

Bank capital regulation



REPORT by Dominik Meyland and Dorothea Schäfer

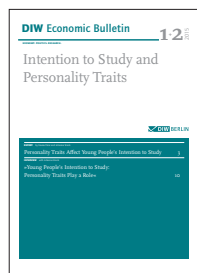
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Risk weighting for government bonds: challenge for Italian banks

By Dominik Meyland and Dorothea Schäfer

Although banks are required to document their equity capital for loans, corporate bonds, and other receivables, they are currently exempted from the procedure when investing in government bonds: they enjoy an "equity capital privilege." As part of the Basel III regulatory framework redraft, the privilege may be eliminated in order to disentangle the default risks between sovereigns and banks. The present study examines how much additional equity capital the banks of the euro area's major nations would require if the equity capital privilege were eliminated. At nine billion euros, the estimates show the highest capital requirement for Italian banks. In comparison, French banks would only require additional capital of three billion euros and German banks would need just under two billion euros. Since eliminating the equity capital privilege would make the Italian state's consolidation efforts more difficult, it is advisable to risk weight newly purchased government bonds only or allow for long transition phases.

Since 2013, the Basel Committee on Banking Supervision (BCBS) has been negotiating the Basel III reform package for the regulatory framework for banks. The negotiations are currently at a standstill because the Trump administration has yet to send its delegation to the table, but the reforms are taking shape. The "output floor" is the main focus of controversy. By specifying a lower limit for the ratio of risk-weighted and total assets, it intends to prevent risks from being weighted too low.¹ In any case, it appears certain that the current general zero-risk weighting for government bonds from EU member states will be eliminated.

Capital requirements planned for EU government bonds

According to Basel III proposals and the EU Capital Requirements Directives (CRD) IV, banks must finance some portion of their investments with their own capital.² The capital requirement level depends on the risk weight of the asset value under consideration for investment.³ This is the core of the Basel regulatory framework, the most recent draft of which is known as Basel III. The equity capital guidelines are designed to ensure that banks can absorb losses in cases of crisis without having to fall back on taxpayers.

However, the risk weighting conventions of bank assets as currently specified are controversial. Banks have an incentive to keep risk weights as low as possible in order to underestimate actual risks in their financial statements.⁴ Low risk weights help banks save equity capital and in general, increase its returns. EU member state

¹ See Andreas Dombret, "Basel III – goal within sight," (Keynote, Deutsche Bundesbank symposium "Banking supervision in dialogue," Frankfurt am Main, 2017) (available online) (accessed: April 07, 2017)

² Capital Requirement Directive IV is the European guidelines for implementing Basel III within the EU's legal framework (available online) (accessed: June 6, 2017).

³ Also see the term "Equity ratio" in the DIW Glossary, (available online, in German only)

⁴ Dorothea Schäfer, "Regulierung der EU-Finanzmärkte," *Wirtschaftsdienst* 96 (anniversary edition) (2016): 563–570.

Box 1

Ratings and risk weights in the standard approach

According to the Basel III regulatory framework, every loan originated by a bank must receive a risk weight. The risk weight determines the share of equity capital the bank must have to back the loan. Low ratings mean higher risk for the bank. Banks are required to use higher shares of equity capital to finance loans with lower ratings, since the risk of default is higher, and they are supposed to cover any losses with their own capital. In the Basel III regulatory framework, the following risk weights apply (RW):¹ (see Table, Box 1)

Table

Risk weights according to Basel III

| Rating | Risk weight |
|--------|-------------|
| AAA | 0% |
| AA+ | 0% |
| AA | 0% |
| AA- | 0% |
| A+ | 20% |
| A | 20% |
| A- | 20% |
| BBB+ | 50% |
| BBB | 50% |
| BBB- | 50% |
| BB+ | 100% |
| BB | 100% |
| BB- | 100% |
| B+ | 100% |
| B | 100% |
| B- | 100% |
| CCC | 150% |
| CC | 150% |
| C | 150% |

Source: Basel III.

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¹ See Basel Committee on Banking Supervision, "Basel III: International framework for liquidity risk measurement, standards and monitoring," (PDF, Bank for International Settlements, Basel, 2010) (available online).

bonds are an extreme case of risk underestimation: the current regulatory framework assigns a value of zero to their risk weight. The equity capital privilege rests on the assumption that interest and repayment claims against EU member states are risk-free. Due to this privilege, banks have been able to finance the purchase of EU government bonds using third-party capital only, by issuing their own bonds or using customer deposits, for example.

The European sovereign debt crisis debunked that notion and served as a reminder that even EU member states can skip their securitized repayment and interest payment claims. A whole string of European government bonds no longer has investment-grade ratings—they are considered junk bonds.⁵

The pending Basel III reform package will likely eliminate the equity capital privilege for EU government bonds. The new rules specify that the lower the EU member state's rating, the higher the proportion of equity capital required when investing in government bonds.⁶ Assuming that the prevailing standard approach to credit risk will be applied to government bonds, pure debt financing will no longer be possible for bonds from nations with ratings lower than AA-. A bank that has already used up all of its equity capital for backing assets must either procure additional equity capital before making purchases of government bonds or cancel its plans. Banks would also require extra equity capital for the government bonds they already have on the books.

Within the proposed Basel III regulatory framework, the amount of equity capital required is always determined by the investment's risk weighting. For a corporate loan with a risk weight of 100 percent, the portion of equity capital for the loan amount granted would be eight percent. With a risk weight less than 100 percent, the portion of equity capital drops below eight percent, and higher risk weights push it above eight percent proportionally.

Banks have two options for determining the risk weight of an investment. Either they turn to the internal ratings-based (IRB) approach and calculate the investment risk

⁵ Investment-grade bonds are bonds with good to excellent creditworthiness, i.e., ratings between AAA and BBB (including Baa3 and BBB-). Many institutional investors, such as pension funds, are required to invest only in investment-grade bonds. Bonds with ratings below investment grade are considered speculative investments. The rating agencies put Greece, Croatia, Portugal, and Cyprus below the investment-grade level, for example.

⁶ Basel Committee on Banking Supervision, "The regulatory framework: balancing risk sensitivity, simplicity and comparability," (Discussion Paper, Bank for International Settlements, Basel, 2013) (available online) (accessed: June 13, 2017). The debt of certain public institutions and subordinate regional authorities also has a weighting of zero. See Wissenschaftlicher Beirat beim Bundesministerium der Finanzen, "Der Staat als privilegierter Schuldner – Ansatzpunkte für eine Neuordnung der öffentlichen Verschuldung in der Europäischen Währungsunion" (PDF, Federal Ministry of Finance, Berlin, 2014) (available online, in German only) (accessed: June 13, 2017).

themselves, or they use an external rating and specify the risk weight using the standard approach. A rating agency that is registered with the European Securities and Markets Authority (ESMA) and recognized by national banking supervision authorities that regulate risk weighting must provide the external ratings.⁷

Based on the ratings, the standard approach determines the portion of equity capital with which the investment in a specific asset category must be financed. If the equity capital privilege were eliminated, this would also apply for investments in EU government bonds, which until now have generally carried risk weights of zero. The three major ratings agencies publish a rating for each EU member state on a regular basis. Based on their ratings, it is possible to determine the additional capital that would result from the capital adequacy requirement.

Estimating the additional equity capital required by European banks

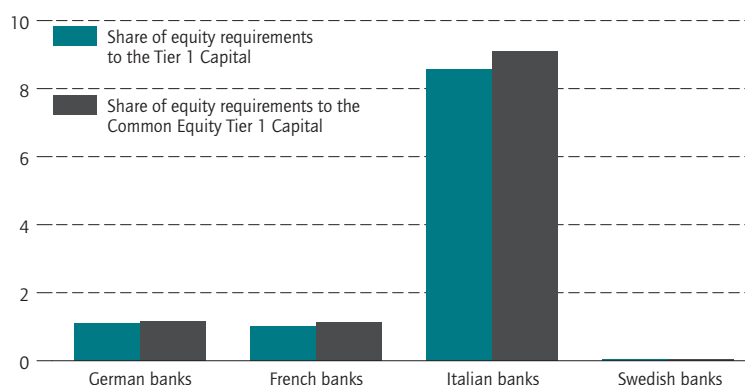
The capital requirements resulting from lifting the equity capital privilege for EU government bonds is estimated for the three largest euro area countries: Germany, France, and Italy. For purposes of comparison, the capital requirements for the Swedish banks which had consistently excellent results in past stress tests is also assessed.⁸ The underlying data on sovereign exposure are from the European Banking Authority (EBA) stress tests for banks conducted in 2014 and 2016.

Data basis

As part of its stress tests in 2014 and 2016, the EBA collected statistics on bank investment in government bonds. The data were collected on December 31, 2013 and December 31, 2015 and grouped according to country and maturity date before publication.⁹ With nine German, six French, and five Italian banks, the total number of banks tested was lower in 2016 than in 2014. For purposes of comparison, we estimated the capital requirements only for the banks that participated in both stress tests. Only the bank investments in the government bonds of the 28

Figure 1

Additional capital needs in relation to the existing Tier 1 capital In percent



Sources: EBA; authors' own calculations.

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The additional capital needs of the Italian major banks are substantial, relative to the existing equity capital.

EU member states were relevant for the estimate.¹⁰ We used credit ratings issued by Fitch Ratings.¹¹

Methodology

To determine the additional capital requirement, we assigned the risk weight resulting from the standard approach to each bank's investment in EU government bonds. We estimated their additional capital requirement (ACR) using the following equation:¹²

$$ACR = \sum_{i=1}^{28} RW_i \times 8\% \times SE_i,$$

in which RW_i describes the risk weight of the government bonds of the i th EU member state (see Box 1) and SE_i the extent of the bank's investment in the government bonds of the i th EU state. At a risk weight of 100 percent, the capital requirement for investments in the government bonds of the i th state equals 8 percent. The sum of the capital requirements resulting from all the bank's investments in EU government bonds equals the bank's ACR.

⁷ Steffen Nauhaus and Dorothea Schäfer, "Nur beschränkt nachvollziehbar: Länderratings während der Krise im Euroraum", *Wirtschaftsdienst* 95 (2015): 678–683; Hans-Helmut Kotz und Dorothea Schäfer, "Rating-Agenturen: Fehlbar und überfordert", *Vierteljahrshefte zur Wirtschaftsforschung* 82 (2013): 135–162.

⁸ Also see Dorothea Schäfer and Dominik Meyland, "Stricter capital requirements for investing in EU government bonds as a means of creating a more stable financial system," *DIW Economic Bulletin* no. 20 (2015): 269–280 (available online).

⁹ The data sets from the 2016 stress test are available online on the EBA website.

¹⁰ The data collection dates from the most recent stress test pre-dates the Brexit referendum. This is why Great Britain is still included.

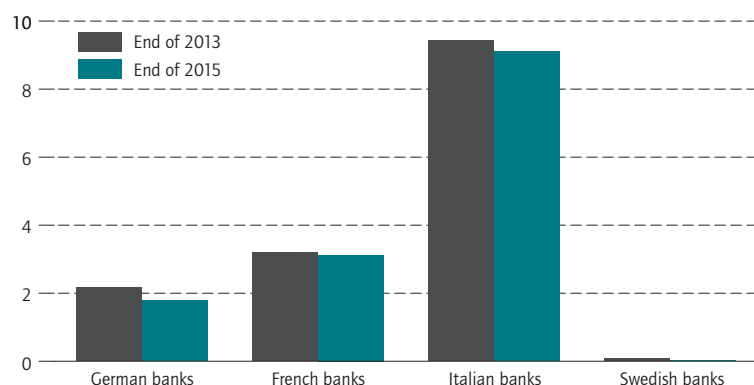
¹¹ The ratings of EU member states are available on the Fitch Ratings website.

¹² See Basel Committee on Banking Supervision, "Basel III: International framework for liquidity risk measurement, standards and monitoring," (PDF, Bank for International Settlements, Basel, 2010) (available online).

Figure 2.1

Additional capital needs

In billion Euro



Sources: EBA; authors' own calculations.

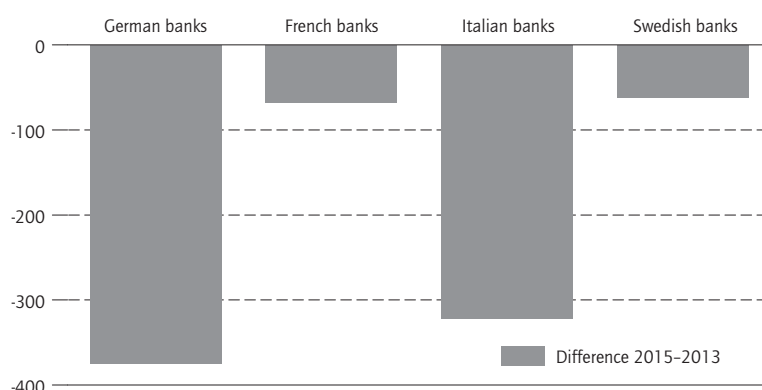
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The Italian banking sector would be severely affected by new capital requirements for government bonds of EU-member states.

Figure 2.2

Development of capital needs

In million Euro



Source: Authors' own calculations.

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The potential additional capital needs for bank holdings of EU-government bonds have somewhat declined between 2013 and 2015.

Additional capital requirement highest for Italian banks

The results of the estimate show that Italian banks would feel the impact of the revised regulation the most. German banks would need only around 1.8 billion euros

in additional equity capital, equal to one percent of the existing regulatory equity capital (see Figure 1). At 9 billion euros of additional equity capital, the Italian banks would be much more strongly affected (around 8 percent of the total regulatory equity capital of the Italian banks in the stress test). The primary reason for this is that Italian banks hold relatively large amounts of Italian government bonds: their government bond portfolios have a home bias.¹³ On the collection date, Italian government bonds had a Fitch Rating of BBB+, yielding a risk weight of 50 percent based on the standard approach. For each euro invested in the purchase of an Italian government bond, the banks would have to finance four cents out of their own funds. For Italian government bonds worth 100 million euros, a bank would need four million euros in additional equity capital. As a consequence of the combination of their home bias and comparatively unfavorable ratings, the planned change in the regulatory framework would confront Italian banks with a major challenge.

The 2016 stress test showed that major French banks had invested in Italian government bonds to a significantly greater extent than their German counterparts and would need a total of 3 billion euros in additional equity capital. Compared to German, French, and Italian banks, the additional capital needs of Swedish banks are extremely small. They would only need 19 million euros in additional equity capital.

Small reduction in government bond holdings since the 2013 stress test

Comparing the investments in EU government bonds across the two stress tests mentioned above, it appears that the additional capital needs of the German, French, Italian, and Swedish banks participating in the stress test decreased slightly between the end of 2013 and the end of 2015 (see Figure 2.1 and Figure 2.2). We continued to see substantial holdings of comparatively risky government bonds at Commerzbank, Deutsche Bank, and NRW.Bank, however (see Figure 3). Countering the trend, Commerzbank's activity in risky EU government bonds has not abated. Instead, the bank's holdings have increased. Like other major banks, however, Commerzbank scaled back on the proportion of Italian government bonds on its balance sheet total (see Figure 4), but its investment in Italian government bonds has remained high. All in all, it would need just under 900 million euros of additional equity capital. The German banks in the 2016 stress test reduced their govern-

¹³ "Home bias" is a term that is often used in conjunction with portfolio structure. It implies that a bank's portfolio contains a disproportionate number of assets from its own country. The investment decision is influenced by a preference for home-country assets.

ment risk and the associated additional capital requirement by almost 20 percent between the end of 2013 and the end of 2015. German banks also exhibited a strong home bias, but German government bonds have an AAA rating. Unlike the Italian banks, the German banks' home bias is thus inconsequential regarding the banks' capital needs.

Compared with other EU member states, the stress test showed that French banks only reduced their risk slightly. At the end of 2015, they had almost as much risk from EU government bonds on their books as they did at the end of 2013 (see Figure 5). Their additional capital requirement had declined by around only 2 percent since the end of 2013 and was three billion euros.

Major Swedish banks would hardly be affected by the elimination of the equity capital privilege for EU government bonds (see Figure 6). They would require a mere 19 million euros in additional equity capital for their existing investment in EU government bonds if required to hold equity capital in the future. The amount equals 0.03 percent of the total equity capital of the Swedish banks participating in the stress test.

Comparing the current capital requirement for government bonds in the Italian banking sector with that of the earlier stress test showed that here, too, the additional capital requirement somewhat declined. However, the Italian banks in the stress test would still have to document significantly more equity capital than if the equity capital privilege falls (see Figure 7). Although some banks have reduced their investments in Italian government bonds (see Figure 8), at nine billion euros the additional capital requirement in the Italian banking sector remains high.¹⁴

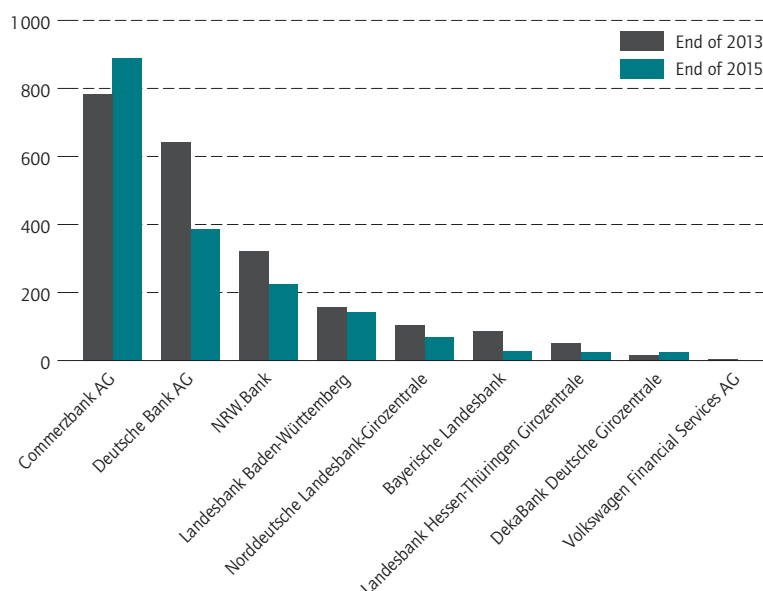
Italy: challenges for banks and the state

If the new capital requirements for EU government bonds do take effect, Italian banks will either need to accumulate substantially more equity capital or cull some of the Italian government bonds from their portfolios. In December 2016, the ailing Italian bank Monte dei Paschi di Siena (MPS) failed to raise capital from private investors. In general, it is an open question whether sufficient equity funds could be acquired in the capital market,¹⁵ although in the past some Italian banks have successfully raised equity capital in this way. For example, Unicredit accomplished the largest capital increase in the history of Italy in spring 2017 when it raised 13 billion euros. However, it is questionable whether shareholders

Figure 3

Additional capital needs of German banks

In million Euro



Sources: EBA; authors' own calculations.

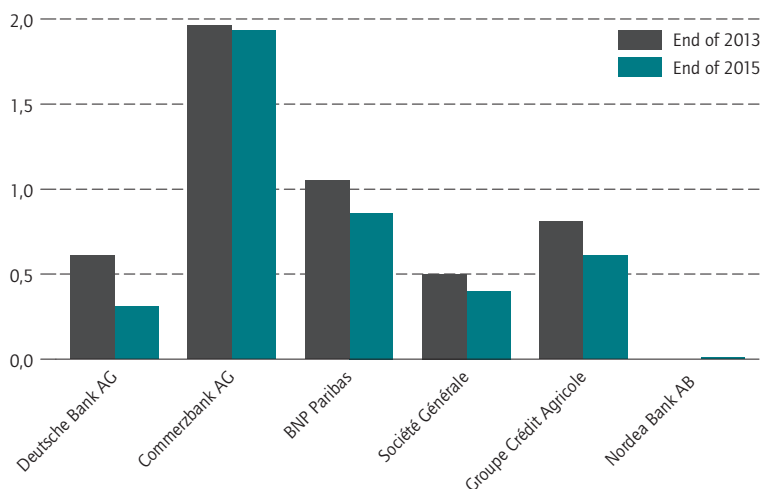
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Among the German banks, Commerzbank would be most affected by the introduction of risk weights for government bonds of EU member states.

Figure 4

The share of Italian government bonds in the balance sheets of major European banks

In percent



Sources: EBA; authors' own calculations.

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Many major European banks have reduced the share of Italian government bonds in their balance sheets between end of 2013 and end of 2015.

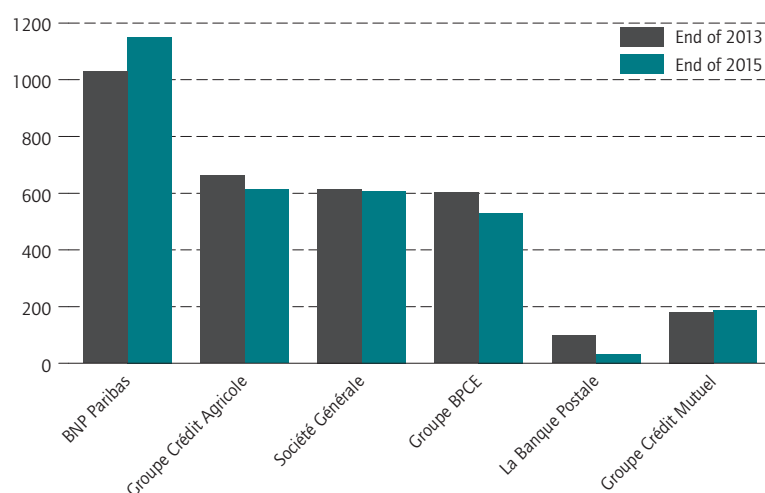
¹⁴ We use "additional capital requirement" and "capital requirement for government bonds" interchangeably.

¹⁵ Monte Dei Paschi Di Siena, (Press release, 2016) (available online).

Figure 5

Additional capital needs of French banks

In million Euro



Sources: EBA; authors' own calculations.

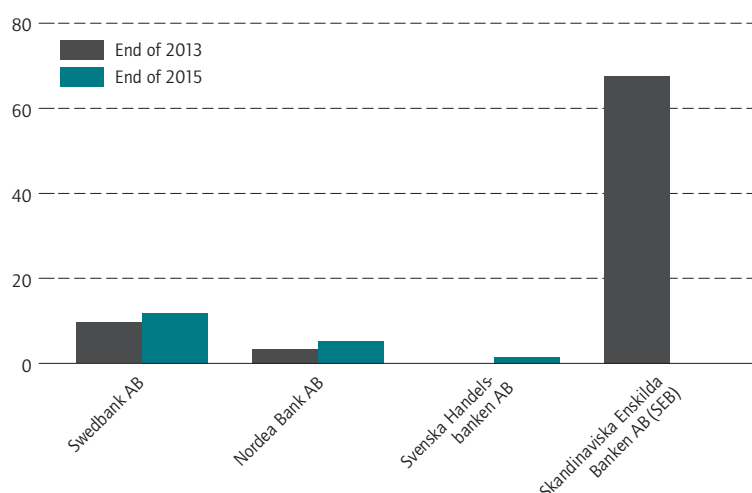
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For some French banks the equity requirements have slightly decreased.

Figure 6

Additional capital needs of Swedish banks

In million Euro



Source: Authors' own calculations.

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The Swedish banks would be hardly affected by the new capital requirements.

would share the burden of further capital increases to the same extent. Ultimately, this will depend on whether the economic situation of the Italian banks has substantially improved by the time the new regulatory framework goes into effect and they can significantly reduce the number of non-performing loans on their books.

The Italian government put together a 20-billion-euro bank rescue package for domestic banks with funds earmarked for recapitalization. Around nine billion euros have been set aside to shore up MPS's equity capital, the lion's share of which will come from the rescue fund. At least five billion euros will be required to cover depositor and senior bondholder losses as two recently failed banks, Banca Popolare di Vicenza and Veneta Banca, are currently being wound up. Additional capital injections are foreseeable—after all, over 15 percent of bank loans in Italy are considered at risk of default.¹⁶ As a result, the rescue package for the Italian banking sector could be too small to cover the additional capital requirement that would result from eliminating the equity capital privilege for the government bonds of EU member states.¹⁷ However, expanding the rescue program would force up Italy's already high level of sovereign debt.

Alternatively, Italian banks could restructure their portfolios if the capital adequacy requirement is implemented for EU government bonds. Reducing the portion of domestic government bonds in their financial statements would increase their immunity to the new capital requirements. Unfortunately, this type of adjustment in investment behavior would have negative consequences on refinancing Italian government bonds. The examined Italian banks hold a solid eight percent of outstanding domestic government bonds. If the banks reduced their investments, it would have a palpable effect on demand for these bonds. Their interest rates would rise first due to diminished demand, and second, because the risk premium on equity capital would also raise the cost of government bond purchases (see Box 2). Such a development would present a major challenge to the effort to consolidate the Italian budget, making this process more difficult. And if the interest rate on Italian government bonds were to rise, it would have an effect on the stability of the common currency.

¹⁶ Benoit Mesnard and Christina Katopodi, "Non-performing loans in the Banking Union: state of play," (Briefing, Economic Governance Support Unit (EGOV) of the European Parliament, Brussels, 2017) (available online) (accessed: June 28, 2017).

¹⁷ European Central Bank, "Financial Stability Review," (PDF, European Central Bank, Frankfurt, 2016) (available online).

Conclusion

The Basel Committee on Banking Supervision presented its first draft of the Basel III revision in 2013.¹⁸ In addition to other concerns, it took issue with the general zero risk weighting of EU government bonds. After the Basel III reform package goes into effect, investments in government bonds could be handled like loans or investments in corporate bonds: they must be backed by an adequate amount of equity capital.

Between 2013 and 2015, the major banks in Germany, France, and Italy reduced their holdings of EU government bonds only moderately. Given the European Central Bank's Public Sector Purchase Programme, the persistent presence of government bond portfolios at major European banks is surprising. Presumably, within the program, banks have been able to sell government bonds at higher prices than before. These findings and the persistence of home bias in the banks' government bond portfolios indicate that applying capital adequacy requirements to achieve the desired decoupling of sovereign default risk from national banks would at least be ineffective in the short term.

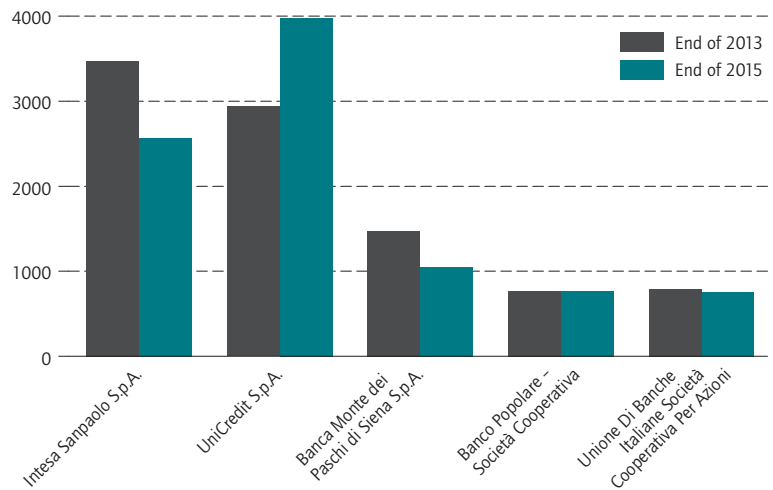
Due to the comparatively weak rating of Italian government bonds, the Italian banking sector would have to increase its equity base significantly. However, this could hamper the Italian state's consolidation efforts. These consequences must be considered if the aim of implementing risk weights for EU government bonds, sensible in principle, is to be pursued.

In order to reduce the additional capital requirements that would arise, lawmakers could stipulate that the capital adequacy requirement be applied only to new purchases of government bonds and not existing holdings. The new regulatory framework would in every case cause the interest rate on new issues to rise. For states with high levels of sovereign debt, this would represent a major challenge.

Figure 7

Additional capital needs of Italian banks

In million Euro



Sources: EBA; authors' own calculations.

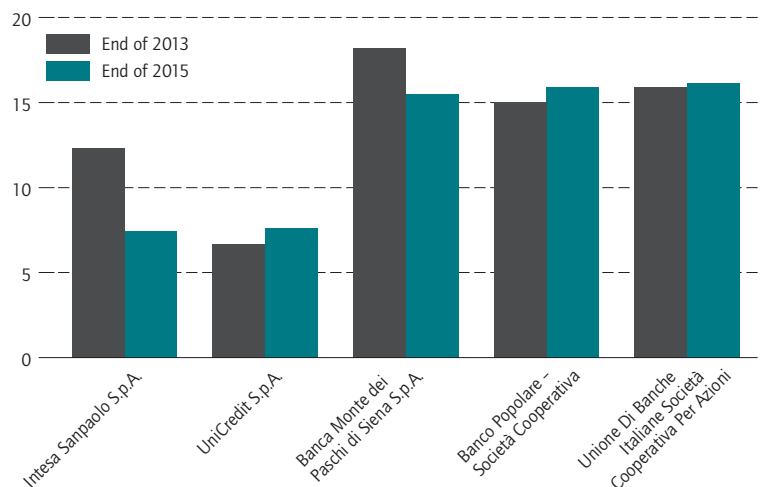
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Italian banks would need significantly more equity capital in case of introducing risk weights for government bonds of EU member states.

Figure 8

Share of Italian government bonds in the balance sheet of Italian banks

In percent



Sources: Banks' annual reports; authors' own calculations.

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The shares of domestic government bonds in the balance sheet of the Italian banks in the stress test are still high.

¹⁸ Basel Committee on Banking Supervision, "The regulatory framework."

Box 2

Higher capital requirements raise interest rates on low-rated government bonds

According to Basel III, banks must use equity capital to finance the loans they extend. The minimum share of capital depends on the borrowing entity's rating. When a bank purchases newly issued government bonds, it is virtually the same as (securitized) lending to the state. All other things equal, the interest rate that loan recipients must pay depends directly on the interest rate the bank must pay on the funds it uses to finance the loan. Assuming the absence of arbitrage, the interest rate R of amount B of the loan granted (in this case, "government bond") is equal to the sum of the interest rates r that the bank pays for own borrowing and the weighted equity capital risk premium, $ROE-r$, where the weighting factor is the capital share $\frac{K}{B}$:

$$R = r + (ROE-r) \times \frac{K}{B} \quad (1)$$

For loans extended to an EU member state (purchase of an EU government bond), the regulatory framework currently specifies an equity requirement K of zero (the equity capital privilege). If the equity capital privilege were eliminated, $K > 0$ would take effect for the purchase of low-rated EU government bonds and the financing costs for banks would rise (the right-hand side of equation (1) becomes larger). If the bank does not want to suffer a loss, it must pass its higher funding costs on to the government by requiring a higher interest rate R . Thus, low rated EU government bonds would have to have higher interest coupons than is the case under the current regulatory framework.

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JEL: G20, G28, G01

Keywords: Basel III, bank capital requirements, government bonds, bank sovereign nexus



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INTERVIEW WITH DOROTHEA SCHÄFER

»Capital requirements for new government bond purchases only could be a reasonable strategy«

1. Mrs. Schäfer, the Basel Committee on Banking Supervision has been negotiating the Basel III reform package since 2013. Banks have long been able to finance EU government bonds with 100% third-party debt capital. Is there agreement with regard to increasing the capital requirement for them? *The committee members agree that capital requirements for EU government bonds must be implemented in the future. But the details have not yet been made public.*
2. Which scenario did you base your study on? *We assumed that in the future, government bonds will have to be backed with equity capital based on the standard approach. This means that government bonds from countries with very good ratings would continue to have capital requirements of zero, that is, risk weights equal to zero. Countries with lower rating levels would receive risk weights higher than zero: for example, 50-percent or 100-percent risk weights are conceivable. Assuming that government bonds will be treated as normal credit exposures based on the standard approach, it is possible to calculate the additional capital banks will need in the future.*
3. This means that the share of equity capital required for a government bond is based on the rating of the country in question? *Exactly. The three most important rating agencies for sovereign states are: Standard & Poor's, Moody's, and Fitch Ratings. We used the ratings that Fitch publishes to calculate the risk weight for government bonds.*
4. How much additional equity capital will the banks in the major euro area states need if the "equity capital privilege" is eliminated? *The German banks tested in the 2016 stress test will only need 1.8 billion euros of additional equity capital. That is an extremely small amount and only one percent of their existing equity capital. They should be able to raise that in the market at any time. French banks enjoy a similar situation: although their requirement of around three billion euros is somewhat higher, it should be easy to raise. Italian banks, on the contrary, would have an additional capital requirement of around nine billion euros. It is extremely difficult for Italian banks to raise capital right now and considering that the state's rescue fund for Italian banks only contains 20 billion euros, nine billion euros is a relatively large sum.*
5. Would an increase in the capital requirement add to the burden of Europe's crisis-ridden countries? *Unfortunately, yes. The reason is that almost all of their banks have major holdings of domestic government bonds. If their own country has a low rating now, these banks will require a comparatively large amount of equity capital. They must raise it in the market—a difficult feat for banks and countries with shaky footing.*
6. What is your opinion on raising the capital requirement? Would the measure contribute to greater security in the European banking sector? *In general, I welcome higher capital requirements for government bonds—it is simply not good risk management to exclude them from all capital adequacy requirements. However, this would mean that countries might have to step in and provide the additional equity capital from their national budgets if banks are unable to raise the additional capital they need in the market. Due to the high sovereign debt levels in crisis-ridden countries, this would be a problem. They would need more money for their national budgets and would have to raise their debt levels once again. The timing would be unfortunate for those countries at present.*
7. How could they escape their dilemma? *One solution would be to apply the capital requirement to banks' new investments in government bonds only. That would definitely alleviate the situation.*

Interview by Erich Wittenberg

Clean drinking water as a Sustainable Development Goal: fair, universal access with increasing block tariffs

By Christian von Hirschhausen, Maya Flekstad, Georg Meran, and Greta Sundermann

One focus of the G20 Summit in Hamburg in July 2017 was the United Nations' sustainable development goals, including those set for the water sector. Despite progress, around 800 million people worldwide do not have adequate access to drinking water. Increasing block tariffs are an instrument widely used to support access to drinking water for poorer segments of the population. With this system, the price of water progressively increases with the volume consumed. An affordable first block ensures that poorer segments of the population have access to drinking water. However, neoclassical economic theory deems this form of tariff inefficient and advises against its use. From a behavioral economics perspective, however, it does have some advantages, which the present study discusses. In addition to their relative ease of implementation, increasing block tariffs are in line with the general public's concept of fairness: poorer population segments should pay less for vital goods.

At the G20 Summit in Hamburg at the beginning of July 2017, the implementation of the Sustainable Development Goals of the United Nations (UN) was a key focus (Box 1).¹ This includes universal access to drinking water stipulated in the sixth goal. Since at least 2000, access to clean drinking water has been a concrete goal of sustainable development. For example, United Nations Millennium Goal 7c proposed reducing the proportion of the global population without access to safe drinking water in 2015 by 50 percent in comparison to 1990.² The development goal was generalized to include access to clean water as a universal human right in 2010: UN Resolution 64/292 demanded a guarantee of the availability and sustainable management of drinking water for everyone.³

Indeed, progress has been made. For example, the number of people in the world with access to a clean drinking water source (defined as adequate protection against external contaminants)⁴ rose by 2.6 million between 1990 and 2015, from 76 to 91 percent. The expansion of water main and pipe systems played an important role in this.⁵ Yet, in 2015 around 800 million people still did not have access to safe clean drinking water—especially in sub-Saharan Africa and rural regions.⁶ Furthermore, one third of the world's population lives without adequate sanitation. The UN estimates the resulting annual income loss in developing countries to be approximately

¹ See United Nations, "Sustainable Development Goals: 17 Goals to Transform our World," (Website, United Nations, New York City, 2016). (available online; retrieved June 15, 2017. This applies to all other online sources cited in this report unless otherwise noted.)

² See United Nations, "United Nations Millennium Declaration," (Resolution adopted by the General Assembly 55/2, United Nations, New York City, 2000) (available online).

³ See United Nations, "The Human Right to Water and Sanitation," (Resolution adopted by the General Assembly 64/292, United Nations, New York City, 2000) (available online).

⁴ WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation, "Improved and unimproved water sources and sanitation facilities," (WHO/UNICEF, Geneva/New York City, 2017) (available online).

⁵ United Nations, "The Millennium Development Goals Report 2015," (PDF, United Nations, New York City, 2015) (available online).

⁶ United Nations, "Millennium Development Goals."

260 billion USD. That equals around 1.5 percent of global GDP. Poor countries in particular suffer income losses of up to ten percent.⁷ In view of climate change, urbanization, and rising demand, the UN continues to prioritize sustainable access to safe drinking water as an essential factor for sustainable development.⁸

Creating sustainable supply will require functional pricing and subsidy mechanisms for supplying and financing drinking water. In addition to water quality, decisions regarding availability must be made: enough water must be available for household use, and universal access to drinking water must be guaranteed. It is extremely difficult to price water because “affordability” is a broad term whose definition varies from place to place. Given this circumstance, the present study discusses the increasing block tariff model for pricing drinking water in developing and emerging countries. It presents current research findings that show this model in a much better light than the prevailing perspective of neoclassical efficiency.

Widespread use of increasing block tariffs globally

Neither academic researchers nor practitioners question the need to aid poor segments of the population in developing countries in securing their right of access to.⁹ There are many instruments and mechanisms available for use when it comes to water supply, but no conclusive assessment of their relative worth. The list of instruments includes: linear tariffs with a constant price per unit consumed, flat rates, direct subsidies for water connections, and increasing block tariffs.¹⁰ The latter are in widespread use in systems providing access to drinking water for lower-income population segments in emerging and developing countries.

In the increasing block tariffs model, the population is allocated a fixed quantity of water at a low bulk price, as a rule, at the point of connection to the water supply main (for example, household, school). Higher consumption leads to a price increase from one block to the next (Box 2). Based on the assumption that poorer households consume less water, they benefit from a lower tariff. Households with higher levels of consumption, which tend to be wealthier, pay for the quantity they use

in excess of the basic block at a correspondingly higher price. Regulatory commissions or water utilities must make decisions on the size of the blocks and volumetric price levels. The first block’s design is especially important. It is often called the lifeline tariff since it targets the subsistence level of particular poor population segments.

Criticism of increasing block tariffs from academic and practical perspectives

Despite the fact that increasing block tariffs are used worldwide, not only in developing and emerging countries but in water-scarce regions as well, their use is often criticized; neoclassical economic researchers and policy consultants challenge whether increasing block tariffs actually benefit poor population segments.¹¹ They proffer both politico-economic and general welfare theoretic arguments.

Neoclassical argumentation emphasizes economic inefficiency

Economists traditionally argue in favor of indirect subsidies rather than direct subsidies—and in this context, in favor of linear tariffs. A fundamental argument against increasing block tariffs is that as a result of price differentiation, prices are not generally equal to marginal costs. From a theoretical perspective, this violation of the marginal principle should lead to the inefficient distribution of the good, water, and an ensuing loss of economic welfare.¹² And, in practice increasing block tariffs generally do not cover costs because their price progression does not suffice to cover the inexpensive blocks.¹³

Lifeline tariff design critical to success

Block size design is also subject to criticism, particularly the dimensions of the most inexpensive block, the lifeline tariff, which is intended to be affordable. The problem is to define an adequate volume, which can be difficult in practice. On the one hand, the volume of the

⁷ United Nations Development Programme, “UNDP Support to the Implementation of Sustainable Development Goal 6,” (PDF, United Nations Development Programme, New York City, 2016) (available online).

⁸ United Nations Development Programme, “Support to Goal 6.”

⁹ For an overview see Sophie Trémolet and Catherine Hunt, “Taking account of the poor in water sector regulation,” (Water Supply & Sanitation Working Notes 11, World Bank, Washington DC, 2006) (available online).

¹⁰ See Ulrike Pokorski da Cunha, “Subventionen im Wassersektor – Ineffizienztreiber oder soziale Notwendigkeit?” *Expertengespräch. Finanzierung in der Wasserwirtschaft*, (PDF, GIZ, Eschborn, 2008) (available online).

¹¹ For this section, see the discussion by Ronald C. Griffin and James W. Mjelde, “Distributing water’s bounty,” *Ecological Economics* 72 (2011): 116–128 and several publications by Dale Whittington and co-authors: Mike Young and Dale Whittington, “Beyond increasing block tariffs: Decoupling water charges from the provision of financial assistance to poor households,” (PDF, Global Water Partnership, Stockholm, (2016) (available online); John J. Boland and Dale Whittington, “The Political Economy of Water Tariff Design in Developing Countries: Increasing Block Tariffs versus Uniform Price with Rebate,” *The Political Economy of Water Pricing Reforms*, ed. Ariel Dinar, published for the World Bank (New York: Oxford University Press, 2000), 215–236 (available online); Dale Whittington, “Municipal water pricing and tariff design: A reform agenda for South Asia,” *Water Policy* 5 (2003): 61–76 and C. W. Sadoff et al., *Securing Water, Sustaining Growth: Report of the GWP/OECD Task Force on Water Security and Sustainable Growth*, (Oxford: University of Oxford, 2015) (available online).

¹² See Young and Whittington, “Beyond increasing block tariffs.”

¹³ See Young and Whittington, “Beyond increasing block tariffs.”

Box 1

Issue linking: the ties between sustainable development goals are growing stronger

The G20 summit in Hamburg in July 2017 took place under German presidency. Measures for implementing the sustainable development goals were on the agenda for discussion. The goals were adopted in 2015, almost at the same time as the 2015 United Nations Climate Change Conference, as part of Agenda 2030.¹ They not only provide guidelines for future development cooperations but also connect climate protection and development.

In the ongoing debates within the G20 group and the upstream T20 group of international think tanks, an intensification of the ties between the individual development goals can be detected.² This process of issue linking can connect global and local environmental protection and development goals. One area in which it is possible to link climate protection and other United Nations sustainable development goals is carbon pricing and subsequently using the yields for infrastructure development,³ including sustainable access to drinking water. This connection makes it possible to achieve two goals using one means: the financial flows resulting from carbon pricing could be efficiently allocated to sustainable infrastructure measures in order to support "green growth" in both emerging and industrial countries. According to estimates, a global investment of over 15 trillion U.S. dollars in water and sanitation alone will be required by 2030.⁴ Some countries could take part of their revenue from national carbon pricing to cover their share of the amount.⁵

¹ See United Nations, "Transforming our world: the 2030 Agenda for sustainable development," (Resolution adopted by the General Assembly A/70/L.1, United Nations, New York City, 2015) (available online) (accessed: June 15, 2017). For more details, see Jeffrey Sachs, *The Age of Sustainable Development*, (New York: Columbia University Press, 2015).

² See Celine Bak et al., "Towards a Comprehensive Approach to Climate Policy, Sustainable Infrastructure, and Finance," (PDF, G20 Insights, Berlin, 2017) (available online).

³ See Joseph Stiglitz and Nicholas Stern, "Report of the High-Level Commission on Carbon Prices," (PDF, Carbon Pricing Leadership Coalition, Washington, DC, 2017) (available online).

⁴ See Amar Bhattacharya et al., "Delivering on Sustainable Infrastructure for Better Development and Better Climate," (PDF, Brookings Institution, Washington, DC, 2016) (available online).

⁵ Bak et al., "Comprehensive Approach."

Box 2

Increasing block tariffs in practice

Increasing block tariffs are used in many developing and emerging countries. There are significant differences in the design of increasing block tariffs with regard to number of blocks, water volume assigned to each block, price, and price structure (Figure 1). In all of the cities shown here, the lowest block, or lifeline tariff block, starts in a lower price segment and rises with increasing water consumption (in cubic meters per month and metered connection).

A survey of water tariffs from the literature shows the world-wide significance of increasing block tariffs, not only in the developing world.¹ In 60 percent of the cases included, they are used for drinking water (Figure 2). The cases include major cities in emerging and developing countries in Africa, the Middle East, and Asia. However, we also found IBTs in some metropolitan regions in industrialized countries such as the USA. (San Diego, San José, Los Angeles, and Seattle) and Australia (Melbourne and Perth).

The differences in design indicate that it is not possible to make a general statement about which increasing block tariff designs are most advantageous. Take Manila and Curitiba for example: both cities allocated a volume of ten cubic meters and a price of zero U.S. dollars per cubic meter to the lifeline block but diverged markedly from there. While the price increases in subsequent blocks were quite low in Manila, Curitiba chose to use sharp rises in the price of water as the volume consumed increased and the blocks themselves were larger.

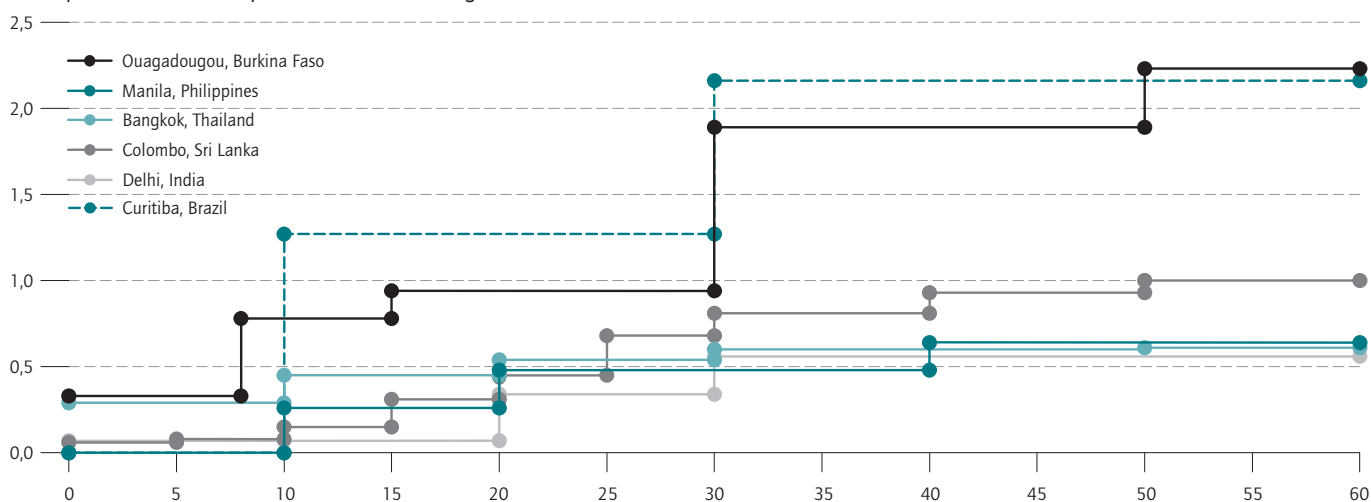
Country-based and hydrological particularities play key roles in the detailed design of increasing block tariffs. These include: the amount of water required for survival, access to the water piping network, and the relationship between household size and water consumption.

¹ See Young and Whittington, "Beyond increasing block tariffs."

Figure 1

Examples for specific designs of increasing block tariffs worldwide

Block price in U.S. dollars per cubic meter drinking water



Source: Own depiction based on data taken from the International Benchmarking Network for Water and Sanitation Utilities (IBNET) tariff database (2017), which is a joint project of Global Water Intelligence (GWI) and the International Benchmarking Network IBNET of the World Bank. It provides information on 193 countries, 1907 utilities, and 5054 tariffs (available online).

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Globally, increasing block tariffs vary not only with respect to the height of the lifeline tariff but also in their further progression.

Figure 2

Sample of places where increasing block tariffs are implemented

Status 2013



Note: This overview shows a sample of cities worldwide where increasing block tariffs are implemented. There is no claim of completeness.

Source: Own depiction based on data taken from Mike Young und Dale Whittington (2016): Beyond increasing block tariffs: Decoupling water charges from the provision of financial assistance to poor households. Global Water Partnership, Stockholm.

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Increasing blocktariffs are not only relevant in a development context

lifeline tariff block can be too large. In some cases, for example, it ranges from ten to 20 cubic meters per month and household or connection (Figure 1, Box 2).¹⁴ This is a very wide range and would probably include consumers in higher income segments as well. From a politico-economic perspective, cases like this would be examples of “subsidizing the middle class.” The working assumption which increasing block tariffs are based on—the positive relationship between water consumption and income—may also turn out to be critical. The relationship between rising income and increased water consumption has not been documented in a uniform empirical manner.¹⁵ Furthermore, if the water prices in the first blocks are too low, this could lead to excessive consumption, aggravating an existing water shortage.

On the other hand, the lifeline tariff block could be too small. Assuming in general that poorer households have more members,¹⁶ the total consumption of the household would rise and a lower volume of water would be available at the lifeline tariff, if it is charged on a per household basis. If several families share a water connection this will lead to higher consumption, moving them into a higher block and in turn, assign them to a higher tariff. These types of contexts can undermine the original purpose and effectiveness of increasing block tariffs, namely, to provide poor population segments with the required water volume at an affordable price.

Others criticize that block tariffs do not reach certain segments of the population at all. This is typically the case in rural regions, where the connection density is low and network infrastructure minimal. Poor population segments are often not connected to the public water network. They procure their drinking water from wells, open water, or mobile water sellers, for example, and do not benefit from the tariff design at all.

Acknowledging social preferences: increasing block tariffs facilitate fair distribution of welfare

The results of current research at DIW Berlin, which takes into consideration the general population’s social preferences, cast increasing block tariffs in a better light

than the neoclassical view does.¹⁷ For some time now, economists have been reviving their interest in the issues of distribution and fairness (Box 3). Taking distribution into consideration has led to further development in preference theory. In the conventional view, only bundles of goods that individuals consume themselves can generate utility. This is the assumption usually underlying *homo economicus*. The theory of social preferences, on the other hand, encompasses the interaction between one’s own consumption and that of others. It assumes that people are social beings and they express this through sympathy or envy of other people—as discussed in the economic literature for centuries (Box 3).

The present report assumes that individuals not only derive utility from self-consumed goods (x_1), but also from the relationship between their own self-consumed goods and the goods that others consume (x_2). A differentiation between envy (weighted with parameter γ) and sympathy (weighted with parameter δ) is made. While envy plays a role when a larger bundle of goods is available to the reference group, sympathy plays a role when an excess of personal consumption in comparison to others leads to negative utility. Fehr and Schmidt introduced this type of social preferences into the literature;¹⁸ it can be formalized as,

$$\text{Social utility} = x_1 - \gamma \max(x_2 - x_1, 0) - \delta \max(x_1 - x_2, 0)$$

The social preferences outlined here indicate that inequality receives a negative rating—with regard to universal access to clean drinking water, for example. If broad sections of the population have little or no access, society’s welfare is at a low level. The perspective of the people who have inadequate access to drinking water is just as important as the perspective of the people who have adequate access to drinking water. The former experience lower utility because they both can access less drinking water and compare this to the higher level of access of others. The latter experience lower utility because they assess others’ inadequate access negatively. In this case, redistribution would be welcome from both societal and individual perspectives.

A society with a high preference for redistribution can assess increasing block tariffs more positively than is possible from the perspective of the neoclassical *homo economicus*. However, it should be taken into account that the specific extent of the redistribution preference

¹⁴ For more information on the categories of “drought,” “water shortage,” and “safe water,” see Water Forum www.water-forum.com/page_1.htm and Phil Greaney, Sue Pfiffner, and David Wilson, eds., *Humanitäre Charta und Mindeststandards in der humanitären Hilfe*, (Bonn: The Sphere Project, 2011) (available online).

¹⁵ See Young and Whittington, “Beyond increasing block tariffs.”

¹⁶ See Momi Dahan and Udi Nisan, “Unintended Consequences of Increasing Block Tariffs: Pricing Policy in Urban Water,” *Water Resources Research* 43 (3) (2007).

¹⁷ For this section, see Georg Meran and Christian von Hirschhausen, “Increasing Block Tariffs in the Water Sector: An Interpretation in Terms of Social Preferences,” *The B.E. Journal of Economic Analysis & Policy* (available online).

¹⁸ Ernst Fehr and Klaus M. Schmidt, “A Theory of Fairness, Competition, and Cooperation,” *The Quarterly Journal of Economics* 114 (3) (1999): 817–868.

Box 3

Social preferences: Adam Smith's "moral sentiments" in the 21st century

The concepts of fairness and equity are slowly but surely working their way into mainstream economics. In these days of financial crises and global risks, they are resonating with large sections of the population. In this context, however, it is important to point out that key arguments in support of fairness and morality in economic action were introduced centuries ago. Classical Greek philosophers, for example, viewed elevated levels of inequality within social segments as potentially explosive. Plato called for capping the income difference between well-to-do and poorer citizens at a factor of four.¹ In the Middle Ages, the ideal of equality was tied to religious standards. In his work *Utopia*, Tudor-era philosopher Thomas More posited the equality of material needs (at a generally low level).

Adam Smith, a founder of classical political economics, reasoned that a key driver of economic development is people's ability to empathize with fellow human beings. In his major work published in 1759, *The Theory of Moral Sentiments*, he developed the concept of the "sympathy" of a non-partisan well-educated spectator concerned with the fate of others out of a human

sense for what is right.² During the 19th century and well into the 20th, the moral issues of equality and inequality were at the core of political economics.³

During the Cold War after 1945, the subject of "distribution" was removed from most economics textbooks, and the focus was placed on the "optimal allocation" of production factors and goods. Distribution issues were relegated to the set of subjects that economics was incapable of making claims about.⁴ With the end of the Cold War and the crisis of neoclassical economics in the wake of the most recent financial and economic crisis, the issue is back on the agenda in the 21st century.

2 "How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortunes of others, and render their happiness necessary to him, though he derives nothing from it, except the pleasure of seeing it." See Knud Haakonssen, ed., *Adam Smith: The Theory of Moral Sentiments*, (Cambridge: Cambridge University Press, 2002).

3 In 1873, Gustav Schmoller founded the German Economic Association (*Verein für Socialpolitik*), the society of German-speaking economists that is still active today, based upon this concept.

4 See Michael Fritsch, Thomas Wein, and Hans-Jürgen Ewers, *Marktversagen und Wirtschaftspolitik*, (Munich: Verlag Franz Vahlen, 1993), Chapter 2.

1 Bertram Schefold, "Platon und Aristoteles," ed. Joachim Starbatty, *Klassiker des ökonomischen Denkens*, (Hamburg: C. H. Beck, 2008).

depends on the socio-economic characteristics of the society in question.¹⁹

In addition, it can be shown that the progression of the tariffs—meaning the relationship of the prices in the different consumption blocks—correlates positively to redistribution preferences in different ways. The stronger the society's preference for providing universal access to essential goods and services, the greater the differentiation required in block tariffs. This implies a price for the initial block that is much lower than the marginal cost, the lifeline tariff. Accordingly, tariffs are determined under consideration of the aspect of social equality.²⁰ Accepting the validity of social preferences implies that increasing block tariffs are more equitable than linear tariffs.²¹

19 See Roland Bénabou and Jean Tirole, "Belief in a just world and redistributive politics," *The Quarterly Journal of Economics*, 121 (2) (2005): 699–746.

20 Redistribution neutrality results in linear tariffs without differentiation.

21 Structurally, this finding is similar to the debate on progressive taxes; in particular, income tax. Here as well, in the context of an increasing consideration of fairness and equality, there appears to be a relationship between societal concepts of fairness and progressive taxes. See Peter Diamond and Emma

Block tariffs are easily implemented

Another argument in favor of block tariffs is their relative ease of implementation. Increasing block tariffs are a simple tariff form with lower transaction costs. It is superior to direct financial assistance, that is, direct transfers to individuals, to the extent that these require specific knowledge of the income of individuals, families, or households. In the developing world of low administrative capacity and typically inadequate governance structures, robust transfer systems are difficult to implement. Alongside mismanagement and corruption, those factors can trigger artificial water shortages.²² Increasing block tariffs reduce the risk of artificial water shortages because they are less susceptible to corruption due to the lack of direct subsidy payments.

nuel Saez, "The Case for a Progressive Tax: From Basic Research to Policy Recommendations," *Journal of Economic Perspectives* 25 (4) (2011): 165–190.

22 Martin Jekel, Georg Meran, and Christian Remy, "Sauberes Wasser: Millenniumsziel kaum zu schaffen, Privatisierungsdebatte entspannt sich," *DIW Wochenbericht* No. 12/13 (2008): 143–148.

However, one cannot assume that once increasing block tariffs are adopted as policy, they will permanently secure access to drinking water for all. In the medium term, financing is an issue (through budgetary resources, funds, external donors, etc.) as well. Interest groups could attempt to influence the detailed design of the block tariffs politically or economically. And other problems relevant in the developing world, such as weak governance structures, could also make it difficult to create an effective design. For this reason, this single economic instrument cannot guarantee universal access to drinking water. It is, rather, one key to achieving the Sustainable Development Goal of universal access to drinking water within a polycentric decision-making context involving diverse actors and interest groups.²³

Conclusions

Despite improvements in recent decades, access to drinking water remains a critical factor in the developing world with respect to direct access for poorer population segments as well as long-term growth in the countries particularly affected. Lacking drinking water quality is a significant economic obstacle to development. To implement the United Nations Sustainable Development Goals, the responsible parties in countries with water shortages—as well as donor countries and international development banks—must re-think the pricing and subsidy instruments being used to provide and finance drinking water.

Increasing block tariffs are a widespread instrument for improving poorer population segments' access to clean water. A specific amount of water is provided at low volumetric prices, and higher consumption leads to a gradual price increase by block. The most affordable block of

a block tariff is called the lifeline tariff. This tariff form frequently draws criticism in the economic literature, in particular because of its (ostensible) allocative inefficiency: its prices are not oriented to the marginal cost principle and are therefore attributed with reducing welfare. The design of the blocks and the uncertainty inherent in the relationship between water consumption and household income are also controversial points.

From a behavioral economics perspective, the value of a block tariff system is easier to assess. In societies that are averse to inequality, progressive increasing block tariffs are considered fair because they better map the societal preference for supporting poorer segments of the population. In addition to the arguments based on behavioral economics, simple implementation speaks in favor of the block tariff model, in particular the ease with which they can achieve the goal of providing minimum amounts of drinking water to poorer population segments.

Actually, the apparent conflict between allocative inefficiency and equality of distribution depends on the subjective assessment of different goals. In any case, an important prerequisite for effective block tariff design is adequate block dimensions—above all, the size of the lowest or lifeline tariff. Country-specific aspects must also be taken into consideration when planning the concrete implementation of instruments. They must be carefully weighed in view of various priorities, such as economic efficiency and effectiveness, fairness, and ecological sustainability.

23 Elinor Ostrom and Roy Gardner, "Coping with asymmetries in the commons: selfgoverning irrigation systems can work," *Journal of Economic Perspectives* 7 (4) (1993): 93–112.

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