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May 9, 2018

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From: The Secretary

Subject: **Kingdom of the Netherlands—Netherlands—Selected Issues**

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INTERNATIONAL MONETARY FUND

KINGDOM OF THE NETHERLANDS—NETHERLANDS

SELECTED ISSUES

May 8, 2018

Approved By
European Department

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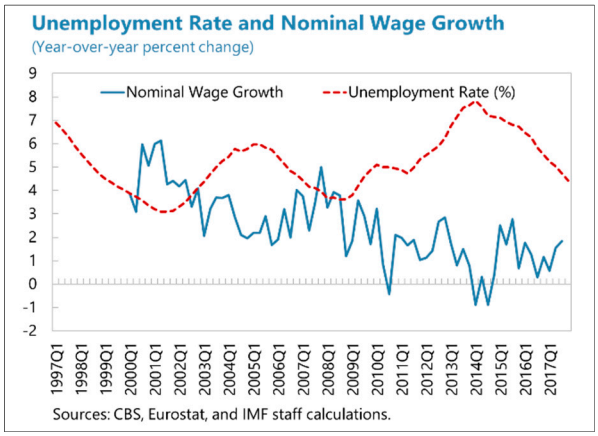
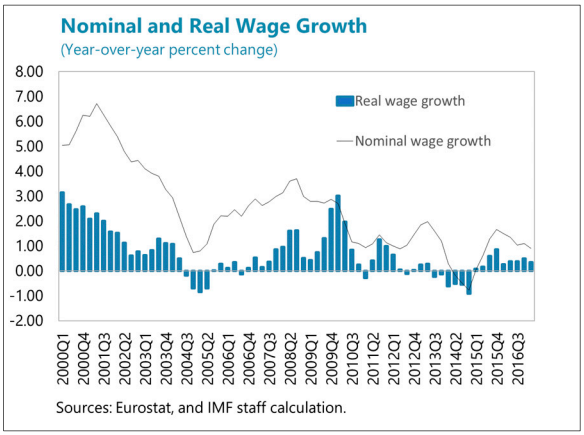
WAGE MODERATION IN THE NETHERLANDS[1]

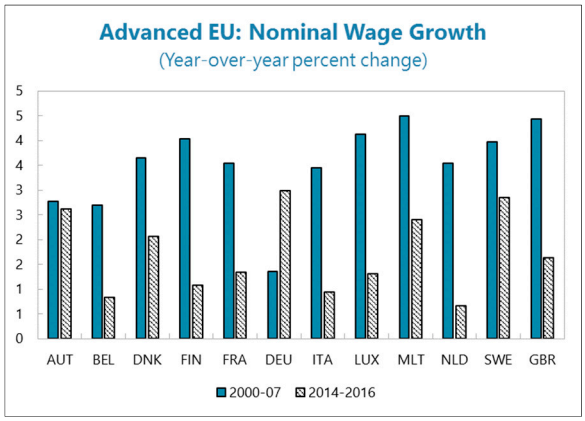
A. Introduction

1. Wage growth has been subdued in the Netherlands despite tighter labor market conditions in recent years. With employment growth picking up since 2014 and labor force participation rising steadily, the unemployment rate has been falling from close to 8 percent in 2014 to 4.4 percent in last quarter of 2017, back to the pre-crisis range. However, nominal wage growth remains subdued at around one percent and real wage growth close to zero, much lower than the wage growth before the crisis. This seems to suggest a flattening of the wage Phillips curve where falling unemployment fails to generate higher wage growth.



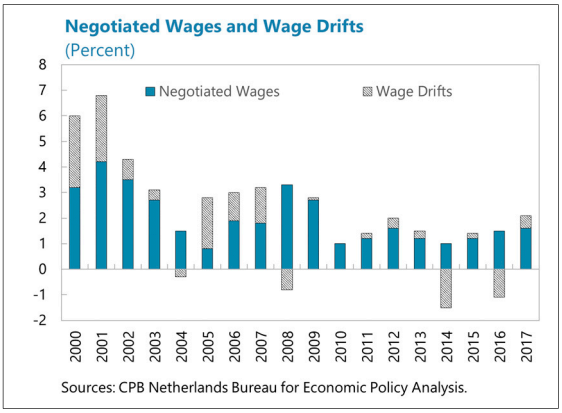


2. The "wage puzzle" is shared by many other advanced economies, though the wage growth in the Netherlands is among the weakest. The latest World Economic Outlook (October 2017) finds that many advanced economies have seen a disconnect between their headline unemployment rates and nominal wage growth in recent years. As in the Netherlands, unemployment rates have been declining in these countries since 2014, and this decline has largely reflected job creation. Yet, nominal wage growth has been broadly stable and remains below pre-crisis ranges for almost all these countries. For around three-quarters of these countries, real wage growth is below its pre-crisis range. However, wage growth in the Netherlands is one of the

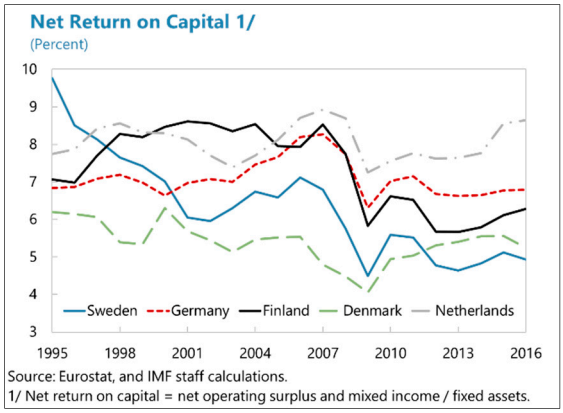


[1] Prepared by Yuanyan Sophia Zhang and Dilyana Dimova. We are grateful for helpful comments from the authorities.

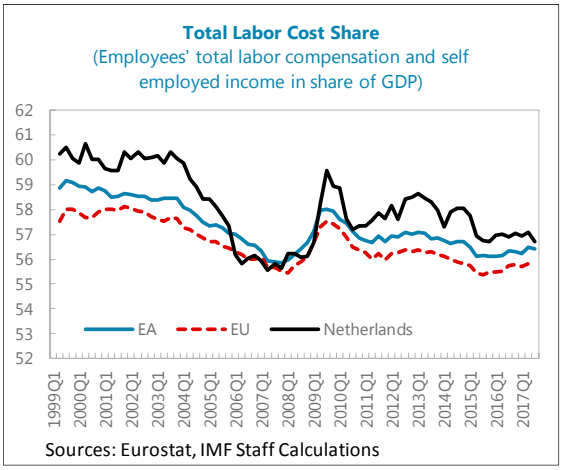
weakest among the advanced EU countries, even including countries whose labor market conditions are more behind the curve.



3. While negotiated wages are showing signs of moderate pick-up, wage drift remains subdued, weighing on the final wage growth. Since the crisis and up to 2017, negotiated wages were growing in the range of 1 to 2 percent, which is slower than the growth rates during 2000—2007 (close to 3 percent); though they had been rising faster in the recent couple of years and are expected to grow by 2.2 and 3.2 percent in 2018 and 2019 respectively, compared with 1.5 percent in 2017. In the meantime, wage drift stood out being exceptionally low in the recent years, and even turned negative in 2014 and 2016, which is quite puzzling as firm profitability is high in the Netherlands compared with other countries, and has remained solid and steadily rising after the crisis. Some anecdotal evidence suggests that this could be due to compositional changes with higher share of low-skilled workers in the labor force. Yet the puzzle of low wage drift remains, which makes it difficult to predict the final wage growth in the coming years despite rising negotiated wage growth.



4. Including self-employed income, the total labor cost share has shown a modest decline since the global financial crisis. The recent trend is not very different from other EA or EU countries. In the Netherlands, rising labor market dichotomy/duality has made self-employed income an important share of total labor income. Without accounting for self-employed income, the Netherlands' employees' total labor cost share would have shown a declining trend after the crisis. Over a longer-term horizon, the total labor cost share has been trending down, broadly in line with other EA and EU countries, possibly driven by factors such as automation, and rising globalization.



5. The following sections examine the fundamental factors driving the Netherlands' "wage puzzle" as highlighted above. Section B summarizes the Netherlands' wage bargaining system and the existing literature on the wage developments both in the Netherlands as well as in the international context. Section C highlights the key stylized facts that motivates the empirical analysis. Section D and E describe the model specifications and underlying data. Section F illustrates the regression results; and section G concludes.

B. Background of Wage Formation in the Netherlands and Literature Review

6. Wage outcomes in the Netherlands in part reflect the nature of the Netherlands' wage bargaining system (Box 1). The collective bargaining process takes place predominantly at the sectoral level, while leaving certain scope of flexibility at the firm/local level. While the wage bargaining process is relatively independent across sectors; wages agreed in other sectors do not deviate much from the ones set in the export-oriented industry sector, which can be influenced by foreign wages, especially among the trading competitors. The bargaining process covers not only the pay, but also types of contracts (e.g. temporary or permanent), retirement and leave benefits, etc. Increasingly, there has been a trend towards more firm-level and individualized wage arrangements. The recent coalition agreement pointed out the importance of having such arrangements to allow the pay to better reflect workers' improving performance and productivity.

7. It is well documented in the literature that wage growth has slowed down significantly both in nominal and real term since the global financial crisis (e.g. Eggelte et al. 2014). The slow wage growth has been largely driven by remaining slack in the labor market (DNB 2017) and rising labor market flexibility (DNB 2018). Peeters and den Reijer (2001) documented a shift in the bargaining power from employees to the employers since 1990s that may have also contributed to the recent low wage growth. Going forward, the tightening labor market is expected to increase negotiated wages from 1.5 percent in 2017 to 2.2 percent in 2018, the number of permanent contracts and tariffs of self-employed; though the wage development is projected to remain relatively moderate (CPB 2017/18).

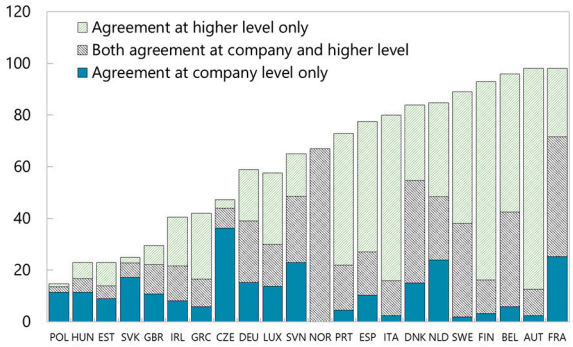
8. Analysis on other advanced economies finds that subdued wage growth can also be attributed to changes to employment structure, technological advancement, etc. among other factors. IMF (2017) finds that while the bulk of the recent wage slowdown in the advanced economies (AEs) can be explained by lower trend productivity, labor market slack that is not captured by the traditional unemployment measures, in many AEs, given increases in part-time employment and temporary contracts. These developments may also point to persistent changes in relationships between firms and workers in response to technological change and remaining labor market rigidities in some countries that deter employers from hiring on standard full-time contracts. Beyond these factors, it is found that automation and diminished medium-term growth expectations may have also contributed to slower wage growth.

Box 1. Netherlands' Wage Bargaining System

The collective bargaining process takes place predominantly at the sector level, but leaves certain scope of flexibility at the firm/local level in the Netherlands. These national or sectoral agreements define the broad framework of wage setting but leave large scope for bargaining at the firm/establishment level. Wage negotiations take place in their respective sector, and are independent of negotiations in other sectors. Sectors can set *minimum* or *standard* terms of employment (a "wage floor") which employers can complement or deviate from *upwards* at firm level; or allow workers and employers to choose "*à la carte*" and trade off wages against working conditions.[1] This form of wage setting is also common in the Scandinavian countries. In contrast, in countries like Germany, national or sector agreements allow and define the conditions for deviations at lower levels via the so-called opening or opt-out clauses.

The sectoral wage bargaining is led by the industry sector, followed by other sectors. There are three major unions: the Christian-Democratic Christelijk Nationaal Vakverbond (CNV), the social-democratically oriented Federatie Nederlandse Vakbeweging (FNV) and the Federation of Managerial and Professional Staff Unions (VCP). All are federations of sector-based labor unions. They bargain with employer's organization over wage formation. The Confederation of Netherlands Industry and Employers (known as VNO-NCW) is the largest employers' organization in the Netherlands. VNO-NCW represents the common interests of Dutch business and cover almost all sectors of the economy, including more than 80 percent of all medium-sized companies and nearly all the large corporate institutions.

Bargaining Levels
(share of employees covered by collective bargaining system)



Sources: OECD Employment Outkook 2017, Chapter 4.

Collective agreements are legally binding for Dutch union members but employers are obliged to offer the same terms to non-union members, so in practice all employees are covered. In addition, the parties to a collective agreement can ask the government to make its term generally binding on all employees in an industrial sector. For this to happen, the agreement must already cover a "substantial proportion" of those employed in the industry—normally 55 percent or more. The agreed collective agreements may include not only pay but also working conditions issues, early retirement, educational leave, the organization of leave over the whole of an employee's working life, the position of women, protecting those with disabilities, and the environment. Increasingly agreements provide for a range of benefits, from which individual employees can choose.

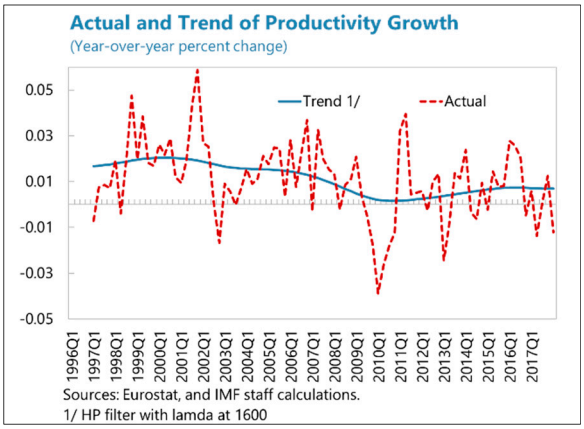
The system of wage formation in the Netherlands is characterized by high penetration (> 80 percent including extension) and relative stability. However, there is a recent trend of decreasing membership rates owing to fewer membership sign-up by young workers, and an increasing share of the self-employed who are not covered under a collective agreement nor are they union members). The aging union membership and decreasing unionization rates cause a widening gap between union density (currently 24 percent) and collective bargaining coverage. There is no formal mechanism in the case of failed collective bargaining and real failure is very exceptional. In this case, the content of the former agreement is still applied. In exceptional cases, such as strikes, the state may take the initiative to appoint a mediator (with the agreement of the parties involved).

[1] The two main wage agreement laws are: the Law on the collective agreement (Wet op de collectieve arbeidsovereenkomst, WCAO), dating from 1927; and the Law on the extension of collective agreements (Wet op het verbindend en onverbindend verklaren van collectieve arbeidsovereenkomsten, WAVV), dating from 1937.

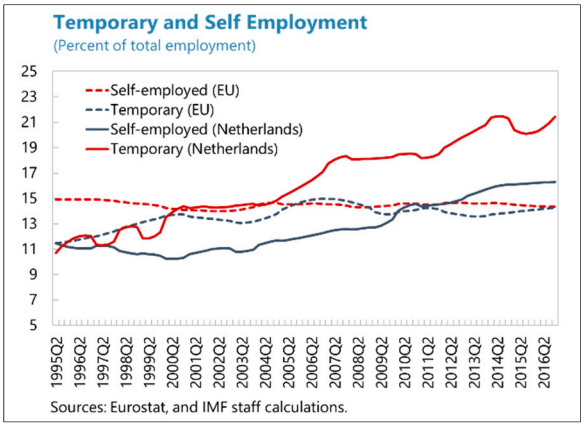
Box 1. Netherlands' Wage Bargaining System (concluded)

Although most bargaining continues to take place at the sectoral level, the number of company agreements is on the rise. In 2013, there were 182 agreements covering normal pay and conditions issues signed at industry level and 519 company collective agreements covering together 5.9 million employees. 10 percent of all wage agreements were covered though company collective agreements which predominate in the largest companies such as Philips, DSM and Shell. There is also a tendency for industry level agreements to become framework agreements, with some of the detailed provisions being negotiated at company level. Another recent trend is towards individualization of pay setting, mainly in the form of the introduction and/or spread of flexible pay forms. The decline of collective labor agreements may furthermore be explained partly by economic trends such as globalization, technological progress and a decline in union membership, possibly leading to more flexible labour markets and lower negotiation power by unions (De Ridder and Euwals, 2016).

C. Stylized Facts

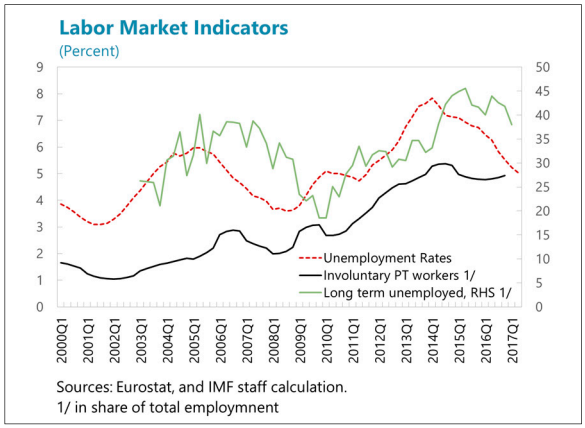


9. Recent wage moderation can be largely attributed to falling labor productivity and subdued inflation expectations. Trend labor productivity declined from above 2 percent to around 1 percent after the crisis. Inflation also remains subdued. Going forward, inflation is projected to rise only gradually to the 2 percent target.

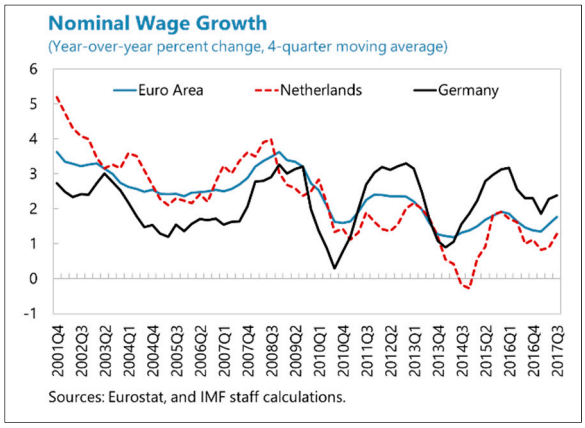


10. Higher flexibility in the labor market may have also contributed a more complicated relationship between wages and unemployment. Motivated by the prospects of avoiding high pension and social security contributions, more workers are willing to become self-employed. Their work arrangements tend to be more flexible, just like workers hired under the flexible/fixed term contracts, which make them more cost competitive to hire than regular employees. As a result, the share of workers becoming self-employed and/or under temporary contracts are steadily rising, much faster than other EU countries. As suggested by DNB (2018), this may have weighed on employees' wage bargaining power. In this context, labor unions' prioritization in making labor contracts more permanent and employment protection more stringent during the wage bargaining process have also created additional burden for faster wage growth.

11. In addition, despite falling unemployment, some non-traditional indicators point to remaining slack in the labor market. Although unemployment has fallen from above 8 percent to less than 5 percent, close to the pre-crisis range; other indicators such as involuntary part-time employment and long-term unemployment remain elevated. This suggest that labor market slack has not yet entirely diminished.



12. The Netherlands' wage growth has been moving closely with or even more slowly than that in Germany and other Euro Area countries. Like other EA countries, wage growth in the Netherlands followed its trading competitors quite closely, including during the period of wage moderation in Germany (2003–05). Post-crisis wages have been growing even more slowly than most euro area countries (due to a higher unemployment gap during the recession), and much more slowly than Germany, despite similar trend productivity growth, labor market slack, and expected inflation.



D. Model Specification

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

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

14. An error-correction specification (ECM) is used to estimate the wage curve.[2] This specification appears similar to the more widely used Phillips curve in wages, except for the inclusion of an error correction term that depends on the lagged levels of real wages and trend labor productivity. When real wages deviate from their long run equilibrium level in relation to trend labor

[2] Sargan (1964) originated the estimation of an error correction model for wages. Zhang (2017) elaborate the model to include more labor slack indicators and external spillovers.

productivity, this error correction term impacts nominal wage growth and promotes a return to equilibrium.

15. The wage curve ECM is enriched with structural variables in addition to domestic labor market slack indicators, inflation expectations, and international labor conditions. Real wages (RW) and trend labor productivity (TLP) are in the error correction term. Nominal wages (W) are determined by d*omestic cyclical factors (D),* including inflation expectations, unemployment gap, and additional labor market slack indicators (e.g. involuntary part-time employment); *foreign cyclical factors* (F), including German wage growth and foreign labor market slack (unemployment rate and involuntary part-time employment in the Euro Area), and *structural factors (*S) such as share of temporary, self-employed workers. We also include the interaction between the structural variables with unemployment to examine the effect of structural changes in the labor market on the Phillips curve relationship. Altogether:

$$d\log W_t = \delta + \lambda_0 d\log W_{t-4} + \sum_{K=1}^{m} \lambda_{1,m} D_{t-i,m} + \sum_{K=1}^{m} \lambda_{2,m} F_{t-i,m} + \sum_{K=1}^{m} \lambda_{3,m} S_{t-i,m}(1+UnemGap_{t-i})$$
$$+(\phi_1 \log RW_{t-4} - \phi_2 \log TLP_{t-4}) + \eta_t$$

Note that the difference operator covers 4 quarters, reflecting the common approach of adjusting wages annually, and the error correction term refers to real wages and trend productivity 4 quarters earlier. The specification also controls for lagged dependent variable, $d\log W_{t-4}$ to reflect possible inertia or base effects.[3] A statistically significant negative coefficient on lagged real wages RW_{t-4} would indicate cointegration between real wages and trend productivity. The parameter ϕ_1 is expected to be approximately equal to ϕ_2, such that real wages grow broadly at the pace of trend productivity in equilibrium.

E. Data

- *Nominal wages:* Our analysis is mainly based on total labor compensation from the national accounts as a ratio to hours worked, but we also test wages and salaries from the national accounts as a ratio to hours worked for robustness check. The key difference between the two measures is that total compensation includes employers' social security contributions. Compared with some short-term wage statistics, measures from the national accounts reflect structural changes in the composition of the labor force (by sector, occupation, and skill level). This makes the national accounts measures more consistent with the measure of labor productivity, which is an average across a changing composition of jobs. The labor cost index (LCI) wages and salary measures are based on a more stable basket of jobs, and include bonuses and benefits (e.g. car, health care, sick leave), same as the wages and salaries measure from the national accounts; but the LCI wage and salary measures only cover the business sector.

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

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

The above and other variables are summarized in the table below:

F. Estimation Results from the Netherlands' Models

16. The estimation results indicate that wage formation has been influenced by both domestic fundamentals and international spillovers in recent decades. The above ECM specification is estimated for the period of 1995Q1 to 2017Q1 with labor compensation per hour from national accounts as the dependent in Table 1. The coefficients on the lagged level of the real wage are statistically significant in all variants of the equation, indicating cointegration between real wages and productivity, with the rate of error correction ranging from -0.5 to -0.7. Variants on the general specification are reported as follows:

- *Models 1–3 include only domestic variables*.[4] In addition to the ECM term (difference between real wages and trend productivity), significant variables include both the unemployment gap, expected inflation and labor productivity growth. Involuntary PT employment does not seem to be significant.

- *Models 4–5 add indicators of labor market slack in the euro area (EA).* Changes in the EA unemployment gap are found to be statistically significant, while domestic labor slack indicators remain statistically significant.

- Models 6–9 add German or EA compensation/wage growth. Foreign wages are found to have a significant impact on Dutch compensation growth, though the significance is higher for the German wages. In the more complete models (7–9), the coefficients on expected inflation, euro area unemployment changes and domestic unemployment gap remain statistically significant.

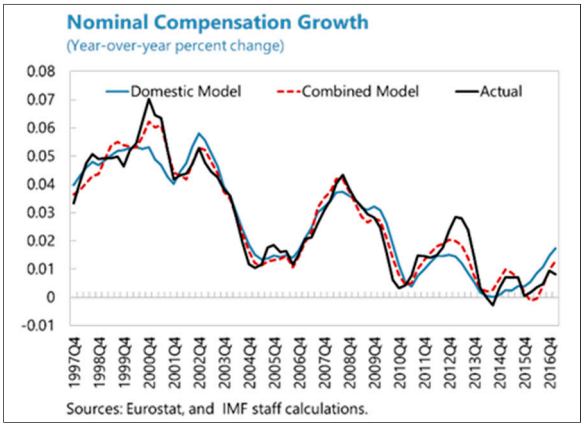
Definition of Key Variables

Variables	Abbreviation	Calculation	Source
Unemployment Gap	UnemGap	Percent deviation from HP-filtered NAIRU (lamda=1600)	LFS
Involuntary PT employment		Involuntary PT workers in share of total employment	Eurostat
Labor compensation per hour	W	total labor compensation per hour worked	Eurostat, National Accounts
Trend productivity	TLP	HP-filtered trend real labor productivity per hour (lamda=1600)	Eurostat
Real Compensation/wage	RW	Compensation or wage / GDP deflator	
GDP deflator		Nominal GDP/Real GDP	Statistics Netherlands
Self-employment	self	Self-employment in percent of total employment	Eurostat
Temporary employment	temp	Temporary contracts in percent of total employment	Eurostat

- *Models 10–14 add the structural changes in the form of employment*. The rising share of temporary and self-employed employment are each found to have significant negative impact on wage growth. They are also found to reduce the responsiveness of the wage growth to

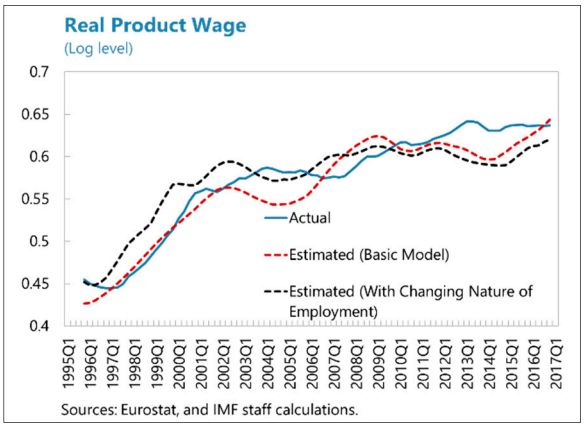
[4] Model 1 is similar to the basic wage equation in Blanchard (1997).

unemployment gap. But when temporary and self-employment are both included in the regression at the same time, the effect of self-employed share becomes less important.



17. The long run regression suggests that compensation has been growing more slowly than trend productivity. The ECM term from the regression 7 show that 1 percent increase in productivity is associated with 0.84 percent increase in the compensation, and the coefficient is significantly less than 1.

$$\log RW = 0.84 \log TLP - 0.10U$$



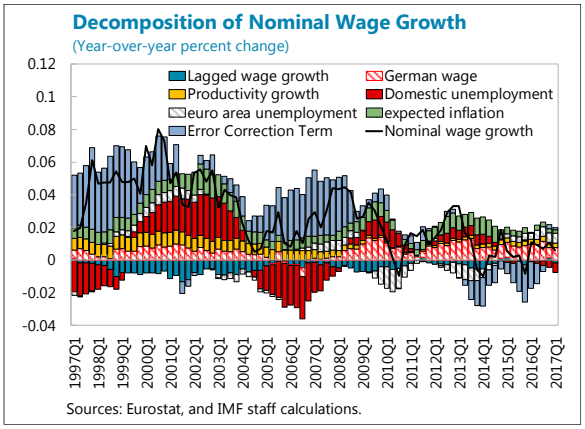
18. This can be partly explained by the rising flexibility in the labor market. If the change in labor market structure, e.g. the rising share of temporary employment is included, labor compensation growth becomes more aligned with the trend productivity; suggesting that the rising share of temporary and self-employed workers may have lowered the responsiveness of the real wage to trend productivity and unemployment over the long run perhaps due to reduced bargaining power of the more flexible employees.

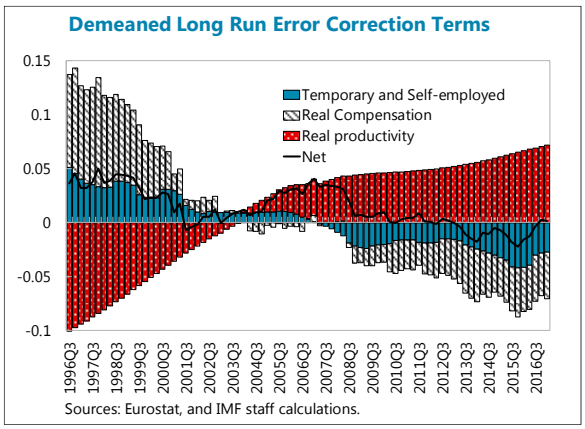
$$\log RW = -1.0\overline{temp} + 0.4\overline{self} + 1.08 \log TLP - (0.17 - 0.9\overline{temp} - 0.79\overline{self}) * U$$

19. The error correction model shows that wage growth reacts to both domestic and foreign factors and explains more than 80 percent of the total variation of the actual wage development. The domestic wage curve model (red line in text chart), which includes unemployment, productivity and expected inflation, has an R-square of 80 percent. The spillover effects from the euro area labor market conditions and German wage growth and structural changes of employment are significant, and contributes an additional 10 percent to the model fit; though neither of their contribution is sizable.

20. The decomposition exercise suggests that the recent moderation is associated with sluggish productivity growth, moderate wage growth in the EA, and changes in the form of employment over time. Decomposing the nominal compensation growth into contributions from variables included in the most complete short-run regression (model 14), it is found that lower productivity growth and expected inflation are the main factors inhibiting the recovery of labor compensation growth that traditional wage Phillips curve would imply. Recent slow wage growth in the EA, including in Germany since the Hartz reform, also weighed on wage growth as maintaining external competitiveness is an important factor in the wage formation process in the Netherlands. In

addition, the negative contribution from the error correction term in recent years reflects structurally lower real wages driven by a rising share of temporary workers.





G. Conclusions

21. Besides various cyclical factors, rising labor market flexibility may have contributed to the wage moderation in the Netherlands. Like other advanced economies, slower productivity growth and lower expected inflation are important drivers to the wage moderation in the recent years. In addition to that, remaining slack in the labor market also weighed on wage growth. Like many other EA or EU countries, foreign wage growth has been showing strong spillovers to domestic wage development, especially for small open economies with strong trade exposures that strive to safeguard competitiveness. But more specifically to the Netherlands, rising labor market duality/flexibility with higher share of temporary and self-employed workers, may have also contributed to stagnant wage growth. Reforms to harmonize labor market employment contracts in a manner that increases flexibility but also allows greater bargaining power for the more "flexible" employees might allow both greater flexibility and higher wages.

22. Going forward, wages are expected to growth faster given higher expected inflation, foreign wage spillovers, and tightening labor market. With labor market slack diminishing further, inflation edging up, and foreign wages growing faster (e.g. the recent round of German wage negotiation), wage growth in the Netherlands might slowly pick up. Negotiated wages are projected to increase from 1.5 percent last year to 2.2 and 3.2 percent in 2018 and 2019 respectively; though the projection of wage drift remain unclear given possibilities of compositional changes, etc. It is also hard to predict whether the proposed policy measures in the coalition agreement that strive to balance the employment protection between temporary and permanent workers would have a positive or negative implication on wages. More research can be done in this area once the outcome of discussions with social partners produces a clearer outcome.

Table 1. Netherlands' Wage Equations

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Nominal Compensation Growth (y/y percent change)													
Short Run Dynamics														
L4. Dept var	-0.11	0.25***	-0.12	-0.10	-0.11	0.19**	-0.09	0.15	-0.08	-0.11	-0.17**	-0.23**	-0.32***	-0.16*
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.10)	(0.09)	(0.08)	(0.08)	(0.10)	(0.11)	(0.09)
L4. Trend productivity growth	2.16***	0.83**	2.18***	1.55***	1.52***	1.05*	1.78***	0.11	1.58***	0.31	0.10	2.20***	1.45**	0.42
	(0.40)	(0.40)	(0.41)	(0.51)	(0.51)	(0.57)	(0.52)	(0.52)	(0.53)	(0.66)	(0.62)	(0.50)	(0.70)	(0.66)
L4. Consumer inflation	0.35*	0.77***	0.35*	0.40**	0.39**	0.87***	0.57***	0.85***	0.58***	0.58***	0.67***	0.10	0.07	0.36*
	(0.19)	(0.20)	(0.20)	(0.19)	(0.19)	(0.21)	(0.18)	(0.21)	(0.18)	(0.17)	(0.16)	(0.20)	(0.24)	(0.19)
L4. Unemployment gap 1/	-0.07***		-0.07***	-0.06***	-0.07***		-0.07***		-0.07***	-0.30***	-0.23***	-0.20***	-0.18**	-0.12*
	(0.01)		(0.01)	(0.01)	(0.01)		(0.01)		(0.01)	(0.07)	(0.07)	(0.06)	(0.07)	(0.06)
L. Change of unemployment rate	0.00		-0.01	0.51	0.51		0.02		-0.11	-0.60***	-0.25	0.91***	1.01***	0.40
	(0.22)		(0.23)	(0.34)	(0.34)		(0.34)		(0.35)	(0.23)	(0.30)	(0.30)	(0.37)	(0.48)
L3. Change of involuntary PT		-0.73**	0.06		0.25	-0.37		-0.32						
		(0.31)	(0.29)		(0.30)	(0.34)		(0.35)						
L4. Temporary employment * Unemployment gap 1/										1.49***	1.12**			0.90*
										(0.45)	(0.45)			(0.48)
L4. Self employment * Unemployment gap 1/												1.04**	0.94*	0.79
												(0.49)	(0.53)	(0.50)
L2. Change of EA unemployment gap				-0.66*	-0.75**	-0.41	-0.71**	-0.58*	-0.67*		-0.59*		-0.46	-0.65*
				(0.35)	(0.37)	(0.29)	(0.34)	(0.30)	(0.36)		(0.34)		(0.38)	(0.34)
L2. German wage growth						0.41***	0.22*				0.44***		0.24*	0.30***
						(0.13)	(0.11)				(0.11)		(0.13)	(0.11)
L2. Euro Area wage growth								0.39**	-0.06					
								(0.16)	(0.14)					
Long Run Relationship														
L4. Temporary employment 1/										-0.55***	-0.76***			-1.00***
										(0.15)	(0.15)			(0.20)
L4. Self employment 1/												-0.12	-0.37*	0.40*
												(0.16)	(0.19)	(0.22)
L4. log Real compensation	-0.50***	-0.50***	-0.50***	-0.56***	-0.56***	-0.58***	-0.69***	-0.45***	-0.64***	-0.60***	-0.63***	-0.54***	-0.49***	-0.69***
	(0.09)	(0.10)	(0.09)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.10)	(0.09)	(0.11)	(0.12)	(0.10)
L4. log Real Trend productivity	0.43***	0.38***	0.43***	0.42***	0.42***	0.45***	0.58***	0.27**	0.54***	0.62***	0.69***	0.44***	0.36***	0.75***
	(0.09)	(0.10)	(0.09)	(0.09)	(0.09)	(0.11)	(0.10)	(0.11)	(0.10)	(0.09)	(0.09)	(0.10)	(0.11)	(0.11)
Constant	-2.68***	-2.47***	-2.68***	-2.73***	-2.69***	-2.89***	-3.64***	-1.88***	-3.37***	-3.59***	-3.92***	-2.75***	-2.26***	-4.29***
	(0.54)	(0.61)	(0.54)	(0.53)	(0.53)	(0.64)	(0.56)	(0.63)	(0.56)	(0.55)	(0.52)	(0.60)	(0.65)	(0.62)
Observations	81	81	81	81	81	81	81	81	81	81	81	81	80	81
R-squared	0.80	0.68	0.80	0.81	0.81	0.73	0.82	0.72	0.81	0.84	0.87	0.83	0.84	0.88

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

1/ lags range between 4 to 6 based on the highest significance level

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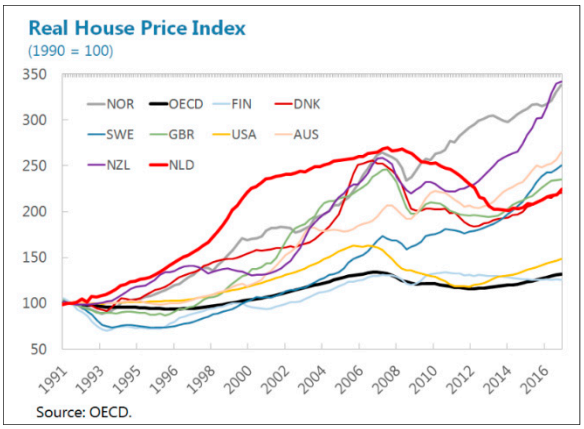
FUNDAMENTAL DRIVERS OF HOUSE PRICES IN THE NETHERLANDS? A CROSS-COUNTRY ANALYSIS [1]

The Netherlands had seen a long housing boom since the early 1990s with house prices rising to high levels, including by comparison to other countries. The boom turned into a bust following the 2007–09 global financial crisis, which left the household sector with excessive debt and a significant share of underwater mortgages. Over the past years, house price growth rebounded strongly in most parts of the country, with price level surpassing pre-crisis highs in the main cities. Given the importance of the housing market to both financial and macroeconomic stability, it is essential for policymakers to monitor the extent to which house prices deviate from economic fundamentals. This paper examines various factors driving the uptrend in house prices, with a particular focus on institutional and structural factors. The extent of a possible valuation gap and the role of structural polies in shaping house price development are gauged empirically in the context of a cross-country panel analysis of long-run fundamental determinants of house prices using data from 20 OECD countries, with policy implications drawn at the end of the paper.

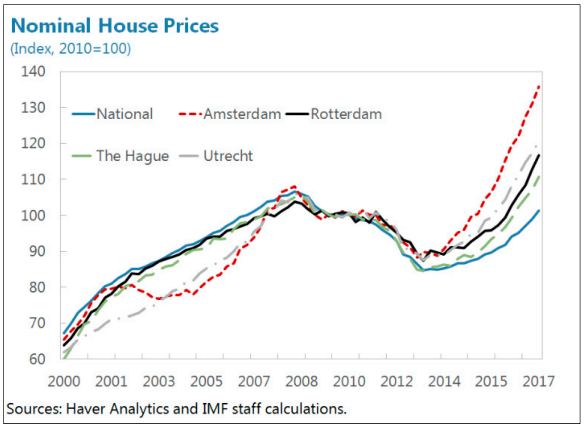
A. Introduction

1. The Netherlands had seen a long housing boom since the early 1990s, which turned into a bust following the 2007–09 global financial crisis (GFC). While real house prices have also been up strongly during early 1990s–2007 in the majority of advanced economies, the Netherlands experienced one of the highest increase among OECD countries, driven in part by easy financial conditions and accompanied by debt accumulation. During 1991–2007, real house prices almost tripled, with average annual nominal house price growth of 8.6 percent (7.1 percent during 2000–07). Real house prices subsequently declined by 25 percent before bottoming out around the end of 2013.

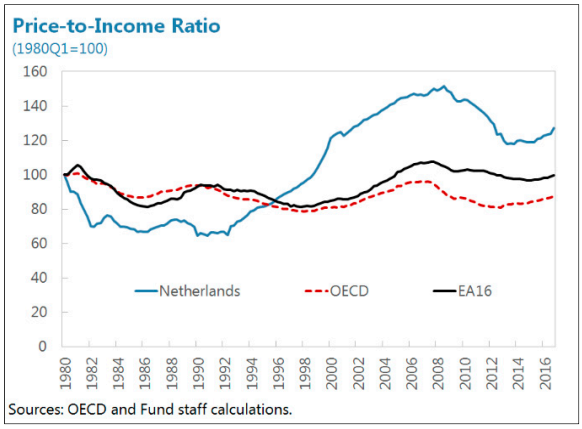


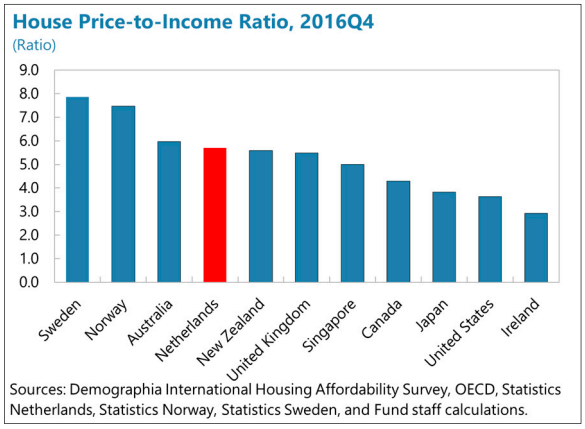
[1] Prepared by Nan Geng (EUR).

2. Nevertheless, house prices growth recovered strongly in most parts of the country over the past years, with price level surpassing pre-crisis highs in the main cities. Following the trough in 2013, house price inflation reaccelerated sharply in recent years, with house price inflation exceeding income growth by a wide margin. House prices nation-wide rose at an average pace of about 7½ percent y/y in the first ten months of 2017—up from 5 percent y/y in 2016, and the growth is particularly high in major cities (e.g., over 10 percent y/y in Amsterdam and Rotterdam in 2017:Q3). House price level are now over 20 percent higher than the post-crisis low in 2013, with price level surpassing pre-crisis highs in main cities. Transaction volumes have also exceeded the pre-crisis highs.



3. The house prices-to-income ratios are also high by international standards. With house prices rising ahead of income over the most part of the past three decades, the average cost of a home relative to the median household income nationwide has more than doubled since the early 1990s, rising much faster than the OECD average. Currently, the house price-to-income (PTI) ratio stands about 15 percent above its 30-year historical average. In absolute terms, the PTI ratio is also relatively high compared to a wide range of countries, hindering affordability especially in the major cities.

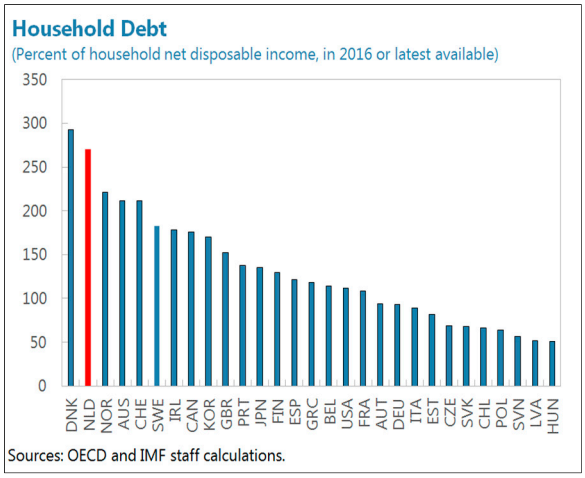


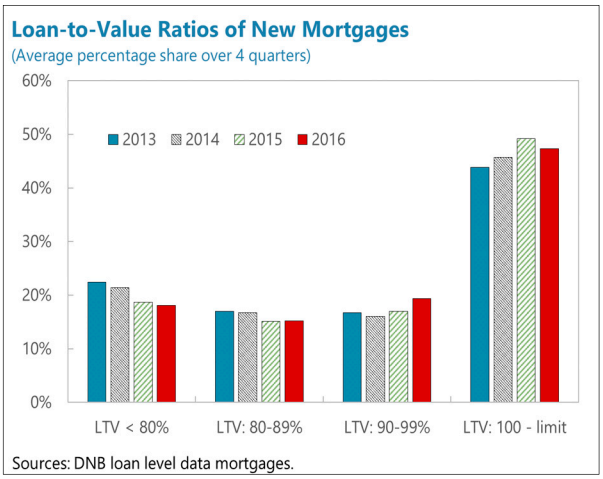


4. The recent boom-bust housing cycle left the household sector with excessive debt and a significant share of underwater mortgages. Households have started to deleverage gradually from record debt levels over the past years however, partly owing to the relaxed tax exemption for gifts used for housing down payments or mortgage repayments.[2] But household debt as a share of disposable income—standing at 270 percent at end-2016—remains the second highest in the OECD,

[2] A once in a life-time gift tax exemption of up to EUR 100,000 for a house purchase was in effect from October 2013 until the end of 2014 and has been reintroduced and made permanent as of January 1, 2017, for people that are between the age of 18 and 40.

with household asset holdings are mostly illiquid in the form of pension entitlements and housing. Against the backdrop of rapidly rising house prices in recent years, the share of mortgages in negative equity—which is particularly prevalent among young borrowers—has gradually declined to 14 percent as of 2017:Q2. However, new mortgages with loan-to-value (LTV) ratio over 90 percent kept rising along with higher house prices.





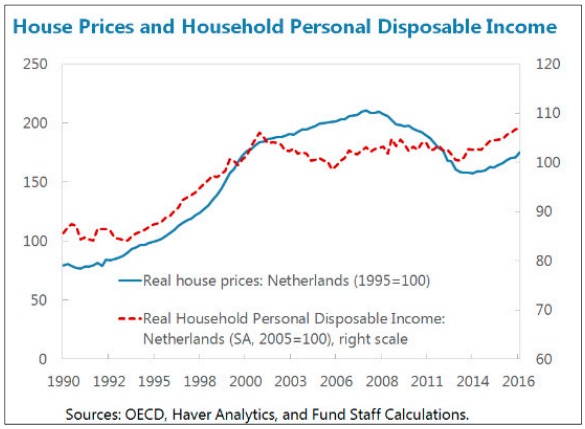
5. For policymakers, it is important to monitor the extent to which house prices deviate from economic fundamentals. If house prices significantly exceed fundamentals, this raises the risk of a house price correction. A large correction in house prices—driven by slower real income growth, a reverse in sentiment, or interest rate hikes—could weaken household balance sheets and depress private demand through wealth effects (Mian et al., 2013). Moreover, this impact tends to be more pronounced for households with high LTV mortgages than for those with low LTV mortgages, as the high LTV group tends to have higher levels of consumption in the very similar Danish housing and household wealth environment (Andersen et al., 2014). While arrears and bank losses related to residential mortgages would remain low—notably due to the full recourse on borrowers and the national mortgage guarantee system, both financial and macroeconomic stability could be undermined if lower consumption impairs business activity and corporate earnings, which would negatively impact output and pushes up unemployment and bank losses associated with enterprise loans. While it is difficult to detect housing `bubbles' in real time, it is helpful to gauge the degree of overvaluation or undervaluation in the housing market by comparing actual price levels to those that would be justified by fundamental demand, supply, institutional and structural factors.

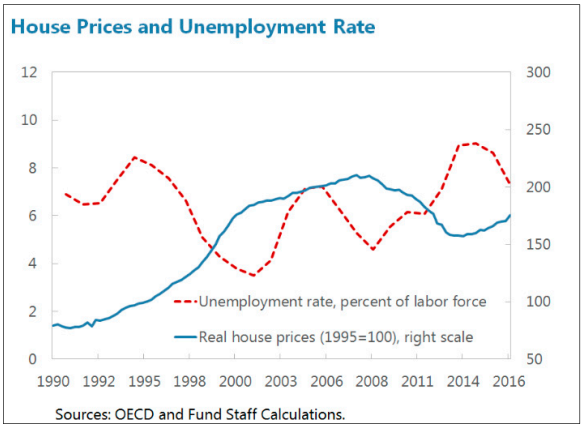
6. The paper is organized as follows. Section B discusses the driving forces behind the uptrend in house prices, including demand, supply, institutional, and structural factors. Section C presents the cross-country analysis of long-run equilibrium house prices using data from 20 OECD countries. Section D concludes with policy implications.

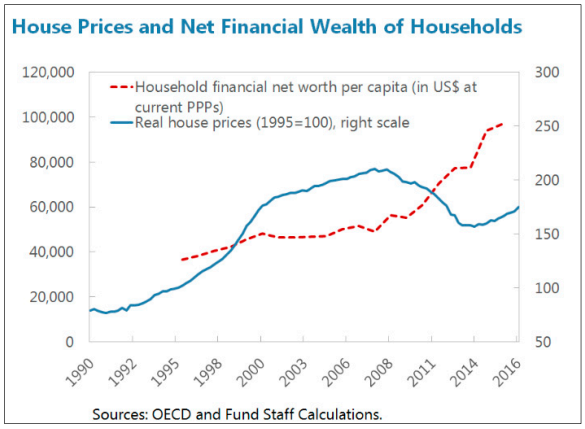
B. Factors Contributing to the Uptrend in House Prices

Demand Factors

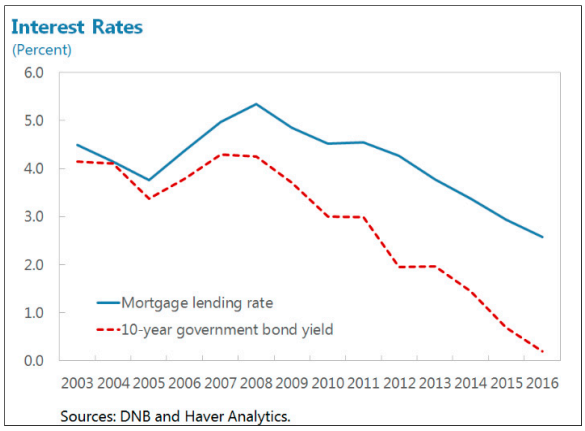
7. Household income and financial net wealth played an important role in shaping house price dynamics. Real personal disposable income (RPDI) grew by 2.0 percent per year on average in the 1990s. This, coupled with a rapid decline in unemployment and rise in female labor participation, have supported strong demand for housing. Following the GFC, the sluggish RPDI growth and sharply rising unemployment have contributed to the housing downturn during 2007—13. In more recent years, the favorable economic and labor market trends, combined with a rapid accumulation of financial net wealth of households, exerted renewed upward pressure on housing demand.

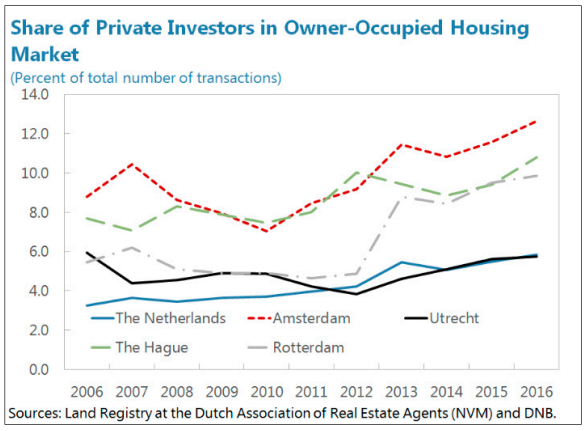




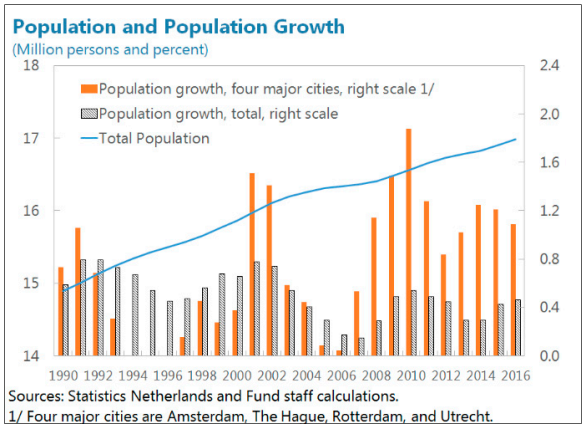


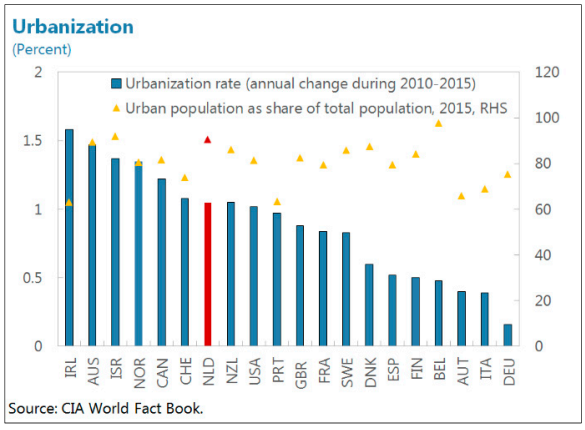
8. Demand has also been fueled by declining interest rates. Mortgage rates have gone down substantially since 2000 to historically low levels in recent years. In addition, housing investment returns have become increasingly attractive after the GFC as long-term bond yields declined along with the slide of policy rates, which stimulated purchases for investment purposes by the wealthier—further driving up the prices.



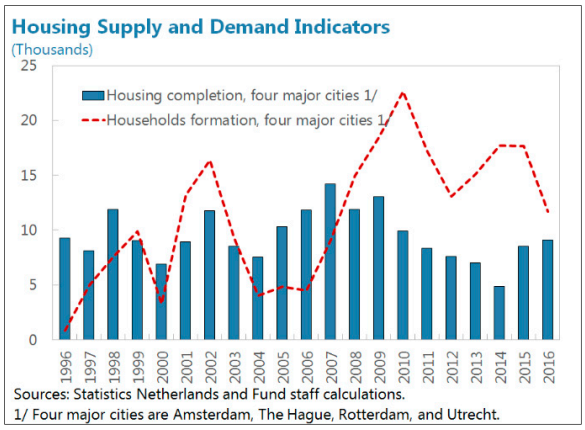


9. Population trends reinforced the high demand for owner-occupied housing, particularly in large cities. Annual population growth averaged about 0.5 percent from 1990–2016—comparable to the average level in advanced economies. Meanwhile, urbanization—with an average annual rate of 1.1 percent over 2010–15—has been exerting additional pressure on demand for housing in the main urban areas. The housing demand pressure is most pronounced in the four major cities, with an average annual population growth rate of 1.2 percent during 2007– 16—substantially outstripping the national average due to a steady inflow of foreign immigrants as well as domestic migration. According to Statistics Netherlands' projections, the number of households will continue to grow over the next few decades, by some 640,000 to 8.4 million (8 percent) by 2030.



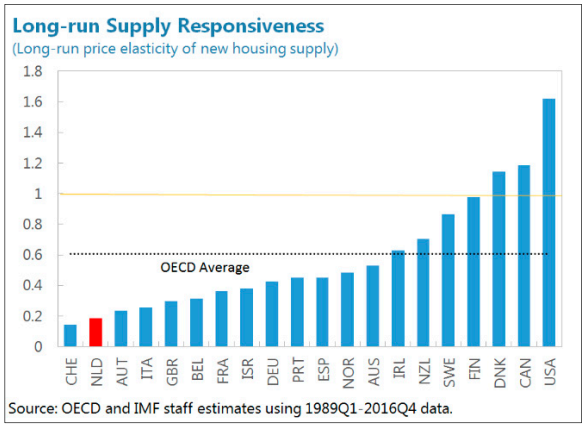


Supply Factors

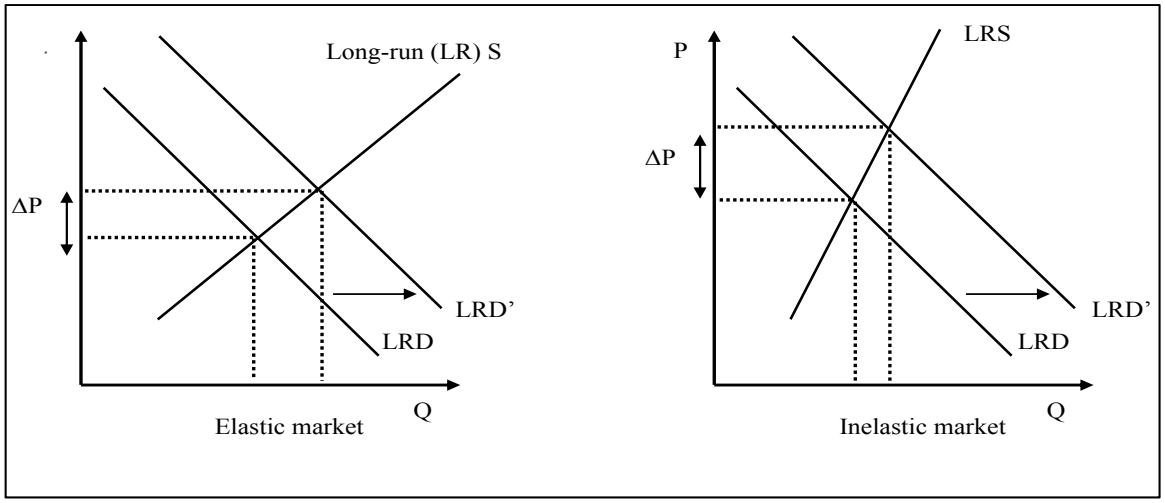


10. Meanwhile, housing supply in large cities has not kept up with housing demand since the GFC. The issuance of new-building permits has stagnated since the crisis and the supply of housing has been lagging behind the expected growth in households in most provinces (Economic Institute for Construction and Housing, 2016). The situation is most acute in the four major cities, where housing completion fell to a record low in 2014 despite the post-GFC surge in population. While residential investment recently rebounded in response to higher prices, housing completion remained well below the estimated household formation, contributing to fast price increases.

Institutional and Structural Factors



11. The slow supply response to rising demand can amplify price increases. According to staff's updated estimates using 1989–2016 data based on the same methodology used in the OECD study (Caldera Sanchez et. al., 2011), The Netherlands has the second lowest price responsiveness of housing supply among OECD countries, with the long-run price elasticity of new housing supply estimated at about 0.2 compared to the OECD average of 0.6. The sluggish supply of housing may reflect both natural (i.e. topographical) and man-made constraints (e.g. stringent local regulations on land use and cumbersome building permitting process, including restrictive zoning codes and building aesthetics criteria). In addition, the capacity constraint of construction sector following the onset of the GFC is an important cause of the slow recovery of construction output in response to fast rising house prices. Subject to a given increase in long-run demand, markets with inelastic long-run supply curve cannot build as much new dwellings as can markets with elastic supply, resulting in greater increase in prices (Anundsen et al., 2016).



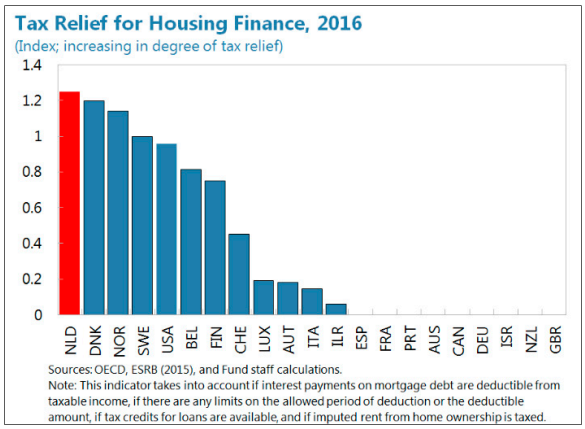
12. Generous tax incentives for mortgage financing and home ownership have substantially reduced the user cost of housing, contributing to high and rising house prices. Like in many other advanced economies, housing investment receives favorable tax treatment relative to other investment in the Netherlands. Interest on mortgages is fully tax deductible,[3] which effectively reduces the debt service costs, thereby incentivizing households to borrow more and purchase more expensive houses. The authorities have started gradually reducing the maximum tax rate that mortgage interest can be deducted against by 0.5 percentage points annually from 52 percent in 2013, to 38 percent in 2041 (50 percent in 2017).[4] However, the tax relief for housing financing in the Netherlands remains one of the most generous in the OECD, and leads to higher house and land prices.[5] In addition, the capital gains tax is one of the lightest in the European Union (Hilbers et. al., 2008; ESRB, 2015) and the recurrent tax revenue from immovable properties is low compared with the OECD average.[6] The favorable tax treatment on housing investment may crowd out capital from more productive uses than housing, resulting in efficiency losses and housing demand distortions by reducing the user cost of owner-occupied housing and encouraging excessive leverage (OECD, 2009; Geng et al., 2016). Moreover, it tends to favor higher-income earners, (e.g., tax savings from mortgage interest deductibility tends to be larger when income are higher). Other things equal, housing demand in markets with more favorable tax treatment on housing would be higher for a given level of income, pushing up house prices relative to markets with lower tax preferences.

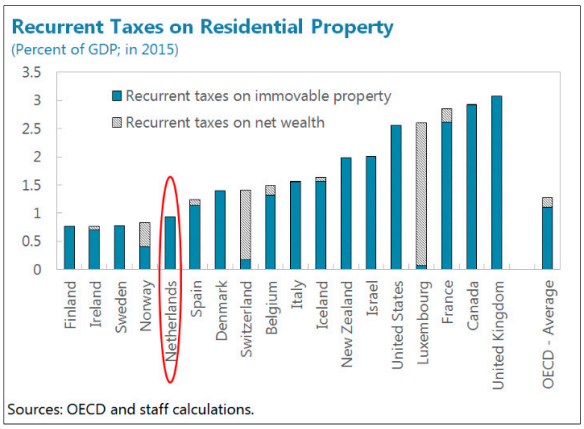
[3] 100 percent deduction for all pre-2013 loans and for post-2013 fully amortizing loans (within 30 years). While the Netherlands is one of the few countries that tax imputed rent from home ownership, the tax level is low and much smaller than the mortgage interest deductibility (MID). A fully neutral taxation of owner-occupied housing would require full taxation of imputed rents and capital gains on housing, combined with mortgage interest deductibility.

[4] The recently released coalition agreement proposes a much more rapid phase-out in steps of 3 percentage points annually until the basic rate of 37 percent is reached in 2023, but this is still subject to approval by the parliament.

[5] Capozza et al. (1996) and Harris (2010) showed that tax-favoring of housing tends to encourage excessive leverage and be capitalized into house prices, without necessarily expanding housing opportunities for households.

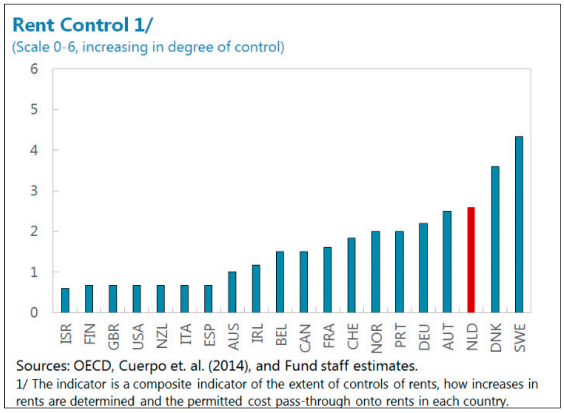
[6] The recurrent property tax in the Netherlands is levied at the local level and varies by region, ranging from 0.1–0.3 percent of property value.

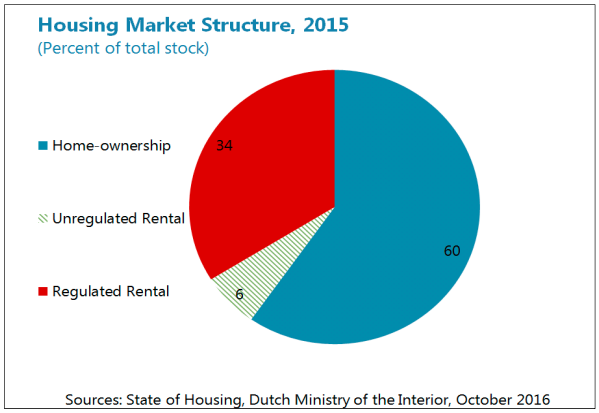




13. Structural weaknesses and strict regulation in the rental market intensifies supply-demand imbalances, putting further pressure on the owner-occupied housing market. The size of the Dutch rental market is at about the OECD average, accounting for about 40 percent of the total dwelling stock. However, both private and social rental housing are subject to strict rent regulation—the third most stringent in the OECD—and social rental housing receives large direct/indirect public subsidies. Social rental housing dominates the rental market and is one of the largest in Europe, accounting for 30 percent of the total dwelling stock, compared to 19 percent in France, 15 percent in the UK, and only 5 percent in Germany (BPD, 2016; Whitehead et al., 2016). But there are allocation issues, with some being occupied by households earning too much relative to their rent—estimated at 18 percent in 2015 (Ministry of Economic Affairs, 2016). In addition, while strict rent control allows low-income earners to rent in the regulated market with rent below the market-clearing level, it also creates "locked-in" effects and hinders efficient use of existing housing stock, resulting in long waiting lists. Meanwhile, rent regulation for private rental, combined with the large subsidies for both homeownership and renting in the regulated market have crowded out public and private investment in unregulated rental dwellings.[7] As a result, the private rental sector has contracted substantially since the 1970s to less than 10 percent of all housing stock despite the slight recovery in recent years. The supply shortage of the unregulated rental housing, especially in large cities, limits the functioning of the housing market, hindering mobility to areas with greatest job availability. This adversely affects the part of the population that is not willing or able to enter the owner-occupied market and that has no access to the social housing market (e.g. young people, singles, and couples without children). This leaves many households with no option but to purchase housing, creating excess demand for owner-occupied housing and debt at high debt levels and possibly amplifying price increases for owner-occupied houses.

[7] The generous tax subsidy for owner-occupied housing and the resulting high land prices provides municipalities strong incentives for developing owner-occupied instead of private rental housing.





C. A Cross-Country Housing Valuation Model

14. To gauge the extent of a possible housing valuation gap, the long-run relationship between real house prices and their potential determinants discussed above is estimated in a cross-country panel model. Following the literature on modelling the housing market,[8] housing demand (D) can be expressed as a function of the real price level of housing (P) and other factors shifting demand (summarized in X). In the long run, the equilibrium price of housing (P^*) is that at which the demand for housing matches the stock of housing (S):

$$D(X, P^*) = S \qquad (1)$$

In practice, the actual price will not always be at the long-run equilibrium, such that for each country i, and time t, there is an error term ε_{it}^{p} between the observed price p_{it} and the long-run equilibrium real house prices p_{it}^{*}. Assuming that (1) is log-linear, p_i^*, can be written in the form of an inverted demand function of the housing stock and the long-run demand shifters (discussed below), giving the following formula for p_{it}:

$$p_{it} = p_{it}^{*} + \varepsilon_{it}^{p} = f(y_{it}, morr_{it}^{post-tax}, w_{it}, s_{it}) + \varepsilon_{it}^{p} \qquad (2)$$

With households maximizing an inter-temporal utility function with non-separability between housing and non-housing consumption (Skaarup and Bodker (2010), the long-run housing price can be derived as a reduced form of its fundamental determinants, which include real per capita household disposable income y_{it}, the real after-tax interest rate for mortgage borrowing $morr_{it}^{post-tax}$, real per capita household net financial wealth w_{it}, and the housing stock per capita s_{it} (column (1). A square term of real mortgage rate is also added to capture any non-linear relationship between house price and interest rate following the present value theory (column (2–5)).

[8] See Meen (2001), Aoki et al. (2002), Poterba (1984), and etc.

In practice, for most countries it is difficult to calculate the effective after-tax interest rate, so we use the updated version of tax relief index from the OECD—which also reflects recent reforms that took place after the original index was created in 2009—to proxy for the generosity of tax incentives for home ownership and mortgage financing.[9] Tax relief such as MID is usually capped at a nominal amount[10] (ESRB, 2015) and hence the tax savings tend to be larger when income is higher, which is captured by including an interaction term between tax relief and income in the augmented model presented in column (3). In addition, an interaction term of s_{it} with the OECD rent control index (also updated to incorporate recent reforms, and rescaled to 0–1) is added to test if rent control hinders the efficient use of existing housing stock (column (4)). Last, to test the differential impact of demand shifters on long-run equilibrium prices resulting from variations in long-run elasticity of housing supply across countries (i.e., the slope of the long-run supply curve), the estimated coefficients of demand factors are allowed to differ across countries through additional interaction terms of the demeaned long-run supply elasticities sr_i with demand variables in the full augmented model presented in column (5). In summary, the long-run relationship between real house prices and their potential determinants discussed above is estimated in a cross-country panel model as follows:

$$p_{it} = (\beta_1 + \beta_2\, sr_i) * y_{it} + (\beta_3 + \beta_4\, sr_i) * morr_{it} + (\beta_5 + \beta_6\, sr_i) * w_{it} + (\beta_7 + \beta_8\, rc_{it}) * s_{it} + \beta_9\, y_{it} * tax\ relief_{it} + \beta_{10}\, morr_{it}^2 + \alpha_i + \varepsilon_{it}^p \quad (3)$$

All variables are in log terms except for mortgage rates, the housing stock to population ratio, the tax relief and rent control indices, and long-run supply elasticities. Country fixed effects are used in the panel estimation to control for other factors resulting in permanent differences in the level of housing prices across countries, which may include time-invariant unobserved housing market characteristics such as cultural attitudes toward housing, etc. In addition, robust standard errors are clustered at the country level. The estimation sample covers 20 advanced countries in the OECD over the period of 1991:Q3–2016:Q4.[11]

15. Estimation results confirm that these factors play important roles in shaping long-run house price developments (Table 1). The explanatory variables all have the expected sign and most are statistically significant. On the demand side, a one percent increase in per capita disposable income raises the long-run equilibrium house prices by a cross-country average of 1.5–1.7 percent, confirming that housing is a luxury good. Tax relief on housing also contributes to spurring housing demand and driving up house prices, with a positive income shock translating into a greater price impact in countries having more generous tax relief. Take the Netherlands for example; tax relief results in about 0.5 percent higher house price from a one percent increase in real per capita

[9] This OECD index takes into account if interest payments on mortgage debt are deductible from taxable income, if there are any limits on the allowed period of deduction of the deductible amount, if tax credits for loans are available, and if imputed rent from home ownership is taxed.

[10] The Netherlands, Sweden, and Norway are the few exceptions for which MID is unbounded.

[11] The 20 countries included in the sample are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Israel, Italy, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and United States.

disposable income (or 2.0–2.2 percent rise rather than 1.5–1.7 percent). Meanwhile, a one percentage point increase in the real mortgage rate reduces real house prices by a cross-country average of about 1.8–2.8 percent. In addition, household net financial wealth has a small positive impact on house prices. Depending on the long-run supply elasticities, the same increase in demand results in different impact on house prices across countries, with an amplified impact seen in more inelastic markets (e.g., the Netherlands) and a more mitigated impact seen in more elastic markets. On the supply side, one percent increase in housing stock relative to the population is associated with a reduction in house prices by about 1.3 percent, with this dampening effect of supply increases partially offset in markets with rent control. In the case of the Netherlands, rent control leads to 0.3 percentage points less decrease in real house prices for one percent increase in housing stock per capita (in other words, 1.0 percent fall rather than 1.3 percent).

Table 1. A Cross-Country Panel Model: Long-Run Determinants of Real House Prices

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
y , log	1.652	1.638	1.538	1.544	1.533
	[0.034]***	[0.034]***	[0.036]***	[0.036]***	[0.037]***
morr , percent	-1.922	-2.759	-2.234	-2.116	-1.776
	[0.214]***	[0.431]***	[0.431]***	[0.432]***	[0.426]***
morr^2 , percent		0.079	0.066	0.051	0.058
		[0.035]**	[0.034]**	[0.033]	[0.032]*
w , log	0.031	0.033	0.023	0.020	0.056
	[0.008]***	[0.009]***	[0.009]**	[0.009]**	[0.010]**
s, percent	-1.070	-1.080	-0.943	-1.267	-1.322
	[0.062]***	[0.062]***	[0.063]***	[0.103]***	[0.102]***
*tr * y* (log)			0.362	0.351	0.487
			[0.048]***	[0.047]***	[0.046]***
*rc * s* (percent)				1.156	0.436
				[0.294]***	[0.230]*
*sr * y* (log)					-0.007
					[0.141]
*sr * morr*					1.133
					[0.154]***
*sr *w* (log)					-0.060
					[0.033]*
Obervations	2042	2042	2042	2042	2042
Adj. R-squared	0.853	0.853	0.856	0.857	0.867
Number of countries	20	20	20	20	20
Country fixed-effect	Y	Y	Y	Y	Y
Corrected for heteroskedasticity	Y	Y	Y	Y	Y
Panel Cointegration Tests for Model (5)					
Kao (Engle-Granger based)		*t-Statistics*	*-3.806*	*Prob.*	*0.0001*
Panel Unit Root Test on Residuals of Model (5)					
Levin, Lin & chu t		*Statistics*	*-2.705*	*Prob.*	*0.003*

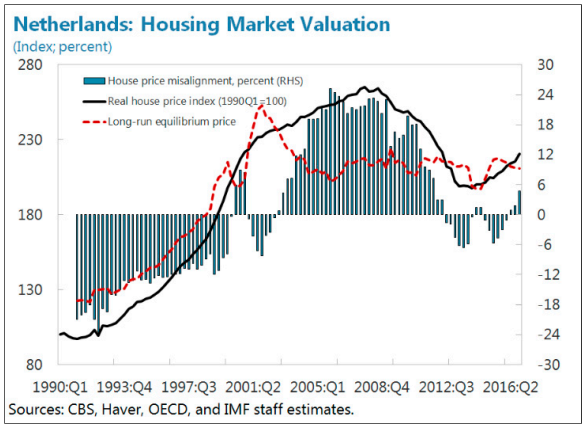
Note: Dependent is the log of real house prices. Significance at 1, 5, and 10 percent levels indicated by ***, **, and *, respectively. Robust standard errors clustered at the country level.

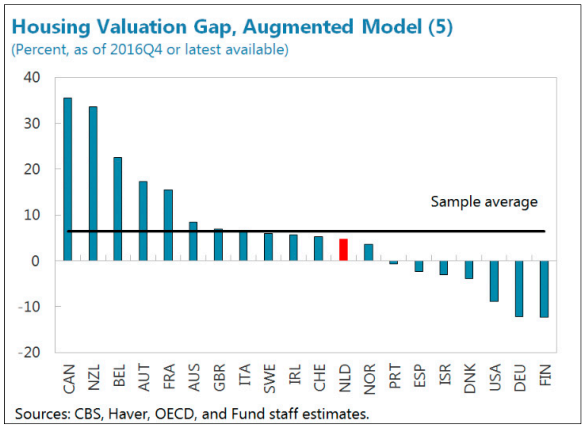
16. Estimation results suggest that current house prices in the Netherlands are modestly overvalued. The model is used to gauge the extent of a possible housing valuation gap. The advantage of our housing valuation model over standard metrics such as the PTI ratio is that it considers a comprehensive list of determinants of long-run equilibrium prices including institutional and structural factors—instead of only one 'fundamental' variable, e.g., income—in assessing the degree of over- or undervaluation. Based on the model estimates in column (5), the degree of price deviation from long-run values implied by fundamentals is measured by:

$$\varepsilon_{it}^{p} = P_{it} - P_{it}^{*}$$

The error term is confirmed to be stationary, i.e., equation (5) is a cointegrating relationship. Based on the metric, the average house prices in the Netherlands in 2016:Q4 are found to be about 5 percent above the estimated equilibrium value as implied by fundamentals—much smaller the estimated deviation during the 2007 peak and below the average of the 20 OECD countries covered in the analysis (also see Annex I). However, real mortgage rates are below their 5 percent average since 1990 by about 2 percent (or below their 3½ percent average since 2000 by about ½ percent) and are likely to unwind (at least partially) over time, and this would lower housing prices by up to about 5 percent (or about 2 percent) in equilibrium, implying that house prices could be up to 10 percent (or up to 7 percent) overvalued.

17. The implied valuations from this exercise should be interpreted with caution. The results can only be indicative of potential valuation gap in the sense that the estimated equilibrium price levels are subject to uncertainties. For example, developments in the housing market are complicated by purchases for investment purposes by high-income households—as housing investment returns exceed long-term bond yields. Also, as mentioned above, while low interest rates have driven up equilibrium house prices which mitigates overvaluation concerns, they do not rule out that demand is excessive, nor that it could fall sharply as interest rates normalize. These could complicate the housing valuation analysis and potentially bias up the estimates of long-run equilibrium prices.





D. Conclusions and Policy Implications

18. In sum, apart from the conventional fundamental demand and supply factors, the interaction of various institutional and structural factors seems to have contributed significantly to high and rapidly rising house prices in the Netherlands. The large direct and indirect subsidies for social housing and the highly regulated rental market is likely skewing housing needs and use in the Netherlands. The coexistence of a well-developed mortgage market and large tax preferences for owner-occupied housing and mortgage debt seems to have further fueled the surge in demand for homeownership and household debt. In addition, the sluggish response of housing supply exacerbated the situation by failing to cushion the impact of demand pressures.

19. Overvalued house prices and elevated household debt are a source of vulnerability in the Netherlands in view of the importance of the housing market to both financial and macroeconomic stability. The recent house-price cycle left the Netherlands with elevated level of household debt and a significant share of underwater mortgages. While households have started to deleverage gradually from the record debt levels over the past years, a large correction of house prices, driven by slower real income growth, a reverse in sentiment, or interest rate hikes could weaken household balance sheets further and depress private demand, and in turn adversely affect corporate and bank earnings.

20. The authorities have been vigilant about the risks and have introduced a series of measures to target the owner-occupied housing sector and strengthen the resilience of banks and households, including additional bank capital buffer requirements in line with Basel III/CRD IV, an introduction of LTV and debt service-to-income (DSTI) caps since 2013, a gradual reduction of LTV limit for mortgages to 100 percent by 2018, a tax exemption for gifts used for housing down payments or mortgage repayments, allowing MID only for new fully amortizing loans, and a gradual reduction of the maximum tax rate allowed for MID from 52 percent in 2013 to 38 percent in 2042 in steps of ½ percent per year.

21. Nevertheless, further and comprehensive reforms are needed to address the risks from the housing market and enhance the macro-financial resilience of the economy. A stable housing market (without pronounced boom-bust cycles) would contribute to smoother economic development. It is critical that policies work together to fundamentally address housing market imbalances that pose risks to stability and growth and hinder labor mobility:

- *Reducing the generous tax preferences for owner-occupied housing and mortgage debt to help prevent demand distortions and excessive leverage:* In particular, as discussed above, the Netherlands has the most generous tax relief on the debt financing cost of owner-occupied housing in the OECD. It is hence important to accelerate the phasing down of MID to ultimately bring it to a neutral level relative to the taxation of other assets. Moreover, given the current low interest rate environment which limits the effective benefit of MID, now seems to be the ideal time to implement the reduction. In this regard, it is welcome that the recently released coalition agreement proposes a much more rapid phase-out in steps of 3 percentage points annually until the basic rate of 37 percent is reached;

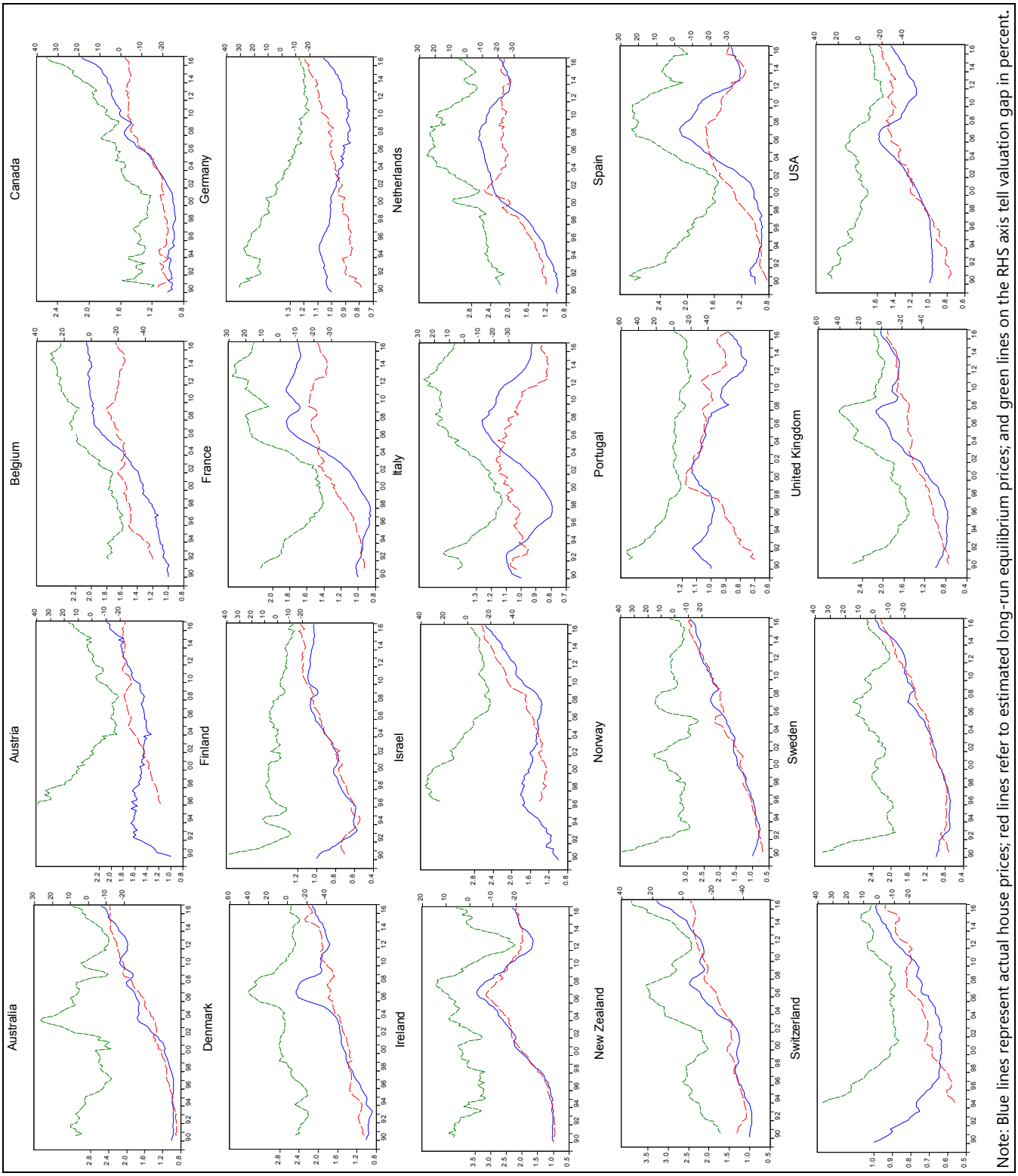
- *Improving housing supply responsiveness in large cities to help dampen housing cycles,* by streamlining and relaxing stringent building aesthetics criteria, restrictive zoning plans, and cumbersome building permission processes. Addressing impediments to urban redevelopment and improving public transportation would help relieve demand pressures in major centers;

- *Phasing out rent control and reforming social housing to enhance flexibility.* Rents on regulated rental housing should be gradually raised to be aligned with market rates while vulnerable households could be protected through targeted housing allowances, which would promote efficient use of existing housing stock, a larger and more robust private rental market, and mobility across housing types and locations;

- *Tightening the macroprudential measures to further contain household financial vulnerabilities:* This includes gradually lowering the maximum limit on LTV ratios by at least 1 percentage point per year to no more than 90 percent by 2028 (as recommended by the Financial Stability Committee (FSC)) and to 80 percent thereafter and introducing prudential ceilings on DSTI caps by income category that could not be relaxed during periods of strong growth; and

- *Considering temporarily allowing for a partial use of pension savings for housing purchases to ease liquidity constraints for first-time home buyers,* e.g. by meeting part of the down payment. This would reduce debt burdens while easing total savings needs of home purchasers. In the US, money accumulated in 401K plans can be used for first-time home purchases; Switzerland, Canada, and Singapore have adopted similar measures.

Annex I. Actual and Estimated Long-run Equilibrium House Prices in Selected OECD



Note: Blue lines represent actual house prices; red lines refer to estimated long-run equilibrium prices; and green lines on the RHS axis tell valuation gap in percent.

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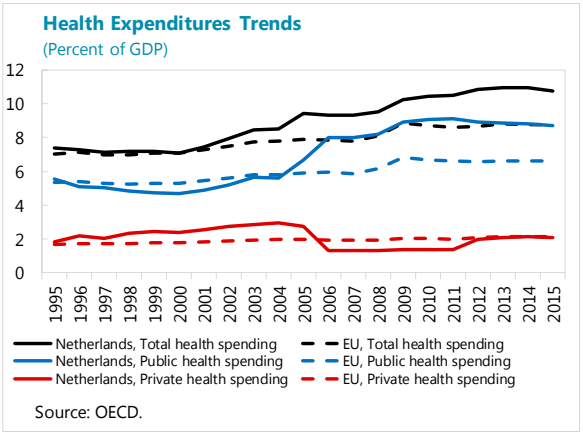
HEALTH CARE REFORMS IN THE NETHERLANDS: HOW EFFECTIVE IS "REGULATED COMPETITION"?[1]

A. Introduction



1. The Dutch health care system has been delivering good outcomes, albeit at rapidly increasing public costs. The quality and accessibility of health and long-term care services have been ranking high in the Netherlands, but like other advanced economies, the country faces significant cost containment challenges notably associated with a rapidly ageing population. Since the end-1990s, public spending on health and long-term care have increased faster than GDP to reach about 6 and 4 percent of GDP, respectively, and have come to represent the highest shares in the budget among European countries.[2] Per national projections, should these expenditures continue to rise linearly at the current pace without triggering any endogenous policy response, total health care cost would reach 31 percent of GDP by 2040, and the average household would have to contribute about half of its income for its funding.

2. The curative health care system underwent a major overhaul in 2006, notably aimed at curtailing costs by introducing more competition. To relieve pressure on public finances, the 2006 health care reform launched the transition from a heavily regulated system to one of "managed competition", meant to foster efficiency gains, to reduce health care prices through bargaining mechanisms, and to incentivize some greater differentiation in the provision of health care services. Equally important was the objective of ensuring universal health coverage of the population by providing for mandatory enrollment and offering affordable care. The new system furthermore entailed closer linking of out-of-pocket expenses from patients to overall health costs, as a way to increase cost-consciousness among lay people and reduce moral hazard. In 2015, important steps were also taken to contain the costs of long-term care, notably via decentralization of social support activities to municipalities.

3. This analysis takes stock on recent developments regarding curative health care developments and policies. A few years into the reform, this paper seeks to identify the cost effectiveness of recently adopted measures pertaining to curative health care, trying to disentangle

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[2] In the text figure, the one-off upward increase in public health expenditure in 2006 reflects the reclassification of some private spending under compulsory health insurance in the OECD system of health accounts, as an effect of the reform—see below.

supply-side from demand-side effects on price curtailment. While severe data limitations preclude rigorous empirical analysis, some quantification is attempted with emphasis laid on the most innovative aspects of the reform, namely changes introduced in the relations between health insurers, health care providers, and patients. Section B describes the new curative health care architecture. Section C provides a few descriptive statistics and reviews the literature on outcomes achieved so far. Section D is a preliminary empirical exploration of the impact of the reform on overall price developments. Section E concludes.

B. The New Curative Health Care Architecture

4. The new curative health care system relies on the principle of "regulated competition" on both markets for health insurance and health care services. Prior to 2006, the financial coverage of health care provision relied on a two-tier system, with a mandatory social health insurance scheme administered by not for profit "sickness funds" covering people in the lower income brackets, i.e. about two third of the population, and voluntary private health insurance schemes covering people with higher incomes. The Health Insurance Act (Zvw) enforced as of 2006 radically changed the institutional landscape by providing for the mandatory insurance of the whole population by private health insurers against a legally defined set of basis health care services. In turn, health insurers are tasked with the responsibility of freely negotiating an increasing share of the tariffs with health care providers, including through the bundling of health care services or the setup of networks with hospitals and general practitioners. Overall, the new system aims at introducing market mechanisms to determine both the level of contributions from patients and the prices of various health care services by putting health insurers in the driver's seat. This is complemented by strict monitoring of health care quality and access by newly-established government agencies, namely the National Health Care Institute and the Dutch Health Care Authority (NZa). About 85 percent of Dutch households also take advantage of second tier, unregulated supplemental insurance schemes offered by insurers, mostly to cover e.g. basic dental costs, prescription glasses, and physiotherapy.

5. The funding of the new system has placed higher constraints on the demand side of the insurance market. Whereas financing of health care under the old system relied almost exclusively on income related contributions, the new financing architecture comprises both an income related contribution of 6.9 percent of income before taxes and social premiums for workers in regular employment,[3] paid by the employer to the tax office and subsequently allocated to

Netherlands: Selected Financial Indicators in the Curative Health Care Sector prior to, and since, the 2006 Reform
(In Euros, unless otherwise indicated)

	Social health insurance							Health insurance act											
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Average annual premium	178.8	189.7	163.6	182.6	344.7	304.6	378.1	1037	1115	1049	1059	1095	1199	1226	1213	1098	1158	1199	1290
Rebate or deductible								255	255	150	155	165	170	220	350	360	375	385	385
Out of pocket expense								102	102	108	112	119	123	146	215	232	236	236	233

Sources: CBS; CPB.

[3] Self-employed workers pay a contribution representing 5.654 percent of their income.

insurers via a risk equalization fund, and a combination of direct payments by individuals to their chosen health insurers – with both financing flows contributing for about half to the (notional) health care budget. Direct payments to insurers comprise a health insurance premium typically amounting to 110 euros per month on average and a deductible currently set at a minimal level of 385 euros per year[4] for basic benefits coverage. To ensure affordability, the government provides income related health care allowances to about 40 percent of Dutch households, and covers in full the health care provision for children. Overall, the financial burden sharing under the new system places a higher weight on individual responsibility and choice while still preserving solidarity, opening the possibility of financial combinations tailored to specific preferences and risk profiles.

6. On the supply side, price competition is expected to result from bargaining mechanisms to jointly determine health care premia and the prices of health care services. While patients can switch among health insurers once a year without restriction, the latter are not allowed to refuse enrollment or discriminate among applicants based on risk – with some ex ante equalization mechanisms offsetting structural discrepancies across categories of patients. Moreover, insurers have to charge the same "community-based" premia to all of their insured population, and are strictly bound by the content of the basic health care package, including with guarantees in terms of geographic access to care. Given these restrictions, insurers are, however, expected to freely compete on the relative combination of premia and deductibles or on the mix of in kind or reimbursement policies they offer to clients, as well as through the setting up of tailored policies such as selective or group contracting aimed at better matching the needs of their insured. In turn, insurers are meant to use their market power to bargain on their purchase of medical goods and services from the various categories of health care providers. In the hospital sector, the spending envelope to be freely negotiated between insurers and health care providers (so-called "segment B" prices) has been gradually raised to 70 percent of hospital budgets, with discussions to be conducted on the basis of a standardized system of coding for inpatient, outpatient and specialist costs, which was simplified in 2012. The remaining 30 percent of hospital prices ("segment A"), generally pertaining to research and complex care, are set nationally by the Dutch Healthcare Authority (NZa).

7. The financial responsibility of insurers and effectiveness of overall competition have been markedly strengthened by subsequent policy adjustments. Lessons drawn from the first few years of the reform, which saw fierce competition on nominal premia for market shares among health insurers (on the demand side) but limited re-negotiations of health care prices (on the supply side), led to important complementary measures to better stimulate and organize competition. In 2012, a hitherto prevailing ex post risk compensation mechanism for health insurers was abolished and shifted to an ex ante risk equalization mechanism, putting them under increased pressure to negotiate costs with health care providers and enlarge their offer of tailored policies to clients along greater premium differentiation. As of this date also, the Ministry of Health introduced so-called "stakeholder agreements" to be concluded per sector (primary care, hospitals, mental healthcare) among health care providers, insurers and patient associations under the aegis of the government.

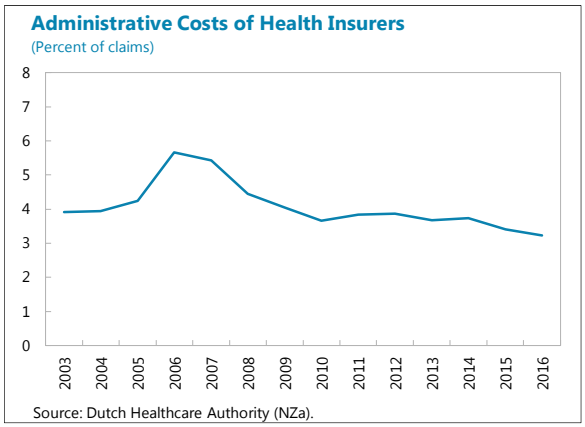
[4] This amount has been frozen for three years in the new coalition agreement.

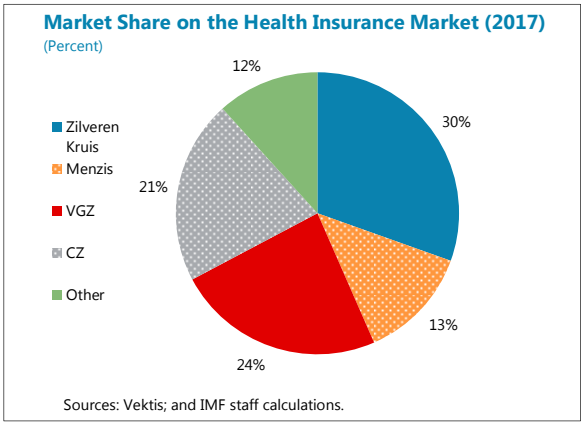
These consist in yearly ceilings for health care expenditure growth, the breach of which can trigger across-the-board savings at the initiative of the government, leading to revenue losses for insurers and hospitals alike, prorated to their respective market shares. Even though this macro-budget tool could, at face value, be considered part of the cost containment toolkit on the demand side of the health care provision market, it is interesting to note that it has been widely recognized by professionals as essentially providing a useful anchor for centralized negotiations among stakeholders, hence helping to organize competition on the supply side.

C. Impact of the Reform on Health Care Markets

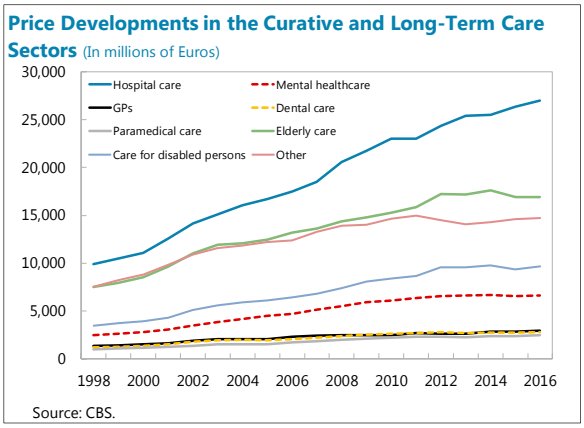
8. Several pieces of evidence suggest that the reform has had important effects on the market for health care provision. The Dutch market for health care services in the Netherlands is traditionally characterized by relatively low use by patients (reflecting the effectiveness of GPs' role as referrals for care provision by specialists, leading to low rates of avoidable hospitalization), excellent access (owing to low out of pocket spending, in turn leading to relatively low health inequality), and generally good outcomes (with still a lower healthy life expectancy than comparable peer countries and above average cancer incidence, likely reflecting lifestyle factors), while also featuring comparatively high costs. Against this backdrop, the reform appears to have fostered marked improvements in health care delivery (see also Figure 1), among which: (i) a drop in the number of uninsured persons from about 200,000 people to negligible amounts; (ii) noticeable productivity gains in hospitals, as exemplified by diminishing lengths of stay, likely due to their enhanced appropriation of investment and staffing decisions; (iii) some visible improvement in client service (lengthening of opening hours, establishment of facilities aimed at preventing the unnecessary use of emergency care, reduction in waiting lists, which had been a perennial problem under the old system). Moreover, the offer of health care services has been enlarged by the opening of multiple independent treatment centers (ZBCs), entrusted with the provision of routine care at lower costs in various specialties (ophthalmology, orthopedics, etc.).

9. The health insurance market appears to have witnessed significant efficiency gains and a shift towards increasing premium differentiation, while remaining relatively concentrated. The reform seems to have resulted in a downward trend of administrative costs (at least those of health insurers – see text table), following the peak experienced immediately upon its enactment. It also seems to have resulted in an increase in price competition on the insurance market, notwithstanding the reinforcement of its oligopolistic structure through a few mergers. Following the 2 percent decrease in the average premium triggered by the competition for market shares in 2006–2008, insurers have started to offer a greater number of differentiated policies, associated with rising variation across premia (up to about 30 percent difference between the highest and lowest nominal premium in 2014) and an increasing uptake by the insured population of higher deductibles in exchange for lower monthly payments. At the same time,





following initial financial losses, the health insurers were able to markedly improve their solvency ratios to about 160 percent, in compliance with Solvency II requirements, thanks to windfall profits realized on basic health insurance. In terms of behavioral developments however, the proportion of people switching insurers each year has settled slightly above 6 percent, i.e. about 1.1 million people, after the initial spike to 17 percent recorded at the time the reform was enacted. The associated relatively low price elasticities bear testimony to some relatively strong consumer inertia, possibly encouraged by important marketing efforts by insurers. Overall, the degree of competitiveness achieved on the health insurance market remains limited, likely reflecting the persistence of important barriers to entry[5].

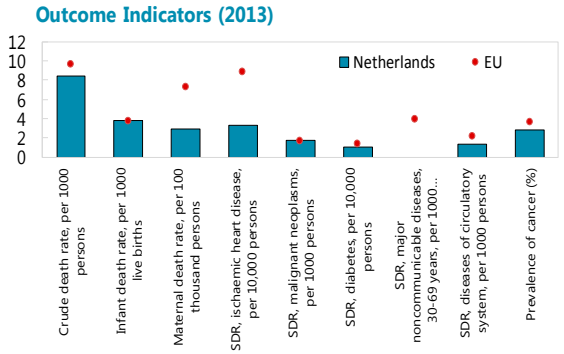


10. While substantial sectoral price reduction has been achieved on the health care purchasing market, the impact is less clear on the overall health expenditure envelope, possibly reflecting excessive hospital concentration. Especially following the implementation of the macro-budget instrument and the simplification of the price coding system in 2012, negotiations between health insurers and care providers seem to have picked up. In the hospital sector, evidence suggests that real prices for "segment B" services have declined or increased at a slower pace than non-negotiated prices, albeit with substantial price variations across types of providers (university hospital, general hospitals, etc.). Nevertheless, the overall health spending envelope has continued to increase at a relatively unabated pace due to some pickup in the volume of care, possibly reflecting the practice by providers of 'upcoding' some medical services to preserve income in the face of lower prices. Importantly, some recent research tends to indicate that such developments could reflect substantial merging operations within the hospital sector over the last few years, which, further to greater consumer trust and comparatively lower regulation, may have resulted in excessive bargaining power of hospitals against health insurers. Among care providers at large, evidence also suggests that administrative costs may have increased for providers, partly owing to the higher number of contractual arrangements and information requirements from insurers and supervisors. By contrast, the price of pharmaceutical products underwent a sharp decrease since 2012, due to the policy of insurers to only reimburse lowest price generic drugs.

[5] A new health insurer, IptiQ, a subsidiary of Swiss Re, was nevertheless able to enter the market in 2018.

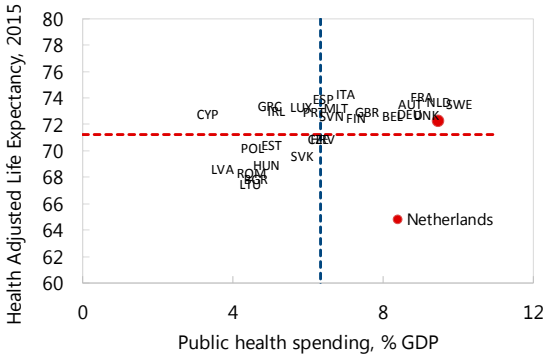
Figure 1. Netherlands: Selected Health Care Indicators

Health care outcomes are in line with EU average…



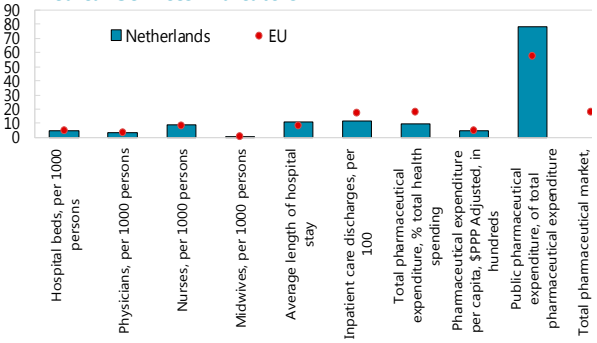
Source: WHO-HFA-DB.

… but come at a relatively high public cost, notably reflecting high and increasing long-term care spending.



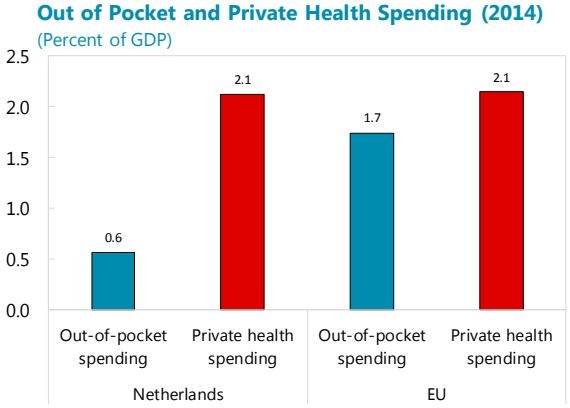
Source: WHO.

The use of medical services tends to be limited…



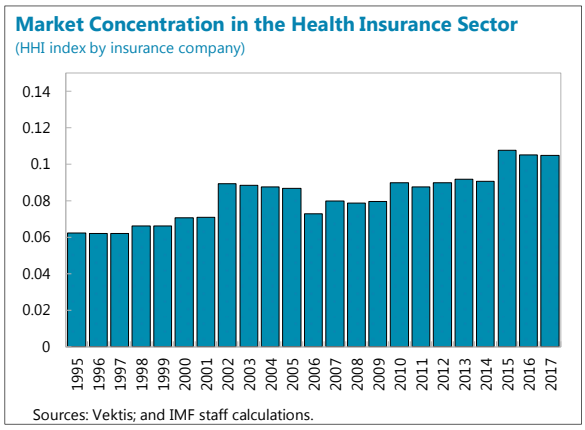
Sources: WHO-HFA-DB.

… despite very low constraints on access



Source: OECD.

D. Preliminary Empirical Investigation: Supply-Side or Demand-Side Effects?



11. Estimating the relative importance of supply-vs demand-side effects on health care prices is critical to assessing the success of the reform. The effectiveness of measures aimed at curtailing health care costs on the demand side (higher deductible, lower reimbursement) have been documented for other countries. The reduction in prices generally comes as no surprise, while raising the important issue of the extent to which it might be associated with a drop in quality and/or access to health care – ultimately a societal choice. Against this backdrop, the most novel aspect of the reform in the Netherlands consists in the search for efficiency gains on the supply side, i.e. the ambition to contain unnecessary costs without undermining quality or access. Thus, given also conflicting evidence on relatively contained sectoral price developments on the one hand, but unabated overall price dynamics on the other, we seek to examine the macroeconomic impact of the reform by estimating the effect of changes pertaining to the organization of the health care insurance market on overall health care spending – in effect internalizing spillover effects typically associated with efficiency gains. To assess the degree of competition on the insurance market, we rely on the Herfindahl-Hirschman index (HHI), namely the sum of the squared market shares of individual insurers—which appears to point out to increasing concentration following the reform, reflecting developments discussed above. In this respect, while diminishing competition generally tends to be associated with upward pressures on prices, it is worth pointing out that the moves towards an oligopolistic structure in the health care insurance market need not necessarily be detrimental to overall health care cost containment if insurers make use of their market power to better negotiate with medical service providers.

12. Very preliminary estimations suggest that more concentration among insurers is positively related to average health care price developments. Using regional data covering post-reform years (2012–2015), preliminary estimations point to a significant positive impact of an HHI index of concentration by market shares in the health insurance sector on average health care expenditures. For annual spending on health care totaling about €1,190 on average over 2012–2015, a one notch increase in the level of concentration is found conducive to a €244 increase in total health expenditure, likely due to hospital spending whereas the coefficient on GP spending is not significant. As can be expected, the ratio of people aged 65 years and above to the whole population ('ageing ratio') is estimated to positively contribute to all type of health spending, while the impact of disposable income is found muted or not significant, probably owing to the strong redistributive nature of the system through health care allowances. A time dummy for 2014 appears to negatively impact total expenditure on health care, possibly reflecting the impact of the one of the first stakeholder agreements on the overall budget envelope; this finding appears, however, difficult to reconcile with positive effects exhibited on hospital and GP spending. Overall, the

interpretation of these results warrants, however, caution in view of the low number of observations and limited explanatory power of the regressions, as well as a likely omitted variable bias, notably due to data limitations preventing to correct for market concentration in the hospital sector.

Effect of the Health Care Reform on Average Health Care Expenditures (preliminary assessment, 2012-2015)

	Average health expenditures (in €)	Average hospital expenditures (in €)	Average GP expenditures (in €)
Health insurers HHI concentration index	244.046**	177.420**	28.420
	(86.717)	(61.178)	(17.918)
Disposable income per capita (in €)	0.067**	-0.004	-0.003
	(0.030)	(0.018)	(0.007)
Ratio 65 year + / total population (in percent)	212.723***	22.911*	-3.724
	(24.952)	(12.361)	(5.212)
Time dummy for 2014	-90.864***	26.460***	16.093***
	(12.669)	(4.367)	(2.314)
Constant	-3,131.711***	343.013	155.178
	(525.888)	(395.814)	(166.491)
Observations	36	36	36
R-squared	0.939	0.628	0.795
Adjusted R2	0.768	0.768	0.768

Fixed effects panel estimations, robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Sources: CBS; Vektis; Dutch Healthcare Authority (NZa); and IMF staff calculations.

E. Conclusion

13. While manifold evidence points to significant efficiency gains in the health care sector, the jury is still out on the effect of the reform on overall price developments. This is hardly surprising, given the difficulty to quantify positive externalities associated with such structural changes just a few years after their enactment, as well as to pinpoint complex interactions between health insurers and hospitals, especially when it comes to assessing their relative bargaining power. The continued pressure towards concentration in both the health insurance and hospital sectors bears testimony to protracted effects of the reform on institutions and behaviors, which are still ongoing. In the current state of the debate, some concern has been voiced that excessive search for cost saving measures may entail a risk of lower quality of care in the future. While a societal choice, this calls for continued vigilance from the regulatory and monitoring agencies within the new institutional framework.

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OPTIONS FOR CARBON MITIGATION AND TRANSPORTATION POLICY IN THE NETHERLANDS[1]

The Netherlands is developing ambitious plans for mitigating carbon dioxide (CO_2) emissions and broader environmental costs of transportation. There is much at stake in the choice and design of policies to implement these plans.

***Mitigation policy**. To strengthen mitigation incentives, improve cost effectiveness, raise more revenue and improve policy credibility, policymakers might consider:*

- *Introducing a carbon surcharge for emissions in the Netherlands covered by the EU Emissions Trading System (ETS), and a carbon tax for emissions in the Netherlands outside of the ETS sector, with emissions prices ramped up predictably and progressively from the near term onwards (and ultimately harmonized across the two sectors);*
- *Complementing pricing with selected measures to (i) strengthen mitigation while containing (politically challenging) impacts on energy prices (e.g., revenue-neutral 'feebates' or tax-subsidy schemes to promote fuel switching in power generation) and (ii) enhance the effectiveness of pricing (e.g., infrastructure for clean technologies).*

***Transportation policy.** To more effectively reduce road congestion, accidents, wear and tear, air emissions, and carbon emissions, while stabilizing revenue, policymakers might consider:*

- *A longer-term transition from fuel to (electronically-collected) distance-based tolls for light-duty vehicles (LDVs), implemented either at the local or national level, with toll rates varying with the severity of prevailing congestion;*
- *Promoting (through fiscal incentives) a market-driven transition to pay-as-you-drive automobile insurance to raise the marginal costs of driving, especially for dangerous drivers (without a new tax burden on the average motorist);*
- *Aligning (upcoming) distance-based charges for heavy goods vehicles (HGVs) according to their contribution to road damage, air emissions, congestion, and accident risk, with charges varied according to the location and timing of driving;*
- *Avoiding tensions between fiscal and environmental objectives, and hard targets for electric vehicles, by replacing the current system of CO_2-related vehicle registration taxes with: (i) an ad valorem tax on imported vehicles (to maintain revenue) and (ii) a continuous (rather than discrete) revenue-neutral feebate or sliding scale of taxes/subsidies for relatively high/low emission vehicles; and*
- *Implementing a feebate scheme to reduce carbon emissions from HGVs, though levied on the in-use fleet and with fees/rebates scaled by a vehicle's annual kilometers (km) driven.*

[1] Prepared by Ian Parry and Ruo Chen. The authors are grateful to helpful comments and suggestions from staff of the Ministry of Finance and Ministry of Economic Affairs and Climate Policy.

A. Background

1. The new Dutch government fully embraced the Paris Climate Agreement and committed to an ambitious climate change policy. The European Union (EU) has pledged to reduce CO_2 and other greenhouse gases (GHGs) by 40 percent relative to 1990 levels by 2030. The Netherlands is planning to go further, increasing its own GHG reduction target for 2030 to 49 percent below 1990 levels. Existing policies designed to meet the EU pledge include: (i) the EU Emissions Trading System (ETS) reducing power generation and large industrial emissions 43 percent below 2005 levels by 2030; (ii) national-level targets for non-ETS emissions—for the Netherlands a 36 percent reduction below 2005 levels by 2030;[2] (iii) EU goals for energy efficiency (a 30 percent improvement by 2030) and renewables;[3] and (iv) EU standards for vehicle CO_2 emission rates. The new government agreement contains substantial policy measures to cost-effectively reduce emissions including: introducing a minimum price for CO_2 emissions from power generation on top of the ETS; shifting taxes off electricity and onto gas generation; phasing out coal plants and natural gas for new buildings by 2030; subsidizing carbon capture and storage (CCS); and expanding offshore wind power.

2. The Dutch authorities are also considering major reforms to transportation policy to complement emission reduction efforts and to address other environmental costs. These reforms include full penetration of electric vehicles into the new car fleet by 2030; adoption of km-based (i.e., distance-based) taxation for HGVs; stiffer penalties to deter dangerous driving; and infrastructure upgrades to alleviate traffic congestion. The first policy will progressively erode traditional revenue sources from LDVs—fuel taxes and CO_2-related vehicle taxes—posing the question of what revenue-raising instruments could replace them.

3. This Selected Issues Paper analyses reform options for carbon mitigation[4] and transportation policy. The focus is on: (i) reforms that might meet CO_2 objectives with lower costs, more revenue, and enhanced credibility; and (ii) reforms to more effectively reduce the environmental costs of road transport while stabilizing revenue. The analysis uses an IMF spreadsheet tool[5] for mitigation policy, and Dutch and IMF estimates of the environmental costs of road vehicles.

[2] CO_2 emissions in the EU were 3 percent lower in 2005 than in 1990, and in the Netherlands were 6 percent higher, therefore the needed reductions relative to 2005 levels are not too different for those relative to 1990 levels (IEA 2017, pp. 94).

[3] Renewables policies are not analyzed below because updated country-level targets for 2030 have not been finalized.

[4] The discussion is limited to fossil fuel CO_2, which is the principle source of GHGs and the easiest to monitor, rather than other sources (e.g., process CO_2 emissions, non-CO_2 GHGs from agriculture).

[5] Similar tools have been used by IMF staff to evaluate a wide range of carbon mitigation policies in China, India, and the Euro Area.

B. CO_2 Mitigation

4. Mitigation policies are evaluated using a spreadsheet tool parameterized to the Netherlands. The model starts with use of fossil fuel products and other fuels in the power generation, road transport, industry, and household/commercial sectors. Fuel use is projected forward in a 'business-as-usual' (BAU) case, accounting for previously implemented mitigation policies (implicit in recent fuel use data)—but not planned mitigation policies—using assumptions about: (i) GDP growth; (ii) income elasticities (i.e., the responsiveness of energy demand to higher GDP); (iii) autonomous rates of technological change (e.g., that improve energy efficiency and the productivity of renewables); (iv) future international energy prices; and (v) the price responsiveness of fossil fuels in different sectors. An 'envisioned policy' reference case is then developed with a simplified representation of the EU ETS, regulations (represented in the model by implicit or 'shadow' prices) to meet requirements for energy efficiency, vehicle emission rates, and the Netherlands target for non-ETS emissions. Various reforms to envisioned policies that replace regulatory approaches with pricing policies, while preserving emission targets, are then considered. The impacts of policies largely depend on how they affect fuel prices (explicitly or implicitly), fuel price responsiveness, and environmental impacts (carbon emissions, local air pollution mortality, etc.) of fuel use. Various data sources are used to parameterize the model, including the IMF (for GDP growth and domestic environmental impacts); the International Energy Agency (for fuel use data by sector); Dutch authorities (for current fuel prices and taxes); and empirical evidence/results from energy models for fuel price responsiveness and rates of technological change.[6] For given (long-run) impacts of policies on fossil fuel use, the CO_2, fiscal, and economic welfare costs[7] predicted by the model should approximate those from more sophisticated (but computationally intensive) models.[8]

5. Currently envisioned policies effectively reduce emissions but lose revenue. Collectively, currently envisioned policies reduce nationwide CO_2 emissions in the Netherlands by an estimated 26 percent below BAU levels in 2030 (and BAU emissions are already 10 percent below 2005 levels). National policies reduce emissions 9 percent, the ETS[9] and energy efficiency policies for the ETS sector both reduce emissions 6 percent, energy efficiency policies for the non-ETS sector reduce emissions 4 percent, and the vehicle emissions rate standard reduces emissions 2 percent (Figure 1a). Envisioned policies reduce revenue by 0.25 percent of GDP in 2030 (Figure 1b, lower set

[6] For example, it is assumed that each 1 percent increase in fuel price reduces consumption of that fuel by 0.6 percent, with two-thirds of the response due to implicit adoption of more fuel-efficient or cleaner technologies and one-third from reduced intensity of use of products requiring that fuel.

[7] These reflect burdens on households and firms from reducing their use of fossil fuels below levels that would otherwise be efficient in the absence of mitigation policies.

[8] For example, EC (2016) provides state-of-the-art modelling for all EU countries on the impact of policies as adopted by end-December 2014.

[9] The allowance price is assumed to be €47 per tonne in 2030, which splits the difference between estimates in EC (2016) and Parry and others (2017). All prices are expressed in year 2015€.

of bars) because energy efficiency policies erode the bases for fuel and electricity taxes and this more than offsets revenue gains from ETS allowance auctions which raise 0.15 percent of GDP, assuming half of allowances are auctioned.

6. A series of emissions-neutral reforms could raise new revenues, close to 2 percent of GDP, but would increase energy and emissions prices and could be politically challenging. Replacing vehicle emissions standards with higher road fuel taxes (holding road emissions fixed) raises 0.4 percent of GDP but requires a fuel price increase of €0.60 per liter.[10] Extending a uniform carbon tax to all non-ETS emissions (while keeping non-ETS emissions fixed and removing the extra road fuel tax) raises revenues of 1.1 percent of GDP but requires a price of €170 per tonne of CO_2. Fully auctioning ETS allowances would raise an additional 0.15 percent of GDP in revenue. Introducing a CO_2 surcharge for the ETS sector (while removing other CO_2-related policies) raises revenues of 0.2 percent of GDP but requires raising the CO_2 price by €52 per tonne. Harmonizing prices across ETS and non-ETS sectors (keeping nationwide emissions fixed) loses a modest amount of revenue and implies an economy-wide price of €136 per ton of CO_2 (upper set of bars in Figure 1b).

7. Although the costs of envisioned polices are not too large (around 0.6 percent of GDP in 2030—lower set of bars in Figure 1c), pricing reforms could significantly lower these costs while generating domestic environmental benefits. The biggest source of costs, 0.35 percent of GDP, is for meeting the national level targets for the non-ETS sector (assumed here to take the form of regulations reducing the intensity of use of fossil fuels by households, commerce, and small industry), while other policy costs are moderate—about 0.15 percent of GDP for the vehicle emissions standard, 0.1 percent for energy efficiency policies within the ETS sector, and around 0.03 percent of GDP each for the ETS and (EU level) energy efficiency requirements for the ETS sector. Costs are moderately lower (0.45 percent of GDP overall) when domestic environmental benefits (primarily reduced air pollution mortality) are netted out. Various pricing reforms (just mentioned) could lower economic costs to 0.4 percent of GDP, or costs net of environmental benefits, to 0.1 percent of GDP (upper set of bars in Figure 1c). The largest cost savings are from carbon taxes for the non-ETS sector.

8. Carbon surcharges and carbon taxes could follow similar policies in the UK and France/Ireland. The UK imposes a variable carbon tax on top of the ETS emissions price (for power generators) where the tax rate equals any prevailing difference between a target for the combined tax/ETS price and the ETS price.[11] To avoid continuous changes in the tax rate, a similar scheme for the Netherlands might specify a fixed tax rate (rising predictably over time) leaving the ETS price component variable. A Dutch surcharge for ETS emissions would have no direct impact on EU wide emissions (as they are fixed by the ETS cap), unless the Dutch government were to simultaneously purchase ETS allowances and withdraw them from the market—though a Netherlands tax might

[10] This reform is more of theoretical than practical interest, as vehicle emissions standards are set at the EU level and cannot be removed unilaterally.

[11] The tax (out to 2021) is set equal to the difference between £18 (€20) per tonne and the EU ETS emissions price (see Ares and Delebarre 2016).

spur similar measures in other member states, increasing pressure for reform of the ETS (to keep it binding). France and Ireland have introduced carbon taxes for non-ETS emissions from fossil fuels, in the former case slated to rise sharply from €31 per tonne in 2017 to €65 in 2020 and €86 in 2022, while the carbon tax in Ireland is currently fixed at €20 per tonne.

9. To make headway on more ambitious (national level) emissions targets, carbon pricing might be combined with selective, fiscal measures to further major mitigation opportunities without a large impact on energy prices and infrastructure investments to enhance the effectiveness of pricing. One potential complementary mitigation instrument is 'feebates' (fee-rebates) for the power sector, involving charges for emissions-intensive generators in proportion to their output times the difference between their emission rate and a 'pivot point' emission rate and subsidies for non-emissions-intensive generators in proportion to their output times the difference between the pivot point and their emissions rate.[12] The charges/subsidies establish a uniform, implicit price on CO_2 emissions, and if the pivot point is set at the industry average emission rate the feebate will be revenue neutral and therefore have only a modest impact on electricity prices (as there is no first-order pass through of carbon pricing revenue or rents). The feebate is more flexible than the proposed natural gas/electricity tax shift as the feebate rate is easily adjusted over time to de-carbonize the power sector at the desired rate (without raising tax burdens on the power sector) and it strikes the efficient balance between gas and other emitting fuels like coal with CCS. Other complementary mitigation measures might include fiscal incentives for the adoption of CCS at industrial plants (as included in the government agreement) and fiscal analogs of regulations (e.g., progressively tightening natural gas standards for new buildings but with the possibility of paying out-of-compliance fees if standards prove costlier than anticipated). Targeted infrastructure investments can also enhance the effectiveness of carbon pricing (thereby lowering the prices needed for emissions objectives), such as modifications to the grid to accommodate more renewables and pipelines for CCS.

10. Targets for emissions prices, rather than quantities, are generally preferred on economic grounds. Quantitative emissions targets can provide more certainty over future emissions, but may result in highly uncertain (explicit or implicit) emissions prices (e.g., emissions prices will vary with future energy demand, fossil fuel prices, future technological changes affecting the costs of low-emission technologies, etc.). This price uncertainty may deter market investments in clean technologies (especially those with high upfront costs and long-range emissions reductions) and may significantly undermine cost-effectiveness in a dynamic sense (to the extent that emissions prices, and incremental mitigation costs, vary from year to year with economic conditions). Economists generally recommend carbon price targets because they provide more certainty for investment and can better accommodate uncertainties (e.g., abatement is automatically greater in periods when incremental mitigation costs are relatively low and vice versa when incremental costs are relatively high). Prices can be set with the expectation of meeting a given emissions target *on average* over time.

[12] That is, fees/rebates would be determined by $t \cdot (CO2/kWh - \overline{CO2/kWh}) \cdot kWh$, where t is the CO_2 price, kWh is the generator's output in kilowatt-hours, $CO2/kWh$ is the emissions rate, and a bar denotes the pivot point emission rate. For further discussion of power sector feebates see, for example, Krupnick and Parry (2011).

11. The more urgent priority may be establishing robust near-term carbon prices than fine-tuning more distant emissions targets. Establishing full credibility for distant targets may be challenging—for example, market participants may believe there is some possibility that distant emissions targets in the Netherlands or EU could be scaled back in the interim if other countries fail to make sufficient progress on their Paris mitigation pledges, as seems a distinct possibility.[13] In fact, establishing more aggressive carbon prices in the near term—through minimum prices for CO_2 emissions, carbon surcharges, taxes and the like—not only strengthens near term mitigation but might also enhance the credibility of longer term targets.

C. Road Transportation: Reducing Environmental Costs and Stabilizing Revenue

The starting point for evaluating an economically efficient tax system for road vehicles is estimates of their environmental, or more precisely, 'external' costs.[14] External costs for gasoline vehicles (Figure 1d) totaled €1.58 per liter in 2013 according to Dutch sources or €1.10 per liter according to IMF sources.[15] Both studies put congestion at, by far, the biggest cost (€0.88 and €0.85 per liter respectively), followed by traffic accidents (€0.44 and €0.17 per liter respectively, global warming (€0.21 and €0.08 per liter respectively[16]), and local air pollution (€0.05 and €0.01 per liter respectively). External costs for diesel vehicles (Figure 1e), averaging over use in LDVs, HGVs, and buses, are either about the same or somewhat lower, totaling about €1.12 per liter in 2013 in both studies. Congestion is still the largest component by far (€0.59 and €0.77 per liter respectively), followed by accidents (€0.15 and €0.13 per liter respectively) or global warming (€0.24 and €0.09 per liter respectively), air pollution (€0.14 and €0.13 per liter respectively), with a small contribution from road damage (€0.01 and €0.02 per liter respectively).[17]

12. Gasoline vehicles are mostly charged for externalities through existing fuel excises but not diesel vehicles. In computing efficient taxes, externalities that vary with changes in driving (i.e., congestion, accidents, road damage), but not fuel efficiency, are multiplied by the fraction of the tax-induced fuel reduction that comes from reduced driving (assumed to be 0.4 in Figures 1d and e). Current gasoline excises, €0.77 per liter, are about equal to, or fall somewhat short of,

[13] For example, at present the global average CO_2 price is only about €1 per tonne (WBG 2017). In fact, expectations that EU climate goals in 2030 might be scaled back could be one reason for the currently very low EU ETS emissions price (€5 per tonne).

[14] An external cost is one that individuals or firms impose on others but do not consider in their own decisions, for example, motorists do not consider the impact of their driving on adding to congestion and increasing travel delay cost for other road users.

[15] The studies use different methods and approaches. See Ricardo-AEA (2014), Schroten A. and others (2014), Parry and others (2014) (with updated estimates for the latter in www.imf.org/external/np/fad/subsidies/data/subsidiestemplate.xlsx).

[16] The Dutch and IMF estimates assume CO_2 damage values of €85 and €32 per tonne respectively.

[17] Diesel vehicles can produce significantly higher air pollution costs, but to the extent heavy vehicles drive fewer km per liter of fuel use, a given congestion and accident cost per vehicle km translates into a smaller cost per liter of fuel.

efficient taxes (€1.07 or €0.70 per liter according to Dutch and IMF estimates respectively) while current diesel excises, €0.49 per liter are well short of efficient taxes (€0.83 or €0.77 per liter implied by Dutch and IMF estimates respectively).[18] This does not necessary mean diesel fuel taxes should be increased however, as diesel vehicles are subject to higher annual road taxes and vehicle registration fees than gasoline vehicles. And possibilities to refuel vehicles across the border limit the room for unilaterally raising gasoline and diesel taxes.

13. Congestion is far more efficiently addressed through peak period pricing of busy roads, administered at the national or local level. Severe traffic congestion is confined to the relatively modest share of total driving occurring in densely populated areas during peak period.[19] Effectively reducing it (for given road capacity) requires charges for vehicle km driven on busy roads, progressively rising and falling over the course of the rush hour.[20] A national-level system would involve recording annual km driven by motorists and levying charges on each km varying according to when and where driving occurs to reflect prevailing congestion costs. Administratively, the system could be implemented by requiring all vehicles have Global Positioning Systems technology which both informs motorists of the charges for their route and transmits information on their driving behavior to an independent billing agency.[21] Local systems for individual urban centers could also charge by the km according to route within the network and time of day, and could match most of the gains from the more comprehensive national-level approach (at least if systems applied comprehensively across urban centers). To date however, local schemes have been far more limited in scope, taking the form of charges for driving in the downtown area (e.g. London, Stockholm, Milan) or on individual highways. There is a tension between keeping the charging system simple and easy for motorists to understand, and a more finely-tuned, but complex, system with rates varying by each major road in a network and over time of day, though systems can start simple and be progressively refined as acceptability and understandability improves over time.

14. Accidents are more effectively reduced through distance-based charging related to accident risk, either through explicit taxes or pay-as-you-drive (PAYD) insurance. In principle the efficient tax for traffic accidents is levied on a km basis, with rates scaled to both driver risk (e.g., based on rating factors from insurance companies accounting for age, prior crash record, etc.) and vehicle risks (e.g., higher for larger vehicles posing greater risk to other road users). These fiscal instruments have yet to be introduced in any comprehensive way, but a promising alternative is a

[18] Gasoline and diesel fuel are also subject to a modest stockholding fee of €0.008 per liter.

[19] For example, estimates for the UK suggest marginal congestion costs (i.e., costs one driver imposes on other road users through slowing their travel speeds) varied from about 1 to 10 pence per vehicle km in 2015 on roads where the volume to capacity ratio is less than 75 percent (which account for 91 percent of total traffic), to about 80 to 170 pence per vehicle km on roads where the volume to capacity ratio approaches 100 percent (9 percent of traffic). See UK DOT (2014).

[20] This policy exploits all possibilities for drivers to alter behavior to alleviate congestion, including flattening the distribution of trip departure times within rush hour periods, shifting from peak to off-peak travel, encouraging alternate modes (e.g., carpools, public transit, walking, cycling), reducing trip-making (e.g. via telecommuting or combining trips), shifting to less congested routes, changing job or residential locations.

[21] The Netherlands was preparing to introduce distance-based charges, and in a later stage congestion charges, for trucks and for cars in 2009 but ultimately decided against it. See Jonkman, and Takens (2011).

voluntary, market-driven transition from current lump-sum annual insurance payments to PAYD insurance where payments are directly proportional to km driven, with per km charges scaled by drivers' rating factors. Public opposition to PAYD should be muted as there is no new tax burden on the average motorist—in fact, low-km drivers are better off under PAYD as their annual payments decline, and this would increase rates for remaining drivers, in turn providing them with more incentives to switch to km-based insurance. Tax incentives may be needed to kick-start the transition however, as an individual insurance company does not capture the benefits to other insurance companies due to the reduced risk of multi-vehicle collisions.

15. Road damage is most efficiently incorporated in upcoming distance-based charges for HGVs, but ultimately charges should account for other environmental costs and vary by location and time of day. Ideally, the road damage charge would vary with axle weight[22] and the vulnerably of roads where driving occurs, as this would encourage truckers to use fleets carrying goods with more axles and choose routes with hardier road surfaces. Analogous to the above discussion, HGV charges should also include components for congestion and accidents, and, if levied in proportion to local air emission rates, could also provide targeted incentives to for adoption of abatement equipment and shifting to cleaner fuel vehicles. According to illustrative calculations in Figure 1f, efficient tolls vary from about €0.45 per vehicle km in rural areas (where road damage is significant but other environmental costs are small) to about €2.60 per vehicle km for peak urban driving (primarily due to congestion, though air pollution damages are also higher).[23] At present, surrounding countries charge roughly €0.15 per HGV km and EU legislation caps charges at €0.40 per km, so charges in the Netherlands would need to be phased in gradually, and increased in coordination with other countries and revisions to maximum EU rates. Diesel fuel taxes could be lowered to contain new tax burdens for trucks (with incentives for low-carbon vehicles preserved through feebates—see below).

16. Modification of vehicle registration fees for imported (new and used) passenger vehicles could avoid the inherent tension between environmental and fiscal objectives in current taxes and uncertainties associated with hard targets for electric vehicles. The present registration fee system allocates new vehicles into one of five CO_2 emission rate brackets, varying from below 73 gram/km to above 162 gram/km, and imposes an escalating system of fixed charges (€356 for the lowest emission rate bracket and €12,593 for the highest bracket) and variable charges (equal to the difference between the emission rate and the emission rate at the lower bound of the bracket, times a charge rising from €2 per gram/km for the lowest bracket to €458 per gram/km for

[22] Road damage increases exponentially with axle weight and therefore is almost entirely caused by heavy vehicles.

[23] Road damage costs are based on EU-wide average estimates from Ricardo-AEA (2014); congestion costs are based on the UK estimates of marginal congestion costs noted above, averaging across road classes within urban and rural classifications and doubling them to account for the greater road space of trucks; accident costs are taken from the IMF nationwide estimates, increased/decreased by 50 percent for rural/urban driving; and air pollution costs are from Ricardo-AEA (2014).

the highest bracket).[24] This system raises less revenue the more successful it is in shifting people to lower emission vehicles (either within a bracket or to a lower bracket). In addition, it violates the principle of providing uniform incentives to reduce emissions and instead creates a bunching of vehicle demand at the top of the next lowest emission bracket. Both problems could be addressed by combining an ad valorem tax on vehicle sales prices set to meet fiscal objectives with a continuous feebate, where fees or rebates are applied to vehicles in proportion to the difference between their CO_2 gram/km and a common pivot point gram/km equal to that averaged across the imported vehicle fleet.[25] The feebate component provides a uniform incentive to reduce emissions (i.e., the incremental reward for a reduction in gram/km is the same for all vehicles) and its rate can be chosen to maintain (or strengthen) existing incentives for low emission vehicles, without eroding the revenue base for the ad valorem tax. Feebates can also provide strong incentives for electric vehicles, but without forcing them into the market regardless of their future costs and public acceptability.[26]

17. A feebate could effectively reduce the carbon intensity of HGVs, though it should be applied to the in-use fleet, scaled to annual km, and integrated into the upcoming charging system. Applying feebates to the in-use HGV fleet, with the fees and rebates for each vehicle scaled in proportion to its carbon emission rate (averaged over annual vehicle trips with and without freight) and multiplied by the truck's annual km driven, would provide comprehensive incentives for reducing carbon intensity of the on-road fleet, and would be administratively straightforward, as the fees and rebates could be easily integrated into the prospective HGV charging system.[27] Varying the pivot point in the feebate with truck class (i.e., setting it equal to the average among trucks within a given weight classification like large tractor trailers versus delivery vans) may be warranted to avoid overly penalizing large trucks which have scale economy advantages[28] over small trucks.

[24] See http://wetten.overheid.nl/BWBR0005806/2018–02–03.

[25] That is, fees/rebates are determined by $t \cdot (gram/km - \overline{gram/km})$ where a bar denotes the pivot point emission rate and t is the price per gram/km.

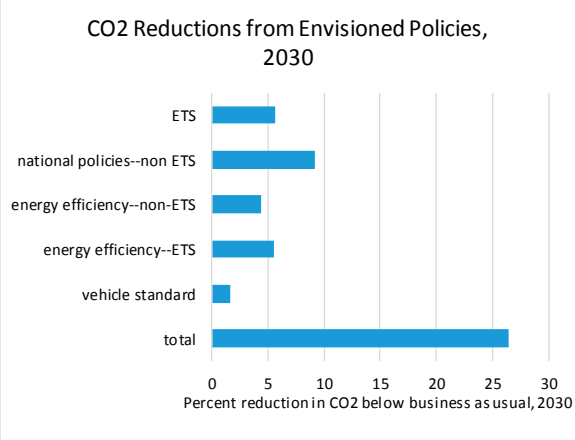
[26] For example, a zero-emission vehicle currently pays a fixed fee of €356 while a vehicle with 100 gram/km pays a fee of €2,355 (fixed and variable fees of €2,077 and €278 respectively), or about €2,000 more. A feebate rate of €20 per gram/km would preserve the current difference in taxes between these vehicles (for a given purchase price), assuming the pivot point is 100 gram/km, while a feebate rate of €40 per gram/km would double the current tax difference.

[27] In contrast, applying feebates to HGV sales only would be administratively challenging given that manufacturers often build specific components (from truck bodies to engines) rather than complete vehicles and it would be considerably less effective (as it would not apply to used trucks which have very long lifetimes).

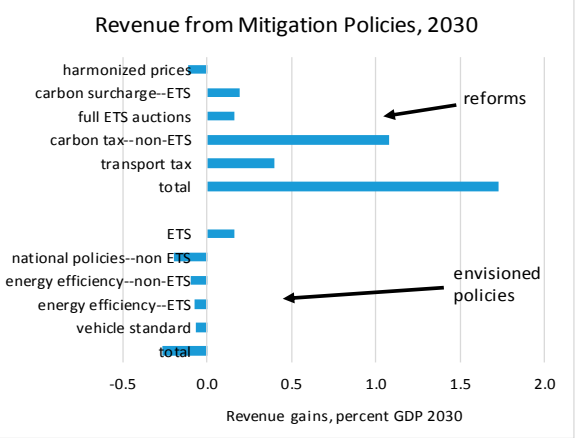
[28] That is, carrying a given amount of freight by one large truck rather than two smaller trucks uses less fuel.

Figure 1. Netherlands: Impacts of Mitigation and Transportation Policies

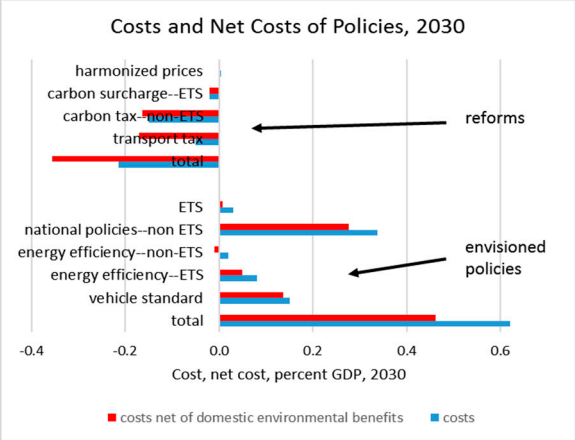
a. Envisioned mitigation policies effectively reduce CO2....



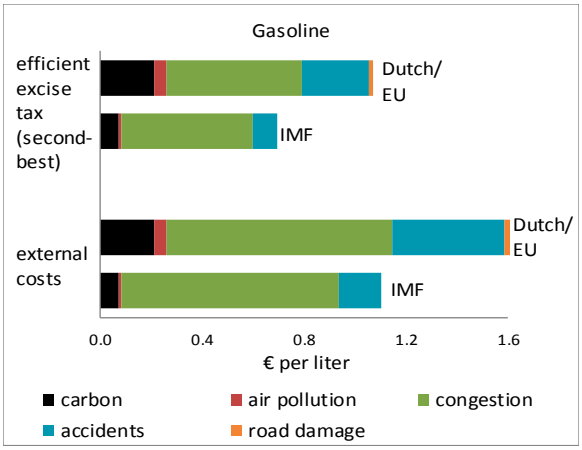
b. ...but forego revenue opportunities....



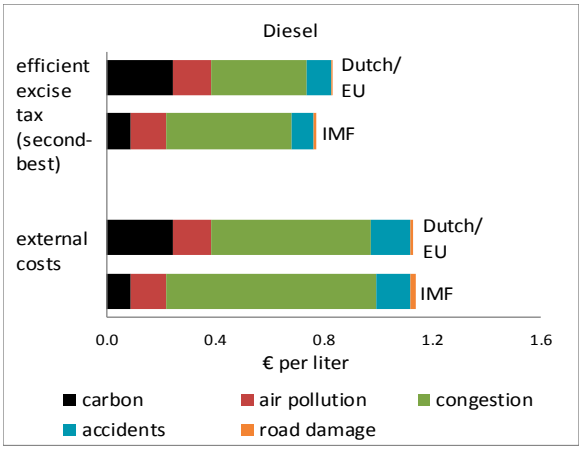
c. ...and impose (moderately) excessive costs.



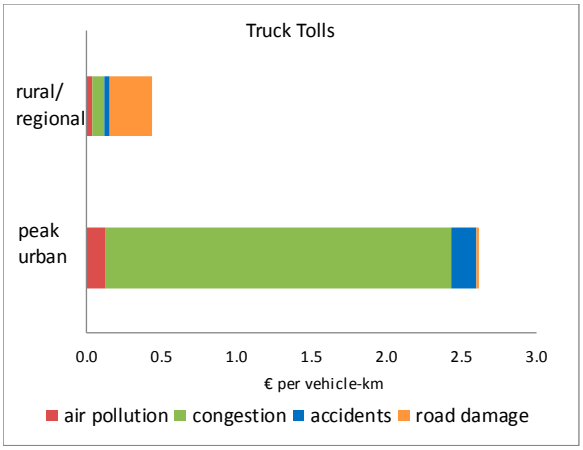
d. Second-best efficient gasoline taxes are around €1 per liter...



e. ...and €0.8 per liter for diesel.



f. Efficient tolls for HGVs vary with location



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