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SELECTED ISSUES

July 2017

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SELECTED ISSUES

June 23, 2017

Approved By
European Department

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DEMOGRAPHIC HEADWINDS[1]

Adverse demographics will weigh on the long-term growth prospects. To address the challenge of declining working age population, policies should not only aim to support fertility, but also to increase labor force participation rate, to improve labor allocation across sectors and to encourage net immigration. However, with some recent measures going in the opposite direction, even such mitigating policies may not fully offset the demographic headwinds.

A. Stylized Facts and Trends

1. Poland faces profound demographic changes. The decline of fertility rate and growing life expectancy, mostly driven by longevity of older cohorts, will significantly change the demographic landscape. As of now, Poland is still a relatively young population by the European Union (EU) standards, with the share of seniors (aged 65+ years) at 15 percent of total population, 3 percentage points below EU average. However, adverse demographics is at work, with the old-age ratio projected to more than double by 2050, surpassing EU levels. Projections[2] envisage that, despite some uptick in fertility rate, the age pyramid will become skewed toward old-age cohorts, while the share of working age groups will diminish dramatically (Figure 1).

2. Decline in working age population has already begun. Following years of growth, the working age population has been trending down since 2012. Demographic projections suggest that this process will go on for decades, yielding some ¼ decline in the number of working age persons by 2050,[3] one of the largest declines in the EU. While other EU countries are also facing demographic problems, the downward trend in Polish working age population will be much steeper (Figure 2). Under the constant productivity assumption, such a decline in the share of working age population would lower GDP per capita by almost one-fifth.[4]

3. Demographics may soon pose a barrier for growth. The historical expansion of working age population appears to have been only partly utilized to boost potential growth, with increased unemployment and declined labor force participation rates dampening potential gains. This has changed in recent years, as declining unemployment and rising participation supported employment growth despite diminishing working age population (Figure 3). However, unemployment rate may be below the natural rate already, and further gains in activity could be

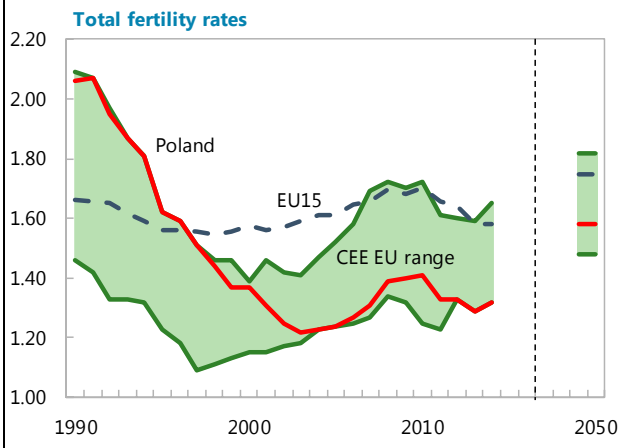
[1] Prepared by Krzysztof Krogulski and Robert Sierhej.

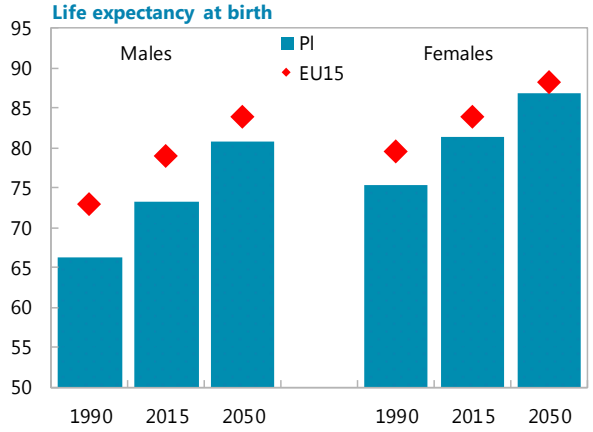
[2] Unless noted otherwise, demographic outlook is based on the Eurostat population projections (Europop 2015).

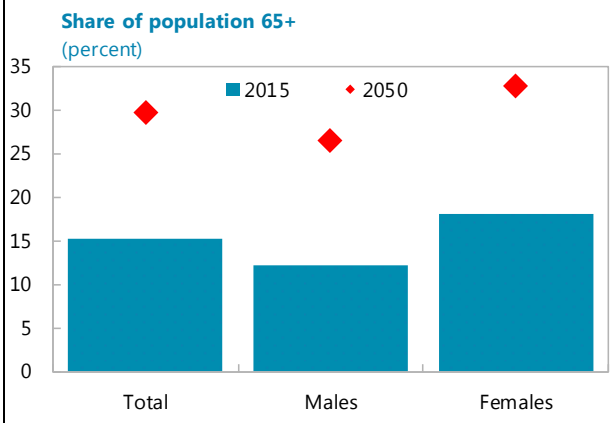
[3] Unless noted otherwise, working age population is defined as persons aged 15–64 years, not including temporary migrants.

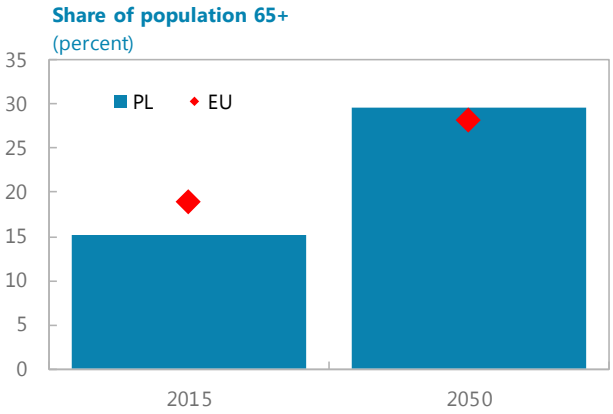
[4] GDP per capita could be written as *GDP/POP=(GDP/WAP)*(WAP/POP)* where *POP* and *WAP* are total and working age population, respectively. Assuming constant productivity, the projected decline in *WAP/POP* from 70 to 57 percent would imply a 19 percent lower GDP per capita.

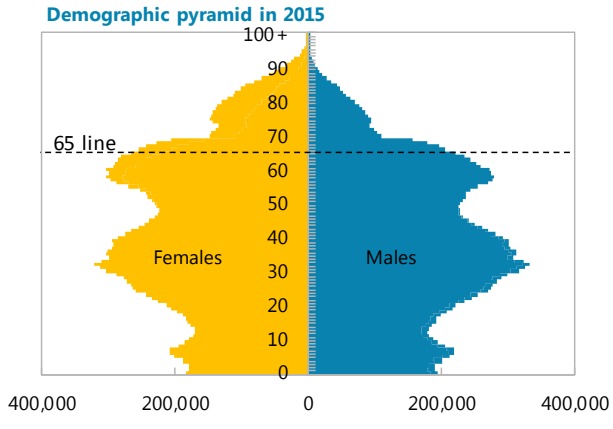
Figure 1. Poland: Population Aging

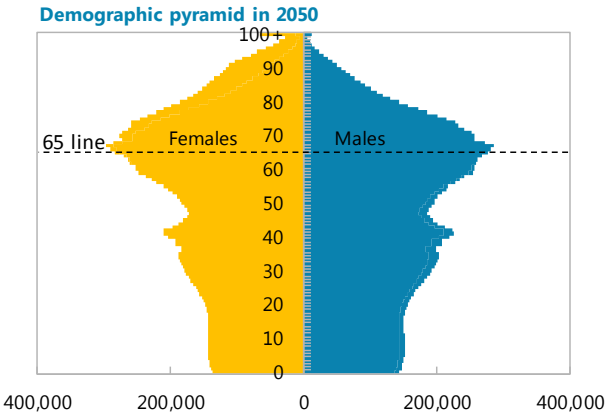








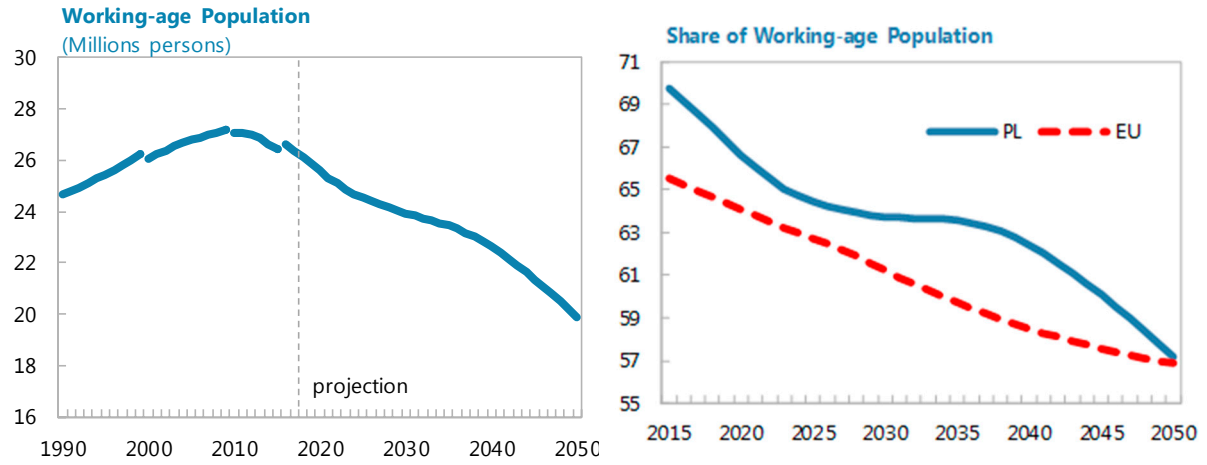




Sources: Eurostat and IMF staff calculations.
Note: CEE EU: Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia; EU15: Austria, Belgium, Denmark, France, Finaland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and -United Kingdom.

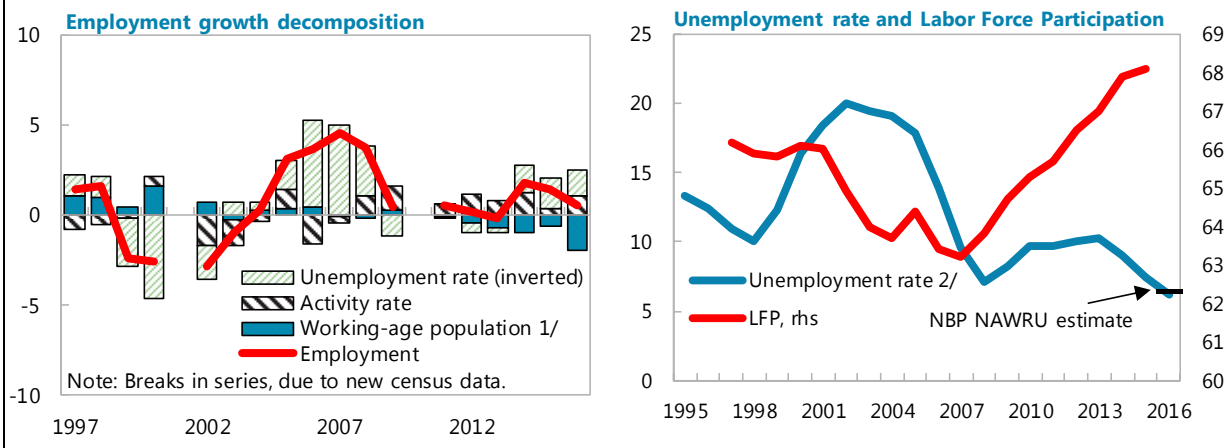
undermined by the reduction in the retirement age.[5] In such an environment, declining working age population could soon become a barrier to sustained employment gains and a constraint on growth.

Figure 2. Working-age Population in Poland



Sources: Eurostat and IMF staff calculations.

Figure 3. Economic Growth and Labor Market

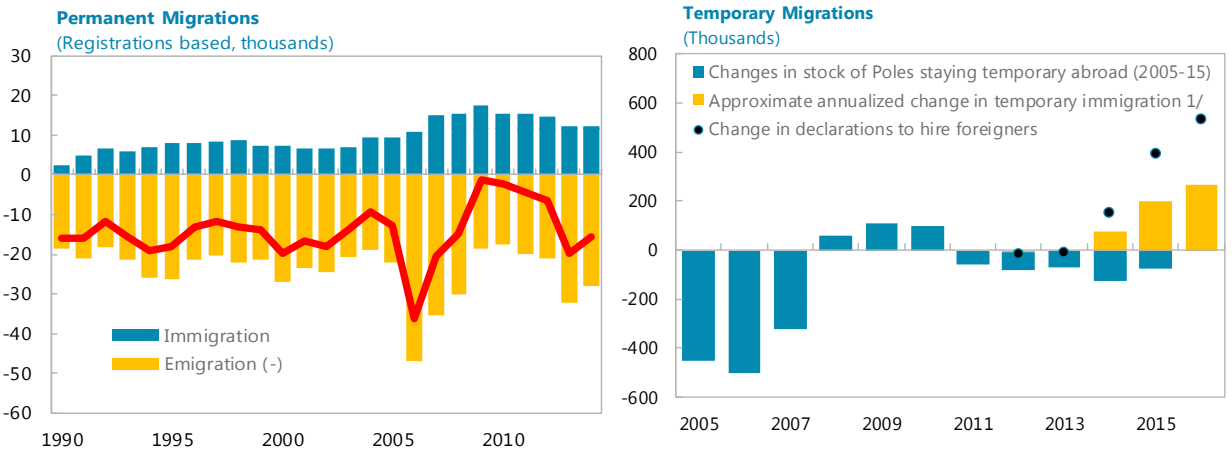


Sources: Eurostat, GUS, NBP, and IMF staff calculations.
1/ Not adjusted for temporary migrants.
2/ Harmonized unemployment rate based on Labor Force Survey.

[5] NBP latest projections (NBP, 2017) suggest that NAWRU was 6.3 percent and unemployment rate 6.1 percent in 2016, with unemployment rate envisaged to stay below NAWRU in 2017–19 and participation rate projected to deteriorate slightly.

4. Net migration was also a drag on the labor supply in the past, but this has changed recently. In addition to a steady outflow of permanent migrants, there was a sharp pickup in temporary migration after EU accession (Figure 4).[6] Persons in mobile working age (18–44 years) accounted for a large share of temporary migrants, around 60 percent relative to 40 percent in total population (GUS, 2014). An offsetting factor was the increasing inflow of migrant workers, mainly from Ukraine (Figure 4).[7] This growing immigration wave reflected pull factors—labor shortages in the Polish labor market—and push factors—political tensions and economic crisis in Ukraine. While inflows of migrant workers exceeded outward migration recently, sustainability of continued large inflows may be in doubt if the situation in Ukraine improves or if the EU visa restrictions are relaxed further for Ukrainian citizens. Moreover, the magnitude of demographic headwinds is such that migrants are unlikely to solve the labor market shortages going forward, as discussed below.

Figure 4. Migrations to and from Poland



Sources: GUS, Ministry of Family, Labor and Social Policy, and IMF staff calculations.
1/ Declarations allow to hire foreigners for a period not exceeding 6 months within 12 consecutive months, hence approximate impact on employment is ½ of the change in declarations.

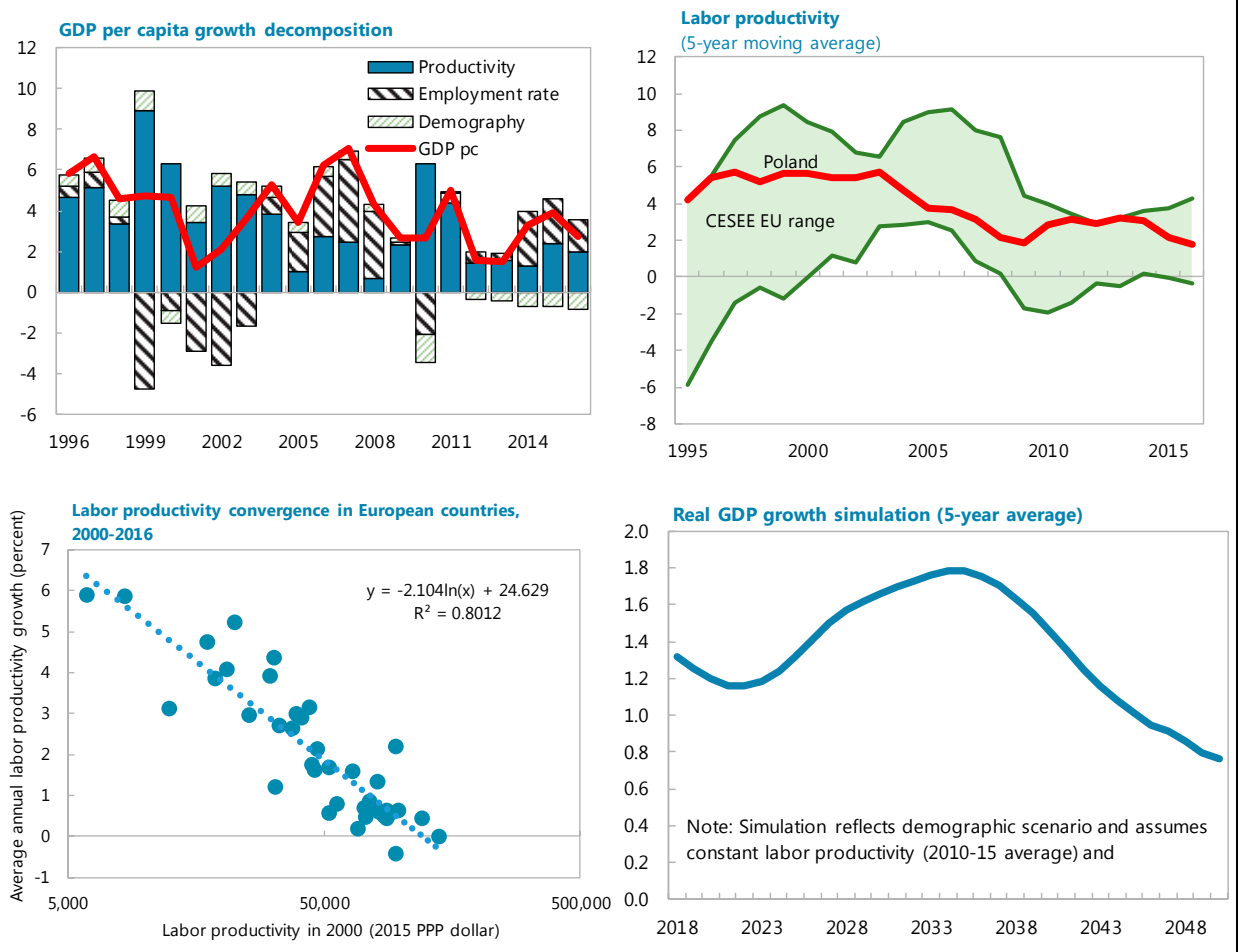
5. Current growth pattern is not sustainable given population trends. While past GDP growth mostly reflected productivity gains, the growth model has evolved in recent years towards a growing role of employment (Figure 5). Since adverse demographics is likely to make further employment gains difficult, sustainability of current growth pattern is in doubt. Labor productivity trended down for years, and reversing this may not be easy, with low hanging fruit largely exploited and with further productivity dynamics generally harder to achieve at higher per capita income

[6] Central Statistical Office (GUS) defines temporary migrants as those staying abroad for more than 2 months until 2006 and more than 3 months since 2007, but not declaring a permanent change in residence.

[7] There are no precise data on migrant workers. Ministry of Family and Labor provides data on work permits for foreigners and employers' declarations to hire workers from selected CIS countries (Armenia, Belarus, Georgia, Moldova, Russia, and Ukraine). In 2016, employers issued 1.3 million declarations, more than a fourfold increase from 2013. Declarations could only proxy the number of migrant workers, as they do not oblige hiring and allow ½ year work within 12 months. NBP estimated that 1.22 declaration was issued per Ukrainian worker, and the average stay in Poland was 5 months in 2015 (NBP, 2016).

levels. Even if a downtrend in productivity growth is stopped, but employment just follows the working age population dynamics, the GDP growth would slow to below 1½ percent in the next decades (Figure 5), which underscores the importance of policies to address both demographic challenges and the productivity growth slowdown.

Figure 5. Productivity Growth



Sources: Eurostat, Total Economy Database, and IMF staff calculations.

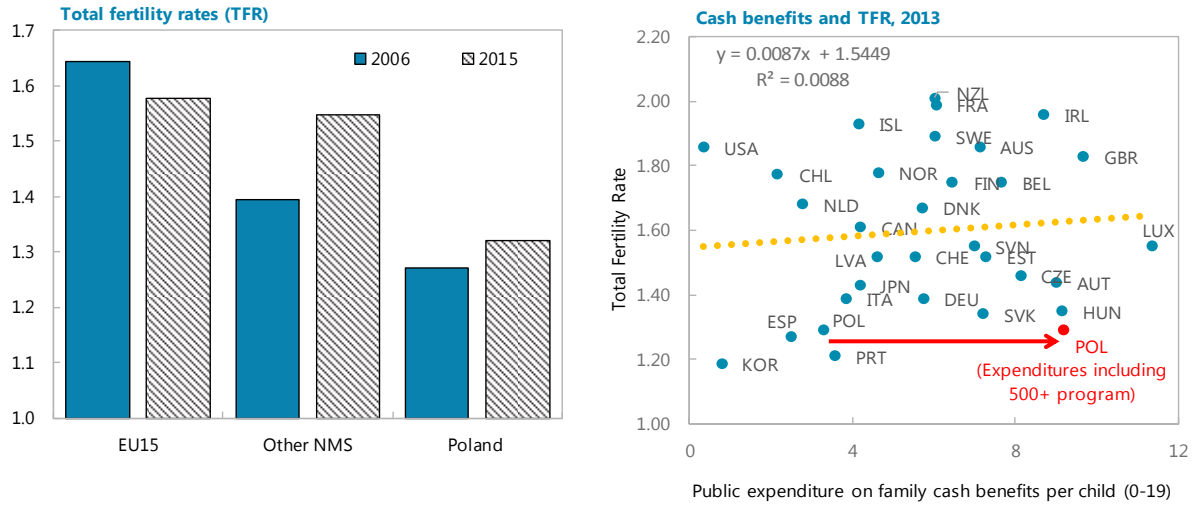
B. Policies

6. Policies need to support labor supply and productivity. Adverse demographics is considered a big challenge to sustainable growth in the government's Responsible Development Strategy (RDS) (CoM, 2017). Policies could address this challenge by affecting labor supply or productivity. The first category would comprise measures to increase fertility, participation rates, or encourage inward migration. The second set of policies could aim at improving human capital, allocation of labor among sectors of the economy, or increasing capital-to-labor ratio. Fixed investments and total factor productivity (TFP) are analyzed separately in subsequent chapters, while

here we highlight some policy options related to the labor market. Given complexity of the issue, this list is by no means comprehensive, rather it highlights some of the main options in selected policy areas:

- Fertility: Poland's total fertility rate is among the lowest in the EU and, while forecasts assume some increase, even the most optimistic scenarios do not envisage a recovery that would allow a full generational replacement. At the same time, opinion polls suggest that the optimal number of children for Polish women is above two. Family policy should support fertility but, even if successful, the newborns will enter the labor market with a long lag. Meanwhile, policies should not exacerbate demographic pressures by eroding the already low female labor force participation. International experience shows that improving access to pre-school childcare, promoting flexible work arrangements, or lowering tax rates on second earners could be useful in this regard (Christiansen and others, 2016a, Christiansen, Sierhej, 2016b). With the new Family 500+ program, Poland's family cash benefits would be among most generous in OECD. However, international experience suggests that family policy package should be carefully crafted, as higher outlays may not necessarily translate into better fertility outcomes (Figure 6).

Figure 6. Fertility



Sources: Eurostat, OECD, World Bank, and IMF staff calculations.

- Labor force participation: Participation rates in Poland are low compared to advanced EU countries, with the widest gap in older cohorts, particularly females. Closing the gap vs. EU15 immediately could increase labor force by 1.3 million persons on average in 2017–50, offsetting only one-fifth of the projected decline in the working age population. Evolving characteristics of the working age persons (e.g., better education)[8] and incentives from employers in response to labor shortages are likely to improve participation rates, but should be augmented by policies

[8] Estimates suggest that changing characteristics of the working age population could boost labor supply by some ½ million of persons by 2050 (Kielczewska, Lewandowski, 2017).

targeted at vulnerable groups. Historical evidence points to the importance of statutory retirement age in determining activity among the elderly, as tighter early retirement provisions since 2009 lifted participation rate in old age groups, particularly among women, who had more privileges. Policies should support this trend given the still wide participation gap for older women (Figure 7), and their pensions adequacy being at risk unless they retire later.[9] Although participation rate of prime-aged women is almost at par with developed EU peers, these cohorts are numerous, so a small improvement could yield sizeable gains. For example, narrowing the gap between prime-aged men and women by half could increase labor supply by ½ million persons by 2050 (Kielczewska, Lewandowski, 2017). Overall, there is a policy room to boost participation and mitigate negative demographic trends, with measures to lift effective retirement age (e.g., by curtailing special pension schemes), improve activity among youth and female (e.g., promoting flexible employment, as part-time work is rare at present), or pursuing family policy helping to combine childbearing and work.

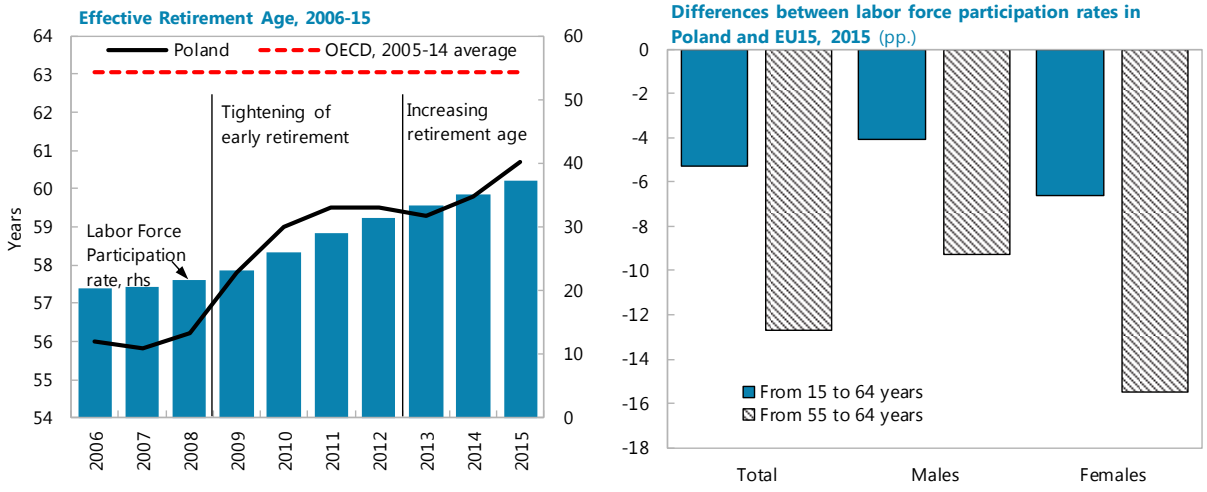
- Migration: The sharp increase in declarations to hire foreigners shows that employers see migrants, predominantly from Ukraine, as a response to labor shortages. These migrants tend to perform mostly low-skilled jobs in construction, household services, or agriculture (NBP, 2016). Going forward, there is a need for a policy to attract skilled migrants, which could usefully augment other measures aimed at addressing demographic challenges and skilled labor shortages. The Responsible Development Strategy (CoM, 2017) recognizes this need, and the Ministry of Family and Labor is working on changes in employers' obligations related to migrant workers but details of planned regulations are yet unknown.

- Labor reallocation: Given demographic headwinds, the ongoing downtrend in labor productivity dynamics is worrisome, as continued productivity gains are necessary to support strong GDP growth. Moving labor to more productive sectors could be one way to boost the overall productivity. Such a process has been taking place, accounting for one-fifth of productivity gains since 2000 (Figure 8).[10] There is a room to continue such a structural transformation, as the least productive agriculture still represents a much larger share of employment than in developed EU countries, and the Responsible Development Strategy suggests that 20 percent of agricultural workforce may be idle (CoM, 2017). Econometric analysis shows that improving business climate, attracting greenfield FDIs, or reducing labor market duality could facilitate labor reallocation among sectors of the economy (Ebeke, Krogulski, Sierhej, 2015). It also suggests that regions enjoying stronger productivity growth were more successful in moving labor from farming to other higher-productivity sectors (Krogulski, Sierhej, Thegeya, 2016).

[9] According to the Social Security Administration (ZUS), reducing the retirement age will yield lower pension benefits, with the difference small in earlier years but ultimately men projected to receive 20 percent and female 32 percent lower pensions by 2050 (CoM, 2016a).

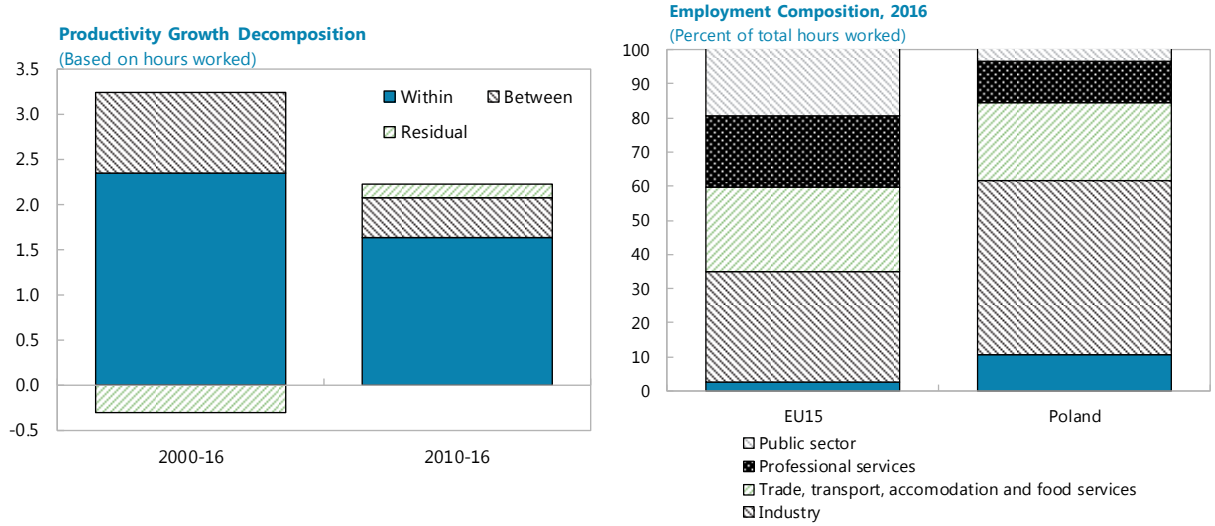
[10] This topic is discussed in Poland Selected Issues (Ebeke, Krogulski, Sierhej, IMF, 2015), with findings based on more granular data suggesting that labor reallocation could explain about ½ of cumulative productivity gains.

Figure 7. Labor Force Participation Rates



Sources: Social Security Office (ZUS), OECD, Eurostat, and IMF staff calculations.

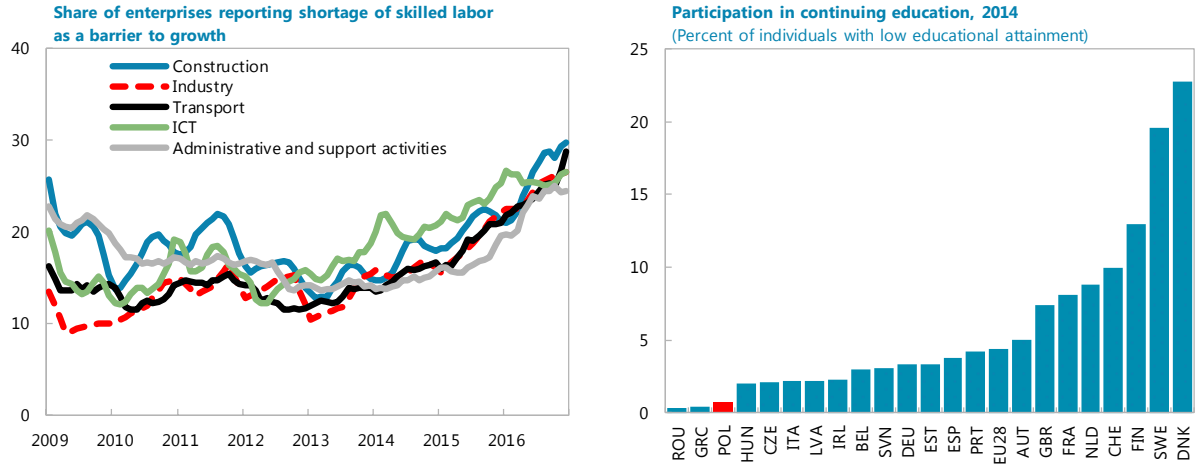
Figure 8. Labor Allocation



Sources: Eurostat and IMF staff calculations.

- Quality of labor: While reallocation of labor would help, it needs to go in tandem with within-sector productivity improvements which offer potentially larger gains (Ebeke, Krogulski, Sierhej, 2015). In this context, upgrading the quality of human capital would help to improve sector-specific productivity. Policy measures in this area are desirable, as firms increasingly point to skilled labor shortages as a barrier to growth (see Chapter 2 for more details). The OECD analysis suggests that, despite notable educational achievements so far, deficits in vocational education remain large (OECD, 2016). Life-long learning, especially among persons with lower education attainments, is weak by international standards (Figure 9), likely reflecting widespread temporary work, as such workers are less likely to obtain training from their employers.

Figure 9. Quality of Labor



Sources: Central Statistical Office (GUS), OECD, and IMF staff calculations.

7. Recent policies may add to demographic pressures. Instead of addressing risks to sustainable growth posed by adverse demographics, some recent measures are likely to have the opposite effect:

- Retirement age: Changes enacted in 2012 imposed gradual increase in statutory retirement age from 60 years for women and 65 years for men to an equalized 67 years, with this target to be reached in 2020 for men and in 2040 for women. The authorities decided to reverse this process, restoring previous retirement age (60/65) as of October 2017. Relative to the "no policy change scenario", this decision will reduce the working age population by close to 2½ million persons by 2050 (GUS, 2014). It will also imply a sizeable fiscal cost at about ½ percent of GDP per year.

- Child benefits: The new child benefits scheme (Family 500+) guarantees a lump sum benefit for each second and next child in a family (poorer families are also eligible to receive this benefit for the first child), implying annual fiscal cost of above 1 percent of GDP. The program is hoped to encourage fertility, yielding 290,000 additional births in ten years after its introduction. [11] However, such scheme could also have a negative impact on the female labor force participation rates, with estimates pointing to a possible withdrawal of 240,000 persons from the labor market (Myck, 2016). While it is too early to judge the actual results, cross-country experience suggests that lump-sum cash benefits tend to discourage female employment (Christiansen and others, 2016a).

[11] The projection is based on Ministry of Family and Labor impact assessment to the law of family benefits (CoM, 2016). International evidence suggests that effectiveness of such programs on fertility may be limited, depending on country-specific circumstances (see Christiansen, Sierhej, 2016; Sobocinski, 2014).

- Other recent measures affecting the labor market:

  - The authorities decided to increase the *primary schooling age* by one year to 7 years, keeping the overall duration of primary and secondary education intact. Other things equal, this would imply a later start of work, reducing labor supply by about 300,000—400,000 persons over long-term.

  - *Minimum wage* hikes significantly outpaced average wage growth in recent years, increasing the minimum to average wage ratio from 35 percent in 2004 to an estimated 47 percent in 2017, relatively high compared to EU peers. As of 2017, a minimum hourly pay, corresponding to the minimum wage, was imposed on some civil law contracts (CLCs), which were widely used in the service sector, like cleaning or security. High level of minimum wage could potentially be harmful, especially for youth employment. Analysis for the region suggests non-linear adverse effects on employment, becoming starker when the minimum-to-average wage ratio reaches 45 percent (Raei and others, IMF, 2016).

  - Given deflationary environment in recent years, the authorities departed from the CPI based indexation of *minimum pension*, mandating a 13 percent hike as of March 2017. Such a decision, apart from increasing aging related cost, is likely to reduce incentives to stay at work after reaching retirement age.

8. The impact of recent policies on labor supply may be difficult to offset. Estimates presented in Table 1 suggest that recent policies (notably the reversal of the 2013 retirement age increase) have significantly exacerbated the already unfavorable trends in the working age population. This conclusion holds even after allowing for positive impact of the new child benefits on fertility and such mitigating factors, as higher participation rates or increasing immigration. Additionally, recent policy measures entail large fiscal costs, with child benefits and lower retirement age alone likely to have a negative fiscal impact of above 10 percent of GDP in the next decade, thus squeezing domestic savings and limiting resources for investments.

C. Concluding Remarks

9. Over the past decades, Poland enjoyed a steady increase of the working-age population. The recent reversal of this trend poses a challenge for growth going forward, as labor supply will become constrained. There are mitigating factors which, if managed properly, may smooth the transition to a new reality. Labor force participation is low by international standards, suggesting some scope for more efficient use of the working-age population. Moreover, recent migration trends suggest that Poland may become a recipient country. Meanwhile, recent policies seem to have exacerbated the adverse impact of demographic trends. In this context, measures to increase labor force participation and labor productivity will be key. Measures facilitating labor reallocation towards more productive sectors and a steady improvement of labor quality are likely to yield significant gains as well.

Table 1. Labor Supply: Demographics and Policies

(percent of working-age population in 2015)	2015	2018	2020	2022	2030	2050
Working-age population (15-64)[1]	**100.0**	**97.3**	**95.3**	**93.4**	**89.0**	**74.2**
change on 2015 (I)	**0.0**	**-2.7**	**-4.7**	**-6.6**	**-11.0**	**-25.8**
Impact of recent policies (II):		**-3.7**	**-4.7**	**-5.2**	**-7.2**	**-9.1**
change on 2015 (I+II)	0.0	**-6.5**	**-9.4**	**-11.8**	**-18.2**	**-35.0**
o/w						
Retirement age reduction[2]		-3.7	-4.7	-5.2	-5.8	-10.3
New births due to Family 500+ program[3]		0.0	0.0	0.0	0.0	2.3
Increased schooling age[4]		0.0	0.0	0.0	-1.5	-1.1
Additional mitigating policies (III)		**1.6**	**3.2**	**3.7**	**5.4**	**6.5**
o/w						
Increased labor force participation (LFP)[5]		1.4	2.8	3.2	4.2	3.6
Immigration[6]		0.2	0.3	0.5	1.2	2.9
Recent and additional mitigating policies (II+III)		**-2.1**	**-1.5**	**-1.5**	**-1.8**	**-2.7**
Resulting working age (I+II+III)	**0.0**	**-4.9**	**-6.2**	**-8.1**	**-12.7**	**-28.5**
Alternative LFP scenario (IV):[7]						
Resulting working age	0.0	*-5.2*	*-7.2*	*-8.7*	*-11.8*	*-22.0*

Sources: Eurostat, Ministry of Family and Labor and IMF staff estimates.

1/ Eurostat baseline demographic scenario
2/ Compared to no-policy change (retirement age equalized at 67)
3/ Additional births as in official projections. Constant after 2026.
4/ Primary school age increased from 6 to 7 in 2016
5/ As in the RDS, LFP goes up from 68 to 73 percent by 2030 and remains constant afterwards.
6/ Migrant workers double from estimated 0.8 million in 2016.
7/ Gradual convergence to LFP in Sweden 2015 (82 percent)

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INVESTMENT CHALLENGE[1]

Despite sizable capital gaps, business investment in Poland is low compared to its European peers. While general government investment is above the EU average, the overall aggregate investment-to-GDP ratio falls short of the "optimal investment" benchmarks, suggesting a significant scope for further capital deepening. The overall uncertainty, regulatory burdens, lack of skilled labor and infrastructure gaps appear to be the main barriers to investment.

A. Stylized Facts

Capital Stock and Investment: Where Does Poland Stand?

1. Poland's infrastructure gaps are still large. Despite notable progress over the past decade, capital stock per capita is only a third of that in advanced EU (Figure 1). Large infrastructure gaps (compared with the EU average and with the new member states[2]) exist in transport, electricity and information and communications technology (ICT) sectors, featuring relatively low motorway density, capacity for power generation, and broadband coverage (Figure 1).[3] Thus, there is still a significant scope for capital deepening and infrastructure investment in Poland.

2. Poland's aggregate investment rate declined after the global financial crisis, led by business investment (Figure 2). Poland's current aggregate investment rate—defined as aggregate investment-to-GDP ratio—is about 3 percentage points below its pre-crisis peak. While Poland's current aggregate investment rate is close to the EU average, there are notable differences across economic sectors:

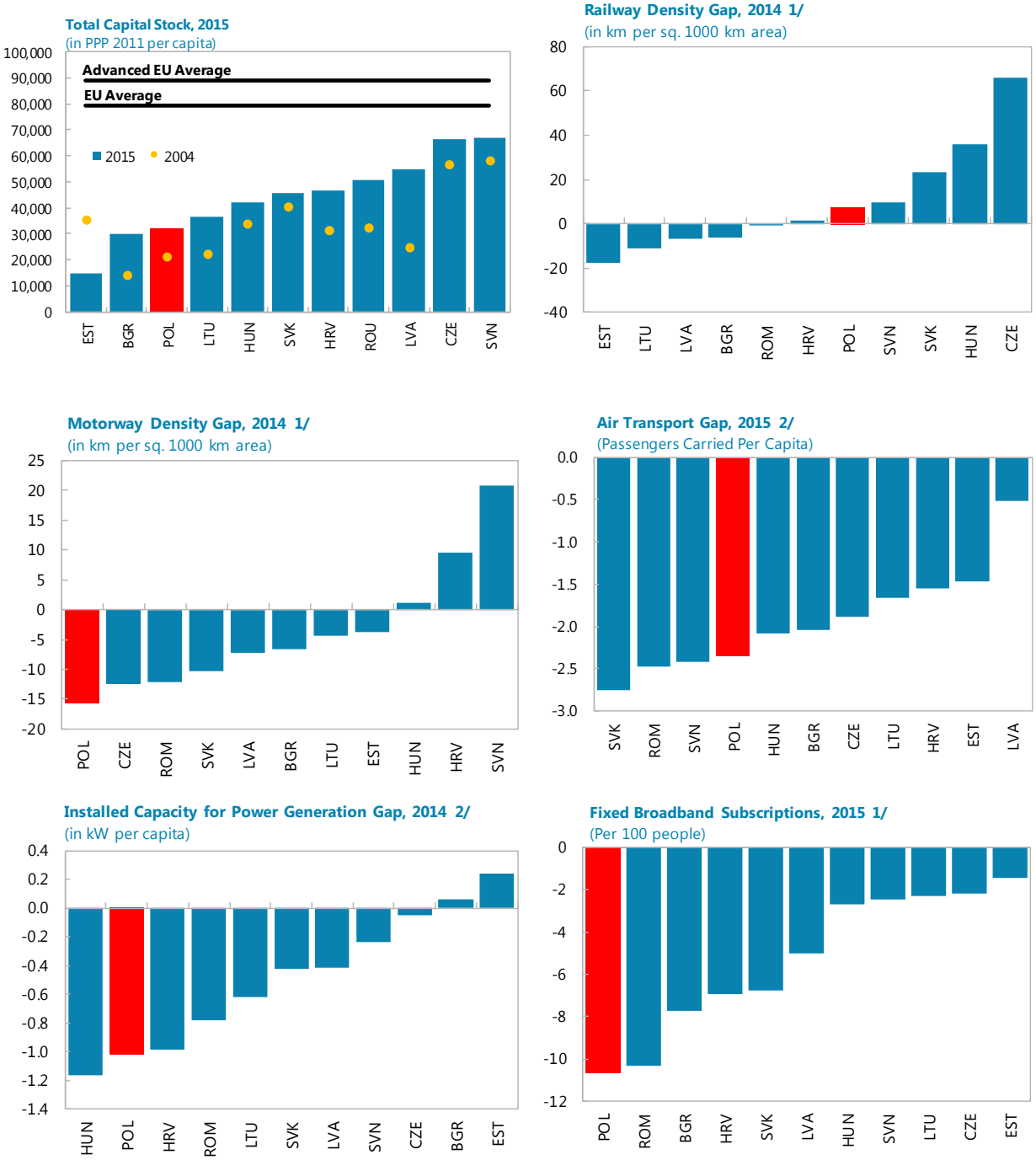
- *Government investment* was on an upward trend since the EU accession, boosted by the EU funds, albeit it declined somewhat after the euro area crisis;
- *Business investment* declined after the global financial crisis, but has been relatively steady in recent years; importantly, business investment rate in Poland appears to be among the lowest in the EU. It should be noted that business investment in Poland includes investment by public corporations (2 percent of GDP), foreign-owned firms (3 percent of GDP), and domestic private investment (only about 6 percent of GDP).
- *Household investment* has been relatively stable, and close to the EU average.

[1] Prepared by Xin Cindy Xu and Yevgeniya Korniyenko, with inputs from Krzysztof Krogulski. The authors of Box 1 are Aron Gereben and Philipp-Bastian Brutscher (both from the European Investment Bank).

[2] Here, the term "new member states" refers to Bulgaria, Croatia, Czech Republic, Latvia, Lithuania, Estonia, Hungary, Poland, Romania, Slovakia, and Slovenia.

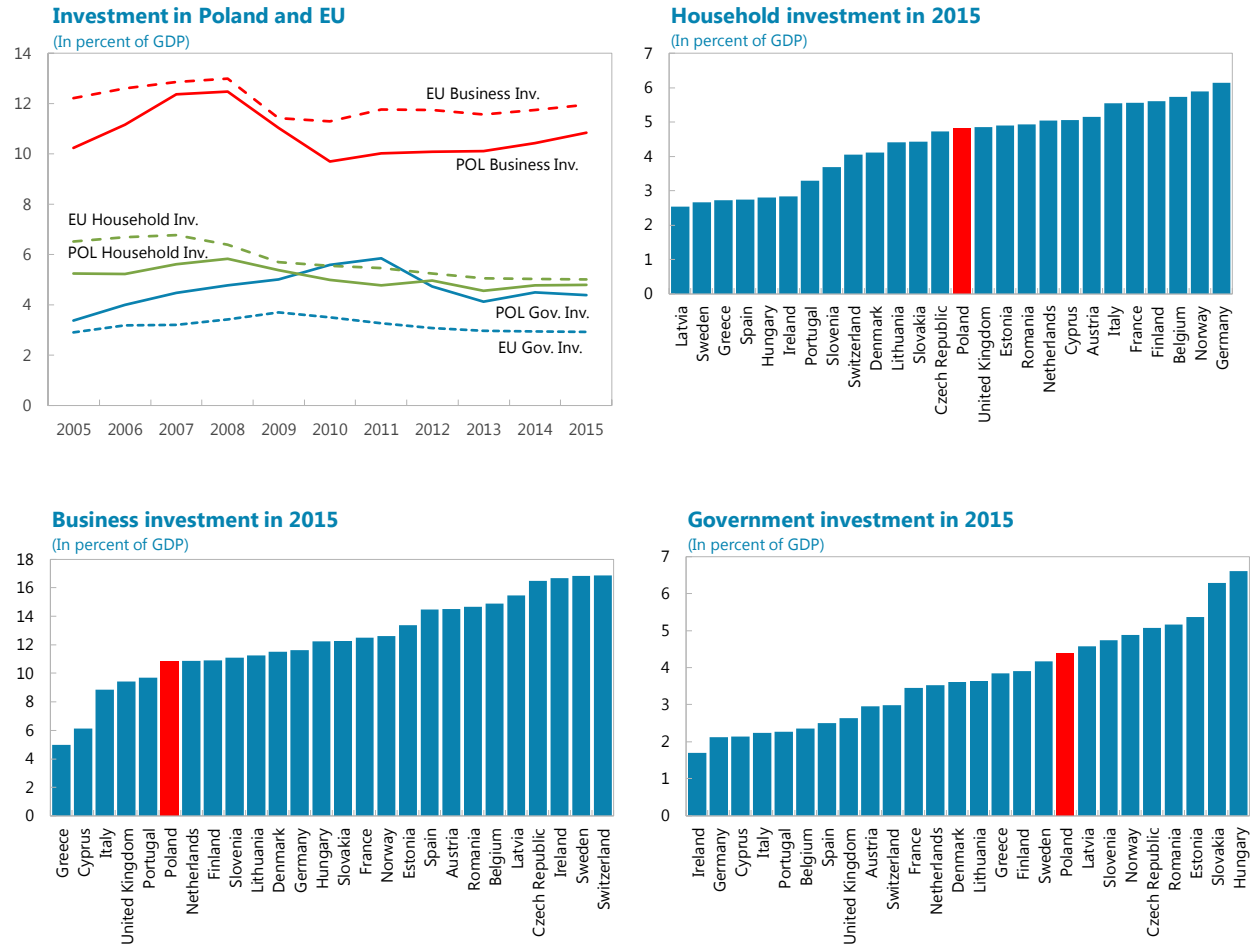
[3] These stylized facts are consistent with the earlier studies by the World Bank and the OECD.

Figure 1. Capital and Infrastructure Stock in Poland and Other EU countries



Sources: Ruben Atoyan, et al., "Public Infrastructure in Western Balkans", IMFWP, 2017 forthcoming. World Development Indicators Database, International Road Federation, Eurostat, Energy Information Administration, and IMF staff calculations.
1/ Gaps computed vis-a-vis EU average adjusted for population density.
2/ Gaps computed vis-a-vis EU average.

Figure 2. Investment by Economic Sectors in Poland and Other EU countries



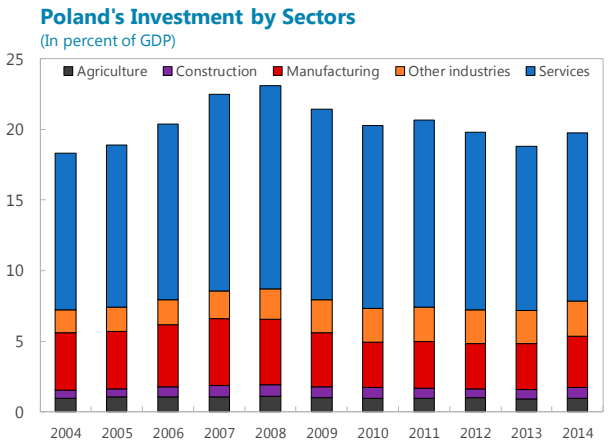
Sources: Eurostat and national authorities.

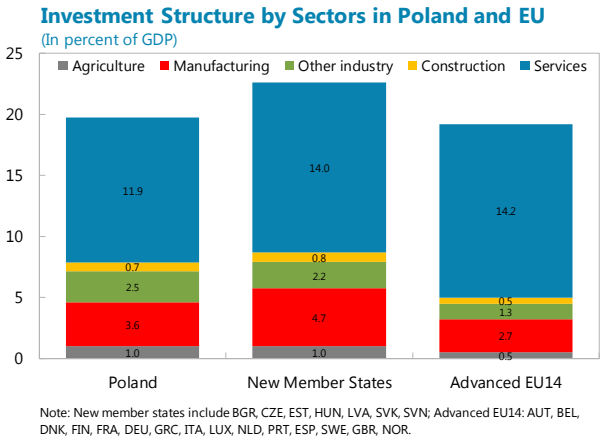
3. A relatively low investment in non-tradable sectors (services and construction) appears to be the main drag (Figure 3). Much of the investment growth right after the EU accession was due to the expanding services sector, but investment in services is still lower than in advanced EU countries and in the new member states. Furthermore, the perceived investment gap—defined as the share of firms who have invested too little in the past 3 years (according to the 2017 EIB investment survey)—appears to be particularly large in non-tradable sectors, including services and construction (see Box 1). Investment in tradable sectors, including manufacturing and non-construction industries, is higher in Poland than in advanced EU, though lower than in the new member states. Agriculture still accounts for a larger share of total investment in Poland (5 percent) than in advanced EU countries (2.7 percent), suggesting that there is a scope for resource reallocation to higher productivity sectors.

4. The investment slump was deeper for domestic private firms and large enterprises, but lasted longer for SMEs (Figure 3). The post-crisis decline in business investment (non-financial corporations) was broad-based, with the largest drop recorded by domestic private firms and large

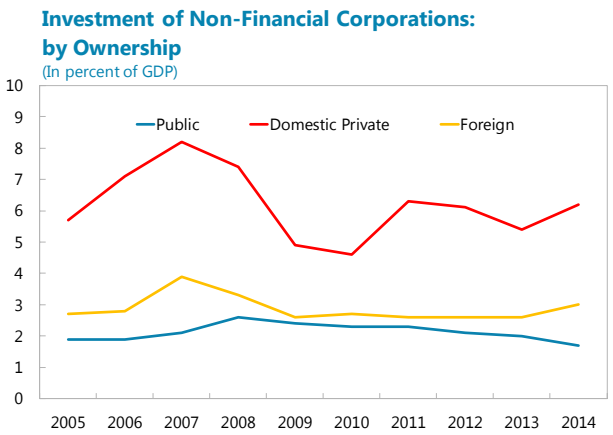
enterprises. The most recent recovery is also led by these two subgroups: while investment rate of large firms rebounded close to the pre-crisis peak by 2015, investment rate of SMEs remained subdued. The 2017 EIB survey also confirms that the perceived investment gap is larger in SMEs than in other firms. Given that SMEs account for 69 percent of employment and 53 percent of gross value added in the private sector, improving investment in the SME sector would help lift the overall investment rate in Poland, as noted in the government's Responsible Development Strategy (RDS).

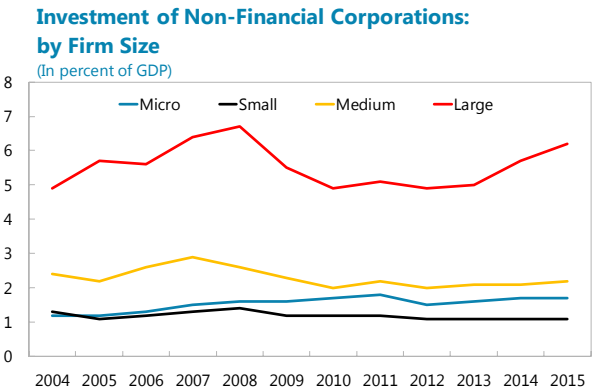
Figure 3. Investment by Business Subsectors in Poland and the EU





Note: New member states include BGR, CZE, EST, HUN, LVA, SVK, SVN; Advanced EU14: AUT, BEL, DNK, FIN, FRA, DEU, GRC, ITA, LUX, NLD, PRT, ESP, SWE, GBR, NOR.





Note: Firm size by number of employees, micro(0-9), small (10-49), medium (50-249) and large (250+)

Sources: Eurostat and national authorities.

B. Investment Benchmarks

Is Poland Underinvesting?

5. In what follows, we construct three benchmarks to assess whether investment rate in Poland is too low.[4]

[4] The first two analytical approaches follow IMF REI (May 2016), and the third one could refer to the empirical setting in IMF WP/12/277 "Is China over-investing and does it matter?"

- The "golden rule", a neo-classical growth model-based steady-state equilibrium level of investment;
- The "historical benchmark" investment rate, consistent with stylized transition dynamics derived from the historical experience of other advanced European countries;
- The "predicted norm", determined by a set of economic fundamentals and structural characteristics, through a panel regression estimation using data for 28 EU countries over the past three decades (Appendix I).

6. Each of these investment benchmarks has its own merits and drawbacks, but taken together, the three approaches should provide a good gauge of whether Poland is over- or under-investing. The following caveats should be kept in mind when interpreting the results:

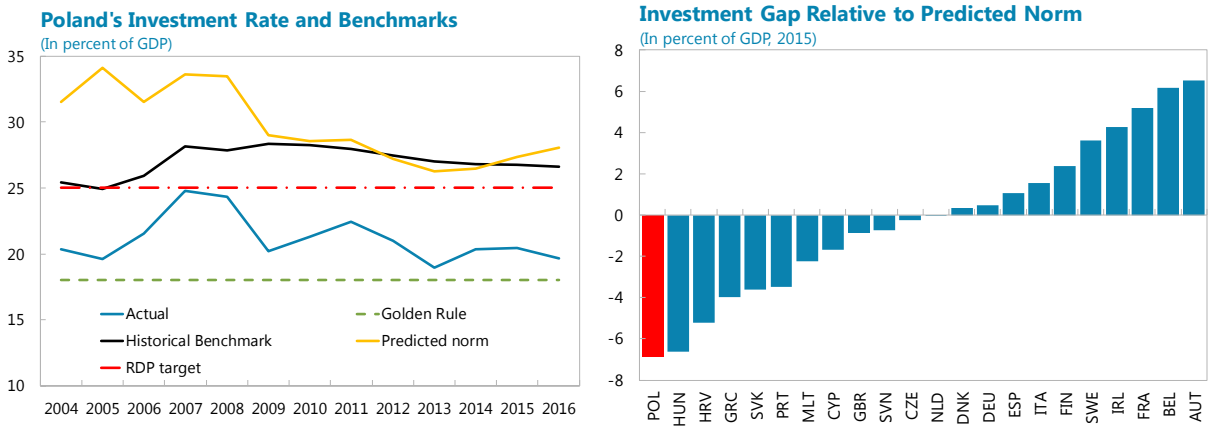
- The "golden rule" benchmark can be interpreted as a *lower bound* toward which the investment/GDP ratio should converge as it approaches the steady state. The main advantage of this approach is that it provides a benchmark that is invariant with respect to country's initial conditions, while the main disadvantage is that it requires knowledge of the unobservable social rate of time preference (see REI, May 16).
- The "historical benchmark" provides a proxy for a sustainable path for investment rate during the *transition to a steady state*, which does not require any assumptions about the social rate of time preference and the position of the country on the saddle-path. However, it assumes similarity in economic structures of Poland with advanced EU peers, which may not capture Poland's own specific structural characteristics (see REI, May 16).
- The "predicted norm" links the optimal investment path to Poland's development level and structural characteristics based on the empirical relationship between investment rates and country-specific economic fundamentals, structural and external factors over time. The drawback of this approach is that it is sample-dependent, as is the case with all regression-based approaches.

7. The investment target set out in the RDS seems appropriate given Poland's development level and structural characteristics. The 25 percent of GDP investment rate is below the predicted norm in recent years, suggesting that the RDS target is achievable given Poland's fundamentals, structural characteristics, and external environment. The RDS target is also a bit below the historical benchmark, indicating that a higher level of optimal investment could also be feasible based on the historical experience of other advanced European countries.

8. Poland's investment rate falls short of both the historical benchmark and the predicted norm (Figure 4). The actual investment rate was about 7 percentage points lower than the historical benchmark in 2016, suggesting that Poland's convergence path could take longer than the time horizon during which other advanced European countries achieved convergence to the present-day income level from the levels similar to Poland's current per capita income. The global financial crisis has further slowed convergence, as the investment gap relative to the historical benchmark has increased after the crisis. The actual investment rate (as of 2016) is about 8 percentage points below Poland's predicted norm. The latter is estimated taking into account Poland's development level, economic fundamentals and structural characteristics (regulatory

efficiency, trade and financial openness), as well as country-specific external conditions (external demand and terms of trade) (see Appendix I). A sizable gap between the actual investment rate and the predicted norm suggests that Poland's investment is below the level that might be expected of a country with a level of development and structural characteristics similar to those of Poland, based on historical experiences of the EU countries. Finally, the actual investment rate is above the "golden rule", which is the lower bound (as discussed above).

Figure 4. Optimal Investment and Investment Gap



Sources: National authorities and IMF staff calculations.

C. Investment Barriers

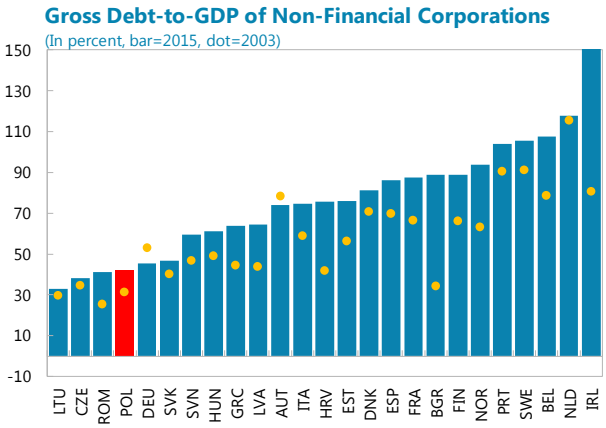
The Role of Domestic and External Factors

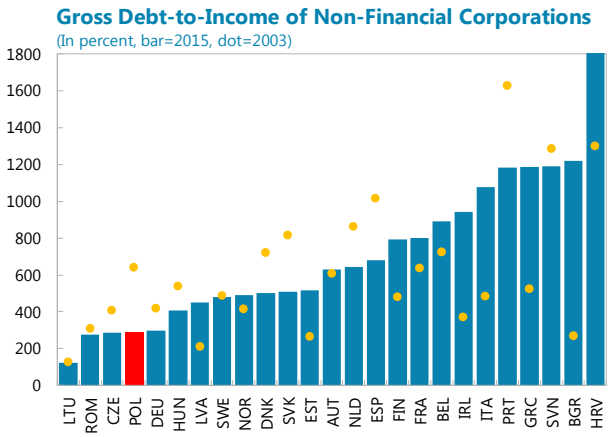
9. What are the key constraints on investment in Poland? We consider several possible explanations:

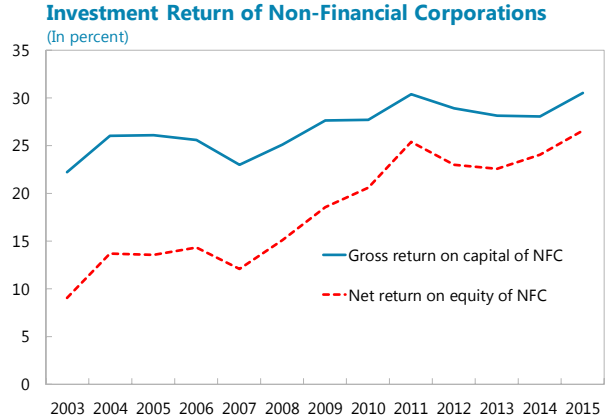
1) **Balance-sheet constraints?** Could it be the case that firms are suffering from a debt overhang that hampers their investment activities? This does not seem likely based on the corporate balance-sheet data. The debt burden of Polish firms is among the lowest in the EU and the debt-to-income ratio has more than halved over the past decade (see Figure 5).

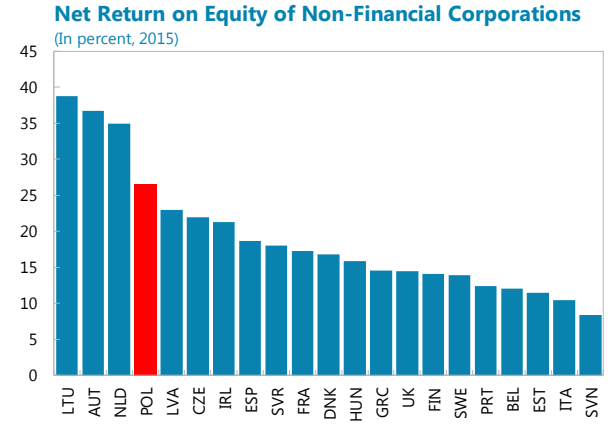
2) **Low rate of return on investment?** Could it be the case that the return on investment is not high enough to provide sufficient incentives to invest/save? The return on capital in Poland has been rising since the early 2000s, and most of corporate profits have been retained (rather than distributed). Moreover, investment returns in Poland rank favorably among the EU countries, especially compared to other Eastern European countries with which Poland is competing for inward FDI from advanced Europe (Figure 5).

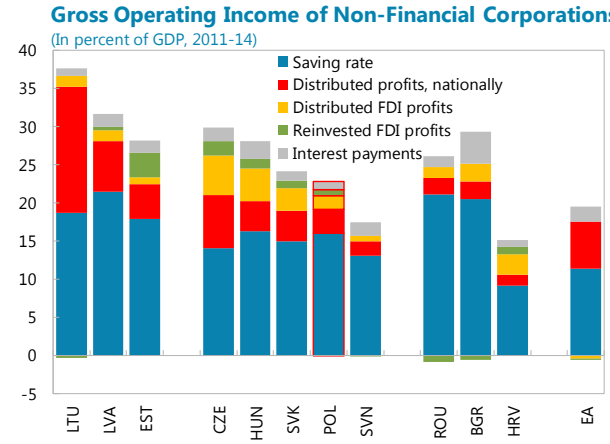
Figure 5. Why Is Business Investment Low in Poland?—Balance Sheets, Profits and Saving

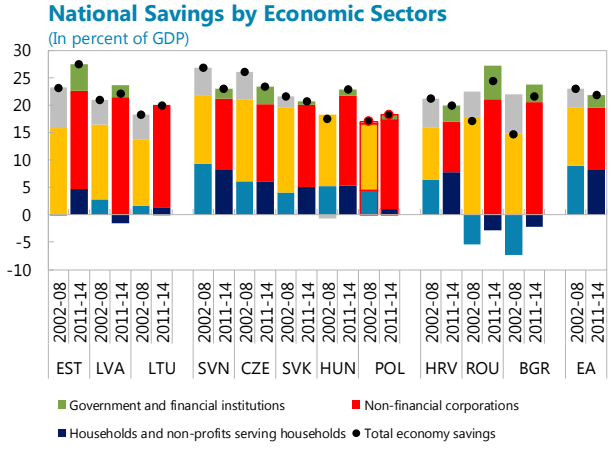










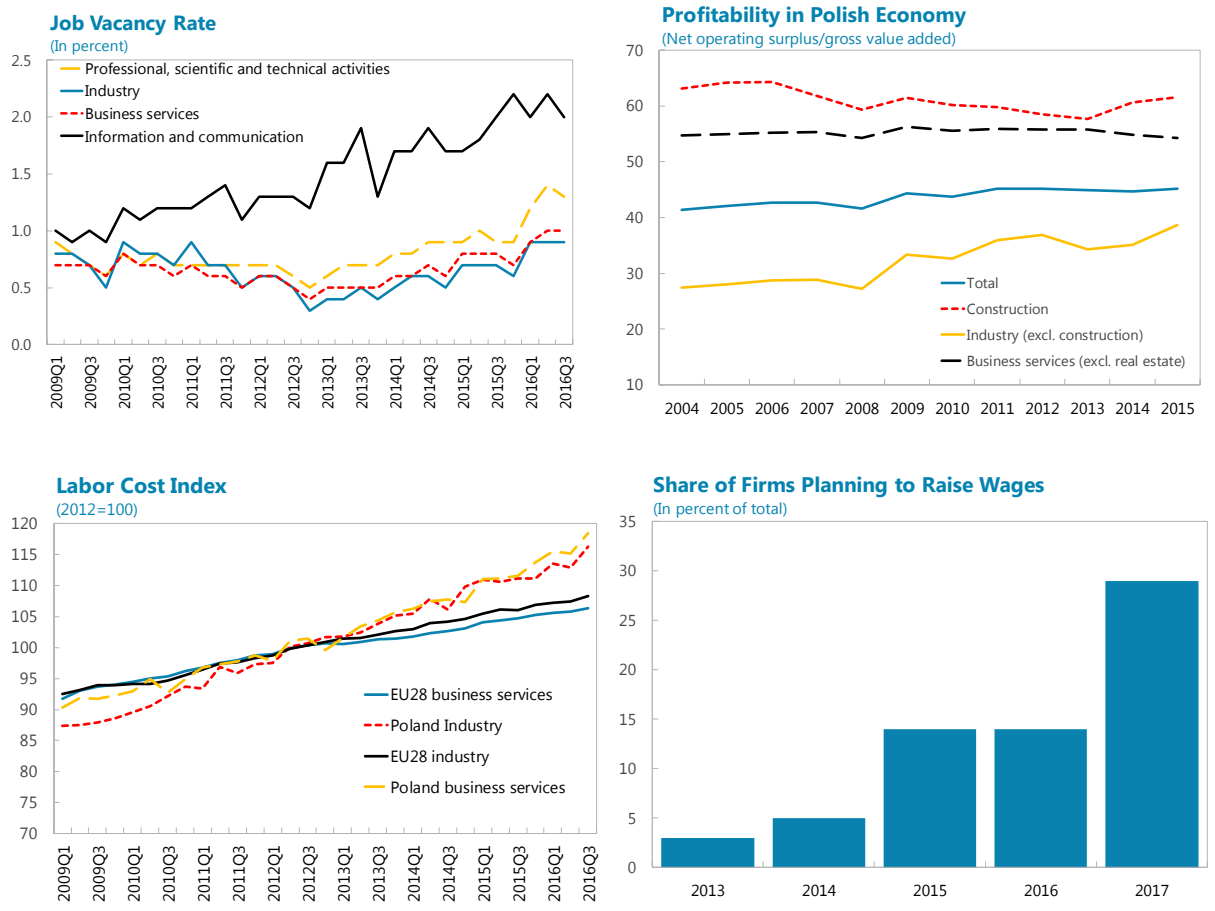


Sources: Eurostat, REI (May 2016), and national authorities.

3) **Insufficient domestic savings?** While the economy-wide saving rate is around 20 percent (less than the 25 percent desired benchmark for aggregate investment rate, according to the RDS), the bulk of national savings are corporate sector savings, which do not seem to be low relative to firms' gross operating income or compared to other EU countries; however, both household financial savings and government savings are very low (Figure 5).

4) **Skilled labor shortages?** Shortages of skilled labor seem to be a problem for firms across all sectors (see Chapter 1), which is consistent with the findings of the 2017 EIB investment survey (see Box 1). The high-tech subsectors (notably, the ICT) have the highest job vacancy rate, followed by professional, scientific and technical services (Figure 6). Furthermore, the share of firms with plans to increase wages in 2017 is at a record high (Figure 6). Labor shortages may have contributed to a faster increase in labor costs in Poland than in the EU in recent years (Figure 6). While Polish firms may be able to absorb some wage hikes in the near term without having to adjust their capital expenditures, the negative impact of rising wages on firms' profit margins may have a stronger dampening effect on business investment going forward.

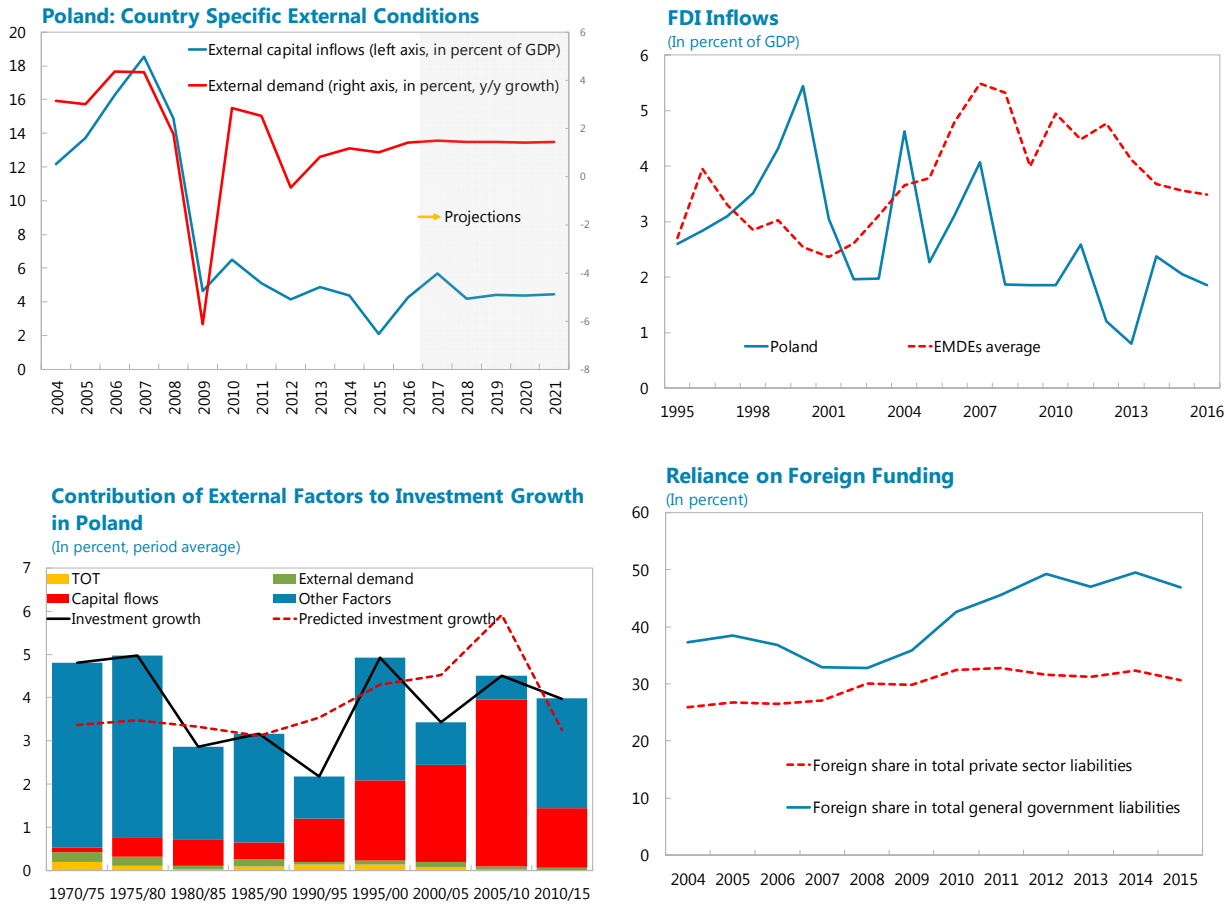
Figure 6. Why Is Business Investment Low in Poland?—Labor Availability and Cost



Sources: Eurostat and national authorities.

5) **Weak external environment?** For an open economy like Poland, a weak outlook for external demand or unfavorable terms of trade developments are likely to have a negative impact on firms' investment decisions. Furthermore, tighter external financing conditions tend to increase firms' borrowing costs and reduce inward FDI, further dampening investment growth. Regression analysis suggests that country-specific external factors (external demand, external financing conditions, and terms-of-trade (TOT)[5]) tend to have significant impact on the rates of capital accumulation in emerging and developing economies (EMDEs) (Figure 7). A factor decomposition further shows that for Poland, sizable *capital inflows* were one of the key factors

Figure 7. Why is business investment low in Poland? —External environment



Sources: Penn World Tables, NBP, and IMF WEO databases and IMF staff calculations.
Note: The contribution of external factors to capital accumulation is estimated based on the panel regression analysis for a sample of 136 countries, 1970–2014. Other factors include fixed effects, trend, constant, and model error.

[5] Country-specific external factors are calculated using the country-specific weights that capture differences across countries in the composition of commodity export and import baskets and in the importance of commodities to the overall economy (for details on the methodology, see Annex 2.1 April 2017 WEO Chapter 2). Country-specific external financing conditions are proxied by a quantity-based measure of capital flows to peer economies (other emerging market and developing economies within the same region) as a share of their aggregate GDP (constructed to be exogenous to each country along the lines of Blanchard, Adler, and de Carvalho Filho (2015)).

supporting capital accumulation since the 1990s and that reduced capital inflows played an important role in dampening the pace of capital accumulation after the euro area crisis. Notably, FDI inflows in Poland have been weaker than inflows in EMDEs, on average, in recent years.

6) **Limited space for external borrowing?**[6] Overall, there seems to be some space for external borrowing. The current account primary balance is higher than the debt-stabilizing balance, indicating that there is some scope for external borrowing without compromising external debt sustainability. Private sector external debt is close to 40 percent of GDP, but is notably lower if one excludes inter-company loans—about 22 percent of GDP. However, aggregate numbers are masking significant differences within the private sector. The reliance on foreign funding is relatively low for financial institutions (14 percent of total liabilities as of 2016:Q3) and notably larger for non-financial corporations (44 percent of total liabilities as of 2016:Q3). Government's reliance on foreign funding has increased since the crisis, but has been relatively stable over the past 4 years. The share of foreign funding in total government liabilities increased from 33 percent in 2007 to 47 percent in 2015 (Figure 7).[7]

7) **Domestic institutional/structural constraints?** The recent EIB survey aims to shed some light on this question by asking firms from different EU countries to choose major or minor investment barriers from a list of factors. Below are the key highlights (see Box 1 for details):

- Companies in Poland cite *political and regulatory climate* as the main barrier to implementing planned investment in the current financial year. This is likely due to an unusually high level of policy uncertainty globally and in Europe, combined with domestic uncertainties related to changes in the regulatory environment.

- *Uncertainty*, *business regulation* and a *lack of skilled staff* emerge as the key long-term structural barriers to investment. Some factors seem to matter more for foreign firms, such as the shortage of skilled staff, than for Polish firms in general or for the state-owned enterprises (SOEs) in particular.

- Compared with EU peers, firms in Poland are more likely to consider *demand for products and services, and infrastructure gaps* in transportation and energy sectors as significant barriers to investment.

- The EIB survey suggests that the reliance on *external finance* and the share of external finance-constrained firms in Poland is close to the EU average. But the SOEs in Poland face more external finance constraints than foreign firms, while firms in the service sector and SMEs are more constrained than those in the industry or large firms.

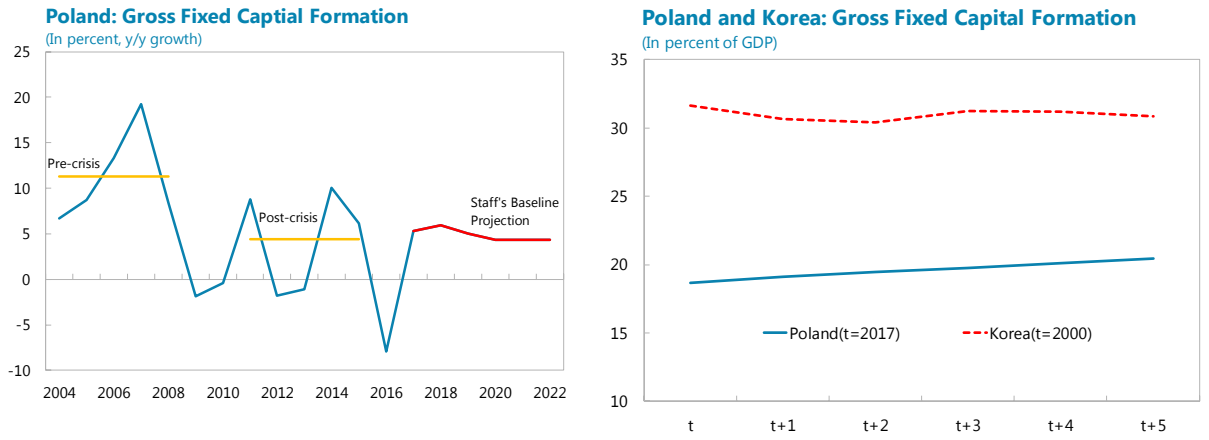
[6] The external borrowing space could be defined as the gap between debt-stabilizing and actual current account primary balances, as in the REI (May 2016).

[7] The picture looks similar for net government and private sector liabilities.

D. Policies

10. With only a moderate improvement in external environment expected over the medium-term, investment growth in Poland will likely stay around its post-crisis average level. Given the pick-up in the EU funds' absorption and supportive external conditions (based on the WEO forecasts for advanced and major emerging market economies), investment growth in Poland is projected to strengthen in the near term, but revert to its post-crisis average over the medium term (see Figure 8). This means that Poland's investment-to-GDP ratio will gradually rise to about 21 percent of GDP by 2022. Such investment rate is not only below the RDS target and the estimated optimal investment benchmarks, but also well below the investment rates observed in the fast converging economies of the past. For example, South Korea had an investment rate of over 30 percent of GDP when it was at about the same income level as Poland is now.

Figure 8. Baseline Investment Path



Sources: IMF WEO and IMF staff calculations.
Note: GDP per capita (PPP) in Korea in 2000 was close to Poland in 2017.

11. Lifting investment rate requires tackling structural bottlenecks. Given that weak external environment and structural bottlenecks appear to be the main factors that hamper investment growth in Poland, policy efforts should focus on addressing domestic institutional and structural constraints:

- Improving labor supply and the quality of labor. Targeted measures supporting *vocational training* and *life-long learning*, the two areas where Poland is lagging compared to peers, can help raise the LFP and reduce skill mismatches. Furthermore, *migration policies* could help reduce shortages of skilled labor by aim at attracting highly-skilled immigrants and encouraging greater permanent immigration (see Chapter 1 for more details).

- Improving business climate**.** Creating a more business-friendly regulatory environment is critical for boosting investment, as also highlighted in the RDS. Towards this end, a total of 12 strategic projects (out of 175) on business regulatory reforms are planned under the RDS, with the key focus on supporting SMEs (7 projects) and innovation (3 projects). These seem to be the right

areas to focus on in view of subdued investment in the SME sector and relatively low investment in business R&D. However, frequent regulatory changes with uncertain reform timetable could also hurt investment, even in the case of pro-business initiatives as firms may delay investment until such changes materialize. Hence, it is important to clarify the implementation schedule of the planned regulatory reforms, and communicate it to the public.

- Upgrading infrastructure. The RDS stresses the importance of improving infrastructure investment and identifies a list of strategic projects in subsectors where gaps appear to be particularly large, namely the ICT, transport and energy.

  Given limited fiscal space, the focus over the *near-term* should be on improving efficiency of public investment, while relying primarily on funding from multilaterals/EU and co-financing from the private sector for the high-priority infrastructure projects. Specifically:

  -*Improving investment efficiency*. Notwithstanding a notable increase in the efficiency of public investment since the EU accession, a gap of 20 percent still exists relative to the efficiency frontier. Further improvements in project appraisal and management could yield large efficiency gains (see REI, Nov 2016 for details).

  -*Multilateral and private financing.* EU structural funds will continue to play an important role in infrastructure investment in Poland over the medium-term. As noted in the RDS, better coordination of the participation of the Polish entities in the EU funded programs and an integrated development investment system could facilitate a more effective use of the EU funds. On developing private funding sources, the RDP emphasizes the importance of Public-Private-Partnerships (PPPs) and proposes a list of measures aimed to create a better climate for public investment using the PPP mechanism. In this regard, international experience with PPPs suggests that ensuring accountability and transparency is critical to minimize fiscal risks, and that PPP-linked contingent liabilities should be properly reflected in budget documents.

  Over the *longer-term*, a successful medium-term fiscal consolidation strategy could create fiscal space for additional deficit financed public investment in infrastructure.

Box 1. Business Investment and Investment Finance in Poland—the EIBIS Survey

The EIB Group Survey on Investment and Investment Finance (EIBIS) is a unique, EU-wide, annual survey of 12,500 firms, 479 of which are operating in Poland. It collects data on firm characteristics and performance, past and future investment activities, sources of finance, financing and other challenges that businesses face using a stratified sampling methodology.

Four in five firms in Poland reported investing in the last financial year, which is slightly below the EU average (Figure 1). Companies operating in the manufacturing sector have been more likely to engage in investment, whereas firms in the construction sector have been investing less actively. Large firms have been more likely to invest than SMEs, and the gap between the two groups is larger in Poland than in the EU in general. Foreign firms have been more likely to invest than SOEs.

Investment intensity in Poland – measured as the value of investment per employee – is lower than the EU average (Figure 2). The size of the gap is only partially explained by the difference in GDP per capita: even after correcting for the differences in economic development, Polish firms still invest less. Investment intensity has been the highest in the infrastructure sector, followed by manufacturing.

Figure 1. Share of firms investing in the last financial year

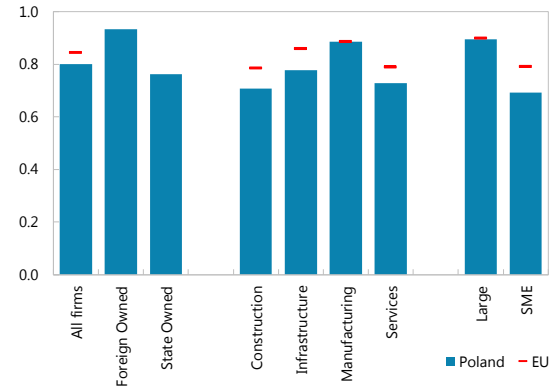
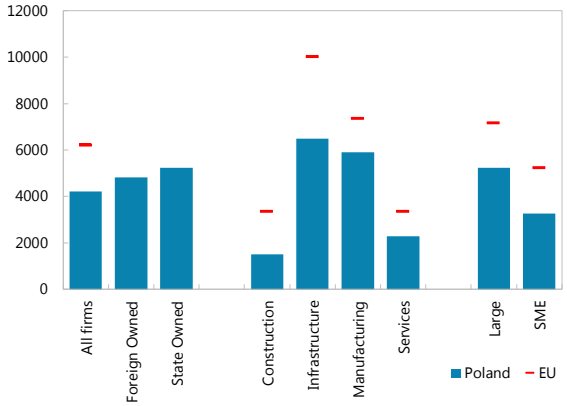


Figure 2. Investment intensity (median investment value per employee, in EUR)



Investment dynamics have been positive: on average, firms have invested more in 2016 than in the previous year (Figure 3). There is a large variation across sectors, however. Investment activity in manufacturing has been accelerating, whereas construction has been experiencing a slowdown. Foreign-owned firms have been much more likely to increase their investment than their domestically-owned counterparts.

Figure 3. Expected investment in current financial year compared to last one

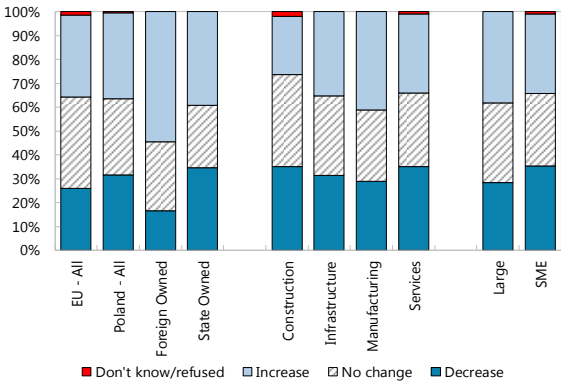
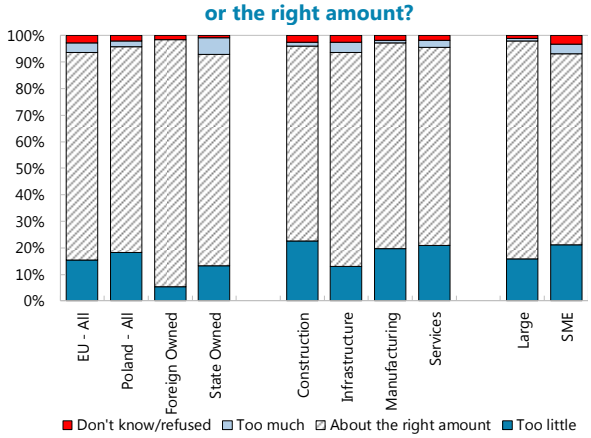


Figure 4. Perceived investment gap – looking back at investment over the last 3 years, was it too much, too little, or the right amount?



Box 1. Business Investment and Investment Finance in Poland—the EIBIS Survey (continued)

About 18 per cent of Polish companies report that they have invested too little in retrospect, which is somewhat above the EU average (Figure 4). This result is consistent across sectors. Almost none of the firms believe that they invested too much. Companies that underinvested report a lower share of state-of-the-art machinery and energy-efficient commercial buildings relative to those companies that made sufficient investment in the past (Figure 5). Suboptimal investment in the past is therefore reflected in the lower quality of the capital stock.

When it comes to investment finance, about two-thirds of funding comes from internal sources (Figure 6). The construction sector is particularly reliant on internal capital accumulation. Also, SMEs are more likely to use mostly internal finance compared to larger corporates.

Figure 5. The impact of investment gap on capital quality, measured as a self-reported percentage of state-of-the-art machinery and energy efficient building stock

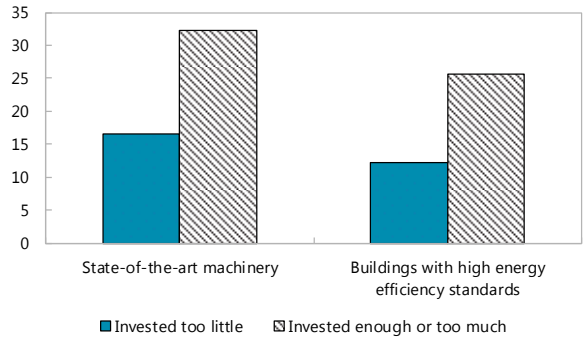
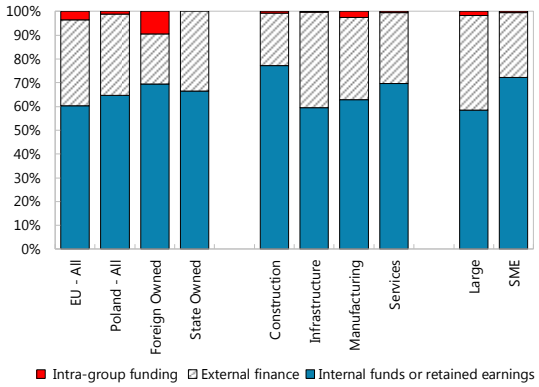


Figure 6. Source of investment finance



Looking at the structure of external finance, products intermediated by banks—such as loans and overdrafts—are most popular (Figure 7). Leasing is also a popular form of financing, as in the rest of the EU. Grants are also an important source of external funding in Poland. This reflects the availability of EU Structural Funds for investment projects in the private sector, particularly for infrastructure development and for SMEs. Overdrafts play a particularly important role in financing investment in construction industry. Capital market based financing – bonds and equity – play a negligible role, not unlike in the rest of the EU.

The proportion of firms experiencing financing constraints is somewhat lower in Poland than the EU average (Figure 8). SMEs are much more likely to face such constraints than large firms. Also, SMEs are typically facing financing constraints in the form of rejected loan applications, whereas larger firms typically face milder forms of financial barriers, such as receiving less credit than they asked for. SOEs are more external finance constrained than foreign firms. A proportionally higher share of construction companies report the available financing to be too expensive.

Figure 7. Type of external finance used for investment

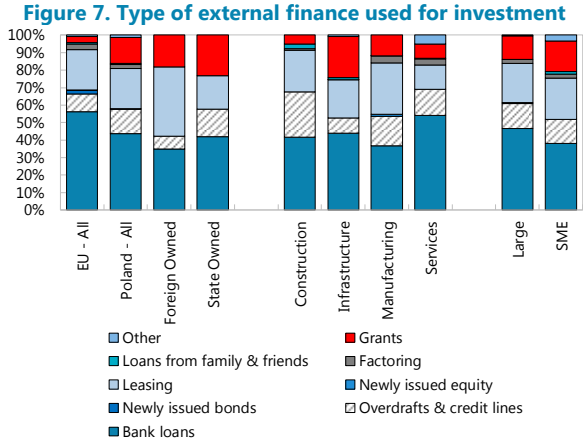
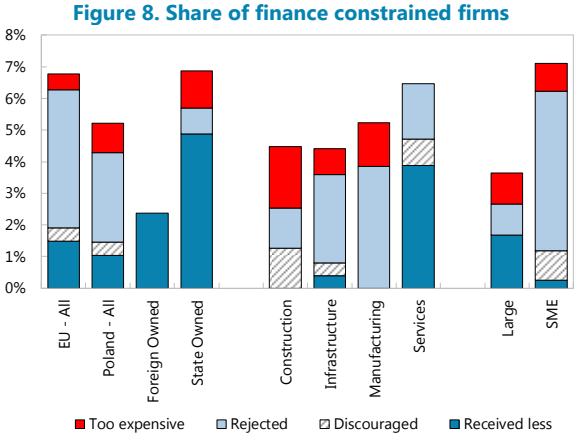


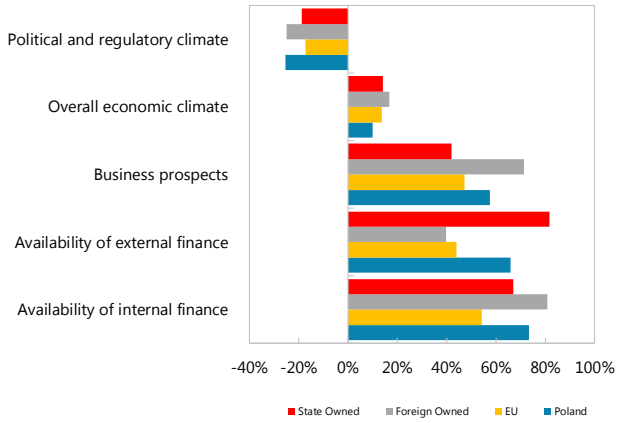
Figure 8. Share of finance constrained firms



Box 1. Business Investment and Investment Finance in Poland—the EIBIS Survey (concluded)

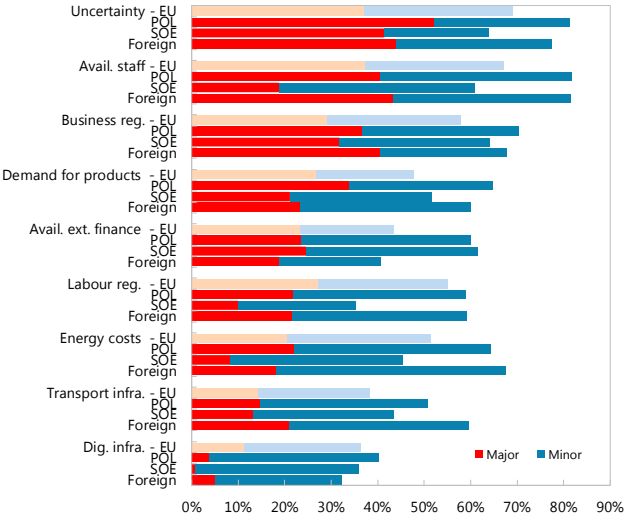
As in rest of the EU, companies in Poland cite political and regulatory climate as one of the key reasons for delaying investment (Figure 9). Availability of external or internal finance is cited as a positive, rather than a negative factor in net percentage terms. In this respect, Polish firms have a more positive view than the average EU company. Nevertheless, firms that report their investment in the past three years to remain below their needs are also more likely to assert that the availability of internal finance affects their ability to carry out planned investment negatively.

Figure 9. Short-term influences on investment



***Uncertainty, business regulation* and *availability of staff with the right skills* are the main structural barriers to investment for Polish firms over the longer-term (Figure 10).** Polish firms are also more likely to consider demand for products and services and infrastructure gaps in transportation and energy sectors as major barriers to investment than their EU peers. In contrast to other EU firms, labor regulations and digital infrastructure are not viewed as significant investment constraints by Polish firms. For those who have invested too little, however, the availability of external finance is also an important barrier. In general, foreign firms operating in Poland find themselves to be relatively more constrained than SOEs, in terms of the availability of skilled staff, business and labor regulations, while SOEs seem to be relatively more constrained in terms of external finance.

Figure 10. Long term barriers to investment



Source: EIBIS Survey.
Prepared by Aron Gereben and Philipp-Bastian Brutscher (both EIB).

Appendix I. Empirical Estimation of Investment Norm

The "predicted norm" is estimated using a panel fixed-effects regression model for 28 EU countries (the actual sample size varies depending on data availability of different controlling variables) over the past three decades. The estimates shown in Figure 4 are based on the specification that includes both country and year fixed effects, as well as countries' economic fundamentals, structural characteristics and external conditions that have been identified in the literature as significant determinants of investment (see column (10) in the table below).

The regression results are robust and broadly in line with expectations. In the simple fixed-effects specification, the country fixed effects capture all the unobservable (time-invariant) factors, including structural characteristics. However, based on the literature, surveys and stylized facts, there are some structural factors that seem to play an important role in explaining private investment activity in Poland and other EU countries. Hence, several regression specifications (see below) explicitly control for some of these factors (e.g. regulatory efficiency, trade and financial openness). The random-effects model specification is estimated as well as a robustness test (column (11)).

Table 1. Investment Norm Regressions[1]

	Economic fundamentals					Fundamentals + Structural			Fundamentals + Structural + External		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
VARIABLES	Inv/GDP	Inv/GDP	Inv/GDP	Inv/GDP	Inv/GDP	Inv/GDP	Inv/GDP	Inv/GDP	Inv/GDP	Inv/GDP	Inv/GDP
Real GDP per capita	1.862***	-0.426	-0.439	-5.714***	-6.406***	-6.243***	-7.400***	-7.288***	-7.202***	-7.159***	-2.242***
	(0.383)	(0.560)	(0.575)	(0.847)	(0.804)	(1.170)	(1.225)	(1.317)	(1.314)	(1.329)	(0.557)
Real domestic demand growth	0.343***	0.413***	0.404***	0.384***	0.328***	0.329***	0.313***	0.314***	0.299***	0.299***	0.324***
	(0.0267)	(0.0307)	(0.0308)	(0.0376)	(0.0358)	(0.0467)	(0.0483)	(0.0485)	(0.0491)	(0.0492)	(0.0523)
Growth in private credit/GDP		0.0282*	0.0277*	0.0485***	0.0502***	0.0564***	0.0488**	0.0486**	0.0516***	0.0514***	0.0475**
		(0.0156)	(0.0156)	(0.0141)	(0.0144)	(0.0190)	(0.0196)	(0.0197)	(0.0197)	(0.0198)	(0.0207)
Growth uncertainty 2/			-0.195**	-0.186*	-0.172*	-0.106	-0.0792	-0.0786	-0.0708	-0.0703	0.0303
			(0.0950)	(0.108)	(0.102)	(0.105)	(0.107)	(0.107)	(0.107)	(0.107)	(0.112)
Real interest rate				-0.421***	-0.287***	-0.410***	-0.424***	-0.423***	-0.405***	-0.408***	-0.522***
				(0.0497)	(0.0495)	(0.0786)	(0.0790)	(0.0793)	(0.0798)	(0.0808)	(0.0823)
Public debt/GDP					-0.0638***	-0.0718***	-0.0764***	-0.0760***	-0.0759***	-0.0757***	-0.0554***
					(0.00716)	(0.00945)	(0.00970)	(0.00986)	(0.00983)	(0.00992)	(0.00853)
Regulation efficiency						0.715**	0.635*	0.647*	0.671**	0.686**	0.296
						(0.321)	(0.329)	(0.333)	(0.332)	(0.339)	(0.317)
Financial openness							2.864***	2.865***	2.758***	2.811***	3.090***
							(0.972)	(0.973)	(0.973)	(1.001)	(1.001)
Trade tariff								0.0192	0.00905	0.0122	0.148*
								(0.0818)	(0.0818)	(0.0830)	(0.0845)
External demand growth									0.248*	0.248*	0.210
									(0.149)	(0.150)	(0.162)
Commodity TOT										0.0370	0.308*
										(0.158)	(0.163)
Constant	13.57***	29.28***	29.84***	72.82***	79.29***	74.48***	82.65***	81.37***	79.79***	75.53***	9.413
	(2.960)	(4.188)	(4.312)	(6.526)	(6.201)	(9.192)	(9.516)	(10.98)	(10.99)	(21.28)	(17.97)
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	989	863	837	663	652	344	332	332	332	332	332
R-squared	0.503	0.487	0.487	0.616	0.667	0.759	0.770	0.770	0.772	0.772	0.635
Number of countries	28	28	28	23	23	23	22	22	22	22	22

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
1/ Dependent variable is investment/GDP, independent variables use their lagged values.
2/ Uncertainty is calculated as the standard deviation of real GDP growth by 3 year rolling window.

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TOTAL FACTOR PRODUCTIVITY GROWTH SLOWDOWN[1]

After the global financial crisis, Poland's total factor productivity (TFP) growth has decelerated significantly, falling to less than a half of what it was before the crisis. A combination of external headwinds (weak external demand and FDI) and domestic structural bottlenecks have slowed technology diffusion and exacerbated the drag from allocative inefficiencies in the Polish economy. Given the medium-term global outlook, the TFP growth in Poland will likely remain well below its pre-crisis level in the absence of structural reforms.

A. Recent Trends and Challenges

1. The TFP growth slowdown has been a global phenomenon, especially after the global financial crisis (GFC). A marked and persistent TFP growth slowdown (or even TFP loss in some cases) has contributed to the post-GFC recessions across *all* income groups. Its negative contribution to growth has been particularly large in emerging markets (EMs) (Adler et al. (2017)).

2. Poland experienced a deceleration in TFP growth as well (Figure 1). Over the last decade or so, Poland enjoyed a higher average TFP than many other EMs. However, its TFP growth has slowed significantly following the GFC, from an annual average of 2.4 percent over 2003–07 to barely 1 percent over 2013–16, although there was a temporary recovery during 2010–12. While the extent of slowdown is broadly in line with that observed in other EMs, it represents a larger drop compared to the EU average.

3. Since the early 2000s, Poland's TFP growth has been on a steeper declining path than in advanced Europe (Figure 1). Poland's trend (i.e., HP filtered) TFP growth has declined from above 2 percent in the early 2000s to about zero in 2015, while the EU average trend TFP growth has largely returned to its pre-crisis rate. Hence, the positive TFP growth differential that Poland managed to maintain against the EU average and advanced Europe (EU-15[2]) over the past decade and a half has disappeared. This suggests that the TFP growth slowdown in Poland is not just a natural consequence of income convergence (in which case, the decline would have been smaller than the EU or advanced Europe average), but likely an outcome from a combination of domestic (structural) and external factors.

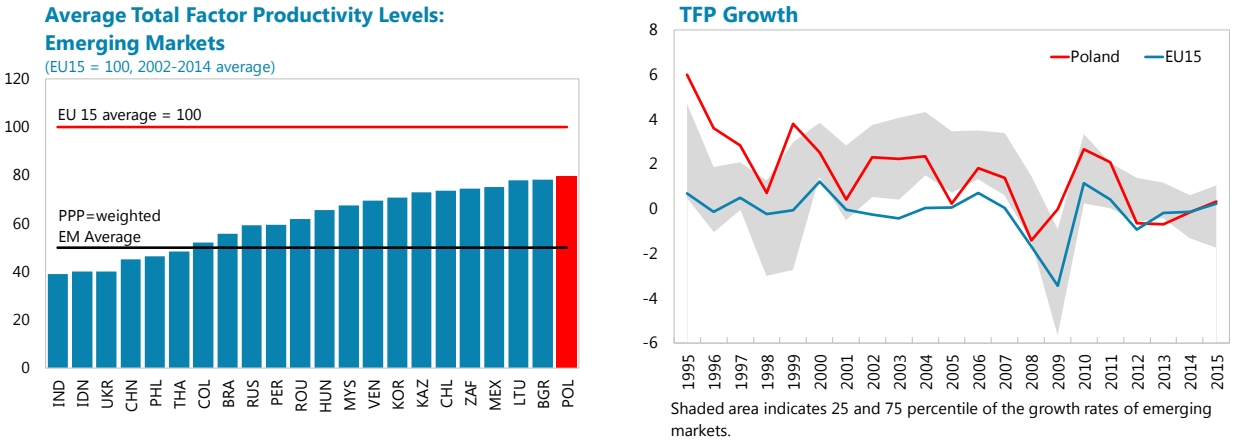
4. The global TFP growth slowdown began before the GFC, but was compounded by crisis legacies, resulting in a persistent and prolonged global slump in productivity growth. Several long-term structural forces are viewed as the key drivers of this slowdown before the GFC: (i) a slowing pace of innovation at the global technological frontier and reduced productivity spillovers

[1] Prepared by Ran Bi, Ezgi Ozturk and Yevgeniya Korniyenko.

[2] The EU-15 comprised the following 15 advanced European countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

to the rest of the world;[3] (ii) population aging across the globe, adversely affecting productivity; and (iii) fading structural reform efforts during the 2000s, especially in accumulating human capital (e.g., via education reforms) in many emerging markets and developing countries. After the onset of the GFC, the TFP growth slowdown has been exacerbated by several factors: (i) policy uncertainties and tight credit conditions during the GFC, combined with pre-GFC corporate balance-sheet vulnerabilities, have hampered firms' access to credit and led to less investment in intangible and physical assets; (ii) resource misallocations within and/or across sectors, which started before the crisis, may have worsened during the GFC; and (iii) global trade slowdown following the GFC may have limited further integration into the global value chains (GVCs) and cross-country technology diffusion.

Figure 1. Poland's Long Term TFP Developments



Sources: Penn World Table 9.0, Conference Board, and IMF staff calculations.

5. This chapter explores the factors behind Poland's productivity growth slowdown and their likely impact on the future TFP growth. The analysis starts by identifying which sectors and types of firms are the main contributors to Poland's TFP growth slowdown. It then separates the role of *allocative efficiency* (i.e., how efficiently resources are allocated across sectors) and *technical efficiency* (i.e., how advanced the technology is within a sector) in contributing to the aggregate productivity growth slowdown. In this context, the chapter also examines the role of external conditions, mainly the GVC participation and external financial conditions, as well as the role of domestic bottlenecks that could affect aggregate TFP growth. Finally, the findings are used to inform the baseline projections of TFP growth over the medium term.

[3] The evidence of a global technological frontier slowdown is somewhat mixed, depending on how the frontier is defined. IMF (2016b) finds that the global frontier (defined using the country-level data) has stopped expanding after the GFC, while OECD (2015) finds that the global frontier (defined not at the country level, but as the top 10 productive firms globally in each industry) has returned to its pre-crisis trajectory but the diffusion to the rest of the firms has slowed significantly. In any case, there seems to be evidence that technology spillovers from advanced economies are likely to slow down.

B. Understanding Poland's Productivity Slowdown

6. This section uses firm-level and sector-level data to examine TFP growth from a micro perspective. Publicly available data on Polish firm- and sector-level TFP are limited. Our firm-level TFP analysis is largely based on the ORBIS and BACH databases, which cover only 3–4 percent of the total number of firms, accounting for around 50 percent of employment in Poland (see the Appendix for details). Therefore, the results should be interpreted with caution. Some robustness checks are presented in the Appendix.

7. Since the early 2000s, the TFP *level* has been declining in agriculture and other industries (excl. manufacturing), but has been largely flat in manufacturing and market services (Figure 2).[4] Agriculture and other industries (excl. manufacturing) account for a relatively small share of the total value-added in Poland, so their declining TFP levels have had a limited impact on the economy-wide productivity.[5] In contrast, manufacturing and market services are relatively large both in terms of value-added and employment, and hence, the sluggish TFP growth in those sectors could be a significant drag on the aggregate TFP growth. Other sectors, including basic services, construction, and trade, have seen moderate TFP growth. The sectoral patterns in TFP are broadly similar to those in labor productivity.

8. Small and medium-size enterprises (SMEs) have experienced sharper declines in TFP during and after the GFC than large firms (Figure 3). Based on the available firm-level data, SMEs in Poland appear to be more productive, on average, than larger firms. This may be an evidence of allocative inefficiencies, as more productive firms should be able to expand and increase their share in total employment. During the post-GFC period, however, large firms appear to have been more successful in maintaining their productivity and continuing capital deepening (which is evident in an increase in labor productivity), while SMEs experienced sizeable and persistent TFP losses.

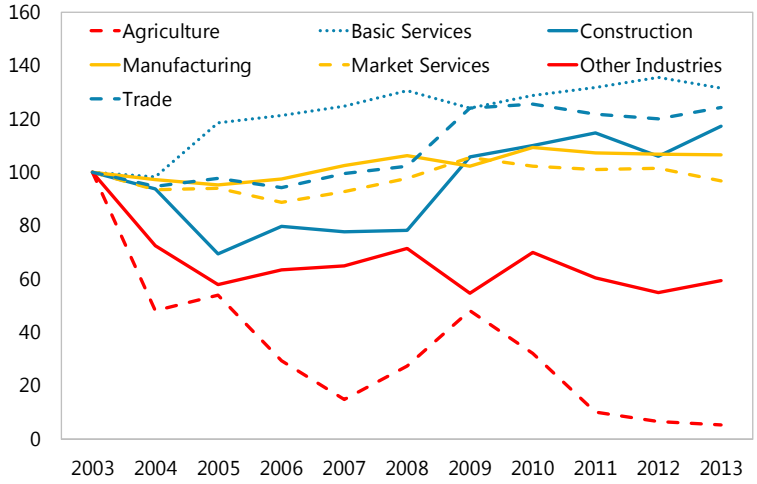
9. More leveraged firms had better TFP performance before the GFC, but performed worse than less leveraged firms after the GFC (Figure 4). In all size groups, the median firms with higher leverage ratios had higher TFP *before* the crisis. After the crisis, however, those with higher leverage ratios tended to have lower TFP. Moreover, the TFP gap between high- and low-leverage firms has been widening during the post-crisis period. A possible explanation is that highly leveraged firms faced tighter financing constraints during and after the GFC. Therefore, they had to cut investment more than their less-leveraged peers, which has constrained TFP growth in high-leverage firms.

[4] Our sectoral classification follows NACE Rev 2, but for presentational purposes, we group narrow sectors into broader categories in the sectoral charts (see Appendix). Our "manufacturing" remains the same as in NACE Rev 2, and "other industries" covers mining and quarrying, electricity, gas, steam and air conditioning supply, and water supply, sewerage, waste management and remediation. Thus, the classification of manufacturing is comparable with Albinowski et. al (2015).

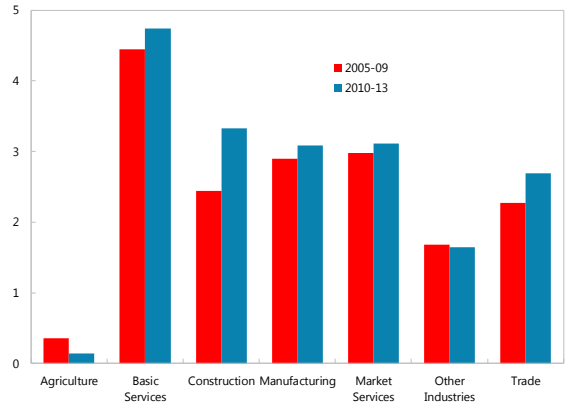
[5] A comparison of the shares of different sectors in the total valued added and in total employment of sample firms (drawn from the ORBIS database) with the corresponding shares based on the Eurostat sectoral data (Figure 2) shows that our sample represents the true population reasonably well. Agriculture is the most underrepresented sector, likely because the ORBIS database is missing many small and micro firms.

Figure 2. Poland: TFP Trends by Sector

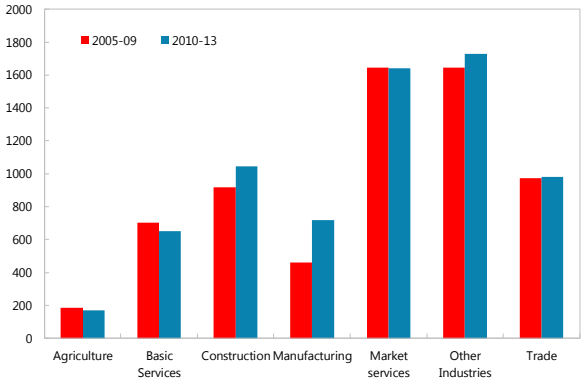
Total Factor Productivity by Sector
(Index, total factor productivity, 2003=100)



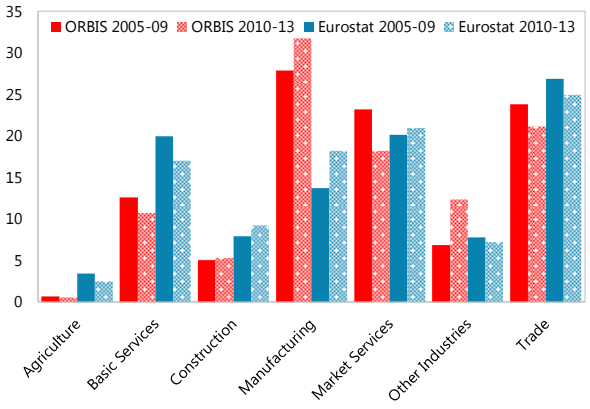
Total Factor Productivity by Sector
(Log total factor productivity)



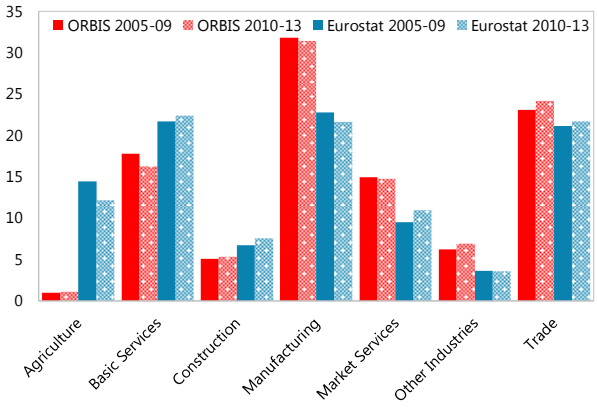
Labor Productivity by Sector
(Real value added per employee, th. 2010 PLN)



Value Added by Sector
(Share of total value added)



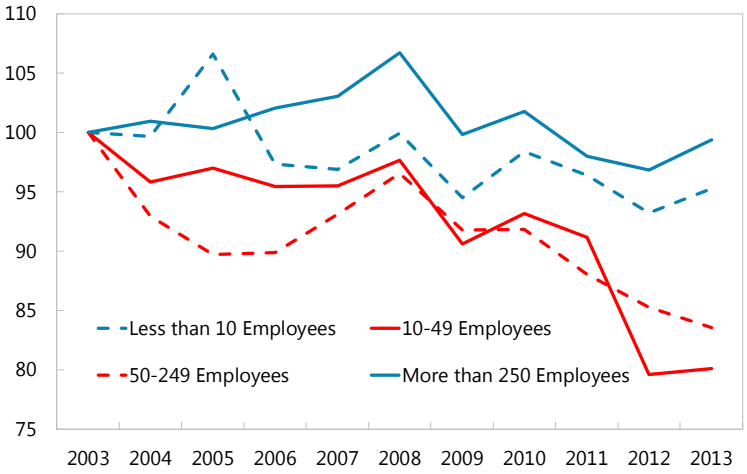
Employment by Sector
(Share of total employment)



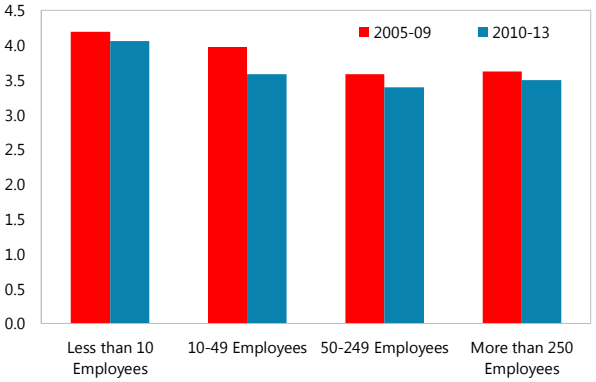
Sources: Eurostat, ORBIS, and IMF staff calculations.

Figure 3. Poland: TFP Trends by Firm Size

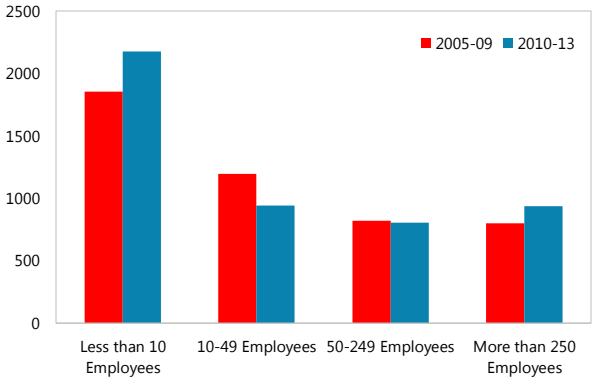
Total Factor Productivity by Firm Size
(Total factor productivity index, 2003=100)



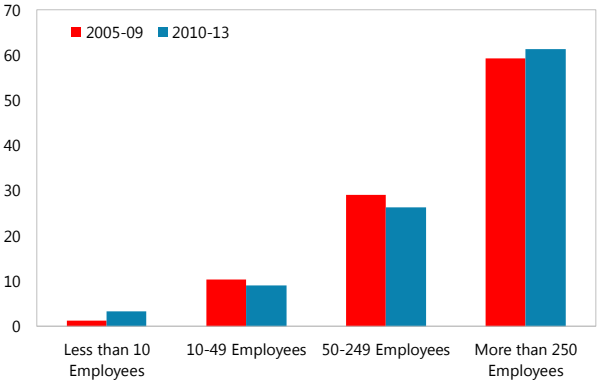
Total Factor Productivity by Firm Size
(Log total factor productivity)



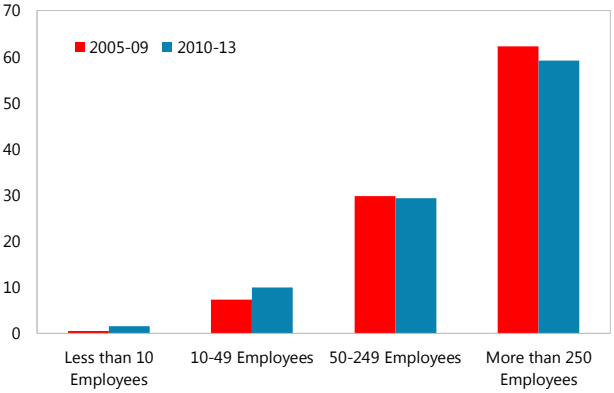
Labor Productivity by Firm Size
(Real value added per employee, th. 2010 PLN)



Value Added by Firm Size
(Share of total value added of sample firms)

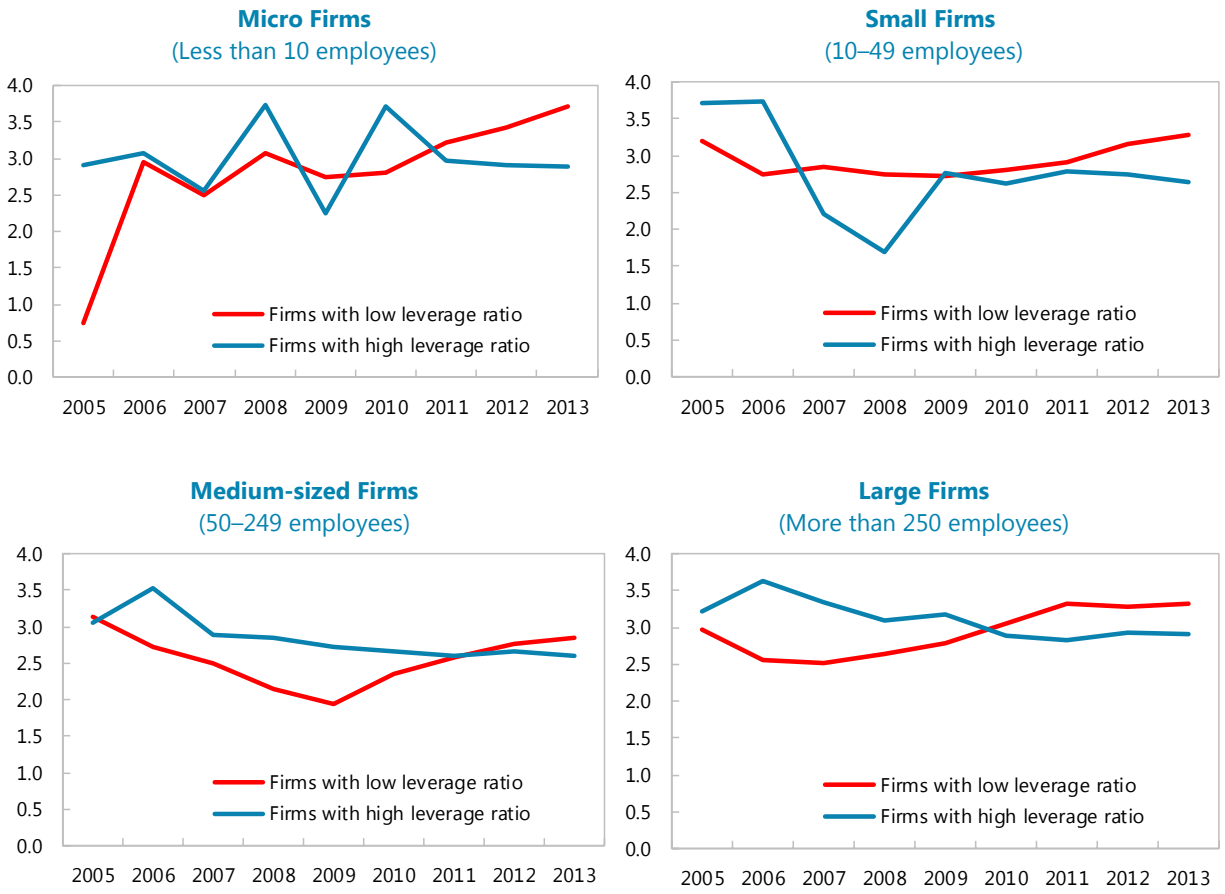


Employment by Firm Size
(Share of total employment of sample firms)



Sources: ORBIS and IMF staff calculations.

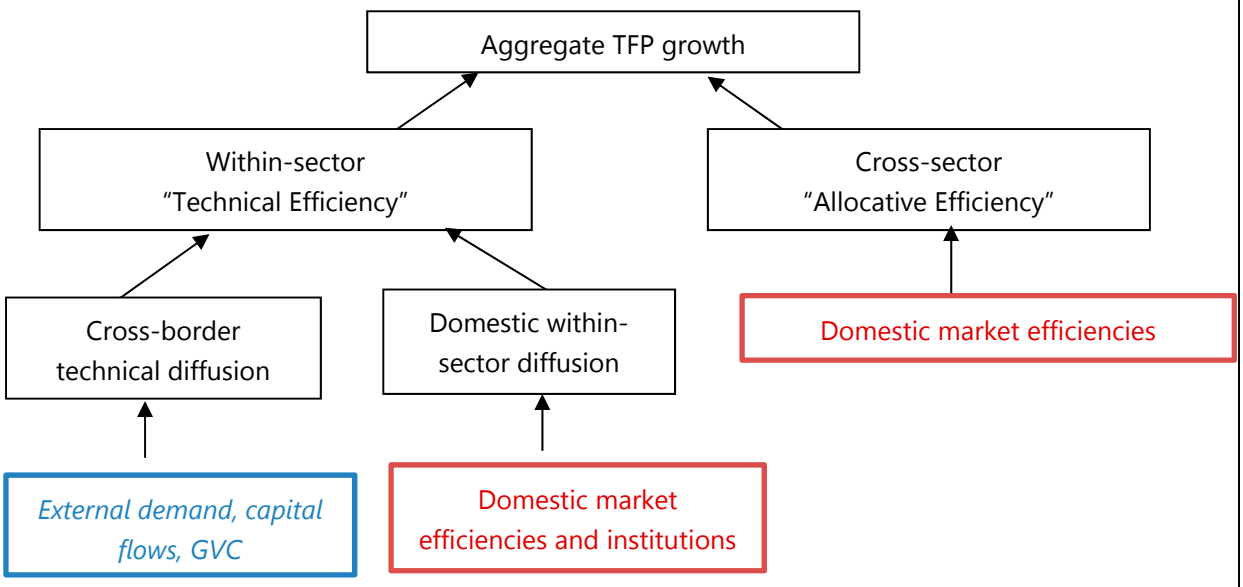
Figure 4. Poland: TFP Trends by Leverage Ratio and Firm Size 1/
(Log total factor productivity; median firms in each group)



Sources: ORBIS and IMF staff calculations.
1/ Leverage ratio is the ratio of long-term debt and short-term liabilities on total assets. In each firm-size group, firms that have leverage ratio ranked in the first quartile are classified as firms with low leverage ratio and firms that have leverage ratio ranked in the fourth quartile are classified as firms with high leverage ratio.

10. In what follows, we use the OECD framework to disentangle different factors that could be behind the TFP growth slowdown. Figure 5 presents a simplified version of the conceptual framework in OECD (2015) "The Future of Productivity", which separates the roles of allocative efficiency *vs.* technical efficiency, and of external conditions vs. domestic factors.

Figure 5. A Conceptual Framework to Assess Productivity Gaps



Source: OECD (2015).

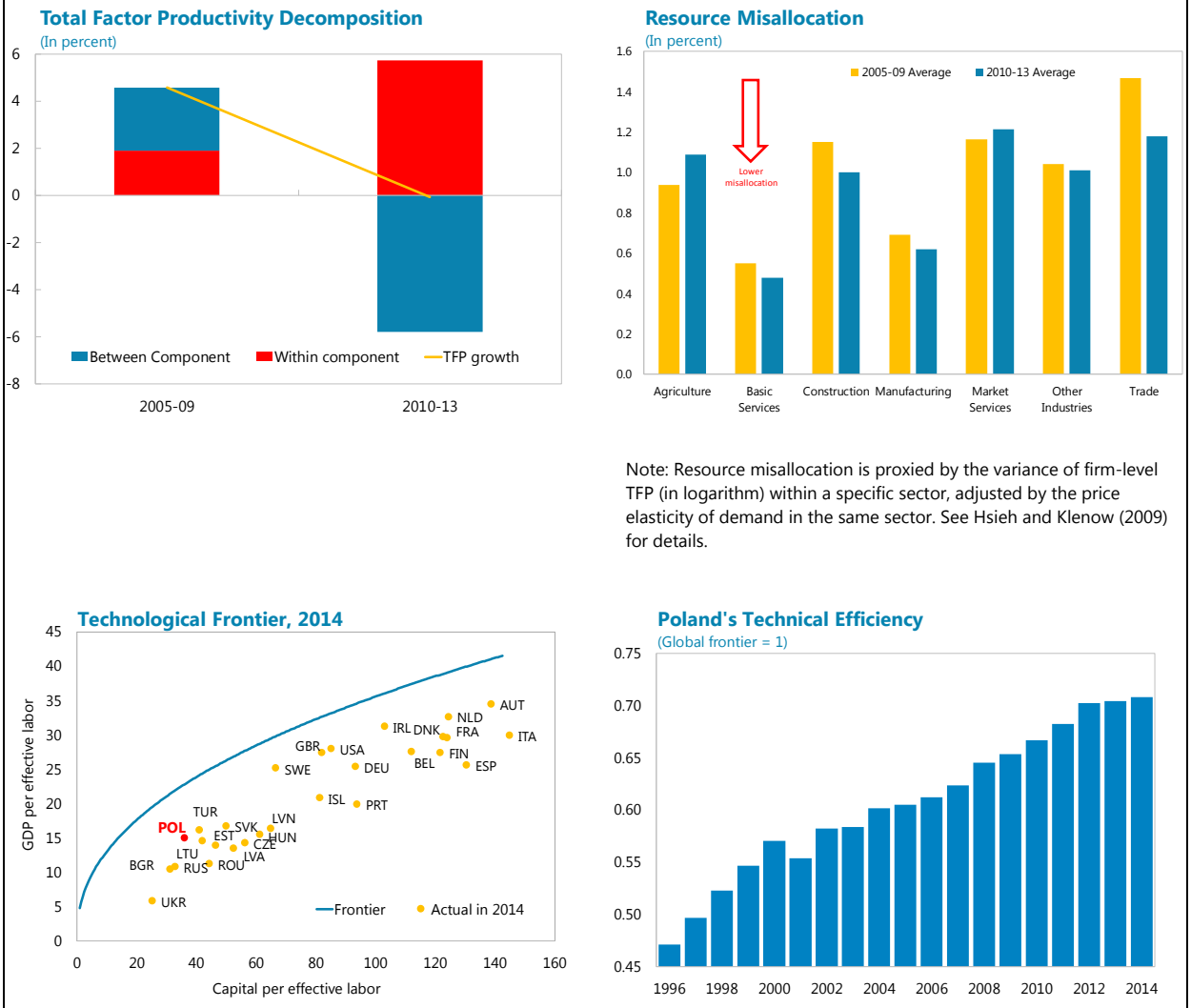
11. A decomposition of Poland's aggregate TFP growth suggests that *allocative inefficiencies* across sectors may have been the main drag after the crisis (Figure 6). The decomposition of the TFP growth, based on the McMillan and Rodrik (2011) approach using the sector-level data,[6] points to continued improvement in the "within" component, which measures within-sector technical efficiency, but a sharp deterioration in the "between" component (measuring the allocative efficiency across sectors) after the crisis. Before the GFC, both technical and allocative efficiencies had similar positive contributions to the total TFP growth, but after the GFC, the contribution of allocative efficiency became negative, almost completely offsetting the positive contribution from technical efficiency. Rising allocative inefficiencies across sectors may reflect several factors, including labor hoarding (perhaps, related to limited labor mobility across sectors) as well as the tendency to invest in low-risk-and-low-return (and hence, less productive) sectors in the environment of high macroeconomic and policy uncertainty.

12. Improvement in *technical efficiency* continued after the GFC, but at a slower pace (Figure 6). Following Hsieh and Klenow (2009), resource misallocation within each sector can be measured as gaps in the marginal products of labor and capital across firms within the same sector. In Poland, this type of resource misallocation has diminished following the GFC in most sectors, except in agriculture and market services. Continued improvements in resource allocation across firms *within* the same sector seem to have played an important role in raising aggregate technical efficiency over time, as evidenced by Poland's steady progress toward the global technological

[6] Ebeke et al. (2015) examines labor productivity across European countries using a similar decomposition approach.

frontier in the last two decades.[7, 8] More recently, however, the improvement in technical efficiency has slowed.

Figure 6. Poland's TFP Decomposition: Allocative Efficiency *vs.* Technical Efficiency



Note: Resource misallocation is proxied by the variance of firm-level TFP (in logarithm) within a specific sector, adjusted by the price elasticity of demand in the same sector. See Hsieh and Klenow (2009) for details.

Sources: ORBIS, Regional Economic Issues, Central, Eastern, and Southeastern Europe (May 2016), and IMF staff calculations.

[7]Given the limitations in sectoral data, the stochastic frontier analysis cannot be done at the sectoral level for Poland.

[8]This draws on the stochastic frontier analysis based on country-level data in IMF (2016b). The global frontier represents the maximum amount of output that can be obtained from given inputs. Then, relative technical inefficiency of a country is measured by its distance from the frontier.

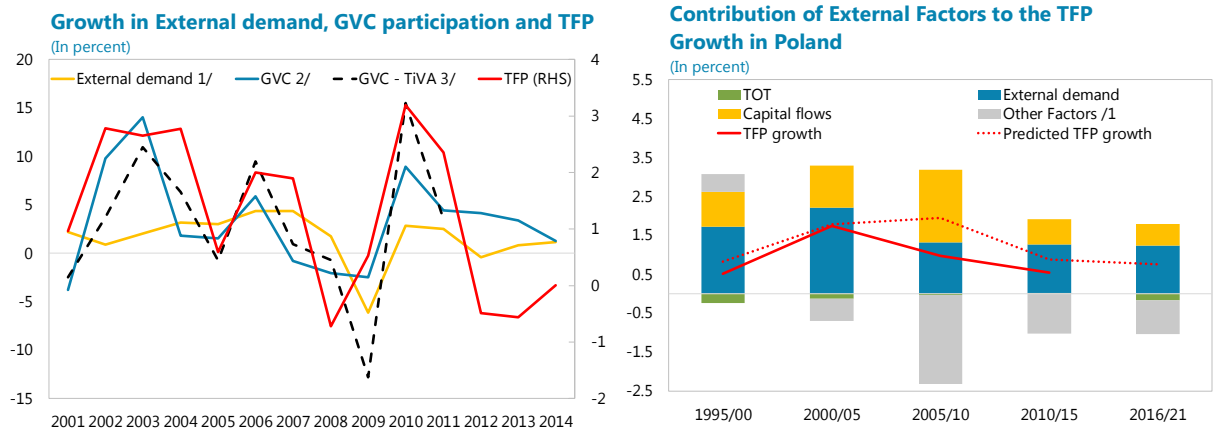
C. The Role of External Conditions

13. External conditions can affect *technical efficiency* in Poland through trade and FDI channels. This section examines how Poland's participation in the GVC and capital inflows have influenced its TFP growth. The goal is to use this analysis to inform our baseline TFP projections under the WEO forecasts of the global environment over the medium term.

14. Historically, Poland's TFP growth has been strongly correlated with its GVC participation, which in turn, is influenced by external demand (Figure 7, chart 1). During 1995-2011, Poland has rapidly integrated into the German supply chain, notably in manufacturing and services. The Polish exports of computers and electronics, machinery and equipment, and motor vehicles have foreign value added of more than 40 percent. After the GFC, the growth rate of Poland's GVC participation declined amid the global trade slowdown, which coincided with a significant TFP growth slowdown.

15. Staff's estimates suggest that both external demand and capital flows may provide some support to Poland's TFP growth going forward. Following the April 2017 WEO approach, country-specific external factors are constructed and a cross-country panel regression (covering 86 advanced and emerging market economies) is used to estimate the contributions of external factors to the TFP growth in Poland (Figure 7, chart 2). External demand (as a proxy for the GVC participation) and capital flows had the largest contributions to TFP growth in Poland in the past. Going forward, with the projected recovery in the EU and continued accommodative global financial conditions as advanced economies normalize their monetary policies only gradually, the external environment will provide some support to Poland's TFP growth over the medium term, but such support will be limited.

Figure 7. Poland: External Conditions and TFP Growth



1/ Defined as a share of intermediate goods produced by Poland as inputs into production of other countries.
2/ Defined as foreign value-added in Polish exports.
3/ Include constant, time trend, fixed effects and model errors.
Sources: Penn World Table 9.0, OECD TiVA database, World Economic Outlook (April 2017), and IMF staff calculation.

D. The Role of Domestic Factors

16. Domestic structural and institutional characteristics affect the technology diffusion and hence the TFP growth as well. The literature has identified a range of structural and institutional characteristics that could affect allocative and technical efficiencies:[9]

- *Factors affecting both allocative and technical efficiencies*: structure of the economy (i.e., relative shares of agriculture, manufacturing and service sector), flexibility of the labor market, government efficiency, and restrictiveness of regulation.
- *Factors affecting allocative efficiency*: affordability of financial services, and business climate.
- *Factors affecting technical efficiency*: quality of institutions (e.g., judicial independence, impartial courts, and protection of property rights) and infrastructure gaps. Evidence on the role of research and development (R&D) spending is more mixed—it seems that what matters is not only the level of spending but also the nature of spending. For example, for emerging and developing countries, complementary R&D spending to facilitate the adoption of global advanced technologies by domestic firms appears to be most effective.

17. Poland has made much progress on structural and institutional reforms over the past 25 years, but gaps remain:

- Based on a wide range of indicators from the World Bank (WB), OECD and World Economic Forum (WEF), the areas where Poland is lagging the most compared to its peers (OECD countries) include *infrastructure*, *business regulation, labor market efficiency,* and *R&D/innovation*. The Poland specific studies by international institutions further identify shortcomings in *human capital development* and *institutions/government efficiency*. A still relatively high share of agriculture and relatively low share of services (compared to peers) suggest that there may be scope to re-allocate resources towards higher-productivity sectors.[10]
- But there are also areas where Poland scores well relative to peers: it has market-friendly institutions; low barriers to trade and investment; less regulatory complexity and less regulatory protection of incumbents; as well as relatively high quality of human capital. These strengths should be preserved and better leveraged.

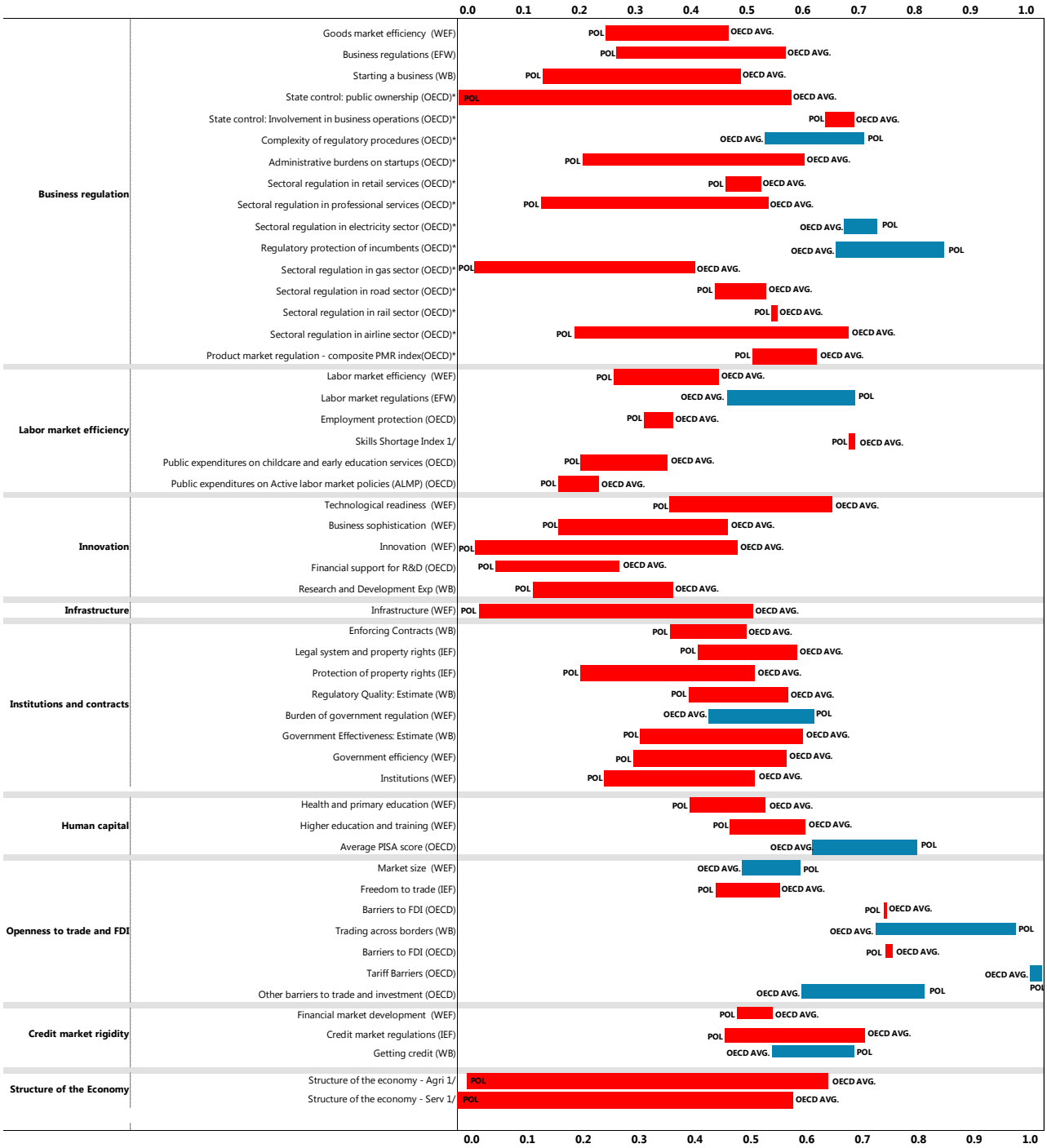
Chapter 4 provides an in-depth analysis of the key structural bottlenecks and quantifies the impact of reforms in these areas on long-term potential growth.

[9] This is a comprehensive list of factors based on the literature. However, not all factors included here are found to be statistically significant in all studies, possibly due to sample and measurement issues.

[10] See the Article 2015 Selected Issues Paper on structural transformation.

Figure 8. Poland: Structural Reform Gaps

The table below shows Poland's position vis-à-vis OECD countries on a number of structural indicators. All indicators are normalized to take values between 0 (min) and 1 (max), with higher values indicating better outcomes. The blue bars correspond to indicators where Poland exceeds the OECD average, while red bars correspond to indicators where Poland falls below the OECD average.



Sources: OECD, World Bank, WEF, IEF, EFW, and IMF staff calculations.

E. Baseline TFP Growth in the Medium Term

18. This section provides the baseline projections of Poland's TFP growth in the medium term. Under the baseline, the key boost to the TFP growth will come from continued improvement in technical efficiency, supported by the projected improvement in the external environment. Meanwhile, the allocative inefficiencies would remain a drag in the absence of further structural reforms. Domestic demographics and projected investment path would also affect TFP growth.

19. Under the baseline, Poland's TFP growth will recover moderately in the near term but will remain flat at around 1 percent over the medium term (Figure 9). Key considerations are:

- *External demand* from Poland's key export destinations is expected to recover moderately in the near term, but the recovery will be more gradual over the medium term (based on the latest WEO projections). Therefore, external demand is projected to boost TFP growth only moderately. If Poland's manufacturing sector manages to increase its GVC participation by more than suggested by the external demand recovery (e.g., if manufacturing sector's TFP growth could return to its peak TFP growth before the crisis), then the medium-term TFP growth could be closer to 1½ percent, but this would likely require additional reform efforts and more FDI.

- *Investment* is expected to increase only gradually, especially private investment (see Chapter 2). Therefore, the boost to TFP growth from investment is also projected to be limited.[11]

- *Aging work force* is expected to have a substantial negative impact on TFP after 2030. Several recent studies find statistically significant impact of an aging work force on TFP growth (Aiyar et al. (2016) and Adler et al. (2017)). Poland's demographics has already been worsening and the share of senior workers (age 55 and above) in the total work force is expected to rise significantly since 2030. While the negative impact from an aging work force will not affect the TFP growth in the medium term, it may be substantial beyond 2030.[12]

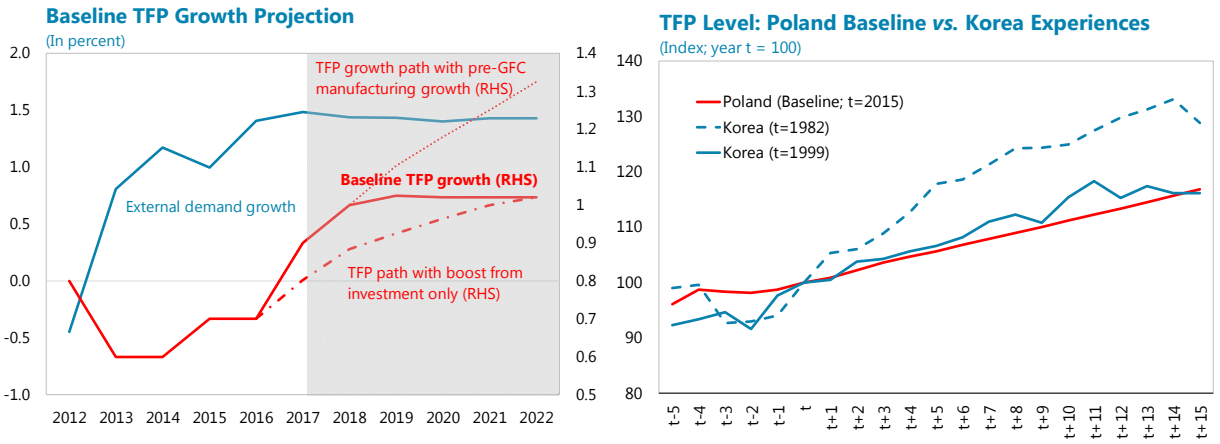
20. The baseline TFP projections are in line with past experiences, but a much higher TFP growth would be needed to achieve income convergence with the EU average by 2030. Figure 9 provides a comparison with the experience of Korea, which managed to sustain a rapid pace of income convergence to advanced economies for over 3 decades. The baseline TFP projections for Poland are in line with Korea's experience when Korea had a similar level of income per capita (1999) as in Poland (2015). However, the baseline TFP growth falls short of Korea's TFP performance during its fastest income convergence episode (starting from around 1982) when Korea's income per capita

[11] Adler et al. (2017) finds that a 1 percentage point increase in the investment-to-capital stock ratio could boost annual TFP growth by 0.506 percentage points.

[12] According to Eurostat projections, a five-year cumulative increase in the share of senior workers is expected to be 2 percentage points or more beyond 2030, which could translate into a five-year cumulative decrease in TFP growth by 1.5 percentage points or more based on Adler et al. (2017).

was much lower than Poland's currently. Even if Poland could achieve Korea's TFP growth of the 1980s and 1990s, its income convergence to the EU average would occur sometime beyond 2030.[13]

Figure 9. Poland: Baseline TFP Growth Projections



Sources: WEO and IMF staff calculations.

F. Concluding Remarks

21. Reinvigorating TFP growth in Poland requires closing structural gaps and better leveraging comparative strengths. Poland's long-term average TFP level is relatively high compared to its EM peers. Its recent TFP growth slowdown after the GFC also appears to be in line with the experiences in many EMs. However, a protracted TFP growth slowdown would hinder Poland's continued income convergence toward the EU living standards. With the existing domestic structural bottlenecks and the expected limited support from the external environment, Poland's TFP growth will likely remain lower than its pre-crisis level over the medium term. Boosting TFP growth requires addressing structural bottlenecks, most notably in *infrastructure*, *business regulation, labor market efficiency,* and *R&D/innovation*. At the same time, Poland also has some comparative strengths, including market-friendly institutions, low barriers to trade and investment, less regulatory complexity and less regulatory protection of incumbents than its peers and a relatively high quality of human capital. Preserving these strengths by maintaining strong policies is critical for sustained strong growth. Chapter 4 discusses possible reform scenarios and the quantification of their impact on potential growth.

[13] Using the baseline assumptions on the evolution of the working-age population and public investment, the TFP growth required to achieve convergence with the EU average per capita income by 2030 should be closer to 4 percent per year. These estimates are based on the simulations using the IMF's Flexible System of Global Models (FSGM), where private investment responds endogenously to higher TFP growth (see Chapter 4), as well as the standard growth accounting approach.

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Appendix I. Data Sample and Comparison of Data Sources

A. Data Sample

Firm-level data is based on the ORBIS database provided by Bureau van Dijk.[1] The original dataset has over five million firm-year observations for 2000–15. By applying some filters and data imputations (see Box A.1. for details), our dataset includes 128,845 firm-year observations over 2003–13 (Table A.1.). The data filtering methodology follows the literature (see Gal, 2013; Kalemli-Ozcan et al., 2015; and Gopinath et al., forthcoming) and includes only years with sufficient observations. Data imputations to extend the coverage follow Gal (2013).

Table A.1. Data Coverage

Year	Agriculture	Manufacturing	Construction	Trade	Market Services	Basic Services	Other Industries	Total
2003	22	548	156	671	294	98	71	**1860**
2004	54	942	319	1221	567	166	159	**3428**
2005	216	2796	830	3853	1644	504	540	**10383**
2006	312	3654	1163	5337	2294	724	674	**14158**
2007	444	4363	1480	6689	3311	1003	736	**18026**
2008	434	4493	1553	6888	3335	1048	745	**18496**
2009	432	4594	1590	7028	3389	1097	765	**18895**
2010	192	3255	1041	4814	1737	606	579	**12224**
2011	180	2540	803	3797	1523	527	486	**9856**
2012	346	2390	1014	4072	2934	730	412	**11898**
2013	313	1765	749	3197	2683	651	263	**9621**
Total	**2,945**	**31,340**	**10,698**	**47,567**	**23,711**	**7,154**	**5,430**	**128,845**

Source: ORBIS.

For presentation purposes, the sector-level TFP data (based on NACE Rev 2) is aggregated into 7 broad sectors, weighted by the number of employees in each sector:

- **Agriculture:** A-Agriculture, forestry, and fishing
- **Manufacturing:** C-Manufacturing
- **Other Industries:** B-Mining and quarrying, D-Electricity, gas, steam, and air conditioning supply, E-Water supply, sewerage, waste management and remediation activities
- **Construction:** F-Construction
- **Trade:** G-Wholesale and retail trade; repair of motor vehicles and motorcycles, H-Transportation and storage, I-Accommodation and food service activities
- **Market services:** J-Information and communication, K-Financial and insurance activities, L-Real estate activities, M- Professional, scientific and technical activities, N-Administrative and support service activities

[1]See https://www.bvdinfo.com/en-gb/our-products/company-information/international-products/orbis for details.

- **Basic Services:** O-Public administration and defense, compulsory social security, P-Education, Q-Human health and social work activities, R-Arts, entertainment and recreation, S-Other service activities.

Box A.1. Rules for Data Filtering and Imputation

- ✓ *Consolidation of the accounts:* To prevent double counting, drop firms with consolidated accounts (C1 and C2) if they are also classified with unconsolidated accounts.
- ✓ *Minimum number of employees*: Drop firms with less than 3 employees.
- ✓ *Negative values for tangible fixed assets and value added*: Drop firms that have negative values of tangible fixed assets or value added in any year.
- ✓ *Data imputation for value added*: Fill in the gaps by summing up "Cost of employees" and "EBITDA".
- ✓ *Data imputation for tangible fixed assets*: Fill in the gaps with "Total Fixed Assets".
- ✓ *Outliers:* Drop firms if their capital, labor, or value added (at least one of them) has a growth rate in the top and bottom 0.1 percent of the growth distribution in the respective sector group at least once during the sample period.
- ✓ *Continuity of firm data:* Keep firms that have data available for value added, capital stock, and labor for at least 3 consecutive years. This rule is relaxed only for 2012–13 to ensure sufficient observations.

B. Comparison of Data Sources

For the sector-level TFP analysis, Bank for Accounts of Companies Harmonized (BACH) database provided by the Banque de France can be used as an alternative data source.[2] The BACH database gathers the data for Poland from the Statistical Survey of the Central Statistical Office (GUS) of Poland. The data provided in BACH are sectoral aggregates of the firm-level survey data and the aggregation is done for general purposes, not specifically for measuring total factor productivity. The number of firms aggregated in each sector is reported in the database.

The coverage of Polish firms in the ORBIS database and that in the BACH database are broadly comparable (see Table A2). The BACH database includes firms with unconsolidated accounts, whereas the ORBIS includes firms with both consolidated and unconsolidated accounts. For 2005–15, both datasets have around 500,000 year-firm observations with unconsolidated accounts, which suggests that in terms of the number of firms the two databases have similar coverage. However, the total number of employees covered in the BACH database in 2013 is three times larger than the total number of employees covered in the ORBIS database when only firms with the unconsolidated accounts are included. As we also include firms with consolidated accounts

[2] See https://www.bach.banque-france.fr/?lang=en for details.

if they do not have unconsolidated accounts, the coverage of employment of our adjusted sample is broadly comparable to that in the BACH database.

Table A.2. Comparison of BACH and ORBIS Databases

	BACH	ORBIS
Number of firms (2005–15)	518,896 (firms with unconsolidated accounts only)	5,155,047 (including both consolidated and unconsolidated) 538,062 (including firms with unconsolidated accounts only)
Number of employees (2013)	5,098,446 (unconsolidated firms only)	10,403,750 (including both consolidated and unconsolidated firms) 1,611,412 (including firms with unconsolidated accounts only)

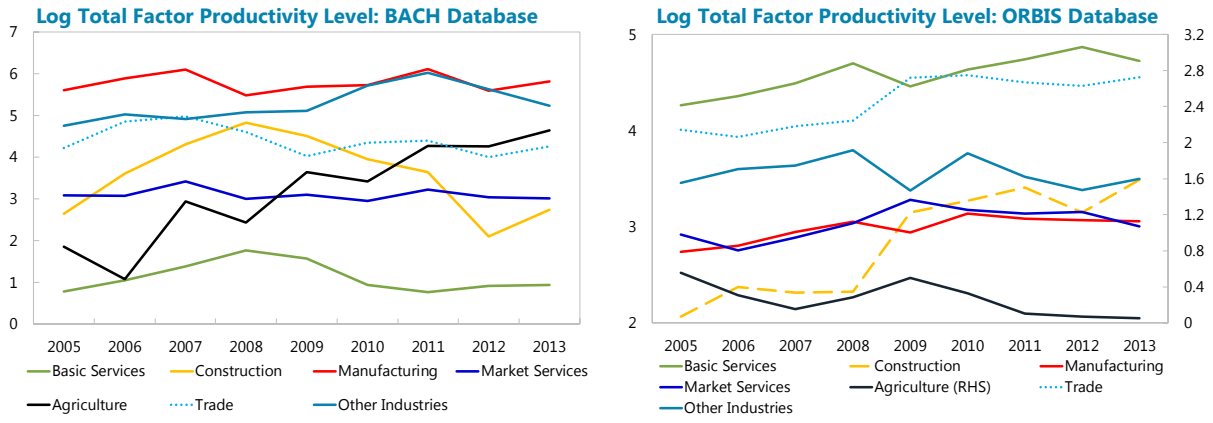
A comparison of the sector-level TFP calculated using our dataset based on ORBIS with that from the BACH database suggest the following (Figure A.1.):[3]

- The TFP levels have been relatively flat in manufacturing, trade, and market services sectors based on data from both databases.
- The TFP levels of the basic services sector calculated from both datasets follow similar paths until 2009, however, the paths diverge afterwards.
- The trends are very different in agriculture and construction. According to the BACH database, the TFP level of agriculture has increased the most over time, and almost reached the TFP level of manufacturing by 2013. However, based on the ORBIS database, productivity in agriculture has been declining, notably after the GFC, and it has always been the lowest among all sectors. According to the BACH database, the construction sector has experienced a large increase in TFP growth before the GFC, followed by a large decline. However, the ORBIS database suggests that productivity in the construction sector was resilient during 2008–09, and has remained largely flat afterwards.

The TFP trends from our dataset are comparable to other Poland-specific studies. In particular, Albinowski et al. (2015) uses a firm-level dataset from the Statistical Survey of the Central Statistical Office of Poland to analyze the productivity trends in manufacturing and its sub-sectors. They find that the manufacturing sector has experienced an average annual TFP growth rate of 5 percent over 2006–13. Using our data, we find an average annual TFP growth of the manufacturing sector of around 4 percent for the same period, close to the estimates in Albinowski et al. (2015) based on data from the national source.

[3] For presentation purposes, we aggregated the sectors in the BACH database into the same 7 sectors as explained above. For Poland, the BACH database does not have data for two sectors: K-Financial and insurance activities; and O-Public administration and defense, compulsory social security.

Figure A.1. Poland: A Comparison of Sectoral TFP based on the BACH and the ORBIS Databases



Sources: BACH, ORBIS, and IMF staff calculations.

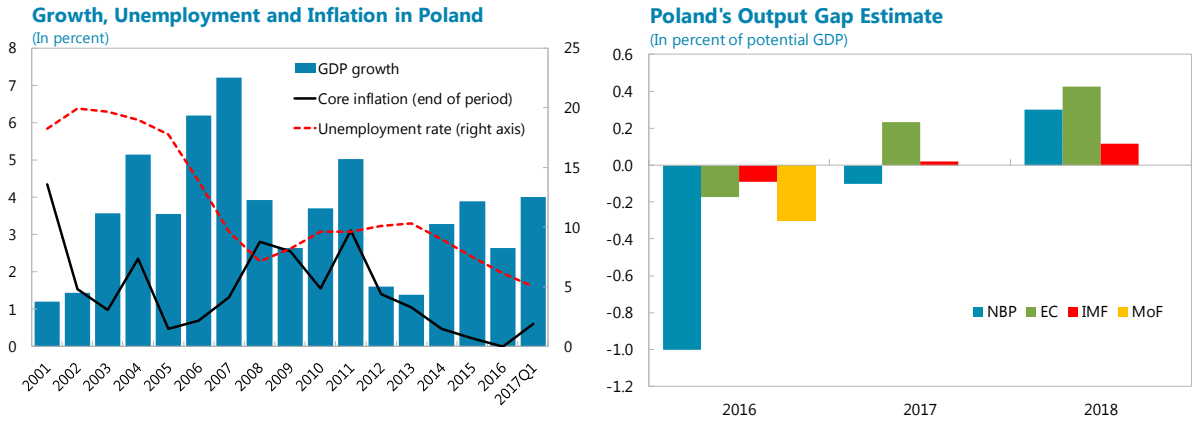
LONG-RUN GROWTH—BASELINE AND REFORM SCENARIOS

Shrinking labor supply and slower TFP growth imply a much slower pace of income convergence to advanced Europe going forward. Addressing structural bottlenecks will be critical for improving allocative efficiency and lifting investment and TFP growth. An illustrative reform scenario shows that under realistic assumptions (calibrated based on the historical experiences of the OECD countries), specific improvements in the product market and labor market regulations, as well as higher infrastructure investment and R&D support could significantly increase the level of GDP in Poland by 2030, though more efforts would be needed to reach the goal set out in the government's Responsible Development Strategy.

A. Baseline Scenario[1]

1. A fresh look at Poland's potential output is needed to better understand the current cyclical position of the economy and the impact of recent policies on the long-term growth. The latest economic indicators point to a strong cyclical upswing. Following a temporary slowdown in 2016, GDP growth strengthened to 4 percent (y/y) in 2017:Q1 amid a record low unemployment and rising core inflation (Figure 1). However, the views on the strength of the cyclical recovery and the output gap estimates vary across different institutions (Figure 1). Furthermore, some recent policies, notably the decision to reverse the 2013 retirement age increase, are likely to have a significant impact on the labor supply over the medium to long term (as discussed in Chapter 1), which is yet another reason for taking a closer look at Poland's potential growth.

Figure 1. Cyclical indicators and Output Gap Estimates



Sources: National authorities and IMF staff calculations.
Note: NBP's estimate (March 2017) is based on a structural macro-model; European Comission's (EC) estimate (February 2017) is based on a Production Function Approach; IMF's estimate (January 2017) is based on a version of the HP filter.

[1] Prepared by Xin Cindy Xu.

2. This section presents estimates of potential output and output gap for Poland based on a range of methods. These include: (i) a univariate Hodrick-Prescott (HP) filter; (ii) a multivariate filter (MVF); and (iii) a production function approach (PF). While each method has its own merits and limitations, taken together they can provide a good gauge of Poland's cyclical position:

- The *HP filter* is a purely statistical method, which minimizes deviations from trend based on a statistical smoothing formula. While this method is easy to use, as it only requires information on the GDP time series, it suffers from the well-known end-of-sample bias and the results are sensitive to the assumption on the smoothing parameter. The end-of-sample problem is typically mitigated by using forecasts.

- The *MVF filter-based approach*, developed by Blagrave, et al. (2015), exploits the economic relationships between inflation, unemployment and output gap, guided by standard economic theories—Phillips curve and Okun's law. It improves the estimation of potential output and output gap by incorporating more information from different cyclical indicators. It also uses the medium-term growth and inflation forecasts to address the end-of-sample problem. But the accuracy of this method depends on whether the underlying economic relationships hold and the assumed values of certain smoothing parameters.[2]

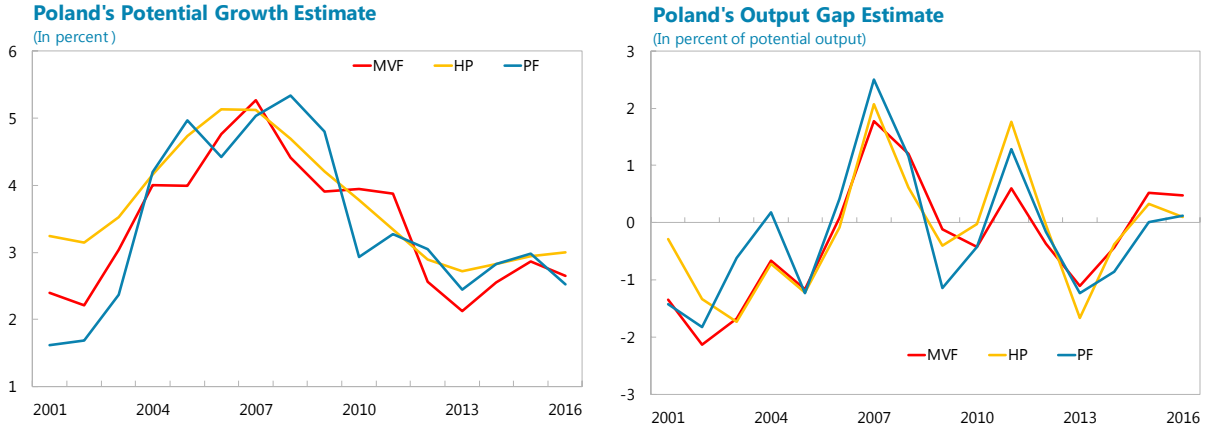
- The *PF approach*, following the framework in Podpiera, et al. (2017), decomposes potential growth into its key production factors-Capital, Labor and TFP, while it also captures the cycles in labor (AHW-average hours worked) and capital (CU-capacity utilization) aiming to improve the estimate of the residual item-TFP. This method provides insights into the key growth drivers from the supply side, but it also relies on the HP filter approach to decompose production factors into structural and cyclical components.[3]

3. All three methods point to a post-crisis slowdown in potential growth and a slightly positive output gap in 2016. The estimated potential growth has declined significantly from the pre-crisis peak of above 5 percent to 2.5–3 percent in 2016, suggesting that the post-crisis growth slowdown has been largely structural. The negative output gap experienced during the global financial crisis and European debt crisis was largely closed by 2015, with a slightly positive output gap opening in 2016. The differences between the estimates generated using the three different approaches are relatively small, especially in the most recent period (Figure 2).

[2] For details on the MVF approach, see Blagrave, et al., 2015, A Simple Multivariate Filter for Estimating Potential Output, IMF Working Paper No. 15/79.

[3] For details on the PF approach, see Podpiera, et al., 2017, A Fresh Look at Potential Output in Central, Eastern and Southeastern European Countries, IMF Working Paper No. 17/37.

Figure 2. Backward Looking—Potential Output and Output Gap Estimates



Source: IMF staff calculations.
Note: MVF results incorporate information from growth, headline inflation, unemployment, consensus forecasts of growth and inflation; alternative measures of inflation (core inflation, Unit labor cost, NBP calculated domestic inflation) yield similar results.

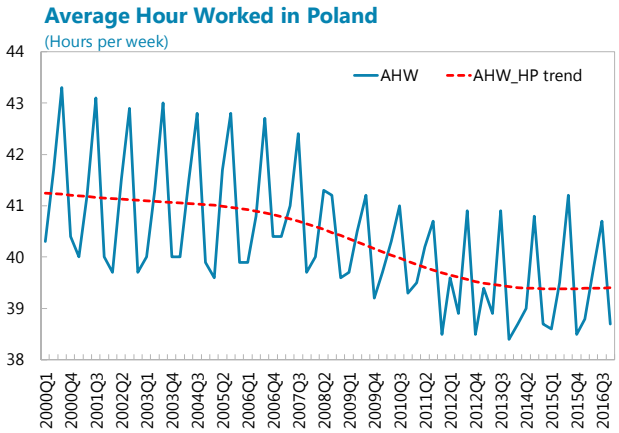
4. The decline in potential growth has been largely due to the TFP growth slowdown, followed by declining labor contribution. A decomposition of potential growth based on the PF approach suggests that the post-crisis potential growth was mainly dragged down by stagnant TFP growth and to a lesser extent, by shrinking labor contribution (Figure 3).

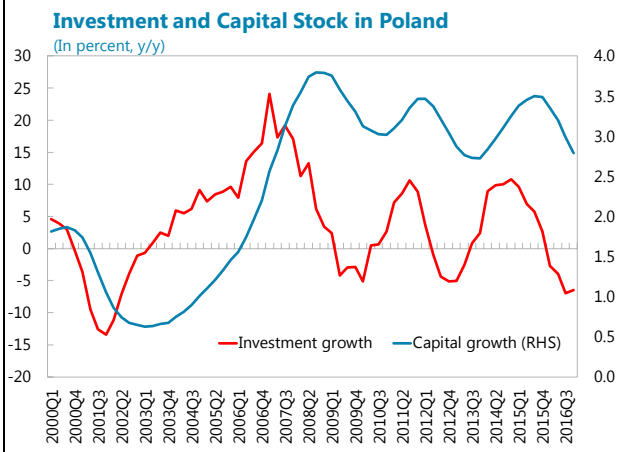
- The adjusted *TFP* contribution (adjusted for AHW and CU) has dropped from the pre-crisis peak of 3 percent to negative in 2016. If we look at the standard TFP contribution (the sum of the adjusted TFP, AHW and CU), it has also declined significantly from 2.4 percent to around 0.7 percent in 2016.

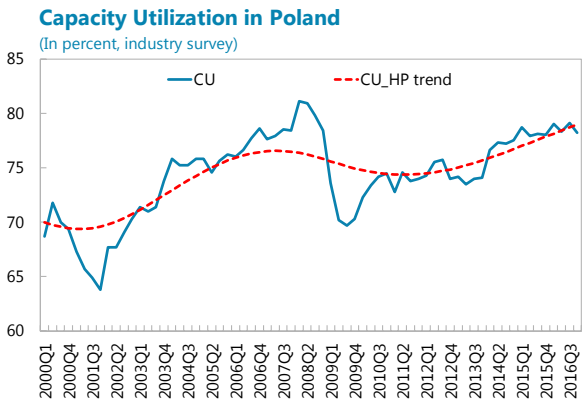
- The reduced *labor* contribution post-crisis largely reflects negative demographics, as the working age population has been on a declining trend since 2012. Although the trend employment growth has picked up moderately since 2012 following the drop during the crisis times, this is partially offset by the decline in average hours worked (AHW) after the crisis.

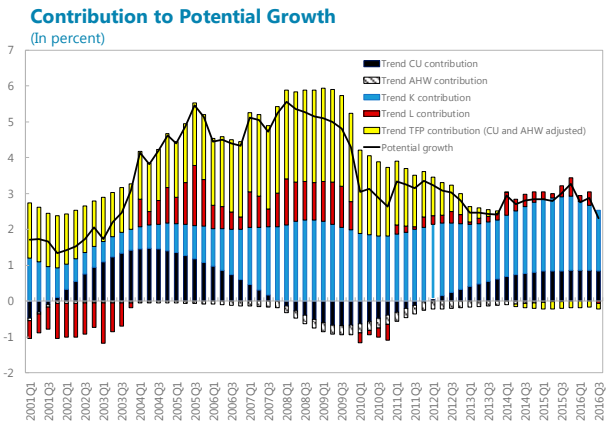
- The post-crisis *investment* growth has been very volatile amid some temporary rebounds, with the average growth of capital stock fluctuating around 3 percent. However, the capacity utilization has been rising quickly and approaching the pre-crisis peak. Thus, capital accumulation has become the main growth driver, supported by rising capacity utilization.

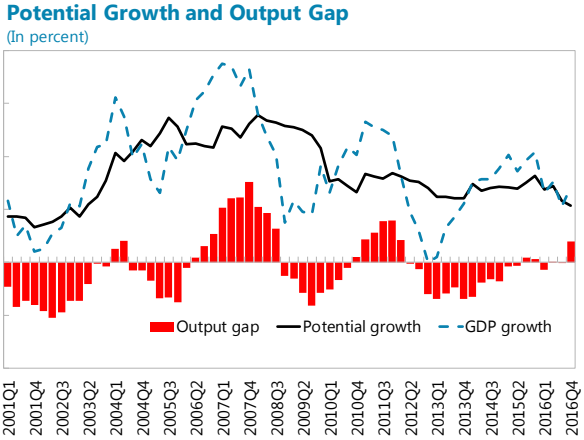
Figure 3. The Production Function Approach







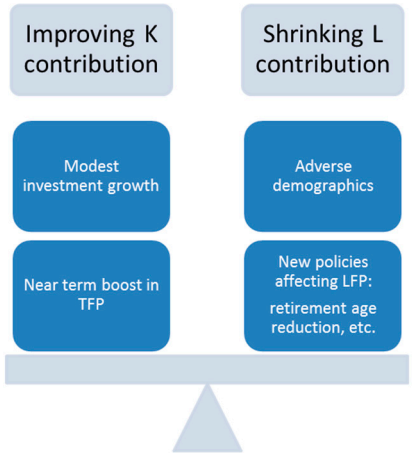


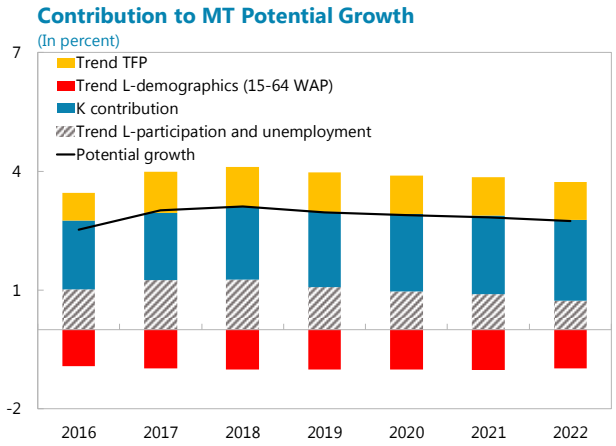


Sources: National authorities and IMF staff calculations.

5. Over the medium term, on current policies, potential growth will likely remain below 3 percent. The impact of unfavorable demographics will become more pronounced (see Chapter 1). TFP growth is expected to recover somewhat reflecting an improvement in the external environment (see Chapter 3). As investment gradually picks up, the contribution from capital accumulation will also increase (see Chapter 2). However, on current policies, the baseline potential growth will likely stabilize around 2.7–3.0 percent (Figure 4), which is well below the pre-crisis average.

Figure 4. Forward Looking—Baseline Potential Growth





Source: IMF staff calculations.

B. Reform Scenarios[4]

6. The key structural reform gaps are identified using both quantitative indicators and qualitative assessments. Quantitative indicators point to four main areas where structural reform gaps appear to be the largest: *infrastructure, business regulation, labor market efficiency* and *R&D/innovation* (see Chapter 3, Figure 8). Qualitative assessments by various international institutions have, in addition, consistently identified shortcomings in the labor market regulations, human capital development and government efficiency (Figure 5).

[4] Prepared by Ezgi O. Ozturk and Zoltan M. Jakab.

Figure 5. Poland: Structural Reform Priorities

	Structural Bottlenecks	Recommendations from International Institutions				
		IMF Board Paper (2016) 1/	IMF REI (May 2016) 2/	IMF Past AIV Reports 3/	OECD (2015) 4/	EC Country Report (2017) 5/
Most Lagging Areas 6/	**Infrastructure**	√	√	√	√	√
	Business Regulation	√	√		√	√
	R&D and Innovation		√			√
Less Lagging Areas 7/	**Labor Market Regulation**	√	√	√	√	√
	Human Capital		√		√	√
	Institutions and government efficiency			√		√

1/ based on findings for all emerging markets, not Poland-specific. See "Staff Note for the G20—A Guiding Framework for Structural Reforms".
2/ based on the comparisons of institutional indicators for Poland relative to other OECD and CESEE countries, see IMF REI (May 2016) for more details;
3/ based on the IMF staff's recommendations over the past four years, see 2016 Article IV, 2015 Article IV, 2014 Article IV, and 2013 Article IV for more details;
4/ see "Economic Policy Reforms: Going for Growth" Country Note on Poland (2015) for more details.
5/ includes areas, where progress falls short of targets, see EC Country Report (2017) for more details.
6/ areas where most indicators for Poland are below the OECD average.
7/ areas where most indicators for Poland are below the OECD average, but the gaps are relatively small compared to the most lagging reform areas.

7. To assess the potential long-run economic impact of structural reforms, we estimate the impact of fully or partially closing the structural reform gaps in four areas:

- *The product market regulation (PMR) reforms* could include the deregulation of network industries (gas, airlines and road sectors), easing of administrative burdens for startups, and changes to the regulations of retail and professional services. These reforms could help boost TFP and increase private investment.
- *Labor market reforms* include active labor market policies (ALMP), increasing spending on childcare and early education, and relaxing employment protection. These reforms could help raise the labor force participation, increase labor mobility and reduce skills mismatches.
- *Increasing infrastructure investment* could help boost TFP and increase private investment.
- *Increasing funding for R&D* could help boost the R&D activity and innovation.

8. The reform efforts are assumed to vary across the three reform scenarios, with the first scenario aiming to be somewhat more realistic than the other two. In the first scenario, the reform efforts assumptions are calibrated by taking into account the past performance of Poland and other OECD countries, as well as the size of Poland's reform gaps relative to the OECD average (Table 1). For example, in the areas where Poland has been significantly lagging behind the best performers, it may be unrealistic to expect rapid progress leading to the closing of the reform gaps by 50 percent or more over the projection period, especially where gaps relative to the OECD

average are large. Hence, the assumptions on the reform efforts vary across different structural reform areas:

- In terms of relaxing *regulations of the network industries, professional services and retail distribution*, Poland does not seem to have made tangible changes during 2008–13, while the best performers achieved substantial progress (Table 1). Given Poland's lack of progress in the past, assumptions on future reform efforts are also less ambitious. If Poland were to close the gaps relative to the current OECD average by around 25 percent in the gas sector, by 40 percent in the airlines and road sectors, and by 45 percent in the professional services and retail distribution, then each of the relevant PMR sub-index would decline by 0.4 points (which is roughly similar to the average reform effort of other OECDE countries that carried out such reforms during 2008-2013).

- In contrast, Poland has been the best performer among the OECD countries in reducing the *administrative burdens on startups*, and therefore, a faster closing of the gap might be feasible. A decline of 0.71 points in this PMR sub-index would allow Poland to fully close the gap relative to the current OECD average.

- Similarly, on *active labor market policies* (ALMPs), Poland could aim to reach the OECD average by increasing public expenditures on the ALMPs from 10.5 percent to 14.8 percent of the GDP per capita.

- Public expenditures on *childcare and early education services* in percent of GDP in Poland increased by only 0.02 percentage points during the 2008–13 period, whereas the best performing OECD country increased these expenditures by 0.73 percentage points. Given the relatively weak past performance, a realistic target for Poland might be to increase the public expenditures by 0.18 percentage points to close half of the gap relative to the OECD average.

- The *employment protection* index in Poland is higher than the OECD average, though the gap is relatively small compared to other areas. Thus, Poland could aim to lower the employment protection index by 0.25 points, i.e., below the OECD average.

- Poland has doubled its *direct public funding of business R&D* between 2008 and 2013. Given this, Poland could aim to maintain the same pace to reach the OECD average.

- Boosting the *infrastructure investment-to-GDP ratio* by 0.36 percentage points (annual average during 2017–30, relative to the baseline) would allow Poland to close the infrastructure gap, measured using public capital stock-to-GDP as a proxy, relative to the EU average by around 27 percent (see below for details).

9. The second and third scenarios assume reform efforts that would close the gaps vis-à-vis the OECD average by half or fully in most reform areas. Specifically, the second scenario assumes that all reform gaps (except for infrastructure gaps) are closed *by half* relative to the current OECD average by 2030, whereas the third scenario assumes that all reform gaps (except for infrastructure gaps) are *fully* closed relative to the current OECD average by 2030 (Figure 6, Table 1).

In all three scenarios, the additional infrastructure spending is calculated as a residual, based on the remaining fiscal space after accounting for the fiscal costs related to other reforms and allowing for some buffer relative to the EDP limit and the debt limits. Under this approach, infrastructure gaps in all three scenarios are closed by 26 to 28 percent relative to the EU average by 2030, depending on the fiscal costs of other reforms. Assuming higher infrastructure spending would entail larger fiscal outlays, which would not be feasible given the fiscal rules and debt sustainability considerations.

10. The impact of structural reforms is assessed using a semi-structural general equilibrium model calibrated for Poland.[5] First, the effects of structural reforms are mapped into changes in the total factor productivity (TFP) and in the aggregate labor force participation (LFP) rate. The general equilibrium impact of each reform is then estimated using the FSGM model. Deregulating product markets and increasing funding for the business R&D are simulated as shocks to the TFP, whereas all labor market reforms are simulated as shocks to the LFP rate. Infrastructure investment is simulated as a shock to public investment. Private investment responds endogenously to higher TFP, and hence, higher expected return on investment.

11. The impact on the level of GDP is estimated using the elasticities from the literature. For the ALMPs, elasticities are from Barnes et al. (2013); for reforms of the childcare and early education services, elasticities are from Thevenon (2013) [6]; for the impact of increased government spending on supporting business R&D, elasticities are from the April 2016 Fiscal Monitor, Chapter 2. All reforms except infrastructure investment are phased in over ten years, and economic agents are assumed to respond to specific reforms (as they are phased in) but not instantaneously to the entire reform package. Additional infrastructure spending (as a share of GDP) increases gradually over the entire period between 2017 and 2030, with the size determined by available fiscal space every year (as discussed above). The impact of the fiscally costly reforms on output also reflects the macroeconomic effects of the required increase in deficit financing.

12. Under the three reform scenarios, the level of GDP could be lifted by about 7–11 percent by 2030 (Table 1). The reform scenario of fully closing the gaps generates the largest output gains (around 11 percent above the baseline GDP level by 2030), with a sizable contribution coming from fully closing the gaps in the PMR. If Poland were to close half of all reform gaps relative to its OECD peers, then the potential output could increase by around 6.8 percent by 2030. The scenario of fully closing reform gaps could be considered too optimistic in some areas, such as regulations of the gas, airlines and road sectors, where previously Poland did not make much progress, whereas the scenarios of closing the gaps by half could be underestimating the reform potential in certain areas, such as reducing administrative burdens on startups, where Poland has made significant progress in the past. Given these considerations, the first scenario, based on past

[5] The model is a variant of the IMF's Flexible System of Global Models (FSGM), see in Andrle and others (2015).

[6] We used the estimates for childcare expenditures which control for labor market characteristics and other interaction variables (Thevenon (2013) Table 5, Column 3)). Thevenon (2013) estimated the impact of childcare and early education for children under 3 years. Since we focus on the total childcare and early education expenditures, we assumed that expenditures on children under 3 years are changed by the same proportion as total expenditures. Thus, the elasticity of Thevenon (2013) could be applied in our exercise.

reform experiences of Poland and other countries, is the most realistic one, which suggests a total reform impact on potential output of about 7 percent (Figure 6 and Table 1). In this scenario, reducing the administrative burdens on startups would generate the largest output gains (around 1.4 percent), followed by increasing infrastructure spending (1.2 percent), reducing sectoral regulations on professional services and retail distribution, and relaxing employment protection (each around 0.8 percent). The estimated impact of other reforms on potential output is around 0.5-0.7 percent, except for the ALMP where the estimated impact is more modest (0.2 percent). The overall impact of the PMR reforms is larger than that of the fiscally costly reforms, given fiscal constraints.

13. The prioritization of reforms should be based on their potential impact on growth, available fiscal space and the cyclical position of the economy.[7] The estimated impact on output is shown in Figure 6, Table 1. The PMR reforms—that do not entail any fiscal outlays—generate the highest *impact on output* over the long run, whereas direct public *funding for business R&D* is estimated to have the largest impact on potential output per percentage point increase in government deficit over GDP. The *fiscal space* is limited, given the fiscal rules and the need to address long-term aging costs. In each scenario, the package of fiscally costly reforms utilizes the entire available fiscal space. In Figure 6, the fiscal cost of each reform is shown as an annual increase in the fiscal deficit (in percent of GDP). In general, with limited fiscal space, the priority could be given to reforms that do not require additional public expenditures, while fiscally costly reforms could, in the first instance, be financed by the allocated EU funds. The current *cyclical position* of the economy is favorable, which bodes well for structural reforms, including those that might have a slight contractionary impact on domestic demand in the near term (e.g., relaxing employment protection), but could generate sizable gains over the long term.

14. The reforms discussed above would help achieve some of the goals set out in the Responsible Development Strategy (RDS). The overarching goal of the RDS is for Poland to achieve convergence with the EU average per capita income by 2030. The key policy areas in the RDS —re-industrialization, development of innovative firms, development of the SME sector, building Polish brand and promoting expansion of Polish companies abroad, mobilizing capital for development and promoting social and regional development—include some the reform areas discussed above (see text table in section D of the 2017 Article IV Staff Report). Staff's estimates suggest that under a range of plausible reform scenarios focusing on the *product market regulations, raising the labor force participation, upgrading infrastructure and increasing support for R&D*, the level of output in Poland could be lifted by about 7–11 percent by 2030, allowing the authorities to cover about 1/3 of the distance to their convergence objectives (Figure 6). Reaching the convergence objectives by 2030 would likely require greater reform efforts in these as well as in other areas. Other areas not included in the simulations, but where there is also scope for improvement (relative to the OECD average), include *human capital development* and *institutions/government efficiency*.

[7]This approach to prioritize structural reforms is discussed in the IMF's Staff Note for the G20—A Guiding Framework for Structural Reforms.

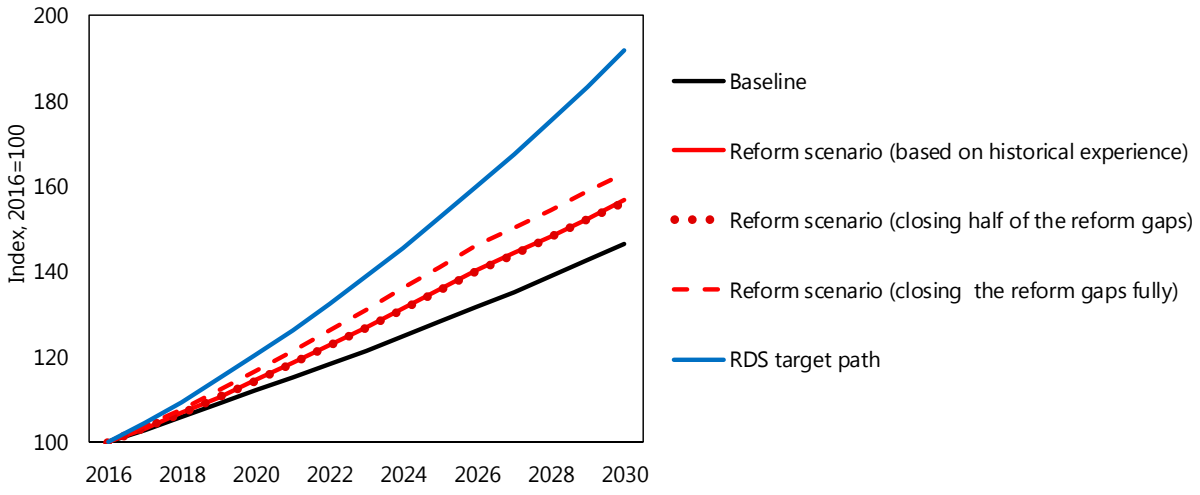
Figure 6. Potential Gains from Structural Reforms

Illustrative Reform Scenarios: Estimated Impact of Specific Structural Reforms on the GDP level by 2030

	Reform scenario based on past experiences of Poland and the best performers		Reform scenario in which Poland **closes half of the reform gaps** relative to the OECD average by 2030		Reform scenario in which Poland **fully closes the reform gaps** relative to the OECD average by 2030	
	Impact on GDP level by 2030 (pp increase)	Impact on Government deficit/GDP (pp increase, avg. per year)	Impact on GDP level by 2030 (pp increase)	Impact on Government deficit/GDP (pp increase, avg. per year)	Impact on potential GDP level by 2030 (pp increase)	Impact on Government deficit/GDP (pp increase, avg. per year)
Relaxing administrative burdens on startups	1.39	-	0.68	-	1.33	-
Relaxing regulations on professional services and retail	0.83	-	0.97	-	1.86	-
Relaxing regulations on gas sector	0.75	-	1.51	-	3.01	-
Relaxing regulations on airlines and road sectors	0.74	-	0.96	-	1.90	-
Relaxing employment protection	0.78	-	0.38	-	0.56	-
Increasing infrastructure spending	1.17	0.36	1.40	0.43	0.78	0.25
Increasing public spending on childcare services	0.49	0.11	0.48	0.11	0.93	0.23
Increasing direct public funding of business R&D	0.49	0.03	0.24	0.01	0.46	0.03
Increasing public spending on ALMP	0.23	0.13	0.09	0.07	0.17	0.13
A combined impact of all reforms	**7.01**	**0.66**	**6.84**	**0.66**	**11.41**	**0.66**
of which fiscally costly reforms	*2.37*		*2.21*		*2.33*	

Note: In the scenario based on the past experiences of Poland and best performers, various structural reform gaps are closed by 25–50 percent. The estimates of the impact of reforms on the level of GDP in 2030 are based on the FSGM simulations using elasticities from different OECD studies. The lastest OECD indicators are from 2013. The fiscal space used for additional spending in all scenarios reflects fiscal constraints (the baseline deficit projections, the EDP and debt limits). For reforms that require fiscal spending, the impact on output takes into account the effects of the required increase in deficit financing. See Table 1 for details and comparisons with past best performers.

Long-run Growth: Baseline, Reform Scenarios, and the RDS Target Growth Path



Note: the reform scenarios shown in this chart correspond to the ones detailed in the table above. RDS target path is based on the targets stated in the RDS.

Table 1. Poland Structural Reform Scenarios: Assumptions, Costs, Results

	Current Level		Past Experience (2008-2013)		Scenario 1: Closing the gaps based on past experience of Poland and best performers			Scenario 2: Closing half of the reform gaps relative to the OECD average by 2030			Scenario 3: Closing the reform gaps relative to the OECD average fully by 2030		
	Poland	OECD Average	Poland	Best performers	Assumptions (by 2030)	Impacts on Potential Output by 2030 (% increase)	Average Impact on government deficit/GDP (pp increase/year; over 2017-2030)	Assumptions (by 2030)	Impacts on Potential Output by 2030 (% increase)	Average Impact on government deficit/GDP (pp increase/year; over 2017-2030)	Assumptions (by 2030)	Impacts on Potential Output by 2030 (% increase)	Average Impact on government deficit/GDP (pp increase/year; over 2017-2030)
Product Market Regulations													
Sectoral Regulations on Gas Sector *(index scale of 0-6 from least to most restrictive)*	4.11	2.49	-0.10	-1.23	decrease by 0.40 points[/1]	0.75	--	decrease by 0.81 points	1.51	--	decrease by 1.62 points	3.01	--
Sectoral Regulations on Airlines and Road Sectors *(index scale of 0-6 from least to most restrictive)*	2.52	1.47	0.00	-2.88	decrease by 0.40 points[/1]	0.74	--	decrease by 0.53 points	0.74	--	decrease by 1.05 points	1.90	--
Sectoral Regulations on Professional Services and Retail Distribution *(index scale of 0-6 from least to most restrictive)*	2.89	1.99	0.05	-1.53	decrease by 0.40 points[/1]	0.83	--	decrease by 0.45 points	0.97	--	decrease by 0.91 points	1.86	--
Administrative burdens on startups *(index scale of 0-6 from least to most restrictive)*	2.58	1.87	-1.20	-1.20	decrease by 0.71 points (fully close the gap relative to the current OECD average)	1.39	--	decrease by 0.35 points	0.68	--	decrease by 0.71 points	1.33	--
Labor Market Regulations													
Public expenditures on Active labor market policies (ALMP) *(per unemployed persons, percent of GDP per capita)*	10.49	14.75	N/A	N/A	increase by 4.26 pp (fully close the gap relative to the current OECD average)	0.23	0.13	increase by 2.13 pp	0.09	0.07	increase by 4.26 pp	0.17	0.13
Public expenditures on childcare and early education services *(percent of GDP)*	0.45	0.81	0.02	0.73	increase by 0.18 pp (close half of the gap relative to the current OECD average)	0.49	0.11	increase by 0.18 pp	0.48	0.11	increase by 0.35 pp	0.93	0.23
Employment Protection *(index scale of 0-6 from least to most restrictive)*	2.23	2.04	0.00	-1.23	decrease by 0.25 points (reach to a strictness level lower than the current OECD average)	0.78	--	decrease by 0.1 points	0.38	--	decrease by 0.2 points	0.56	--
R&D													
Direct public funding of business R&D *(percent of GDP)*	0.04	0.08	0.02	0.13	increase by 0.04 pp (fully close the gap relative to the current OECD average)	0.49	0.03	increase by 0.02 pp	0.24	0.01	increase by 0.04 pp	0.46	0.03
Infrastructure Investment													
Infrastructure gap relative to EU average [2/] *(in percent of total gap)*					Close the infrastructure gap relative to EU average by 27 percent	1.17	0.36	Close the infrastructure gap relative to EU average by 25.8 percent	1.40	0.43	Close the infrastructure gap relative to EU average by 27.8 percent	0.78	0.25
A combined impact of all reforms						**7.01**	**0.66**		**6.84**	**0.66**		**11.41**	**0.66**
of which fiscally costly reforms						2.37			2.21			2.33	

Sources: OECD and IMF staff calculations.

Note: Past experiences for the R&D reforms are based on the difference between 2012-14 average and 2007-09 average. All other past experiences are based on the differences between 2008 and 2013 indicators.

1/ For the PMR, 0.4 percentage points decline is assumed for Poland by using judgement based on Poland's and OECD best performers' experiences in reducing the regulations in these sectors during the 2008-13 period. With these assumptions, Poland closes gaps relative to the OECD average by 25 percent in gas sector, 40 percent in airlines and road sectors, and 45 percent in professional services and retail distribution.

2/ The infrastructure gap is proxied by the difference between Poland's public capital stock/GDP and the EU average. Infrastructure spending in three reform scenarios is calculated as a residual item by utilizing the available fiscal space after taking account into the fiscal costs of other reforms, while also leaving some "safety buffer" relative to the EDP debt and deficit limits. For all other reforms with fiscal costs, the spending target is reached gradually over the next 10 years. For instance, for the R&D the first-year spending in percent of GDP is higher by 0.04/10 pp, in the second-year it is higher by 0.08/10 pp... etc. Once the target spending level is reached, it is maintained for the 2027-2030 period. The impact on the government deficit/GDP for infrastructure spending refers to the average over the entire 2017-2030 period.

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