suggest that the Irish economy has firmly moved into the upswing phase of a business cycle. Notwithstanding the general uncertainty surrounding output gap estimations, the currently positive output gap is confirmed with reasonable confidence as the range of the three applied methods has recently narrowed. The economy is in the midst of a cyclical upswing.

References

Byrne, S., M. O'Brien, 2016, "Understanding Irish Labour Force Participation", *Research Technical Papers* 01/RT/16. Central Bank of Ireland.

Blagrave, P., R. Garcia-Saltos, D. Laxton, and F. Zhang, 2015, "A Simple Multivariate Filter for Estimating Potential Output," *IMF Working Paper* 15/79.

Clancy, Daragh, 2013, "Output Gap Estimation Uncertainty: Extracting the TFP Cycle Using an Aggregated PMI Series", *The Economic and Social Review*, Vol. 44, No. 1, Spring, pp. 1–18.

Denis, Cecile, Daniel Grenouilleau, Kieran Mc Morrow, and Werner Roger, 2006, "Calculating Potential Growth Rates and Output Gaps – A revised Production Function Approach", *Economic Papers* No. 247, ECFIN, European Commission.

Elmeskov, J. and MacFarland, M. (1993), "Unemployment Persistence", OECD *Economic Studies* 21, pp. 59–88.

Epstein, N. and C. Macchiarelli, 2010, "Estimating Poland's Potential Output: A Production Function Approach", *IMF Working Paper* No. 15.

IMF, 2010, "Decomposing Irish Growth", Box 1, *IMF Country Report* No. 9/195, International Monetary Fund.

IFAC, 2018, "Inside the "Upside Down": Estimating Ireland's Output Gap," *Working Paper* 5, Irish Fiscal Advisory Council, January 2018.

Linehan, Suzane, Reamonn Lydon, Tara McIndoe-Calder, Paul Reddan, and Diarmaid Smyth, 2017, "The Labour Market and Wage Growth after a Crisis", Quarterly Bulletin 04, October 2017, Central Bank of Ireland.

Lawson, Robert A., Edward Bierhanzl, 2004, "Labor market flexibility: An index approach to cross-country comparisons", *Journal of Labor Research*, Volume 25, Issue 1, pp 117–126, March 2004.

Lozej, Matija, 2017, "Economic Migration and Business Cycles in a Small Open Economy with Matching Frictions", *Manuscript*, Central Bank of Ireland, 2017.

McAleese, Dermot, 2000, "The Celtic Tiger: Origins and Prospects", *Policy Options*, July-August 2000, pp. 46–50.

Szeto, K.L., M. Guy, 2004 "Estimating New Zealand NAIRU", New Zealand Treasury, WP 04/10.

Teixeira de Silva, T., 2001, "Estimating Brazilian Potential Output: A Production Function Approach", *Working Paper*, Research Department, Central Bank of Brazil.

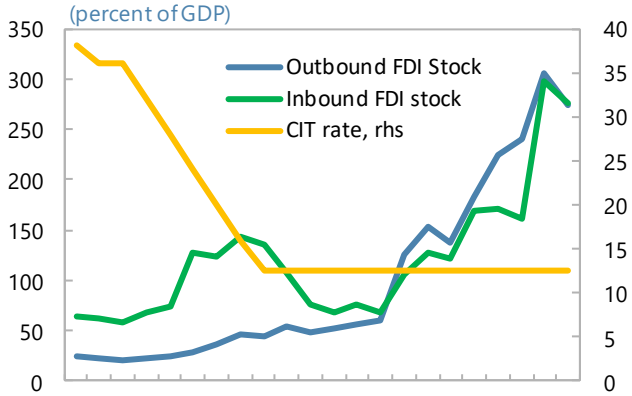
Watson, M. W., 1986, "Univariate detrending methods with stochastic trends", *Journal of Monetary Economics*, Vol. 18, No. 1, pp. 49–75.

THE IMPACT OF INTERNATIONAL TAX REFORMS ON IRELAND

A. Introduction[1]

1. Over the last two decades, the Irish stock of inbound foreign direct investment (FDI) has risen dramatically from roughly 60 percent of GDP to 275 percent (Figure 1). Several features of Ireland's economy, including a skilled, English-speaking workforce, membership in the European Union (EU), and a pro-business institutional environment, help attract investment. In addition, Ireland's relatively low and stable corporate income tax (CIT) rate on active trading income has played a key role in attracting foreign capital.

Figure 1. Inbound and Outbound FDI Stocks and CIT Rate



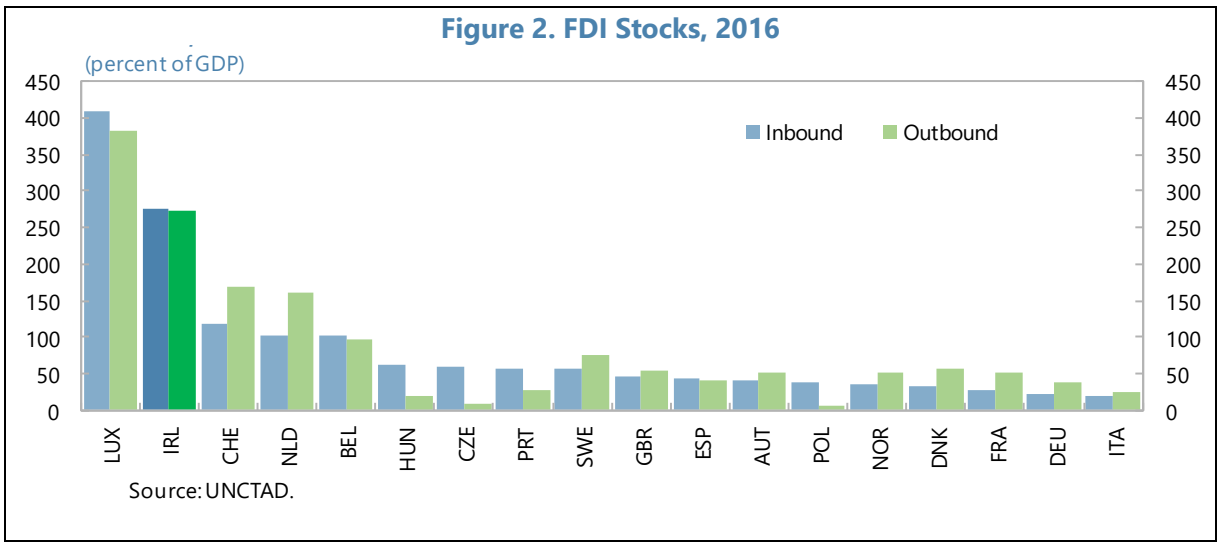
Sources: IMF CDIS and UNCTAD.

2. Recent international tax reforms are putting pressure on the international tax system from which Ireland has benefitted. Specifically, the Global Forum on Tax Transparency and the OECD/G-20 Base Erosion and Profit Shifting (BEPS) project are encouraging greater disclosure by corporations, tax administrations, tax planners and financial institutions as well as adoption of anti-abuse measures by governments in order to combat cross-border tax avoidance strategies. Ireland has been an active participant in these fora. The EU adoption of the Anti-Tax Avoidance Directives (ATAD, 2016–17) puts it in the vanguard of countries implementing BEPS recommendations. And the U.S. "Tax Cuts and Jobs Act" (TCJA) of 2017, which slashed the U.S. CIT rate from 35 percent to 21 percent, among other measures, substantially improved the international tax competitiveness for U.S. investment. Looking forward, OECD/EU initiatives on taxing the digital economy and the EU's common consolidated corporate tax base (CCCTB) may—if adopted—put further pressure on Ireland's corporate tax base. The purpose of this paper is to examine the impact of these reforms—and the U.S. tax reform in particular—on Ireland's economy and fiscal resources.

B. Foreign Investment in Ireland

3. Ireland has been highly successful in attracting foreign investment. As of 2016, Ireland had the second-highest ratio of inbound FDI stock to GDP in Europe, after Luxembourg

[1] Prepared by T. Matheson (FAD) and E. Kleinbard (FAD external expert).



and followed by Switzerland, the Netherlands, and Belgium - all countries distinguished by favorable corporate tax regimes (Figure 2). Notably, Ireland's outbound FDI stock, at 275 percent of GDP, is commensurate with its inbound FDI stock.

4. Ireland's bilateral FDI stocks are highly concentrated (Figure 3). The largest source of inward investment is the United States, which is the ultimate beneficial owner (UBO) of more than two thirds of the total inbound FDI stock. However, only about 30 percent of inbound investment flows directly from the U.S., indicating that more than half of U.S. investment is thus channeled through a third jurisdiction. Other major immediate sources of inbound FDI are the Netherlands (14 percent), Luxembourg (9 percent), the United Kingdom (8 percent), Switzerland (7 percent), and Bermuda (6 percent). Of these, official data on UBO investment identify only the UK share, which is less than 3 percent of total inbound FDI. Notably, 15 percent of inbound FDI is ultimately owned by Irish investors, indicating "round-tripping" of some domestic investment. The largest destination for outbound FDI is Luxembourg, which accounts for nearly half of the total. Other major destinations are the UK (12 percent), U.S. (11 percent), Netherlands (7 percent), and Bermuda (5 percent).

C. Ireland's CIT Regime

5. Ireland's tax regime has played an important role in attracting foreign investment.[2] First, the corporation tax rate applied to active "trading" income is 12.5 percent, which is among the lowest in Europe (Figure 4)[3]. Comparatively, however, this advantage has been eroding, as other European countries—as well as the U.S., the largest source of Irish foreign investment—have reduced their own CIT rates.

[2] See also IDA Ireland (2016), "Taxation in Ireland 2016".

[3] A higher 25 percent rate applies to passive income. The overall CIT rate comprises both central and subnational corporate taxes (where the latter exist).

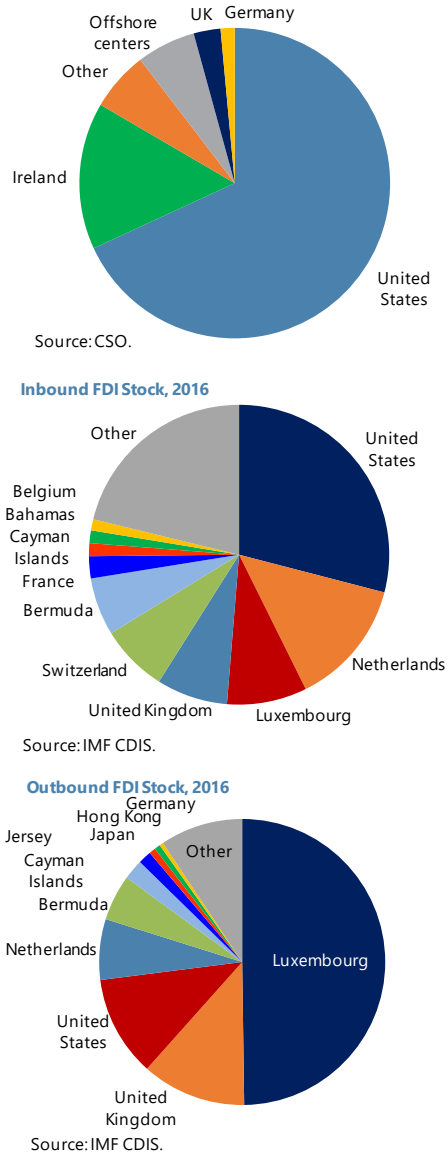
6. Several other features of Ireland's tax code also play an important role in stimulating investment generally and attracting FDI in particular:

- ***Trading losses may be carried back one year, offset against passive income on a value basis or carried forward indefinitely against trading profits.*** Group consolidation is not allowed, but companies may transfer losses and certain expenses where there is at least a 75 percent ownership link.[4] Capital assets may also be transferred within a group without triggering the 33 percent capital gains tax.

- ***Several provisions benefit research and development and intellectual property (IP).*** A 25 percent research and development (R&D) tax credit is available for qualifying expenditure undertaken within the European Economic Area (EEA) including wages, structures, equipment and overhead. Unused tax credits may be transferred to key R&D employees, refunded over three years, or carried forward. A knowledge box introduced in 2015 applies an effective 6.25 percent income tax rate to profits from qualifying IP assets proportional to the share of the cost of research and development by the Irish company in total development or acquisition costs of the IP.[5]

- ***Ireland operates a "worldwide" CIT such that earnings of foreign subsidiaries are subject to taxation in Ireland when distributed to the Irish parent.*** However, foreign tax credits (FTCs) are granted under domestic law for both foreign tax credits and withholding taxes, and excess FTCs can be used to offset tax on other foreign income or carried forward

Figure 3. Foreign Direct Investment

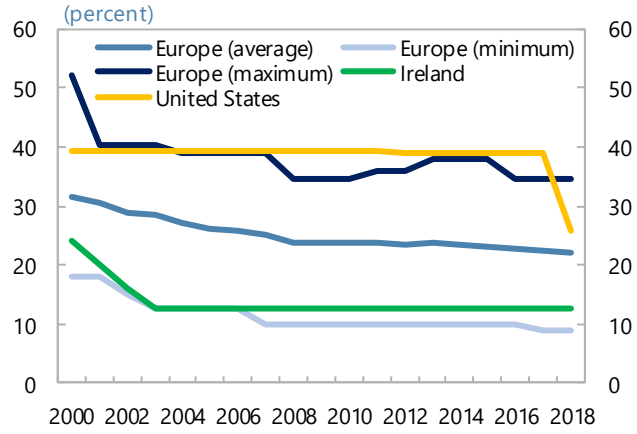


[4] That is, one company is 75 percent owned by the other, or both are at least 75 percent owned by a third company.

[5] That share may also receive a further "uplift" of up to 30 percent. Ireland's IP box was crafted to comply with OECD BEPS Action 5 on harmful tax practices by linking IP tax breaks to the domestic share of IP costs. It requires detailed accounting of costs and contributions to an ultimate product; as such, it is generally perceived as most useful to small and medium-sized Irish enterprises.

indefinitely. Given Ireland's relatively low corporate rate, repatriated foreign earnings are thus unlikely to face any residual Irish tax liability when repatriated.

Figure 4. Overall Statutory Rates



Source: OECD.

- ***Domestic law generally imposes a 20 percent withholding tax (WHT) on outbound dividends, interest and royalties, but numerous exemptions are available.*** Dividends paid to EU member states or tax treaty signatories are usually exempt, as well as those paid to publicly listed companies and their subsidiaries. Royalties and interest on long-term obligations paid to EU members or tax treaty signatories are also usually exempt, provided that the income is taxed in the foreign jurisdiction.

- ***Ireland has an extensive tax treaty network of more than 70 countries, which it continues to expand.*** Based on the OECD model, these treaties often reduce or eliminate cross-border WHTs on dividends, interest and royalties. Treaty provisions for leasing profits and payments have also facilitated the development of Ireland's global aircraft leasing industry.

- ***Ireland's tax residence rules have played an important role in shaping foreign investment structures.*** Prior to 2015, certain companies were only deemed an Irish tax resident if their place of effective management was in Ireland. A corporation could therefore be incorporated in Ireland, but non-resident for tax purposes if managed and controlled outside of Ireland. This definition contributed to coverage gaps in international taxation, such as those exploited by the "double-Irish Dutch sandwich" structure (see Annex).[6] In 2015, Ireland amended its corporate tax residence rules to include companies that are either incorporated or effectively managed in Ireland. Structures existing prior to 2015 are grandfathered for tax purposes through 2020.

- **Cross-border anti-abuse rules are currently limited although this is scheduled to change.** Ireland has no controlled foreign corporation (CFC) rules requiring current taxation of passive foreign earnings. It has no thin capitalization rules, although certain related-party interest may be disallowed or recharacterized as dividends.[7] Transfer pricing rules, which are based on the OECD guidelines, currently apply only to the trading income of larger

[6] For a thorough description of this structure, see Kleinbard (2011).

[7] See Section 130 and Section 247 of the Tax Consolidation Act of 1997. The EU Anti-Tax Avoidance Directive (ATAD) requires introduction of earnings stripping and other rules within the next few years. See Section III for details.

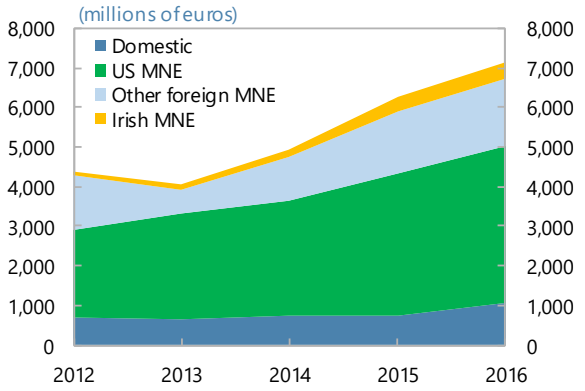
companies, although the Coffey Review suggested that consideration should be given to extending this coverage to passive income and companies of all sizes when Ireland adopts the updated 2017 OECD transfer pricing guidelines.

7. Irish capital allowances are moderate, while the treatment of capital gains is at present fairly restrictive. Companies may choose between the depreciation rate used in their financial accounts and straight-line tax depreciation allowances over the following terms: Equipment 8 years, scientific equipment 1 year (expensing), intellectual property 15 years; and non-agricultural structures 25 years. Capital gains are ring-fenced and subject to a tax rate of 33 percent (which was raised from 20 percent following the 2008 financial crisis).

D. Corporation Tax Revenues

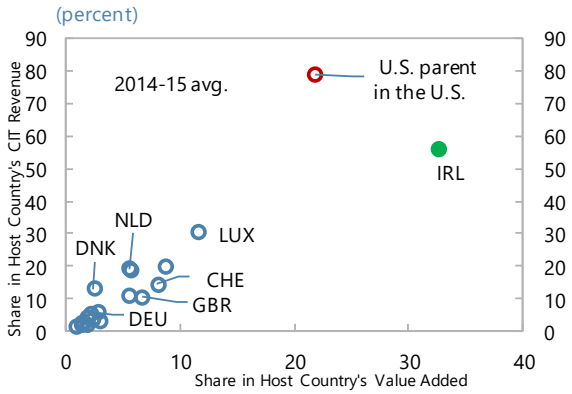
8. Foreign MNEs—especially U.S. companies—account for the lion's share of Ireland's corporation tax revenues (Figure 5). Specifically, foreign MNEs account for about 80 percent of total CIT revenues, of which about 70 percent (or 56 percent of total CIT revenues) comes from companies with U.S. parents.[8] Purely domestic Irish companies pay about 15 percent of the total, while Irish-parented MNEs account for a much smaller share.[9] Relative to other European countries, Ireland is much more heavily dependent on U.S. MNEs for corporate income tax revenue (Figure 6).

Figure 5. Corporation Tax Revenues



Sources: BEA and DoF.

Figure 6. U.S. MNE's Fiscal Relevance in Selected Host Countries



Sources: US BEA; Eurostat; Haver; WEO; and IMF staff.

9. Despite its relatively low statutory rate, the Irish corporation tax generates revenues in line with the European average (Figure 7). The ratio of CIT revenue to GDP in

[8] Data on aggregate domestic, foreign MNE, and Irish MNE data are provided by the DoF, which did not provide detailed country data. Irish CIT payments by U.S. MNEs data are therefore taken from U.S. Bureau of Economic Analysis (BEA) data for 2012–2015. Data for 2016 are interpolated based on their 2015 share in foreign MNE revenues.

[9] The share of Irish MNEs jumped from 3.6 percent to 5.8 percent in 2015, likely due in part to the U.S. corporate inversion phenomenon that peaked in that year.

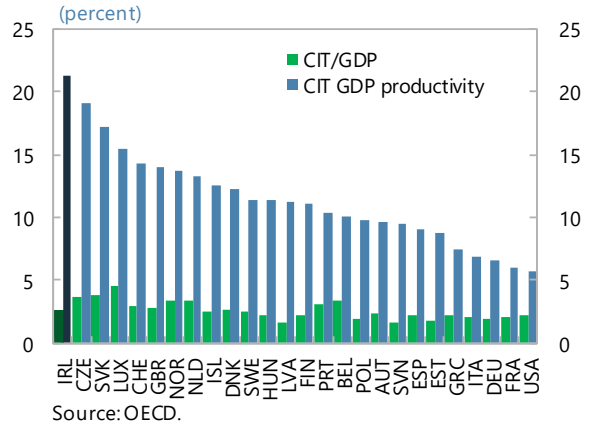
Ireland in 2016 was 2.7 percent, compared to a European average of 2.6 percent. However, controlling for the CIT rate, Ireland's CIT productivity—the ratio of CIT revenues to the product of the statutory CIT rate and GDP—is the highest in Europe at 21 percent versus an average of 12 percent. To understand what drives this ratio, it can be decomposed into:

$$\frac{CIT\ Revenue}{CIT\ rate*GDP} = \frac{1}{CIT\ rate} * \frac{CIT\ Revenue}{CIT\ Base} * \frac{CIT\ Base}{CGOS} * \frac{CGOS}{GDP} \qquad (1)$$

Where CGOS = corporate gross operating surplus, a national accounts component measuring the return on corporate investment before tax, depreciation and interest deductions. The ensuing analysis calculates each term of Equation (1) for Ireland. For the comparative analysis, however, the second and third ratios on the right side are consolidated, since data on CIT bases were not available for all OECD countries.

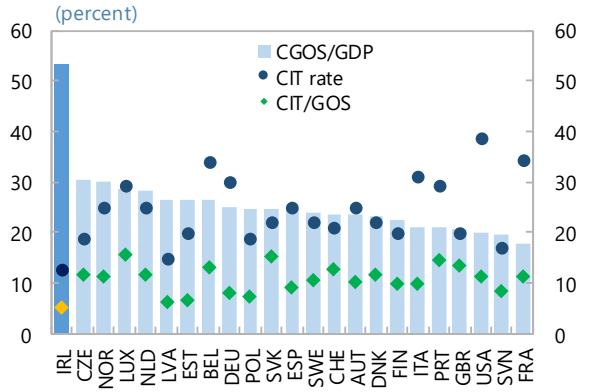
10. The ratio of Irish CIT revenue to the CIT base in 2016 was 10 percent—fairly close to the statutory CIT rate on trading income.[10] The ratio of the CIT base to the CGOS was 49 percent, while the ratio of CGOS to GDP was 53 percent—the highest in Europe by a large margin (Figure 8). Combining the second and third terms of equation (1), the ratio of CIT revenue to CGOS is about 5 percent in Ireland, compared to a European average of 10.7 percent. Ireland's high CIT productivity is thus driven largely by an unusually high share of corporate profits in GDP. Correspondingly, the share of Irish wages in GDP is the lowest in Europe (Figure 9).

Figure 7. Corporate Income Tax Performance, 2016



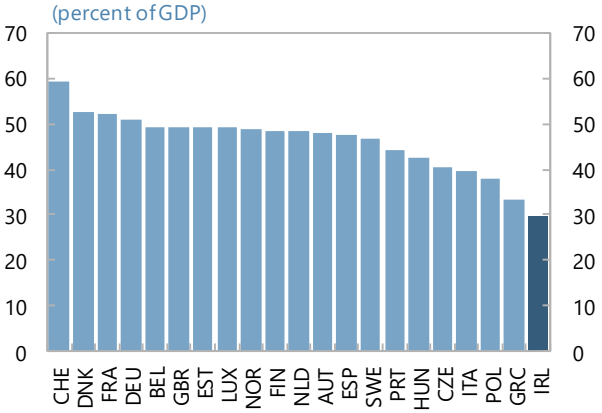
Source: OECD.

Figure 8. Corporate Tax and Gross Operating Surplus, 2016



Source: OECD.

Figure 9. Wages, 2016

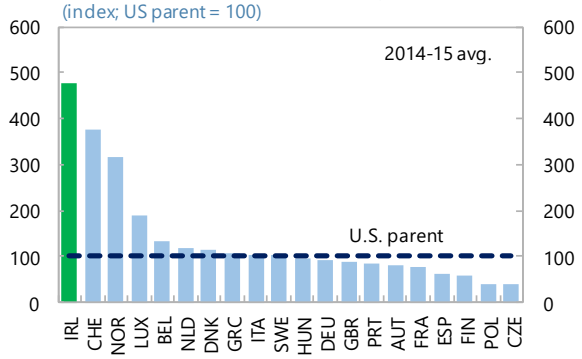


Source: OECD.

[10] The CIT revenue-to-base ratio of 10 percent also includes passive income taxed at 25 percent, which accounted for about 6 percent of taxable corporate profits in 2016.

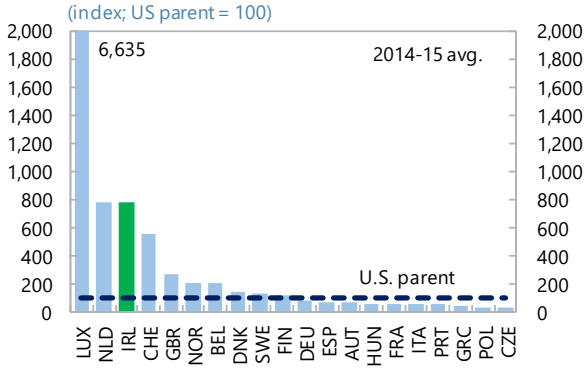
11. A high share of corporate profits in GDP—particularly for a low-CIT rate economy—may indicate inward profit-shifting by MNEs.[11] To further examine this relationship, country-level data on the foreign affiliates of U.S. MNEs from the U.S. Bureau of Economic Analysis (BEA) show that Irish affiliates have an unusually high ratio of value added and total assets per employee (Figure 10 and 11). Further, Ireland's share of U.S. MNE profits is much higher than its shares of real productive factors and third-party sales (Table 1).[12]

Figure 10. U.S. MNE's Affiliates – Value Added per Employee



Sources: US BEA; Eurostat; Haver; WEO; and IMF staff.

Figure 11. U.S. MNE's Affiliates – Total Assets per Employee



Sources: US BEA; Eurostat; Haver; WEO; and IMF staff.

Table 1. Irish Affiliates of U.S. MNEs

(Millions of USD, unless otherwise specified)

	Net Income	Employment (headcount)	Payroll	Property, Plant and Equipment	Third-party sales	Income Tax
Amount	131,625	124,800	9,304	73,438	2,356	3,976
Share of total	12.3	0.9	1.5	5.2	2.3	4.4

Source: BEA.

12. The following analysis estimates the impact of two major features of the U.S. tax reform—the statutory rate cut and expensing of capital investment—on Irish inbound FDI and CIT revenues. The methodology for the estimate, which is detailed in Beer, Klemm and Matheson (BKM), assumes that changes in statutory tax rates affect corporate tax revenues in two ways: through profit-shifting as well as through changes in FDI. The percentage change in

[11] See European Commission (2017).

[12] Net income figures for Irish affiliates of U.S. MNEs reported in the BEA data include income of the aforementioned entities that are incorporated in Ireland but not tax residents of Ireland. The Irish CIT tax base for U.S. MNE affiliates is therefore smaller, but the DoF did not provide data on its size. If tax-resident U.S. MNE affiliates have the same ratio of CIT to financial profits as all foreign MNEs, which averaged 10.6 percent during 2012–2016, then the share of U.S. MNE profits reported in the BEA data that is subject to Irish CIT is roughly 30 percent. However, the income tax data reported by BEA should be accurate.

FDI resulting from the change in the U.S. statutory tax rate, $\Delta\tau_{US}$, is calculated as $\Delta\tau_{US} * \omega * \varepsilon_{FDI}$, where ε_{FDI} is the elasticity of FDI with respect to the tax rate and ω is the share of total foreign investment that involves the U.S. The percentage change in corporation tax revenues resulting from the changes in both FDI and profit shifting is calculated as:

$$\frac{[\Delta\tau_{US} * \omega * (\varepsilon_{FDI} * \kappa + \gamma) * \tau_{IRL} * \pi_{it}]}{\text{CIT revenue}_{it}}$$

Where κ is the share of capital revenue in total revenue; γ is the elasticity of corporate profits with respect to the statutory tax rate[13]; τ is the corporate tax rate (12.5 percent); and π is corporate profits.

13. To assign values to these parameters, the analysis draws on a large literature measuring the elasticity of both FDI and profit-shifting to changes in tax rates, as well as the details of the U.S. reform. These parameters are summarized in Table 2. For profit-shifting, the relevant rate is the statutory tax rate, which fell by 14 points. A review of the profit-shifting literature by Beer, de Mooij and Liu (2017) finds an average profit-shifting semi-elasticity of 1.2 percent: That is, a one percentage point increase in a jurisdiction's statutory tax rate (or its relative rate) reduces reported profits by 1.2 percent.

Table 2. Ireland: Parameters for TCJA Impact Assessment

Variable	Description	Value	Source
	Percent		
γ	Semi-elasticity of profits w.r.t statutory tax rate	1.2	Beer, de Mooij, and Liu (2018)
ε_{FDI}	Semi-elasticity of FDI w.r.t statutory tax rate	0.5-2.4	Beer, Klemm and Matheson (2018), De Mooij and Ederveen (2008)
ε_{FDI}	Semi-elasticity of FDI w.r.t EMTR	1.3-4	De Mooij and Ederveen (2008)
ε_{FDI}	Semi-elasticity of FDI w.r.t EATR	3.2-5.9	De Mooij and Ederveen (2008)
ω	US weight based on bilateral FDI	20.2	IMF CDIS database
ω	US weight based on corporate microdata	44.3	ORBIS database
κ	Irish capital weight	60	OECD database
	Points		
$\Delta\tau_{US}$	Statutory tax rate	14	Beer, Klemm and Matheson (2018)
$\Delta\tau_{US}$	EATR	11.7	Beer, Klemm and Matheson (2018)
$\Delta\tau_{US}$	EMTR	7.6	Beer, Klemm and Matheson (2018)

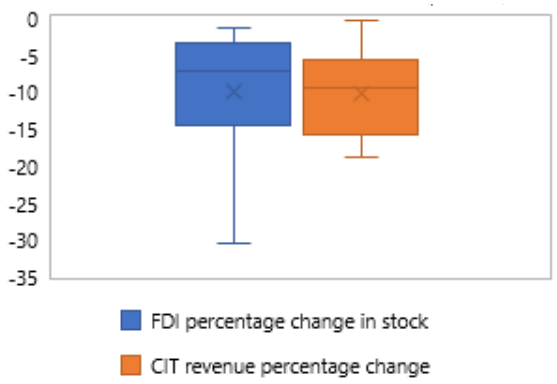
[13] The tax elasticity of corporate profits captures both the costs and benefits of profit-shifting. For a thorough discussion of these costs, see Altshuler and Grubert (2013).

14. FDI is believed to respond more to effective average tax rates (EATRs) and effective marginal tax rates (EMTRs) than statutory rates. [14] EATRs and EMTRs take into account not only the statutory rate but also the breadth of the tax base, including depreciation allowances, investment tax credits etc. Due to the move to expensing, the U.S. EMTR was reduced to zero (from 7.6 percent prior to the reform), while the EATR for a company earning 20 percent economic profits fell by 11.7 points. Although these tax measures decreased by less than the statutory rate, their investment elasticities are generally found to be higher than for the statutory rate.

15. The change in the U.S. tax rate must be weighted by the share of Ireland's MNE investment that involves the U.S. BKM uses two weighting schemes, one based on bilateral FDI as reported in the IMF CDIS database and the other based on MNE-level microdata reported in Bureau van Dyke's ORBIS database. The FDI weight is the sum of Ireland's bilateral inbound and outbound FDI with the U.S. divided by the sum of its total inbound and outbound FDI (25.2 percent)[15]; and the microdata weight is the average value for MNEs with an Irish affiliate of one divided by the total number of countries with affiliates (less one), which for Ireland is 44.3 percent.

16. Two further adjustments were made to the BMK parameters. BMK assumes an average capital income share (the ratio of capital income to total value added) of one third. As shown in the previous section, however, Ireland's capital income share is much higher. Estimates were also made using a capital share of 60 percent, in line with Ireland's average value for the past five years. Also, the ORBIS MNE profit and FDI stock data used in BMK were replaced by 2015 data from Ireland Revenue and the CSO, which resulted in only minor upward adjustments.

Figure 12. Percentage Change in FDI Stock and CIT Revenue from U. S. Tax Reform



Sources: CSO; MoF; and IMF staff.

17. Estimates of the FDI and corporate tax revenue impacts of the U.S. rate cut are presented in Figure 12. The range of estimates reflects the variation in elasticities and U.S. investment shares applied. The average reduction in the inbound FDI stock was 10 percent, while the

[14] For a detailed description of these tax measures, see De Mooij and Ederveen (2008). The EMTR, which measures the "tax wedge" on an investment that just breaks even on an after-tax basis, determines the scale of investment; while the EATR, which measures the average tax burden on a discrete investment earning economic profits, determines location decisions. The EATR is bounded between the statutory rate and the EMTR. Because effective tax rates vary not only by country but also by type of investment (e.g., structures, equipment and inventories), it is difficult to specify them for general investment. Since statutory rates are readily available and are a main determinant of effective rates, they are used in many empirical FDI studies.

[15] This figure is based on immediate FDI relationships, rather than ultimate beneficial ownership.

minimum was 1.4 percent and the maximum was 30.5 percent. The average reduction of CIT revenues was also 10 percent, which as a share of GDP is approximately 0.25 percent (or 0.37 percent of GNI*). The minimum revenue reduction was 0.007 percent of GDP and the maximum was 0.45 percent.

18. It is important to bear in mind that these estimates reflect the impact of only a portion of the U.S. corporate tax reform: the 14–point cut in the statutory rate and expensing of capital investment (which affects the EMTR and EATR). The analysis does, however, incorporate the removal of prior law's deadweight loss associated with the cost of maintaining the old "deferral" system, as expressed by the profit-shifting elasticity. Other features of the reform and their possible implications for Ireland's economy and tax revenues will be discussed in detail in the following section. Also, the above estimates consider only tax-induced movements of capital and income. They do not capture any location-specific business exigencies that might induce or preserve investment in Ireland regardless of U.S. tax rate changes, such as the necessity of maintaining an operation in the EU in order for a firm to avail itself of the EU passport.

E. The U.S. Tax Reform

19. The major provisions of the 2017 U.S. Tax Cuts and Jobs Act are:

- The standard federal CIT rate was cut by 14 points from 35 percent to 21 percent. Unlike several other major features of the TCJA, this measure is permanent.
- Capital investment expense was made fully and immediately deductible—a policy known as "expensing". This measure is temporary through 2022, at which point it is scheduled to phase down and ultimately revert to the pre–2018 system of depreciation unless extended by act of Congress.
- Interest deductibility was limited to 30 percent of earnings before interest, tax, depreciation and amortization (EBITDA). From 2022, a more restrictive ratio will be applied — 30 percent of earnings before interest and taxes (EBIT). This limit applies to interest paid to both related and unrelated parties.
- The TCJA generally removes former law's inclusion of dividends received by U.S. MNEs from their CFCs in those MNEs' taxable income.[16] U.S. parent companies now receive a 100 percent dividends-received deduction for foreign dividends from companies in which they hold an at least a 10 percent share. By itself, this is consistent with a "territorial" system of taxation. Existing CFC rules, known in the U.S. as subpart F rules, are retained

[16] This feature of the previous tax code, which permitted "deferral" of taxation until foreign dividend distribution. was the cause of the roughly $2.6 trillion U.S. MNE offshore earnings stockpile built up under the old system. Deferral was furthermore encouraged by U.S. accounting standards, which permitted corporations that made an election to forego repatriation indefinitely not to recognize a deferred tax liability on those earnings in their financial statements.

for specified forms of passive and mobile income. Foreign branch earnings are also taxed at the domestic 21 percent rate.

- In place of the previous high-rate worldwide system with deferral, a new worldwide tax system without deferral was introduced at a much lower rate: The global intangible low-tax income ("GILTI") tax applies to the total non-U.S. active income of a U.S. MNE's CFCs, reduced by the excess of 10 percent of foreign "qualified business asset investment" (QBAI) over CFC interest expense.[17] GILTI is calculated as a single pool of all non-US income. As applied to a U.S. MNE, therefore, the GILTI base comprises the aggregate CFC incomes, less CFC losses, from all of that MNE's CFCs (reduced by the 10 percent deemed return to QBAI less interest expense, as just described). All CFC foreign tax credits (FTCs) related to GILTI income are likewise pooled on a global basis. Only 50 percent of GILTI income is included in the U.S. parent's tax base, making the effective U.S. statutory tax rate on GILTI 10.5 = 21*0.5 percent.[18]

- The tentative U.S. GILTI tax may be paid using FTCs. However, FTCs allowed against GILTI income are subject to two "haircuts" that can raise this rate: a 20 percent general haircut, which raises the effective GILTI rate to 13.125 percent = 0.8*10.5 percent, and a second "inclusion percentage" which depends on the share of total positive foreign income, including the 10 percent return to QBAI excluded from the GILTI base. FTCs also are limited by the general principle (ignoring for simplicity the prospect of domestic loss) that foreign taxes are creditable only to the extent of the U.S. tax rate applied to the relevant foreign source income, as measured under U.S. tax accounting principles. In this regard, U.S. tax law provides that the U.S. tax rate on foreign source income should reflect the principle that a share of certain domestic expenses, particularly interest expense, must be allocated against foreign sources, thereby raising the foreign effective tax rate on foreign source income from a U.S. tax accounting perspective. The TCJA offers no guidance on how these principles will be extended to the GILTI FTC.

- FTCs not allowable against GILTI in the current year cannot be carried forward or back, or used against other foreign source income; they thus have no value for U.S. MNEs. If U.S. domestic interest expense is allocated against GILTI, and as a result a U.S. MNE incurs additional "excess" FTCs, that expense allocation has the same economic impact as disallowing the deductibility of that interest expense.

- The TCJA repeals the former corporate alternative minimum tax, but introduces a new "base erosion and anti-abuse tax" (BEAT). The BEAT's purpose is to prevent

[17] Legislative history to the TCJA suggests that the exclusion for a deemed 10 percent return on QBAI applies only to profitable CFCs. There is debate as to whether interest expense of unprofitable CFCs is included in the calculation, even though the deemed 10 percent return on QBAI from such companies apparently would be ignored.

[18] The exclusion is scheduled to decrease to 37.5 percent as of 2026, bringing the effective tax rate to 13.125 percent = (1–0.375)*21 percent before FTCs, or 16.4 percent = 13.125/0.8 percent after FTCs.

income-stripping from the U.S. tax base by both foreign and domestic MNEs.

- The BEAT applies only to corporations that are members of a group with at least $500 million in average annual domestic gross receipts, and that (simplifying) make deductible payments to foreign affiliates totaling 3 percent (2 percent for banks and securities dealers) or more of total tax deductions. Excluded for this purpose are the 100 percent deduction for foreign dividends, payments excluded in the next paragraph, and the deductions allowed for GILTI and for FDII (described below). Amortization or depreciation of property purchased from a foreign affiliate is treated as a deductible payment to that foreign affiliate.

- If a company satisfies the BEAT threshold, then it must pay the greater of its regular tax or the BEAT. The BEAT tax base comprises the regular tax base plus add-backs for deductible payments to foreign affiliates. Importantly, payments for cost of goods sold (COGS) are not treated as BEAT add-backs. The same is true for certain payments for services rendered by foreign affiliates with zero markup; it is unclear whether payments rendered for a markup are treated entirely as within the BEAT base, or whether instead only the markup is. The BEAT alternative tax rate is 10 percent–11 percent in the case of financial companies. [19] Since BEAT applies to gross interest payments, it is particularly problematic for financial companies, which in any event are subject to lower thresholds, as described above. (Many such companies also rely on foreign service centers, the payments to which might also fall into the BEAT.) No foreign tax credits are allowed against BEAT income, which complicates it relationship with GILTI, as discussed further below.

- The TCJA also introduces an export-oriented form of patent box for "foreign-derived intangible income" (FDII). The FDII confers a 37.5 percent deduction for foreign-source income related to exploitation of U.S. intangibles, less a 10 percent return to domestic tangible assets (similar to QBAI). This deduction results in an effective tax rate of 13.125 = 21 * 0.625 percent—the same as the GILTI rate, if the GILTI tax were satisfied with FTCs.[20]

- A new anti-hybrid rule, in the spirit of BEPS Action 2, provides for symmetrical treatment of cross-border financial flows. If, for example, a "dividend" received by a U.S. parent was deducted in its source country, it would not qualify for the dividend received deduction and thus would be subject to tax. Similarly, outbound payments such as interest and royalties will not receive a deduction in the U.S. if they are not taxed in the destination country.

[19] For 2018 only, the BEAT rate is 5 percent (or 6 percent for financial companies). As of 2026, the rate will rise to 12.5 percent.

[20] As in the case of GILTI, the FDII rate will increase to 16.4 percent in 2026.

- A one-time transition tax was imposed on the accumulated stock of unrepatriated U.S. MNE foreign earnings, which were believed to total roughly US$3 trillion as of end 2017. The tax has a split rate: a 15.5 percent rate applies to foreign earnings held in liquid assets, and an 8 percent rate applies to earnings reinvested in real assets. Liquid investments are believed to account for roughly half of the offshore earnings stockpile.

20. The TCJA is extraordinarily complex and uncertain, and its uncertainty is moreover unlikely to be resolved quickly. It was passed entirely along partisan lines, which leads some observers to anticipate possible changes; it includes many provisions that change or sunset under their own terms; and the speed of its drafting leaves the application of many of its provisions – and particularly their interaction – open to significant debate. The Internal Revenue Service will be hard pressed to issue regulations in a timely manner, and MNEs have only begun to analyze the law's impact.

21. U.S. tax experts view the FDII as the most unstable TCJA provision because its reduced tax rate on IP service exports may violate World Trade Organization (WTO) treaty obligations. It therefore appears unlikely that U.S. MNEs will move IP that is currently offshore to the U.S. in order to take advantage of the lower FDII rate. To the extent that MNEs have non-tax reasons for locating IP in the U.S., FDII offers an additional "carrot," at least in the near term. WTO disputes usually take many years to resolve, and if FDII is eventually overturned, the U.S. government may not "claw back" past MNE tax benefits. Questions have also been raised as to whether the FDII is in breach of international rules on harmful tax competition as agreed at the OECD forum on Harmful Tax Competition.

22. Despite the large share of offshore earnings attributed to Ireland, Irish fiscal authorities expect the U.S. transition tax to have little effect on Irish CIT revenues. Moody's (2018) reports that Ireland is the largest single location for U.S. MNEs' unrepatriated earnings, with roughly US$670 billion or 20 percent of the total.[21] According to Department of Finance officials to the extent that these profits have accumulated primarily in Irish registered companies that are not tax resident in Ireland, and have been invested by those non-Irish resident companies in non-Irish source assets, they are not part of the Irish tax base.[22]

23. Though the focal GILTI rate is 13.125 percent, in practice this rate could often be higher. In addition to the general 80 percent haircut, GILTI FTCs are reduced by an inclusion percentage, calculated as:

[21] The breakdown of Irish assets into liquid and real investments is unknown, but as previously noted overall those shares are thought to be roughly equal. In light of the very low effective tax rates enjoyed by some U.S. MNEs in respect of their Irish CFCs, it is entirely possible that the cash portion is higher.

[22] Those assets and associated earnings in many cases are held in entities that from an Irish perspective are offshore parent companies of onshore Irish operating companies. At the same time, from a U.S. perspective those two companies conflate into a single Irish corporation, by virtue of the application of the 'check-the-box' rules. See Annex for further details.

$$\frac{Net\ GILTI\ income}{Total\ Positive\ CFC\ income}$$

where the denominator includes the 10 percent of QBAI deducted from the GILTI base less interest expense. Assume, for example, that a U.S. MNE's aggregate results from its CFCs comprise the following: $1,000 of positive foreign income from CFC 1; foreign losses of $100 from CFC 2; QBAI of CFC 1 of $1000; no CFC interest expense; and foreign taxes of $125. Its GILTI income would be $800 = $1000 - $100 - $1000*0.1, and its inclusion percentage would be 800/1,000 = 80 percent. Its tentative U.S. tax liability would be 0.21*800/2 = $84. Barring other considerations, the MNE would offset this with FTCs equal to $125*0.8*[800/1000] = $80, so its net U.S. liability would be $4. Total taxes paid are $129 or 14.33 percent of net profits.

24. Another factor affecting GILTI liability is domestic interest expense allocation. Under U.S. income tax rules, domestic interest expense must be allocated to foreign income proportionate to its share in global income, and FTCs are accordingly reduced by the ratio of GILTI income less interest expense to GILTI income. As previously noted the TCJA did not directly address how these rules will operate in the case of GILTI. If, in the above example, $100 of domestic interest expense is allocated to foreign income, the FTC would be limited to ($400–$100)/$400=75 percent of the tentative U.S. GILTI tax liability, or $84*0.75 = $63, so $17 of the FTC cannot be used. The new net GILTI liability would therefore be 0.21*($400) – $63 = $21.

25. It may seem that GILTI creates an incentive for U.S. MNEs to locate low-yielding tangible assets offshore in order to reduce their GILTI liability. Where the average foreign tax rate is zero (or very low), this may be the case. But when applied to global effective foreign tax rates in the neighborhood of the Irish statutory rate or higher, inclusion of the 10 percent return on QBAI in the denominator of the FTC inclusion percentage dampens this incentive. Moreover, the incentive to locate tangible assets offshore is counterbalanced by the zero-rate EMTR on marginal investments in the U.S. afforded by expensing.

26. Finally, MNEs subject to BEAT may lose the full value of their FTCs against their GILTI income, since BEAT does not permit FTCs. MNEs in this position could therefore be double-taxed on their non-U.S. income. Under the pre-2018 U.S. CIT, MNE structures were oriented toward stripping income out of the U.S. using various types of related-party payments. Now that the U.S. rate has been sharply reduced and BEAT penalizes related-party payments, MNEs will likely restructure their operations to minimize related-party payments outside of COGS. The risk of sweeping GILTI into the BEAT base will impel firms to strive to stay below the BEAT thresholds.

27. As a worldwide tax system without deferral, GILTI should allow foreign countries to set their CIT rates near the GILTI rate without deterring foreign investment. When a large investor country such as the U.S. operates a worldwide system, other countries have an incentive to set their CIT rates at or just below the investor country's rate, because MNEs headquartered in the investor country will be taxed at that rate on their worldwide income in any event. However, if that worldwide system—like the old high-rate U.S. system—allows indefinite deferral of income repatriation, then it becomes effectively territorial, and countries hoping to lure investment have

an incentive to lower their CIT rates to attract investment. As foreign CIT rates declined and MNEs became adept at shifting profit to low-tax jurisdictions, U.S. MNEs had increasing incentives to hold their foreign earnings offshore indefinitely (although maintaining those earnings offshore bore some costs). The elimination of deferral under GILTI restores the incentive for foreign countries to set their tax rates at or just below 13.125 percent, because U.S. MNE income will be taxed immediately at this rate in any event. Ireland's 12.5 percent CIT rate on trading income thus appears well-positioned with respect to GILTI.

28. Nonetheless, the pooling of worldwide income and FTCs under GILTI preserves an incentive for U.S. MNEs with investments in high-tax jurisdictions to "blend down" their foreign tax rate by investing in low-tax jurisdictions. From a corporate CFO's perspective, the GILTI rate is a practical ceiling as well as a floor: Foreign tax credits in excess of 13.125 percent of foreign income cannot be used or carried forward, so the goal will be to limit the average foreign tax rate to that percentage. Thus, governments may still see an advantage to offering tax rates below the U.S. GILTI rate to attract additional investment. Conversely, U.S. firms that enjoy very low effective foreign tax rates will have less disincentive to invest in high-tax countries, since those taxes will simply substitute (although with a 20 percent haircut) for U.S. GILTI tax that would otherwise be unavoidable.

29. While full territoriality vitiates the need for corporate "inversions", the U.S. international tax system, dominated by GILTI, is still worldwide (albeit with a much lower rate.) U.S. incentives to invert are therefore greatly weakened, but not entirely eliminated. If the GILTI rate is raised according to current or future legislation, and/or if foreign tax rates continue to decline, U.S. inversions could resurface. The TCJA contains measures designed to limit inversions, but their impact has not yet been tested.

30. Irish tax advisors and U.S. MNE representatives reported that they have only just begun to respond to TCJA. Their first priority has been to calculate their liability under the one-time transition tax, followed by necessary adjustments of their first-quarter 2018 financial statements. No major decisions have yet been made on revision of global structures, and revisions that eventually ensue will depend on each MNEs particular configuration and future growth opportunities. Tax advisors also reported that international tax system changes due to OECD/G-20 BEPS initiatives, discussed below, are at least as important to European operations as the U.S. tax reform.

F. OECD/G-20 BEPS

31. The OECD G-20 BEPS project, initiated in 2013, is slowly but steadily altering the European tax landscape. Generally, the objectives of the BEPS project are to identify practices in the prevailing system of international corporate taxation that contribute to base erosion and profit-shifting; to recommend legal and administrative measures to combat those practices; and to encourage adoption of those measures at the national and regional levels. Rather than shift to a fundamentally new system for taxing corporate income, the BEPS reforms aim at tightening

the rules of the existing tax system, retaining its basic features of separate accounting and arm's length pricing.

32. The BEPS project consists of 15 "actions", which are divided into minimum standards, and best practices. The EU, including Ireland, is in the vanguard of countries moving ahead with implementation of those actions. Actions 2, 3, and 4 are embodied in the ATAD, discussed in the following section. The Coffey Report (Coffey, 2017) made extensive recommendations for transposing to national law Ireland's commitment to the BEPS project, including detailed recommendations on transparency (Chapter 5), transfer pricing (Chapter 6) and anti-abuse issues including hybrid mismatch arrangements and controlled foreign corporation (CFC) provisions (Chapter 7). As recommended by the Coffey Report, the Irish authorities are considering adopting the updated 2017 OECD transfer pricing guidelines and broadening the application of transfer pricing.[23] Ireland has also implemented the four BEPs "minimum standards"—exchange of information (Action 5), anti-treaty shopping (Action 6), country-by-country reporting and transfer pricing documentation (Action 13) and mutual agreement procedures (Action 14)—and passed or scheduled peer reviews for all four.

33. The concept of "substance" as the determinant of the location of income is central to the BEPS agenda, particularly as expressed in the transfer pricing guidelines. In practice, this means inquiring whether observable commercial undertakings, in headcount, managerial responsibilities, tangible investments, and commercial risk assumption and management (but not pure financial risks divorced from other functions), and similar factors align with the jurisdiction in which income is recorded for tax purposes. In connection with IP, these functions are summarized in the OECD BEPS work as the development, enhancement, maintenance, protection, and exploitation of that IP — the "DEMPE" functions. Work is progressing on the open transfer pricing issues that remain, namely the taxation of hard to value intangibles. It is anticipated that by 2020 any open transfer pricing issues will have been resolved.

34. Ireland signed the Multilateral Instrument (MLI, BEPS Action 15) in 2017, and expects to fully ratify and implement it within the next two years. The effect of this process will be to align its numerous bilateral tax treaties more closely with BEPS standards regarding all treaty partners who are also signatories to the MLI. (This excludes the U.S., which has not signed the MLI.) Ireland has reserved on Article 10 (denying treaty benefits to low-tax permanent establishments (PEs) in third countries); Ireland does not exempt PE or branch income. Article 11 (the "saving clause" preserving a country's right to tax its own residents under domestic law) and Article 12 (extended definition of PE to cover certain agency relationships, such as commissionaire arrangements). On treaty shopping, Ireland is expected to adopt the "principal purpose test", which disallows treaty benefits if the principal purpose of an arrangement is to obtain that benefit, unless allowing it is consistent with the purpose of the treaty.

[23] See OECD (2017). Ireland's existing transfer pricing rules (as of August 2017) are summarized in an OECD questionnaire available at http://www.oecd.org/tax/transfer-pricing/transfer-pricing-country-profile-ireland.pdf .

35. The effective dates of the various BEPS actions will vary, but as a general matter substantially all of them will be in force in respect of Ireland by the end of 2020. Further, various new disclosure initiatives will have come into force, on top of existing country-by-country reporting requirements. Concomitantly, grandfathered IP conduit entities will either have expired or been nullified by ongoing multilateral initiatives, including the ATAD (see following section). The tax landscape for multinationals will thus look very different by that date. Well-advised MNEs already are adapting their Irish structures and activities to reflect these realities.

36. The effect of BEPS-related reforms on Irish CIT revenues is unclear, but potentially positive: Compelled to align better the location of productive assets and reported profits, MNEs may relocate some IP assets currently held in IP conduit structures to jurisdictions with significant R&D functions. However, since those assets are not currently part of the Irish tax base, this in itself should not undermine Irish revenues. To the extent that MNEs have invested real assets in Ireland to support profit- or IP-shifting into Ireland, that incentive may nonetheless diminish. Conversely, MNEs may choose to locate more productive assets in Ireland—particularly those related to R&D activities—in order to support retaining a larger share of IP in a relatively low-tax jurisdiction. This could benefit not only Irish CIT revenues, but overall productivity.

G. EU Anti-Tax Avoidance Directives

37. The EU Anti-Tax Avoidance Directives (ATAD I, 2016, and ATAD II, 2017) implement several of the Actions of the BEPS project. They are one cornerstone of the European Commission's Anti-Tax Avoidance Project, the other being the CCCTB, discussed below. As European Council Directives, ATAD requires that every Member State amend its internal law to comply within the time frames specified. ATAD addresses tax avoidance along five margins:

Interest Limitation Rules

38. Article 4 of ATAD I (BEPS Action 4) requires legislation limiting the deductibility of "exceeding borrowing costs" (net interest expense) to 30 percent of EBITDA. Rather than imposing a general interest expense limit (as in TCJA), ATAD targets disproportionate debt capitalization of one member of a financial accounting consolidated group. Simplifying, and depending on which option a member state exercises in adopting Article 4, the 30 percent cap applies to: (i) "exceeding" interest costs paid by one member of a financial accounting consolidated group to another member in a presumptively lower-taxed jurisdiction, or (ii) third-party exceeding interest costs of one member used to finance an equity investment in a low-taxed affiliate.

39. Article 4 must in general be implemented by January 1, 2019. However, member states that have adequate existing interest limitation rules may defer implementation until 2024. The Irish authorities maintain that Ireland's rules in this area are "equally effective" to Article 4 of ATAD I, so that Ireland should be able to defer the application of Article 4 until January 1, 2024. Given Ireland's low statutory CIT rates, MNEs are not likely to have engaged in widespread interest stripping out of Ireland in the past in any event.

Controlled Foreign Company (CFC) Rules

40. Articles 7 and 8 of ATAD I require adoption of CFC rules (BEPS Action 3) by January 1, 2019. ATAD defines a CFC as an entity or permanent establishment where: (1) In the case of an entity, more than 50 percent of the voting power or capital is owned, directly or indirectly (including through associated enterprises) by a taxpayer in a Member State (the "controlling shareholder"); (2) The entity or permanent establishment is not subject to tax in the jurisdiction of the controlling shareholder; and (3) the actual CIT paid by the entity or permanent establishment is less than 50 percent of the CIT that would have been paid if the CFC were fully subject to tax under the CIT applicable to the controlling shareholder.

41. Member states may choose between two alternative CFC regimes. Regime A resembles U.S. subpart F in requiring the controlling shareholder to include in income its share of a list of passive or mobile income earned by the CFC, including interest, dividends and royalties from intellectual property. However, regime A will not apply where the CFC "carries on a substantive economic activity supported by staff, equipment, assets and premises." In turn, member states may elect not to apply this safe harbor to CFCs resident in countries that are not parties to the EEA Agreement. Finally, Member States that adopt regime A may opt not to treat an entity or permanent establishment as a CFC at all if one-third or less of its income falls into the proscribed list.

42. Regime B applies a subjective purpose test that requires the controlling shareholder to include in income its share of the CFC's income "arising from non-genuine arrangements which have been put in place for the essential purpose of obtaining a tax advantage." This is further explained as situations where the CFC would not have owned the assets or undertaken the risks in question if it were not for "significant people functions" performed by the controlling shareholder that are relevant and instrumental in generating the CFC's income. When regime B is adopted, the controlling shareholder's income inclusion is limited to an arm's length calculation of the amounts generated from assets and risks linked to the controlling shareholder through its performance of those significant people functions.

43. Ireland's CIT does not currently contain a CFC regime, so it will need to adopt one before 2019. Since Ireland's trading CIT rate is relatively low, most Irish operating companies will not be captured by CFC rules because their CIT rate should not be lower than 6.25 percent (as measured under Irish tax accounting principles). The rules would, however, be relevant to pure tax haven subsidiaries, including financing vehicles that have been employed to strip income from a high-tax jurisdiction without including that income in Ireland. The Irish authorities are expected to publish a proposal in late summer, with a view to adopting legislation by the end of 2018.

Hybrid Mismatch Arrangements

44. ATAD I and II provide complementary rules for hybrid mismatch arrangements. Article 9 of ATAD I contains two fairly simple hybrid mismatch rules that applied to transactions

between member states. The first denied one deduction where a hybrid otherwise would lead to a double deduction, and the second denied a deduction where the income was not included on the other side of the transaction. ATAD II completely revised those provisions with more complex and far-reaching measures that apply to transactions involving at least one EU member state as well as to "reverse hybrids"—where an entity is treated as a fiscal transparency in the source state but as a separate company in the residence of the owner. The revised provisions must be transposed into domestic law by the end of 2019, although the reverse hybrid rule can be deferred until the end of 2021.

45. Hybrid and reverse hybrid arrangements are creatures of aggressive tax planning, not genuine business transactions. Their widespread propagation and rapid evolution have depleted tax revenues around the world.[24] The new ATAD rules, together with the robust exercise by the U.S. Treasury of the very broad authority derogated to it by the Congress in the TCJA in respect of hybrid transactions, could be expected to very substantially reduce the impact of these sorts of schemes on a global basis.

46. The ATAD anti-hybrid rules are not expected to have a material impact on domestic operations in Ireland, where hybrid arrangements are reportedly uncommon. Nonetheless, hybrids feature heavily in U.S. tax structures involving Irish operations, particularly as a result of those structures' reliance on "check the box" planning.

Exit Tax

47. Article 5 of ATAD 1 requires member states to adopt an "exit tax" that would apply to transfers of assets in or out of the Irish tax base. The exit tax must take effect by January 1, 2020. The ATAD it leaves to each member state to set the exit tax rate; the tax base is the fair market value of the transferred assets less their tax cost. Ireland has an exit tax in place, but it is not as broad as required by ATAD, so Ireland will need to amend it.

48. Ireland should consider carefully the design of its exit tax in order to protect its CIT revenues over the long term. The design of this exit tax will be important to long-term levels of Irish CIT revenues: As described in the Annex, MNEs have in some instances "on-shored" IP formerly held offshore of Ireland (in, for example, Double Irish structures). For IP on-shored in 2015–17, Irish CIT as then in effect allowed capital allowances and interest expense on debt incurred to purchase such IP to offset 100 percent of the revenues generated by that IP. (The sum of these expenses is limited to 80 percent of IP revenue for IP on-shored from 2018 onwards.) When that capital allowance is exhausted in several years' time, firms will face Irish CIT at the 12.5 percent rate on large amounts of unsheltered income. Robust exit taxes will preserve

[24] One well-known example of a hybrid is the "Tower Structure" employed by many U.K. enterprises to fund investments in the United States. In return for a modest investment in tax advice and the formation of two companies, firms obtained a double deduction of the cost of financing their U.S. investment. See Dodwell (2014).

for Ireland the benefit of collecting taxes on this income, or an economic substitute in the form of an exit tax.

49. The current rate of the Irish exit tax is the 33 percent capital gains tax rate. Irish tax officials noted that, while corporate taxpayers generally accept the concept of an exit tax, they object to its being levied at a rate more than double the general CIT rate. This raises the issue of whether the corporate capital gains tax rate should be modified to mirror the CIT rate on trading income.

General Anti-Abuse Rule

50. Article 6 of ATAD I requires member states to adopt as a backstop to other ATAD measures a general anti-abuse rule (GAAR). The GAAR would permit (or require) member states to ignore an arrangement "which, having been put into place for the main purpose or one of the main purposes of obtaining a tax advantage that defeats the object or purpose of the applicable tax law, [is] not genuine having regard to all the facts and circumstances." This rule must take effect by January 1, 2019.

51. Ireland has in place its own GAAR, which tax experts consider to be largely in compliance with the standards of the ATAD.[25] On this basis, Article 6 should have little direct effect on the administration of the Irish CIT.

H. Digital Taxation

52. How to tax digital companies, which can have substantial presence in a country's online market with minimal physical presence, is an increasingly salient problem. Both the OECD and the EU have been working on methods to reallocate some of the buoyant profits of digital MNEs from the location of IP ownership—often a low-tax jurisdiction—to the markets in which their services are consumed, user data is generated, and/or their advertising is sold.[26] These initiatives could significantly shrink the Irish corporate tax base by generating deductible or creditable foreign taxes for digital MNEs that currently report substantial profits in Ireland.

53. Pursuant to BEPS Actions 1 and 7, the OECD project focuses on defining new criteria for digital permanent establishments (PEs). A recent report (OECD 2018) proposed potential definitions, and the OECD aims to reach a consensus on this issue by 2020. Meanwhile, the EC has promulgated a draft directive on the taxation of digital income, which would add to traditional norms for the allocation of taxing rights across jurisdictions an independent emphasis on "user participation" as a component of value added in the case of certain digital service companies, such as social networks. As an interim measure, the EC report also proposes a provisional EU-wide 3–percent "equalization tax" on the gross revenues from services whose

[25] See, for example, Coffey (2017).

[26] See EC (2018) and OECD (2018).

principal value arises from "user participation": online advertising sales, user data sales, and digital interaction platforms. The tax would be due in the jurisdiction where the user is located and apply to companies that exceeded certain revenue levels.

54. The EC initiatives rely on principles that cannot easily be reconciled with the traditional arm's length formulations on which the OECD has relied. The EC approach should be appreciated as pointing to new basic methodologies. The emphasis for example on "user participation" can be understood as introducing a new "factor of production" to standard economic analysis. Ordinarily in economic analysis a firm's income is ascribed to labor, capital, and the efficiency with which the two are combined. The "user participation" idea essentially ascribes a source of value-added to users, who are neither part of the firm's labor force nor its capital stock.

55. As a tax measure, the EU digital tax directive would have to be adopted unanimously to enter into force, which appears unlikely. However, several countries both within and outside of the EU[27] have moved forward with unilateral measures to tax some aspect of digital activity. The Irish tax authorities report that the Irish tax treatment of foreign digital taxes will depend on their exact nature: Indirect taxes are typically allowed as a deduction, while taxes on profits are typically allowed as a credit, provided there is a foreign PE. However, if the digital levies have the character of a sales tax, they may conflict with the EU VAT directive.

I. CCCTB

56. The CCCTB, which the European Commission first proposed in 2011, was rejuvenated in 2016 by the release of two draft directives. The first, on the Common Corporate Tax Base, defines the calculation of taxable income, and the second, on the Common Consolidated Corporate Tax Base, defines how corporate groups should consolidate those calculations and apportion them among the Member States in which they do business. If adopted, the CCCTB would be mandatory for all companies with a minimum level of revenues and would apply to all EU income up to the "water's edge". Member States would remain free to determine their own CIT rates.

57. The CCCTB is a type of formulary apportionment (FA), according to which corporate income would be allocated on the basis of the following formula:

$$\frac{1}{3} * Sales + \frac{1}{3} * Assets + \frac{1}{3} * (\frac{1}{2} * Payroll + \frac{1}{2} * Employment)$$

As indicated with respect to the U.S. in Section IIC, Ireland's share of productive factors and third-party sales tends to be lower than its share of profits. As a small state where low effective tax

[27] These include the U.K. and Australian "diverted profit taxes" and Italy's 3 percent tax on gross revenue associated with certain digital transactions, including advertising sales.

rates have led to significant in-shifting of corporate profits, Ireland therefore stands to lose substantial revenue from a move to formulary apportionment, even if it is limited to EU profits.

58. Unlike BEPS, which aims at curbing abuses under the current international tax system, FA represents a radical departure from that system. Advocates of FA claim that it would yield significant benefits in terms of simplification, transparency and fairness relative to the current system based on separate accounting and arm's length prices. Compared to financial accounts, FA factors such as employees, tangible assets and third-party sales are arguably harder to manipulate. Corporations have become extremely adroit at manipulating the current income tax system to reduce their tax burdens: The EC asserts that 70 percent of corporate profits within the EU are profit-shifted for tax purposes; it estimates that adoption of a CCCTB with a deduction for both debt and equity financing would lead to increased GDP growth of up to 1.2 percent, while compliance costs would fall substantially[28]. As a tax measure, the CCCTB would have to be passed by unanimous vote of the EU Council, giving every member state potential veto power.

J. Conclusions and Policy Implications

59. Recent and impending international tax reforms have both positive and negative implications for Ireland's economy and tax revenues. The U.S. tax reform has reduced headline rates and increased tax allowances, making the U.S. a more competitive location for future investment. Over the medium term, this may cause moderate erosion of Ireland's inbound FDI stock and CIT revenues. This is more likely to result from reduced future investment than from repatriation of existing intangible assets. The U.S. reform in general has an uncertain future, due to its many important sunsets, its lack of bipartisan support, and its fiscal cost. The future of the patent box, FDII, is particularly uncertain due to its possible violation of WTO rules. It would appear, however, that a return to a high-rate worldwide system is highly unlikely.

60. Ireland appears well positioned with respect to the new low-rate U.S. worldwide tax without deferral, the GILTI. Since U.S. MNEs will henceforth be taxed immediately at roughly 13.125 percent on their worldwide earnings, foreign countries should be able to impose taxes of up to that level without deterring foreign investment. Ireland's statutory CIT rate on trading income, at 12.5 percent, thus appears well-positioned. To the extent that U.S. MNEs operate in high-tax jurisdictions, however, they will want to blend down the average tax rate on their total foreign income. Thus, low-tax jurisdictions still have an incentive to offer rates significantly below the GILTI rate, and U.S. MNEs will still have incentives to search for tax planning structures that yield low effective tax rates.

61. The European tax landscape is also changing rapidly due to enactment of the various OECD/G-20 BEPS measures, including the ATAD. Most of these measures will be put in place from 2021, which together with the expiry of existing Irish IP conduit structures should

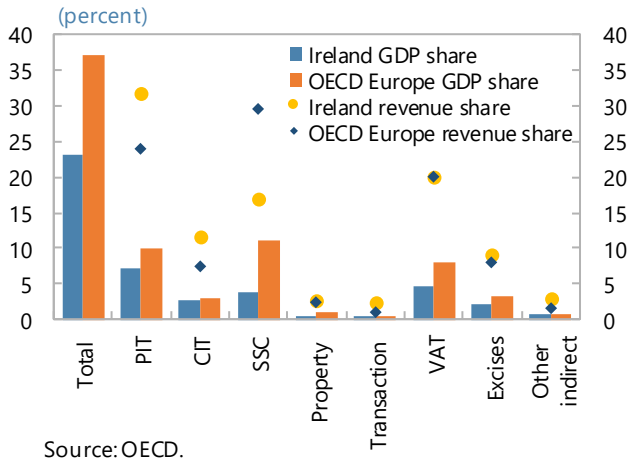
[28] European Commission (2016), "Corporate Tax Reform, Pro-Business, Anti-Avoidance," https://ec.europa.eu/taxation_customs/sites/taxation/files/ctr_factsheet2016.pdf.

constrain the ability of MNEs to shift profits across borders. To the extent that Ireland, as a relatively low-tax country, has benefitted from this profit-shifting, this may also put pressure on its CIT revenues. However, to the extent that BEPS has catalyzed a new emphasis on *substance*—i.e., the location of real factors of production, particularly human capital, proportional to the location of profits—it could actually benefit Ireland. Despite the IP-intensity of its inbound FDI, Ireland currently accounts for a very small share of global value chains in most industries.[29] International realignment of MNE profits and productive assets may result in some IP outflow from Ireland, but it could also result in an inflow of productive assets. Ireland should capitalize on this opportunity to develop its human capital stock and grow its share in global value chains. This would support future CIT revenues as well.

62. Two other prospective international tax reforms—digital taxation and the CCCTB—have more serious negative implications for Ireland's CIT revenues. As a relatively small market, Ireland would lose in any reallocation of taxing rights based more heavily on consumer or user location than the current system. And as a low-tax country that has benefitted significantly (whether in real or fiscal terms) from profit-shifting, Ireland would also lose from a system of formulary apportionment that emphasizes the location of real factors. Since any change in EU tax directives requires unanimous approval, they currently appear unlikely. However, individual countries are introducing unilateral digital taxes that will have the potential to reduce Ireland's tax base, and the OECD will continue work on defining a digital PE that may have the same effect over a longer horizon.

63. Relative to its European neighbors, Ireland is a relatively low-tax country (Figure 13). Its ratio of total tax revenues-to-GDP, at 22.3 percent, is well below the OECD European average of 37 percent. While its ratio of CIT revenue-to-GDP is roughly average, it constitutes a much larger share of tax revenues than in most European countries. Ireland thus has a variety of options for compensating any decline in corporation tax revenues that may result from the U.S. and other international tax reforms.

Figure 13. Irish Revenue Structure vs. OECD Europe, 2016



Source: OECD.

64. Ireland relies relatively heavily on income taxes, which deter investment and labor effort. As Ireland's VAT efficiency is quite low (see Staff Report for the 2018 Article IV Consultation, paragraph 14), the best way to compensate any decline in CIT revenues would be to broaden the VAT base, in particular by eliminating domestic zero-rating and taxing energy at the full rate. Broadening the base of the

[29] Podpiera (2017)

recurrent property tax, which has the unusual characteristic of being both efficient and progressive, would also be an efficient means of raising revenue. Finally, numerous tax and investment experts cited the personal income tax, which imposes high marginal rates on earnings at a relatively low-income level, as a significant deterrent to skilled immigration. Streamlining the PIT would make it easier for Ireland to attract the highly skilled foreign personnel necessary to support its future as a European IP hub.

Annex I. Tax-Minimizing Structures

MNEs with an Irish presence have used a variety of structures that play off discrepancies in international tax rules to reduce their corporate tax liabilities. Prominent examples include:

1. **Double-Irish Dutch Sandwich.** Prior to 2015, the Irish definition of tax residence depended on the place of a company's effective management rather than incorporation. An MNE could therefore establish two subsidiaries in Ireland: an operating company that was both incorporated and tax-resident in Ireland, and an IP holding company that was incorporated in Ireland but tax-resident in a jurisdiction with extremely low or no corporate income tax. The operating company would receive income from sales throughout the region, but offset almost all of it with royalty payments to a related subsidiary in the Netherlands, which attracted no withholding tax.[1] The Dutch company in turn distributed these payments to the "Irish" IP holding company as royalties. Dutch income tax was levied only on a small spread in the royalty rates, and there was no Dutch withholding tax on the payment of royalties under Dutch domestic law. From a U.S. perspective, however, the income still appeared to be in Ireland, because the three entities would be combined into one Irish corporation through "check the box" elections. The 2015 change in Ireland's definition of tax residence to encompass all entities that are either incorporated or effectively managed in Ireland precluded these structures; however, existing structures were grandfathered through the end of 2020.

2. **Single Malt.** In this structure, royalties from the Irish operating company are paid to an Irish-incorporated but Maltese tax resident company managed and controlled in Malta. Since Malta is also an EU member, there is again no withholding tax on that payment, and although Malta has a high CIT rate of 35 percent, it does not tax income earned entirely outside of Malta. Because the company is deemed Maltese-resident for the purposes of the Ireland-Malta tax treaty, it is also treated as Maltese-resident for Irish domestic law purposes, notwithstanding that it is Irish incorporated. Thus, although Ireland's domestic law no longer permits incorporation without tax residency, such a structure can still be established under one of its tax treaties.

3. **IP on-shoring.** Given the waning viability of IP conduit structures, IP-rich MNEs have explored "on-shoring" strategies that also exploit asymmetrical treatment of the transaction by Irish and U.S. authorities. Irish law permits an Irish resident company to amortize the purchase price of IP over 15 years or at the rate used in the firm's financial accounts. In an on-shoring transaction, the Irish company purchases highly valued existing IP from the offshore company using accumulated cash and/or debt. The Irish company can then claim

[1] The EU Interest and Royalty Directive eliminates the application of intra-EU withholding taxes on cross border interest and royalty payments in many cases regardless of whether the intra-EU tax treaties allow for withholding taxes on cross-border interest and royalty payments. Similarly, the EU Parent-Subsidiary Directive eliminates withholding taxes on participating dividend payments between EU member states.

capital allowances based on the full purchase price as well as any related interest expense against the income it derives from licensing the IP or associated product sales. From a U.S. point of view, however, the purchase is a transaction within a single corporation and thus generates no tax consequences. On-shored IP income is ring-fenced so that losses cannot offset other trading income. Up to 2015, IP capital allowances and interest on acquisition debt were limited to 80 percent of IP income, but as of 2015 this limit was abolished. In accordance with a recommendation of Coffey (2017), the 80 percent restriction was re-introduced in 2018; however, IP on-shored in the 2015–17 period is grandfathered with respect to this rule. This onshoring strategy contributed to the 25.5 percent surge in Irish real GDP in 2015.

References

Altshuler, R. and Grubert, H., 2013, "Fixing the System: An Analysis of Alternative Proposals for the Reform of International Tax," *National Tax Journal*, September, 66 (3), 671–712.

Beer, S., R. de Mooij, and L. Liu, 2017, "International Corporate Tax Avoidance: A Review of the Channels, Effect Sizes and Blind Spots," mimeo, International Monetary Fund.

Beer, S., A. Klemm and T. Matheson, 2018, "Tax Spillovers from U.S. Corporate Income Tax Reform," IMF Working Paper, forthcoming.

Coffey, S., 2017, "Review of Ireland's Corporation Tax Code", Report for the Ministry of Finance, June 30.

De Mooij, R. and S. Ederveen, 2008, "Corporate tax elasticities: a reader's guide to empirical findings," *Oxford Review of Economic Policy*, Volume 24, Number 4, pp 680–697.

Dodwell, W., 2014, "Tumbling Tower?" *Tax Adviser*, May, pp. 28-29.

European Commission, 2017, "Aggressive Tax Planning Indicators: Final Report," Working Paper No. 71-2017.

European Commission (2016), "Corporate Tax Reform, Pro-Business, Anti-Avoidance," https://ec.europa.eu/taxation_customs/sites/taxation/files/ctr_factsheet2016.pdf.

European Commission (2018), "Proposal for a Council Directive laying down rules relating to the corporate taxation of a significant digital presence," https://ec.europa.eu/taxation_customs/sites/taxation/files/proposal_significant_digital_presence_21032018_en.pdf.

Kleinbard, E., 2011, "Stateless Income", 11 *Florida Tax Rev*. 699–774.

Podpiera, J., 2017, "Ireland: The role of Foreign-Owned Multinational Enterprises," Selected Issues Paper, IMF Article IV Report for Ireland.

Moody's Investor Services (2018). "New tax law poses credit challenges and opportunities for multinational companies." Cross-sector report, April 30.

OECD, 2017, "*OECD Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations 2017*," OECD Publishing, Paris, http://dx.doi.org/10.1787/tpg-2017-en.

OECD, 2018, "*Tax Challenges Arising from Digitalisation – Interim Report 2018: Inclusive Framework on BEPS*," OECD/G20 Base Erosion and Profit Shifting Project, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264293083-en.

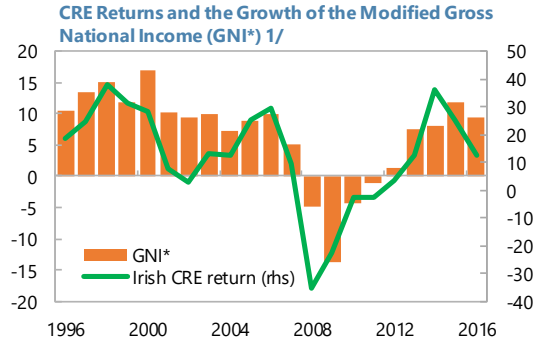
THE IRISH COMMERCIAL REAL ESTATE MARKET: SYNCHRONIZATION AND THE ROLE OF EXTERNAL FACTORS[1]

This chapter examines the synchronization of the Irish returns on commercial real estate (CRE) properties with those in peers to better understand the importance of external factors in explaining the high volatility of CRE returns in recent years. The analysis finds that the cyclical pattern of Irish CRE returns is highly corelated with that in other advanced economies, yet with much higher volatility. Moreover, a vector auto-regression (VAR) analysis points to a high impact of international CRE prices on Irish CRE prices, and to strong feedback effects between the latter and domestic economic activity. These findings underline the importance of continued close monitoring of this market to ensure that the financial system is resilient to possible drops in collateral values and investment flows.

A. Introduction

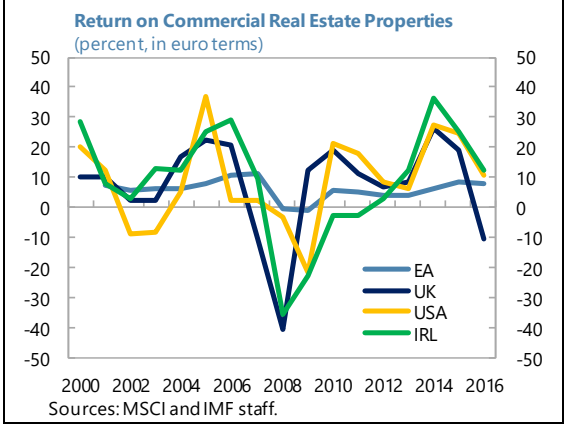
1. Irish CRE prices and rents have bounced back strongly in recent years after experiencing a highly volatile boom-bust episode (Figure 1). The Irish CRE market has been on a recovery path since 2012, after a prolonged and substantial adjustment in which a highly-leveraged commercial property boom was abruptly unwound and returns on CRE properties dropped by more than 50 percent cumulatively in 2008–11.[2] The massive adjustment, which negatively affected construction activity, had far-reaching adverse effects on the financial system and the economy as a whole. Since then, Ireland's growth prospects have improved substantially, and the rapid expansion of economic activity as well as domestic and foreign investors' search for yield have prompted a renewed demand for CRE properties and pushed prices and rents upwards in the face of limited supply. While CRE prices remain significantly below their pre-crisis highs and the price-to-rent ratio continues to be well

Figure 1. CRE Return and Domestic Economic Activity



1/ GNI*: GNI less the effects of redomiciled companies' profits and the depreciation of intellectual property and aircraft leasing companies.
Sources: Haver and IMF staff.

Figure 2. CRE Returns



Sources: MSCI and IMF staff.

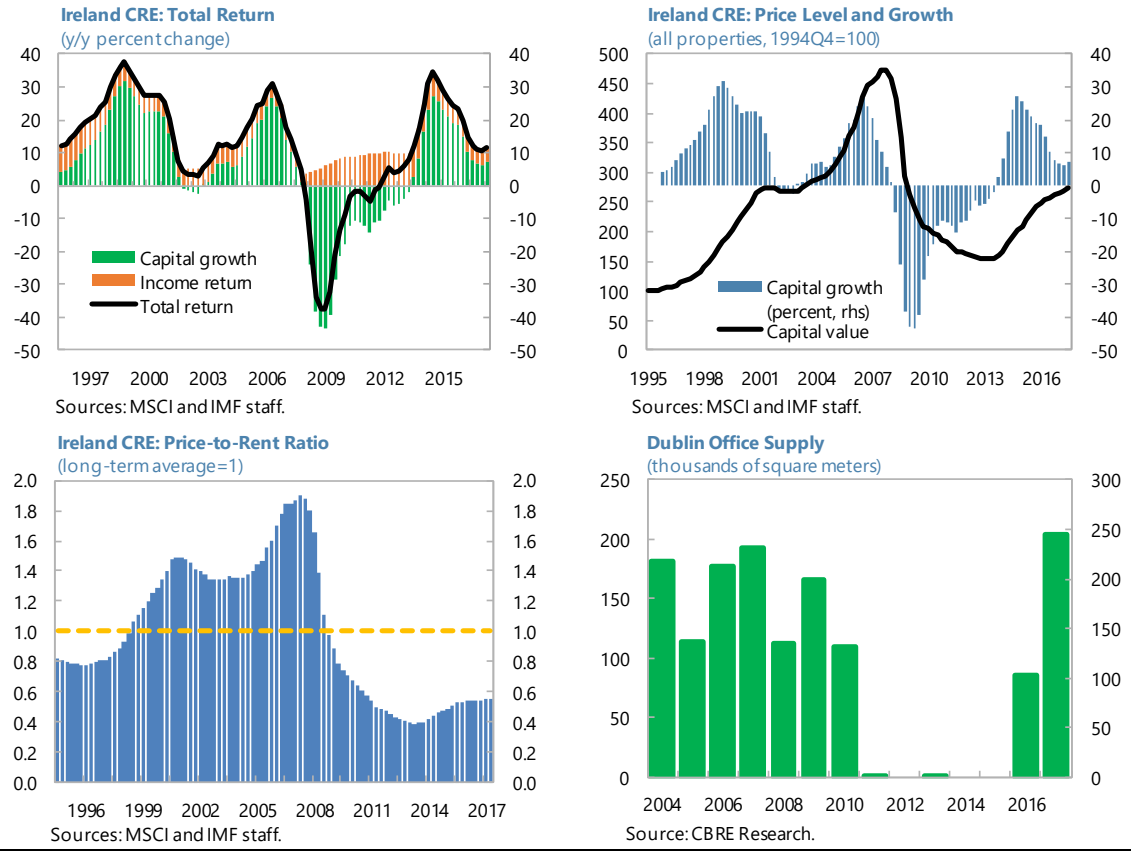
[1] Prepared by Nir Klein. The paper benefited from useful comments and suggestions by Gerard Kennedy and the participants of the workshop at the Central Bank of Ireland.

[2] The total return incorporates both capital and income elements.

below its long-run average, demand pressures, including from foreign investors, are likely to persist in the period ahead, keeping the returns in this market elevated.

2. The high volatility of the CRE market was also featured in other economies, including in Ireland's key trading partners. The CRE returns in countries that were at the epicenter of the global financial crisis, such as the U.S. and the U.K., also exhibited high volatility in recent years with trends that are closely correlated with those in Ireland. The average return on CRE properties in the euro area showed a similar trend, though its volatility has been more limited. The apparent co-movement in the CRE returns between Ireland and other countries may suggest that the developments in the Irish CRE markets are also influenced by external factors, which could work through both direct and indirect channels.

Figure 3. Ireland's CRE Market: Selected Indicators



3. Recent empirical evidence corroborates the strong co-movement in the real estate markets across countries. While housing is considered a non-tradable heterogeneous asset, there is growing empirical evidence that shows that the degree of synchronization of real house price returns has been surprisingly high across countries. For example, Case et al. (2000), who examined the synchronization of commercial property returns, show that the co-movement between property prices and GDP growth decrease noticeably after controlling for global GDP, suggesting that real estate markets are largely correlated through common movements of real GDP. Other studies, which focused more on the synchronization of the residential property

prices, found that real house price returns can be highly correlated across countries, partly due to global and regional housing factors (Cesa-Bianchi, 2012), and that they have become more synchronized over time (Hirata et al., 2012), with increases in the short-run co-movements around global recessions (IMF, 2018)

4. The strong real estate price co-movement across countries points to the existence of underlying common driving factors. These include the synchronization of the property market fundamentals such as income and interest rates, as well as enhanced financial integration, which results in synchronized borrowing conditions. These effects may have played a prominent role in currency unions where countries share the same monetary policy, and trade and financial markets are strongly integrated. Expectations about global economic and financial conditions are likely to result in synchronized business cycles and CRE returns. The presence of international lenders and investors (e.g. equity firms, real estate investment funds (REITs), and institutional investors) that operate in various markets simultaneously may have also contributed to strong synchronization across countries. Finally, global confidence effects and the degree of investors' risk aversion can also increase the co-movement in property price dynamics.

5. The drivers and degree of property price synchronization may have policy implications. Coordinated movements in CRE prices across countries suggest that country-specific or global shocks can be transmitted from one country to another rather quickly through both direct and indirect channels and could potentially inflict widespread bouts of economic and financial instability. Indeed, large house price swings in the past were associated with periods of financial instability across many countries, especially if they were accompanied with a pullback of global investors and capital flight (Claessens et al. 2008, 2011). Therefore, understanding the drivers of the synchronization in the CRE markets is important to enhance the resilience of the financial sector and the economy against shocks.

6. Against this background, the analysis takes a closer look at the drivers of Irish CRE returns and the impact of the latter on the Irish economy. Specifically, this chapter aims to:

- Examine to what extent the returns on Irish CRE properties co-move with those in peers, and whether this synchronization has changed over time;
- Investigate the role of global factors and Ireland's bilateral linkages with peers in driving the synchronization of Irish CRE returns with those in other countries; and
- Assess the sensitivity of Irish CRE prices to international CRE prices, and the linkage between the CRE market and the broader domestic economy through a VAR analysis.

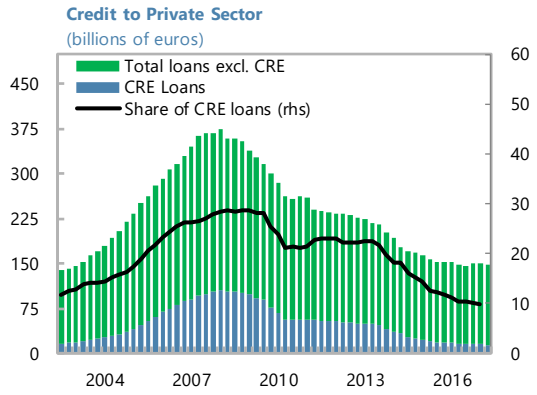
7. The chapter is organized as follows: Section B provides a short description of the recent developments in the Irish CRE market with a focus on CRE investment and financing. Section C assesses the co-movement of the CRE's total return in Ireland with that in peers, and section D examines the drivers of the synchronization using panel estimates. Section E explores the sensitivity of Irish CRE prices to changes in international CRE prices and their effect on the

domestic economy through a VAR analysis. Section F summarizes the key takeaways and offers some policy implications.

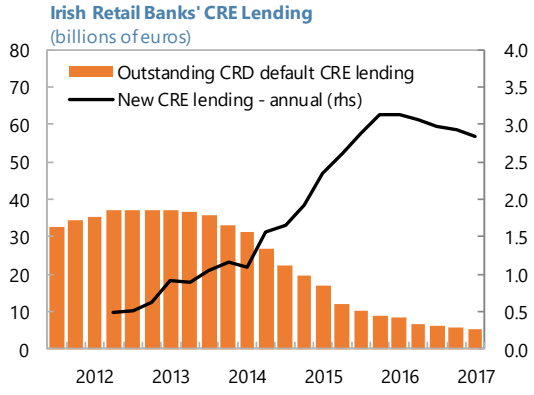
B. CRE Investment and Financing: Some Stylized Facts

8. Domestic banks' deleveraging in the post-crisis period was accompanied with a significant decline in their CRE exposure. Domestic banks have deleveraged considerably since the onset of the financial crisis, registering a contraction in all loan categories. Nevertheless, the decline in the CRE portfolio was substantial, largely reflecting the transfer of large CRE loans from bank balance sheets to the National Asset Management Agency (NAMA). Overall, domestic banks' exposure to the CRE market declined to about 10 percent of total loans in 2017q4 from nearly 30 percent in 2009 (Figure 4). In recent years, however, new bank lending—although still falling short of the large redemptions—has picked up after a prolonged period of subdued activity. The level of impaired loans on bank balance sheets also dropped significantly, yet, at about a quarter of total CRE loans, they remain elevated.

Figure 4. Bank CRE Lending



Sources: Central Bank of Ireland and IMF staff.

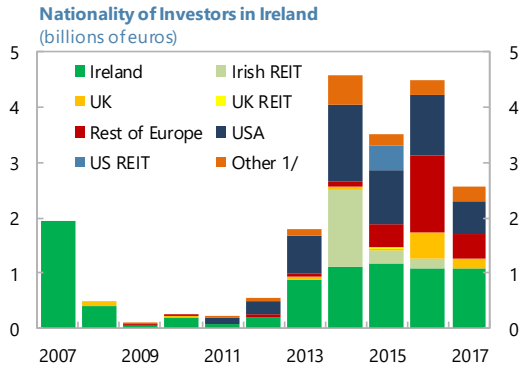


Source: Central Bank of Ireland.

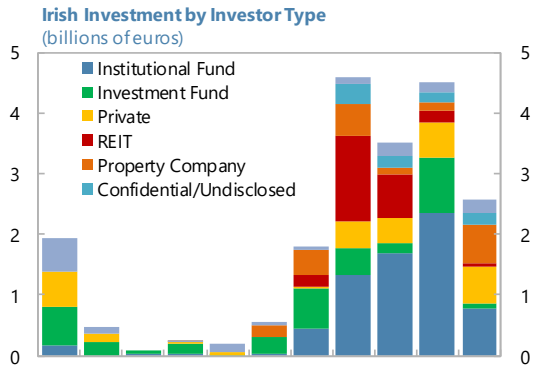
9. Foreign investors' activity has increased significantly in recent years (Figure 5). The CRE market prior to the crisis was largely dominated by Irish investors that funded their activity by bank financing. However, in recent years the role of foreign investors increased and, apart from 2014, they accounted for most of investment in the Irish CRE market. The total foreign investment in CRE in 2011–17 amounted to about €10 billion, of which €5.5 billion is related to direct investment by U.S.-based investors. Investment by U.K. investors and investors from other European countries represented 8 percent and 23 percent, respectively, of foreign investment over this period, while direct investment from other regions such as Asia, Africa, and Canada, remained rather small. Investment by Irish investors has shown signs of recovery from 2013, yet at an annual average of €1.6 billion in 2013–17, it remained well below the pre-crisis levels.

10. CRE investment was driven by a diversified group of investors. Irish REITS, which used bank and nonbank funding sources (including equity), acquired a sizeable portfolio of assets after their entry in the market in 2013, but more recently they have been less involved in new investments. The role of institutional investors also increased as pension and insurance

Figure 5. CRE Market: Composition of Investors



1/ "Other" also represets investors of undisclosed origin.
Source: CBRE Research.

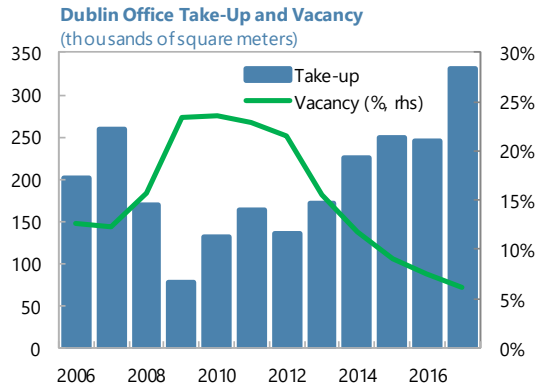


Source: CBRE Research.

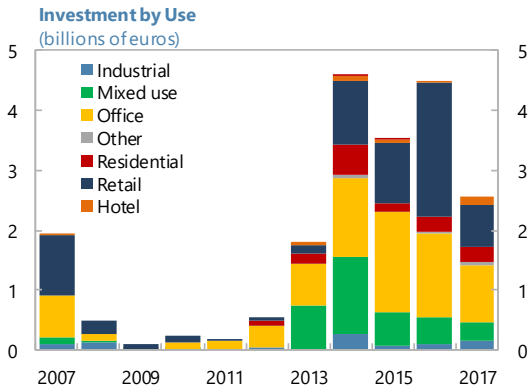
funds from the U.S., the U.K., and Germany sought to match long-term liabilities with long-term assets. Other private investors such as investment funds and property companies were also active.

11. The value of CRE investment moderated in 2017 as commercial properties available for sale declined. Following very strong investment activity in 2014–16 of about €3.5–4 billion a year, investment fell to about €2.5 billion in 2017, reflecting in part the shrinking supply of offices. Dublin's office vacancy rate has fallen to a record-low of 6 percent at end-2017 from about 24 percent in 2010, while the take up has reached the highest level in last 15 years. Although declining, investment in offices and retail assets continued to make up the bulk of investment in the CRE market (Figure 6).

Figure 6. CRE Market: Investment, Take Up, and Vacancy



Source: CBRE Research.



Source: CBRE Research.

12. New development is underway in the face of sustained demand pressures. Demand for CRE properties is likely to be sustained in the period ahead, in line with the favorable outlook for the Irish economy. Nevertheless, price pressures are likely to be mitigated by the extent of new development commencing and planning applications that are being lodged. According to CBRE Research, office supply in Dublin is projected to increase by an annual average of 220,000 square meters in 2018–20, exceeding the average annual take up of about 200,000 square meters

in 2010–16. The post-Brexit arrangement—while expected to have a negative impact on the Irish economy as a whole—may exacerbate demand pressure in prime locations in Dublin due to relocation decisions.

C. The Co-movement of Ireland's CRE Return with Peers

13. Recent studies applied a range of measures to assess co-movements among economic variables, including property prices. There is no single way to measure synchronization as each method has its pros and cons. Some methods are simple and intuitive yet sensitive to filtering methods, while other more sophisticated ones, may be subject to prior assumptions and estimations errors. Methodologies that were applied in the context of the housing market include a simple rolling correlation, a dynamic factor model (Kose et al. 2012 and IMF, 2018), an inverse of the absolute difference of house prices, instantaneous quasi-correlation, and concordance statistics. Some studies such as Hirata et al. (2012) also used a variance decomposition into global and country-specific components to assess the common factor in house price movements across countries.

14. This study employs two alternative indicators for synchronization that are commonly used in empirical studies. The two indicators complement each other as one measures the synchronization in the level of the CRE returns (*Synch1),* while the second indicator measures the synchronization of CRE returns' cycles *(Synch2).* The construction of these two indicators is as follows:

Synch1: We follow Morgan, Rime, and Strahan (2004) and Kalemli-Ozcan et al (2013), and construct the synchronization measure as the negative of the absolute difference between Ireland's and country j's total returns (*TR*):

$$Synch1_{irl,j,t} = -\left|TR_{irl,t} - TR_{j,t}\right|$$

By construction, this measure obtains non-positive values. Less negative values would suggest higher correlation.

Synch2: We follow Duval et al. (2016) and IMF (2018), and calculate the instantaneous quasi-correlation that can be computed at any point in time:

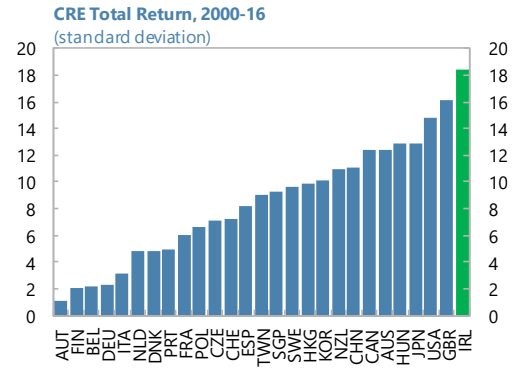
$$Synch2_{irl,j,t} = \frac{(TR_{irl,t} - \overline{TR}_{irl})(TR_{j,t} - \overline{TR}_{j})}{\sigma_{irl}^{TR}\sigma_{j}^{TR}}$$

where $TR_{j,t}$ denotes the total return of CRE property of country j in year t, and $\overline{TR}_j$ and σ_j^{TR} represent the mean and standard deviation of the total return over the sample period, respectively. A negative value would suggest that synchronization is low as the total return in one country is above its long-term average while the total return in the counterpart country is below its long-term average. Positive values, which suggest higher synchronization, would result if both countries simultaneously experience returns above or below their long-term averages. Other things the same, higher volatility would suggest less synchronization.

We use annual data for 2000–16 from Morgan Stanly Capital International (MSCI). The data covers all properties types (office, industrial, retail, residential, and hotels) across 27 countries (including Ireland) for which data is available.[3] To ensure comparability across countries, the CRE total return is measured in euro terms.

15. Table 1 presents the summary statistics of the total return and the synchronization by both measures. We divide the sample into three sub-periods: the pre-crisis period 2000–07, the crisis period (2008–2011) when Ireland experienced a prolonged period of negative returns on CRE properties, and the recovery in 2012-16. Over these three periods the total return exhibited high volatility. It ranged from 40 percent (Canada) in the run up to the crisis to about -40 percent (Great Britain) during the financial crisis. The volatility in Ireland has been the highest in the sample owing to the boom-bust episode in 2005–11 as well as the strong recovery in recent years (Figure 7). The two synchronization measures show that, on average, Ireland's degree of synchronization declined slightly in 2012–16 compared to the pre-crisis period. Moreover, during the crisis (2008–11), the measures moved in opposite directions: *Synch1* indicates a decline in the synchronization, while *Synch2* shows an increase in synchronization (Figure 8). This suggests that, while the downturn in the Irish CRE return largely coincided with that in peers, it was much more severe than in other countries.[4]

Figure 7. CRE Return Volatility



Sources: MSCI and IMF staff.

Table 1. Summary Statistics 1/

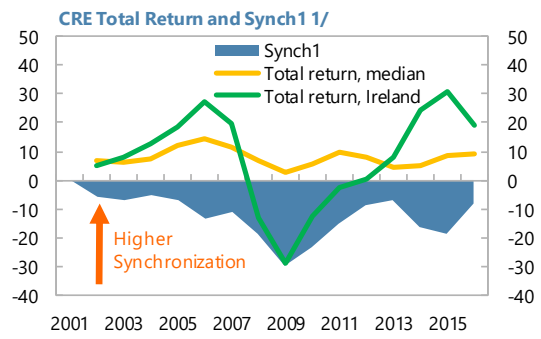
	2000–07			2008–11			2012–16		
	Total Return	***Synch1***	***Synch2***	***Total Return***	***Synch1***	***Synch2***	***Total Return***	***Synch1***	***Synch2***
Average	10.5	-9.2	0.2	4.1	-18.2	1.1	8.8	-11.5	0.1
Min	-10.5	-31.3	-1.3	-40.6	-54.2	-3.8	-10.3	-34.9	-1.2
Max	39.8	-0.2	2.2	33.3	-0.3	8.4	36.1	-0.3	1.4
Std.	8.4	7.5	0.6	14.2	13.2	2.3	7.2	9.6	0.5

1/ Figures are calculated only for countries that have full representation over the sample period.

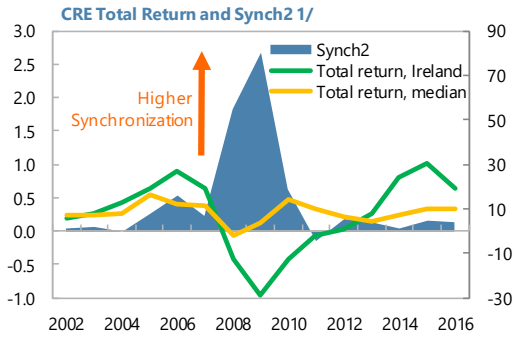
[3] The sample includes Australia, Austria, Belgium, Canada, Switzerland, China, Czech Republic, Germany, Denmark, Spain, Finland, France, Great Britain, Hong Kong, Hungary, Ireland, Italy, Japan, Korea, the Netherlands, New Zealand, Poland, Portugal, Singapore, Sweden, Taiwan, and the USA. For some countries, data is only available for a shorter period.

[4] While synchronization of CRE returns is measured across countries, one would expect it to be more likely between cities, including in Ireland where some regions are more insulated from external shocks.

Figure 8. CRE Return and Synchronization Indicators



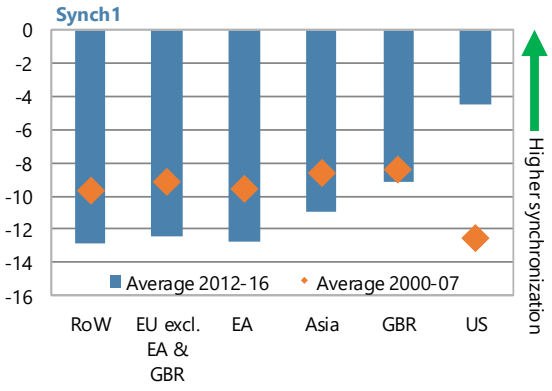
1/ To ensure comparability over time, the sample includes only country with full representation in 2000-16.
Sources: MSCI and IMF staff.



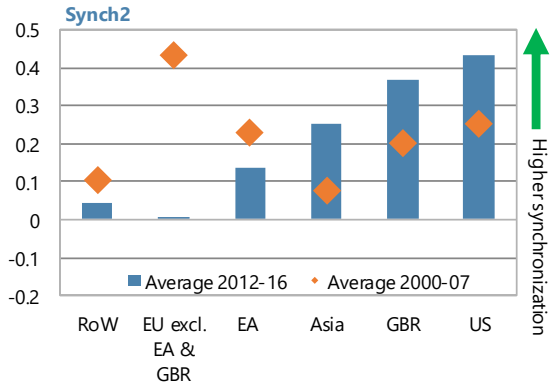
1/ To ensure comparability over time, the sample includes only country with full representation in 2000-16.
Sources: MSCI and IMF staff.

16. The co-movement of Ireland's CRE returns varied significantly across countries and over time. The calculation shows that, for both measures, Ireland's synchronization with the U.S., Great Britain, and Asian countries is high compared to that with other countries in the sample (Figure 9). In addition, while *Synch1* shows that, apart from the U.S., the degree of synchronization has declined in recent years compared to its pre-crisis level, *Synch2* shows that the synchronization with the U.S., Great Britain, and Asian countries has increased overtime.

Figure 9. CRE Return Synchronization with Other Regions



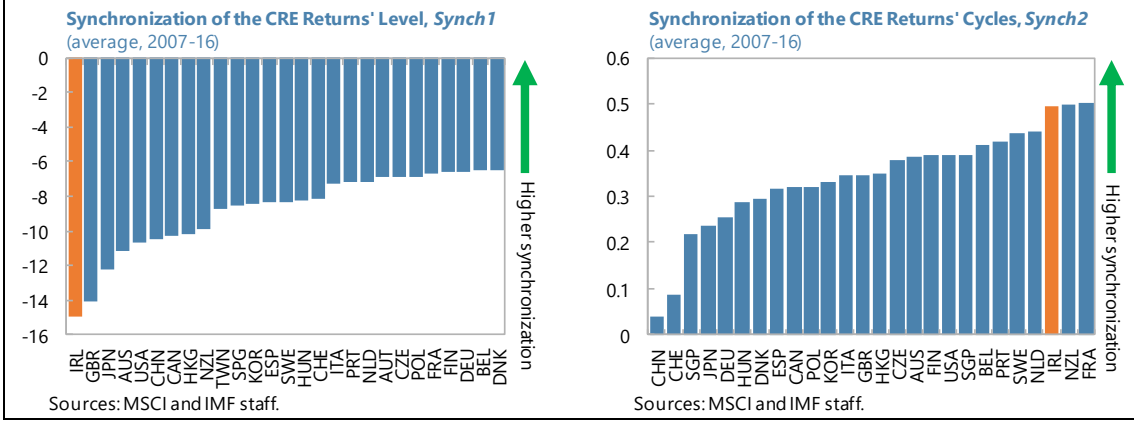
1/ For some countries the data is not available for early 2000s.
Sources: MSCI and IMF staff.



1/ For some countries, data is not available for the early 2000s.
Sources: MSCI and IMF staff.

17. The two indicators suggest that while Ireland's synchronization with regard to the returns' cycle is high, the synchronization of the returns' level is low. To assess how Ireland's synchronization in CRE returns compares to other countries, we calculate for each country in the sample the average synchronization with its counterparts. The calculation shows that Ireland's cyclical synchronization, as measured by *Synch2*, has been one of the highest in the sample, reflecting the economy's high openness and the large presence of foreign-owned companies that are affected by external macroeconomic conditions. The fact that Ireland is part of a currency union and shares monetary policy with other members may also have contributed to the high co-movement of the CRE returns' cycle. Nevertheless, the synchronization of the returns' level, as measured by *Synch1*, indicates low synchronicity reflecting the high volatility of Irish CRE returns over the sample period (Figure 10).

Figure 10. CRE Return Synchronization



D. The Determinants of Synchronization in the CRE Markets

18. We estimate the following specification to study the relationship between the degree of synchronicity and various global and bilateral factors:

$$Sync_{irl,j,t} = \alpha_{irl,j} + \beta BILATERAL_{irl,j,t} + \gamma GLOBAL_t + \varepsilon_t$$

where $Synch_{irl,j,t}$ reflects the co-movement between Irish CRE returns and those in country j as measured by the two measures (*Synch1, Synch2*); $BILATERAL_{irl,j,t}$ is a vector of bilateral variables of Ireland and country j. These include financial linkages, proxied by country's j portfolio investment in Ireland as a share of Ireland's GDP (*FINANCIAL*), bilateral trade (*TRADE*, imports plus exports as a share of Ireland's GDP), government long-term yield differentials in absolute value (*ABS_SPREAD*), and synchronization of business cycles, measured by the co-movements of output gaps (*OUTPUTGAP_SYNCH*). $GLOBAL_t$ represents a vector of global variables that may affect CRE market synchronicity such as risk aversion (*VIX*), and the global liquidity gap, which is measured as the deviation of bank credit to the nonfinancial private sector (as a share of global GDP) from its trend. The specifications include several dummy variables such as *Crisis* for the global financial crisis in 2008–09 and *EA* for Euro area members, which share a common currency and thus may experience a higher level of synchronization. The regressions are estimated using an instrumental variable method to address a possible endogeneity bias (two-stage least square), with country and time fixed effects.

Table 2. CRE's Total Return: Determinants of Synchronization

Instrumental variable estimation, two-stage least square (GLS2LS), Random Effects 1995-2016

Dependent Variable: SYNCH1

	(1)	(2)	(3)	(4)	(5)
VIX	-2.431***	-2.538***	-2.675***	-2.488***	-2.439**
GLOBAL LIQUIDITY GAP	4.575***	4.470***	2.533**	4.602***	4.332***
CRISIS	-17.955***	-16.092***	-8.481	-17.876***	-16.178**
EURO AREA	1.284*	-0.011	1.302	6.462**	-8.607
ABS_GOV YIELD SPREAD		-1.809**			
OUTPUTGAP_SYNCH			2.805***		
TRADE				-0.839	
FINANCIAL					2.921***
Constant	28.015***	32.151***	36.545***	27.529***	20.146***
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
R^2 (overall)	0.625	0.642	0.557	0.571	0.363
# obs.	364	363	364	324	319
Hausman test p-value *H_0: RE H_1: FE*	0.122	0.985	0.945	0.163	0.998
# countries	26	26	26	25	25

*** Indicate significance level of 1 percent; ** indicates significant level of 5 percent, and * indicates significance level of 10 percent.

19. The estimation results for *Synch1* are presented in Table 2. We present only the random effects specifications as Hausman tests validate the consistency of the estimated coefficients. The estimations show that global factors play an important role in the co-movement of CRE returns: higher global liquidity, which is associated with low interest rates and search for yield, tend to increase the degree of synchronization while higher risk aversion, as measured by the VIX, tends to reduce it. Moreover, the estimations show that during the global financial crisis the synchronicity of CRE returns declined significantly on average. The analysis also indicates that co-movement of Irish CRE returns is affected by the country's bilateral linkages. Higher business cycles synchronization (as measured by the co-movement of output gaps), and higher financial interconnectedness (proxied by portfolio investment in Ireland as a share of GDP) contribute to higher CRE return synchronicity.[5] Higher correlation of long-term yields, which may capture the cost of capital, contribute to higher synchronization. Relatedly, Ireland seems to exhibit higher synchronicity with countries within the monetary union, reflecting perhaps the absence of exchange rate risks for investors in the euro area. Bilateral trade was not found to have a significant impact on the synchronicity of the CRE returns.

20. The estimation results for the cyclical synchronization measure (*Synch2)*, which are presented in the Annex (Table A1), have lower explanatory power. Nevertheless, the results confirm the impact of bilateral linkages such as business cycle synchronization, correlation of

[5] FDI flows were not found to have a significant impact on the synchronization of the CRE returns. Also, the interaction of EA with other variables was not found to have a significant impact.

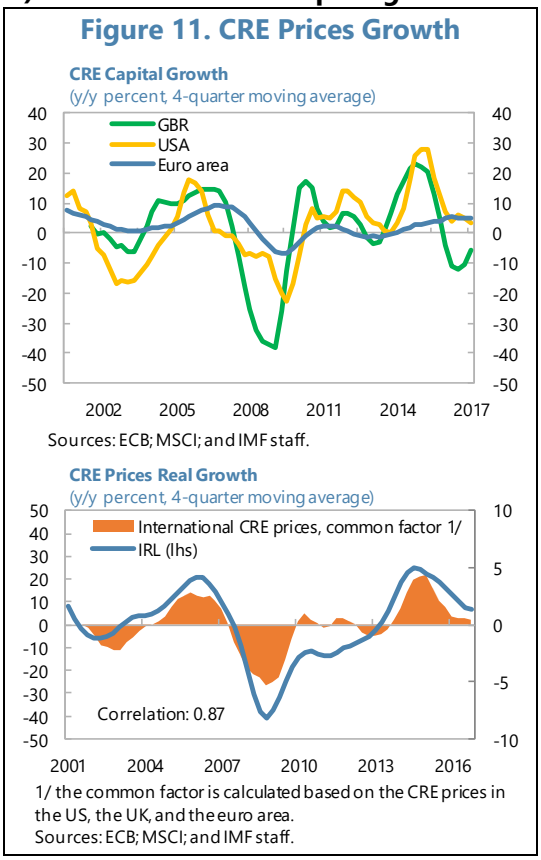
long-term yields, and financial links. The crisis period was associated with higher synchronization, and some specifications also indicate that the synchronization of Irish CRE returns are, on average, higher with EA countries. Global variables, however, were not found to have a significant impact on Irelands' synchronization of the returns' cycle.

E. The Sensitivity of Irish CRE Prices to Changes in International CRE Prices

21. This section evaluates the extent to which the Irish CRE prices are sensitive to global CRE prices and international developments. To study the sensitivity and the potential impact of external conditions on the Irish CRE market and domestic economy, we employ a reduced-form Vector Auto Regression (VAR) model, which includes four variables: GDP growth in advanced economies, the real growth of CRE prices in advanced economies with strong financial linkages to Ireland, the real growth of Ireland's CRE prices, and a measure of Ireland's domestic economic activity (modified final domestic demand).[6] The latter is used given the significant impact of multinationals' activity on Ireland's headline GDP figures.

22. We use a Principal Component Analysis (PCA) to extract the CRE capital growth among selected advanced economies. The calculated factor is based on quarterly data for the CRE capital growth for the period 2002Q1–2017Q3. Due to limited availability of quarterly data, the calculation relies on CRE prices of Great Britain (GBR), the U.S., and the euro area (EA). The trajectory of CRE capital growth in these three economies is largely correlated, though the volatility of CRE prices in the EA was significantly more limited than that in the U.S. and Great Britain (Figure 11). Moreover, EA price increases have remained subdued in recent years, while those in the U.S. have registered strong gains. In the U.K., CRE prices recovered strongly following the financial crisis; however, prices (in euro terms) have changed course from 2016q3 onwards, following the U. K's decision to exit the EU.

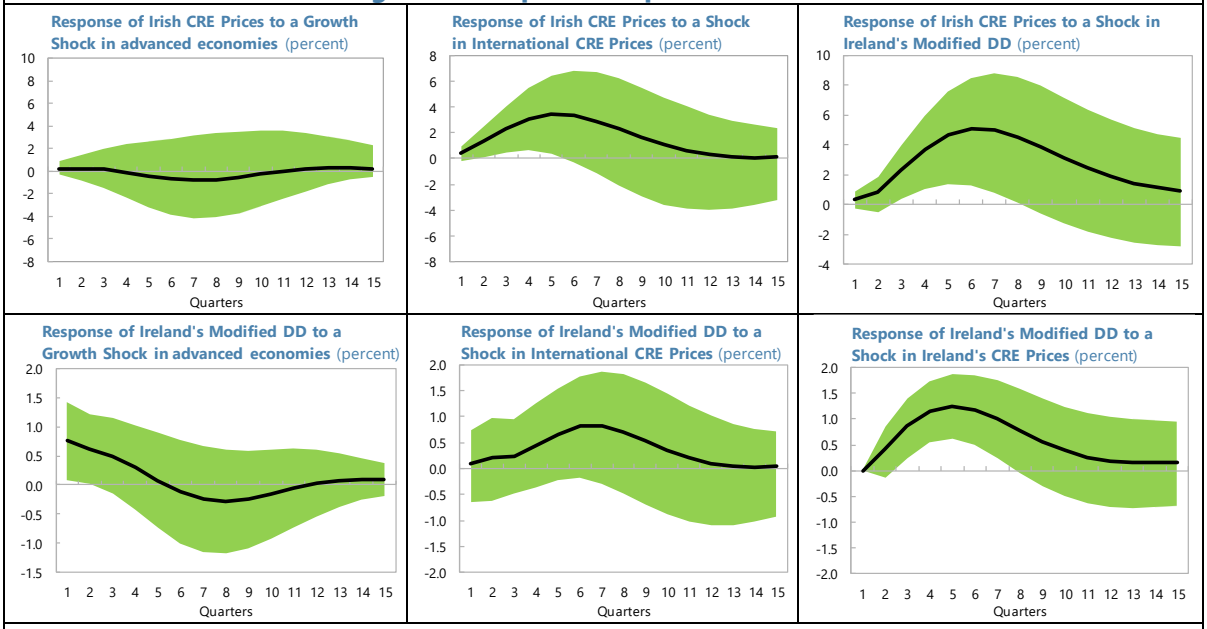
Figure 11. CRE Prices Growth



23. The calculated common factor is highly correlated with Irish CRE capital growth, though it exhibits a lower volatility (Figure 12). The common factor's loadings, which reveal the

[6] Total Domestic Demand less the effects of trade in aircraft by aircraft leasing companies and imports of intellectual property.

Figure 12. Impulse Response Functions



1/ Shaded areas represent ± 2 standard errors to each side.
Source: IMF staff.

magnitudes of the variables included in the factor, suggest that it allocates higher weights to the CRE capital growth in the U.S. and GBR compared to that in the EA. The volatility of the common factor is significantly lower than that of the Irish CRE capital growth, reflecting in part the Irish boom-bust period, yet the correlation between the two is high (0.87), implying that the two series have moved together over time.

24. The dynamic behavior of the model is assessed using impulse response functions (IRFs). The shocks in the VAR were orthogonized using Cholesky decomposition, which implies that variables appearing earlier in the ordering are considered as more exogenous, while those appearing later in the ordering are considered as more endogenous. Since the objective is to assess the impact of international economic developments on the Irish economy through the CRE channel, advanced economies' GDP growth is placed first in the ordering, followed by advanced economies' CRE capital growth, and Irish modified final domestic demand. Ireland's CRE prices are placed last, allowing them to be subject to a contemporaneous effect of all other variables. The VAR is estimated over 2002q1–2017q3, using two lags of endogenous variables.[7] Unit root tests reject the null hypothesis that the endogenous variables have a unit root.

25. The summary statistics and correlation matrix are presented in the Annex. They show that Ireland's CRE prices and domestic demand growth exhibited significantly higher volatility compared to that in advanced economies, reflecting sharp movements in both boom and bust periods. The correlation matrix (Table A2) indicates that Ireland's modified domestic

[7] The VAR lag structure was chosen by the Akaike Information Criterion (AIC).

demand and CRE prices are strongly correlated with each other and with the global GDP growth and international CRE prices.

26. The VAR analysis indicates that the CRE market has been an important channel through which international developments affect the Irish economy (Figure 13). Specifically, the IRFs indicate that:

- A shock of one standard deviation to international CRE prices, equivalent to 0.8 percentage points, results in an increase of up to 3.5 percent y/y in Irish CRE prices by the fifth quarter (in real terms).
- A shock of one standard deviation to Irish CRE prices, equivalent to about 2 percent in real terms, leads to an increase of 0.7 percent y/y in Ireland's modified domestic demand by the sixth and seventh quarters. A shock of one standard deviation to modified domestic demand, equivalent to 2.6 percent, results in an increase in Irish CRE prices of up to 5 percent y/y in the fifth quarter.
- A shock of one standard deviation to advanced economies' GDP growth, equivalent to 0.4 percent, results in an average increase of 0.5 percent y/y in Ireland's modified domestic demand in the first year, possibly reflecting various channels such as consumer and business confidence, higher government revenues, or more favorable credit conditions.

F. Key Takeaways and Policy Implications

27. Irish CRE prices and rents have bounced back sharply in recent years following a massive adjustment in 2008–11. This recovery was supported by strong investment by nonbank Irish institutions, including REITs and institutional funds, as well as by a variety of foreign investors, largely from the U.S. and Europe. At the same time, the domestic banking system continued to reduce significantly its exposure to the CRE market. Despite banks' deleveraging, their exposure to CRE market remains non-negligible, at about 10 percent of total loans, and new lending to this sector is picking up.

28. The analysis uses two alternative measures to assess the degree of CRE returns' co-movement between Ireland and its peers. These measures point to a high degree of synchronization with regard to peers' CRE return cycles, but with much higher volatility, possibly reflecting the economy's small size and high openness. The large presence of multinational companies may have also contributed to a strong transmission of external conditions into the economy. Indeed, the VAR analysis suggests that international CRE prices have a significant and robust impact on Irish CRE prices, and that there are strong feedback effects between the latter and modified domestic demand. The analysis also shows that the degree of synchronization of Irish CRE returns with that of the U.S. and the U.K. is higher than with other countries, and that the synchronization of Ireland's CRE returns with that of other countries is affected by both global and bilateral factors.

29. Turning to policy implications, the high sensitivity of CRE prices to international developments implies that the movements of the latter can serve as an early warning indicator to possible movements in the domestic CRE market. Moreover, the strong feedback effects between CRE prices and domestic demand stress the importance of close monitoring of the CRE market and the need to close data gaps, including on transactions, leases, and financing, as part of the efforts to safeguard financial stability.

30. New bank lending to the CRE sector, including to REITs, and existing property exposure should be managed prudently to enhance the resiliency of Irish banks and the broader financial system to a possible decline in CRE prices and the potential need for an increase in provisions. An increase in banks' risk appetite and a possible change in banks' business models should be monitored closely. Funding from nonbank financial institutions and their exposure to the banking system also requires careful attention.

31. Lastly, in the absence of independent monetary policy and given that CRE activity has been largely externally-financed, there is scope to continue using tax measures (i.e. stamp duty, property tax, capital gains tax) to effectively manage demand and dampen the strong sensitivity of the Irish CRE prices to external CRE price movements.

References

Case Bradford., William .N. Goetzmann, and K. Geert Rouwenhorst, 2000, "Global Real Estate Markets - Cycles and Fundamentals", NBER Working Paper No. 7566.

Cesa-Bianchi, Ambrogio. 2012 "Housing Cycles and Macroeconomic Fluctuations: A Global Perspective", IDB Working Paper series No. IDB-WP-343.

Claessens, Stijn, M. Ayhan Kose, and Marco E. Terrones, 2008. "What Happens during Recessions, Crunches and Busts?" IMF Working Paper.

Claessens, Stijn, M. Ayhan Kose, and Marco E. Terrones, 2011 "How Do Business and Financial Cycles Interact?" IMF Working Paper.

Duval, Romain, Nan Li, Richa Saraf, and Dulani Seneviratne, 2016. "Value-added Trade and Business Cycle Synchronization." Journal of International Economics 99:251–262.

Hirata, Hideaki, M. Ayhan Kose, Christopher Otrok, and Marco E. Terrones. 2012. "Global House Price Fluctuations: Synchronization and Determinants." No. w18362. National Bureau of Economic Research.

IMF, 2018. "House Price Synchronization: What Role For Financial Factors?" Global Financial Stability Report, Chapter 3.

Kalemli-Ozcan, Sebnem, Elias Papaioannou, Jose-Luis Peydro, 2013. "Financial Regulation, Financial Globalization, and the Synchronization of Economic Activity." J. Finance. LXIII, 1179–1228.

Kose, M. Ayhan, Christopher Otrok, and Eswar Prasad. 2012. "Global Business Cycles: Convergence or Decoupling?" International Economic Review 53 (2): 511–538.

Morgan, D., Rime, B., Strahan, P., 2004. "Bank Integration and State Business Cycles." Q.J. Econ. 119 (4), 1555–1585.

Annex I. Determinants of Synchronization

Table A1. CRE's Total Return: Determinants of Synchronization					
Instrumental variable estimation, two-stage least square (GLS2LS), Random Effects 1995–2016					
Dependent Variable: SYNCH2					
	(1)	(2)	(3)	(4)	(5)
VIX	0.021	0.041	0.019	0.056	0.056
GLOBAL LIQUIDITY GAP	0.119	0.052	-0.253	0.095	0.097
CRISIS	1.309*	1.506*	2.716**	1.089	1.134
EURO AREA	0.208*	-0.008	0.184	1.095*	
ABS_GOV YIELD SPREAD		-0.275*			
OUTPUTGAP_SYNCH			0.442***		
TRADE				0.616	
FINANCIAL					0.137*
Constant	0.384	0.269	0.447	-0.947	-1.349
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
R^2 *(overall)*	0.341	0.342	0.258	0.280	0.321
# obs.	377	363	365	325	320
Hausman test p-value H_0*: RE* H_1*: FE*	0.177	0.378	0.990	0.999	0.999
# countries	26	26	26	25	25
*** Indicate significance level of 1 percent; ** indicates significant level of 5 percent, and * indicates significance level of 10 percent.					

Annex II. Summary Statistics: VAR Endogenous Variables

Table A2. Summary Statistics: VAR Endogenous Variables				
	ADVANCED_GDP	*INT_CRE*	*IRL_CRE*	*IRL_MFDD*
Mean	2.153	0.000	0.529	3.949
Median	2.485	0.227	3.390	5.010
Maximum	4.830	5.484	27.263	13.650
Minimum	-4.730	-6.243	-42.943	-11.380
Std. Dev.	1.574	2.421	16.513	5.454

Table A3. Correlations: VAR Endogenous Variables				
	ADVANCED_GDP	*INT_CRE*	*IRL_CRE*	*IRL_MFDD*
ADVANCED_GDP	1.000	0.688	0.732	0.671
INT_CRE	0.688	1.000	0.832	0.657
IRL_CRE	0.732	0.832	1.000	0.824
IRL_MFDD	0.671	0.657	0.824	1.000