A one-off wealth tax for Belgium:
Revenue potential, distributional impact, and environmental effects

Arthur Apostel and Daniel W. O'Neill

Author accepted manuscript published in *Ecological Economics*

doi:10.1016/j.ecolecon.2022.107385

Abstract

Policymakers and economists are becoming increasingly concerned about wealth inequality. Here we estimate Belgium's wealth distribution — and based on this distribution — the revenue potential, distributional impact, and environmental effect of three proposals for a one-off Belgian wealth tax. Our method consists of (1) estimating the Belgian wealth distribution by extending survey data with a top-tail Pareto distribution based on a novel national rich list, and (2) combining the estimated wealth distribution with proposed tax configurations and published elasticities. There are four main results. First, the wealthiest 1% of households possess ~24% of total net wealth, substantially more than previous estimates suggest. Second, the revenue potential of a one-off tax is considerably higher than estimated by wealth tax advocates. Third, the distributional impact would be limited as the richest 1% of households would still possess at least 23% of total net wealth. Fourth, a one-off tax would likely reduce CO_2 emissions by only 0.1–0.6%. Overall, our findings suggest a one-off wealth tax could finance over half of Belgium's COVID-19 costs, but would lead to only small reductions in wealth inequality and environmental impact. Ecological economists may therefore wish to pursue other policy proposals to achieve fair distribution and sustainable scale.

Keywords

Wealth tax – Wealth distribution – Belgium – Environmental effect – Revenue potential – Distributional impact

Highlights

- We estimate the effects of three proposals for a one-off Belgian wealth tax
- The richest 1% of Belgian households possess around 24% of total net wealth
- Revenue potential of a one-off wealth tax is between 5.9 and 43.1 billion euros
- The richest 1% of households would still possess at least 23% of total net wealth
- Consumption-based CO_2 emissions would decrease by only 0.1 to 0.6%

1. Introduction

Policymakers and economists alike are becoming increasingly concerned about the distribution of wealth. Wealth–income ratios are on the rise in the industrialised world, and wealth is much more unequally distributed than income (Piketty and Zucman, 2014). These and similar findings by Piketty and colleagues have led to a surge in the number of studies concerned with wealth inequality and wealth taxation. Such studies have had their influence on policy institutions. The director of the IMF has recently called on governments to reduce large disparities in the distribution of not only income but also wealth by raising taxes for the rich (Georgieva, 2020).

Questions of distribution have always been central to the ecological economics research programme. In their well-known textbook, Daly and Farley (2011) describe the just distribution of a society's resources as one of the three main policy areas of ecological economics. As far back as his 1977 book *Steady-State Economics*, Daly called for a "distributist institution" that would place a maximum limit on both income and wealth, arguing that "Without some such limits, private property and the whole market economy lose their moral basis" (Daly, 1977, p. 53). In the first article of the journal *Ecological Economics*, Constanza (1987) argued that distribution becomes more important in low-growth societies, while an analysis of the more-recent degrowth literature found that proposals concerned with social equity were as common as proposals concerned with environmental sustainability. The authors noted that "the degrowth academic literature is, if anything, more focused on social equity than on environmental sustainability" (Cosme et al., 2017, p. 328). The importance of greater equality, as an end in itself, is further exemplified by the phrase "degrowth *for* social equity", which appeared in the title of one of the seminal articles on degrowth (Schneider et al., 2010, emphasis added).

Beyond the moral argument for greater equality, there are other reasons why ecological economists may be interested in the specific issue of wealth taxation. On the one hand, it has been suggested that more equal societies may also have lower environmental impacts (e.g. Wilkinson and Pickett, 2009; Cushing et al., 2015). A wealth tax could provide a way to finance COVID-19 budget deficits, which would have a lower environmental impact that an aggressive pro-growth strategy, given the link between economic activity and resource use (Hickel and Kallis, 2019; Haberl el al., 2020). However, a wealth tax might also incentivise the wealthy to look for higher-yielding investments, thus leading to more economic growth, and with it greater environmental impacts. Despite these conflicting possibilities, empirical research exploring the link between wealth inequality/taxation and environmental impact remains extremely limited.

The COVID-19 crisis has led to considerable government deficits, and the associated increase in public debt worries policymakers. According to the IMF (2021), public debt-to-GDP in advanced economies rose by 18 percentage points in 2020. For Belgium, the National Bank of Belgium (2021) estimates that public debt-to-GDP rose by 17 percentage points (or around 45 billion euros), of which almost 36 billion euros were tied to the government's COVID-19 response. Policymakers are worried about the implications of this increase in government debt for long-term debt sustainability, meaning that policy action to reduce debt-to-GDP ratios seems likely. One illustration of policymakers' concern with debt sustainability can be found in the National Bank of Belgium's (2021, p. 153) annual report for 2020, which calls the sustainability of public debt "*un défi comparable à celui de limiter le réchauffement climatique*"[1].

For those who are concerned about both rising public debt and high levels of wealth inequality, a wealth tax may appear to be an effective policy instrument. Indeed, three Belgian policy actors have recently advocated for a one-off wealth tax as a desirable source of revenue to finance the coronavirus budgetary cost. A one-off wealth tax differs from an annual wealth tax in the sense that the amount of tax which needs to be paid is fixed from the beginning and does not change over time, regardless of whether the tax is paid in one year or over a succession of years (Advani et al., 2020). In all proposed configurations, only the very wealthy would be taxed, with proposed tax rates ranging from 1% to 5% (Table 1).

Table 1. Overview of one-off Belgian wealth tax proposals

<table>
<tr><th>Origin</th><th colspan="2">Proposal</th><th>Rough estimate</th></tr>
<tr><td>Groen (2020),
Flemish green party</td><td colspan="2">1% wealth tax for the richest 1% of households*</td><td>5 billion euros</td></tr>
<tr><td>PVDA (2020),
Belgian communist party</td><td colspan="2">5% wealth tax for households with a net wealth of more than 3 million euros</td><td>15 billion euros</td></tr>
<tr><td rowspan="6">De Grauwe (2020),
prominent neoclassical Belgian economist</td><td colspan="2">Progressively increasing wealth tax</td><td rowspan="6">10 billion euros</td></tr>
<tr><td>Tax</td><td>Net wealth brackets</td></tr>
<tr><td>1%</td><td>1 million; 10 million</td></tr>
<tr><td>2%</td><td>10 million; 100 million</td></tr>
<tr><td>3%</td><td>100 million; 1 billion</td></tr>
<tr><td>4%</td><td>>1 billion</td></tr>
</table>

* Groen calls this an illustration, and proposes that a commission of experts should work out feasible one-off wealth tax configurations.

[1] "a challenge comparable to limiting global warming"

While their proponents have provided rough estimates of revenue potential for all three Belgian wealth tax proposals (Table 1), these estimates are based on either outdated or questionable data.[2] The reason for these shortcomings is that there is simply no good estimate of Belgium's wealth distribution available. Moreover, the distributional impact of these wealth tax proposals is unclear, which makes it impossible to have an informed debate about how much a wealth tax would reduce Belgian wealth inequality. Lastly, given the possible link between wealth inequality and environmental impact, policymakers may want to consider the environmental effects of wealth tax proposals, but quantitative estimates of environmental impact are not available.

In light of these considerations, this article aims to answer the following research question:

- What is the revenue potential, distributional impact, and environmental effect of three proposals for a one-off Belgian wealth tax?

However, given the fact that no good estimate of the Belgian wealth distribution is currently available, even though such an estimate would be both informative for public debate and essential to answer the above question, we must first answer the following question:

- How is wealth distributed in Belgium?

This article proceeds as follows: Section 2 outlines the theoretical and empirical background of our estimation procedure. Section 3 provides a discussion of the underlying data and methods. Section 4 presents the results. Section 5 discusses the results and relates them back to the literature. Section 6 concludes.

2. Theoretical and empirical foundations of the empirical analysis

This section has four parts. First, techniques for estimating the wealth distribution and their applicability to Belgium are explored. Second, the determinants of revenue potential are examined. Third, previous studies of the Belgian wealth distribution are analysed. Lastly, the environmental effects of a wealth tax are discussed.

[2] De Grauwe (2020) uses uncorrected 2017 HFCS survey data, while Groen (2020) combines the wealth shares estimated by Vermeulen (2016) with national accounts aggregates, and PVDA (2020) combines the wealth shares estimated by Rademaekers and Vuchelen (1999) with national accounts aggregates. See Sections 2.1 and 2.3 for a discussion of why these sources are problematic.

2.1 Wealth distribution estimation techniques

Since there is no Belgian wealth register, the wealth distribution needs to be approximated. The literature holds three principal wealth distribution estimation methods (Kopczuk, 2015): (1) capital income tax revenues can be related to capital income tax rates and rate-of-return estimates; (2) estate tax revenues can be related to estate tax rates and mortality statistics; or (3) wealth surveys can be used. As a representative sample of micro tax data is not available, the two tax-based estimation techniques are not easily applied to Belgium.

In contrast to tax-based approaches, the survey estimation method is readily applicable. However, the survey-based technique has two major limitations. First, there is the issue of *differential unit non-responsiveness*, i.e. households at the top of the wealth distribution exhibit more non-responsiveness than other participants (ECB, 2011; Osier, 2016). Second, *aggregated net household wealth based on surveys is substantially lower than aggregated net household wealth in macro national statistics*, and differential unit non-responsiveness does not entirely explain this gap (Chakraborty et al., 2018). As financial data in the national accounts are very reliable, it is highly likely that surveys underestimate total net wealth (Waltl, 2020). While the literature has not yet reached a consensus about the causes of this underestimation, there seems to be broad agreement that underreporting of assets (e.g. Vermeulen, 2016) and non-inclusion of certain wealth components in surveys (e.g. Waltl, 2020) both play an important role.

To confront the issue of differential unit non-responsiveness, the dominant correction method consists of replacing survey data above a certain wealth threshold with a Pareto distribution (see Fig. 1 for an example). Such a top-tail Pareto distribution is usually estimated based on a combination of top-tail wealth survey data points and rich list entries (e.g. Bach et al., 2014). While the Pareto distribution has also been estimated entirely on the basis of survey data (e.g. Eckerstorfer et al., 2016), Vermeulen (2014, 2018) shows that these results are biased and underestimate wealth inequality when differential unit non-responsiveness occurs. It is often taken as an empirical regularity that the top-tail wealth distribution is Pareto-shaped, although this assumption has faced criticism (e.g. Brzezinski, 2014; Clauset et al., 2009).

Given the uncertainty regarding its cause, the underestimation of net wealth in surveys is not always corrected. Studies that do correct tend to rescale survey wealth components to the macro aggregates (e.g. Vermeulen, 2016). Some authors prefer to rescale only financial assets and liabilities but not real assets, as surveys may provide more reliable estimates of aggregate real assets than the national accounts (Krenek and Schratzenstaller, 2018).

In summary, of the three main wealth distribution estimation methods, only the survey-based technique can be straightforwardly applied to Belgium. Although wealth surveys have two important limitations (differential unit non-responsiveness and the mismatch between aggregated net wealth in surveys and national statistics), correction methods are available for both limitations.

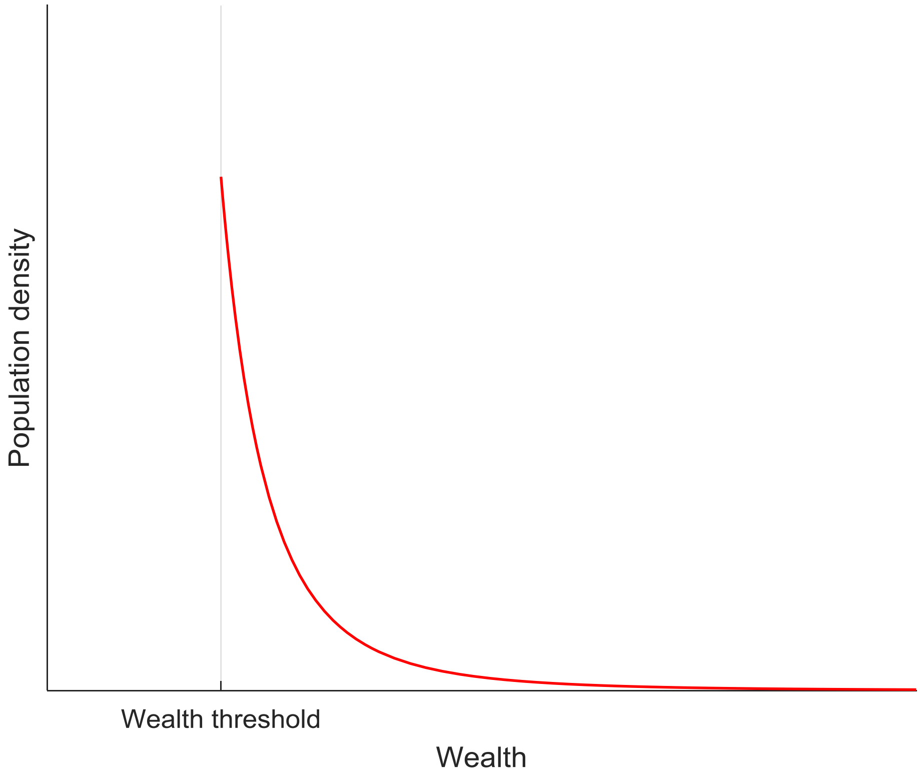


Fig. 1. An example of a Pareto distribution. A Pareto distribution is fully determined by its Pareto parameter α and its threshold w_{min}. In the above figure, $\alpha = 3$ and $w_{min} = 1$. See Supplementary Information for its functional form.

2.2 Revenue potential of a wealth tax

The revenue potential of a wealth tax cannot simply be calculated from the wealth distribution. Tax avoidance, tax evasion, and a reduced savings rate could lead to a decline in the tax base if a wealth tax were introduced. Unfortunately, the literature does not provide an estimate of the tax elasticity of a one-off wealth tax. However, a limited number of studies have examined the influence of a recurrent wealth tax on the tax base in high-income countries (Table 2). Reported elasticity estimates vary substantially. A one-off rather than a recurrent wealth tax would likely induce substantially less tax avoidance, tax evasion, and real effects, especially if it came into force unexpectedly or if it were applied retroactively (Boadway and Pestieau, 2018).

Table 2. Overview of elasticity of wealth estimates in high-income countries

Study	Data	Estimation	Elasticity	Estimate
Seim (2017)	Sweden, 1999-2006	Bunching-based	Net-of-tax rate	[0.12; 0.33]
Jakobsen et al. (2020)*	Denmark, 1980-96, top 2-3%	Difference-in-difference	Net-of-tax rate	[1.09; 8.86]
	Denmark, 1980-96, top 1%	Difference-in-difference	Net-of-tax rate	[6.36; 11.33]
Brülhart et al. (2016)	Switzerland, 2003-12	Difference-in-difference	Tax	[-0.23; -0.34]

Note: Net-of-tax rate equals 1 - marginal tax rate. The net-of-tax rate elasticity is defined as the proportional change in wealth relative to a proportional change of one percent in the net-of-tax rate. The tax semi-elasticity (estimated by Brülhart et al., 2016) is defined as the proportional change in wealth relative to a change of one percentage point in the tax rate.
* Jakobsen et al. (2020) only focus on the top of the wealth distribution, and distinguish between moderately wealthy and very wealthy households.

Some of the variation in elasticity estimates might be explained by the estimation method, as the literature on tax elasticity of income points out that bunching-based methods (such as used by Seim, 2017) do not capture all responses, primarily because they disregard the impact of frictions (Kleven and Schultz, 2014). Another methodological explanation of the variance is given by Saez and Zucman (2019), who note that the tax semi-elasticity of wealth estimated by Brülhart et al. (2016) is based on relatively small variations in the tax rate and thus might not be very convincing.

A non-methodological explanation for the variance in the estimations is that tax avoidance and tax evasion are highly dependent on the regulatory context (Saez and Zucman, 2019). In Sweden and Denmark, taxpayers' wealth is predominantly reported by third parties (Seim, 2017; Jakobsen et al., 2020), whereas in Switzerland it is the taxpayer who self-reports to tax authorities (Brülhart et al., 2016). In line with this consideration, Brülhart et al. (2016) have found empirical evidence that underreporting of assets rather than taxpayer mobility is likely the main mechanism behind their substantial estimate for Switzerland.

Overall, both Seim (2017) and Brülhart et al. (2016) may be criticised on methodological grounds. While Jakobsen et al. (2020) present the most reliable estimates, the particular context of their results (i.e. third-party reporting of wealth) should be noted.

2.3 Previous research for Belgium

The literature on the shape of the Belgian wealth distribution is extremely limited and can be divided in two categories. The first category consists of studies by Frank et al. (1978) and Rademaekers and Vuchelen (1999). In both studies, capital income tax data and rate-of-return estimates are combined to derive wealth estimates for income distribution brackets. This method seems problematic. A great number of ad hoc assumptions are made, for example, regarding the occurrence of tax avoidance and tax evasion or the wealth distribution within income brackets. Moreover, even if the methodology were to be flawless, the results are fairly dated since the studies are two to four decades old.

The second category of studies consists of work by Vermeulen (2014, 2016, 2018). These studies are survey-based and use the ECB's Household Finance and Consumption Survey (HFCS), which is the only Belgian wealth survey available (Kuypers, 2018). Vermeulen (2014, 2016, 2018) corrects for the survey non-responsiveness of wealthy households by estimating a Pareto distribution based on the Forbes rich list. Vermeulen (2016) additionally corrects for underestimation of net wealth in surveys. One major problem with this approach is that the Forbes rich list is highly questionable for Belgium, as it contains very few observations. Its 2010 version, used by Vermeulen (2014, 2016, 2018), is made up of a single data point. The more-recent 2020 Forbes list holds only two datapoints with Belgian residency, and neither individual is a Belgian citizen, which makes the recent Forbes list even less representative for the larger top tail wealth distribution. Additionally, a number of Belgian billionaires included in a high-quality national rich list for Belgium (De Rijkste Belgen, 2020) are not included in the Forbes rich list, which further lowers confidence in the accuracy of its representation of the top of the wealth distribution.

Finally, there is only one scientific estimate of the revenue potential of a Belgian wealth tax, in the context of a study on the revenue potential of an EU-wide recurrent wealth tax. A recurrent wealth tax of 1% on net wealth above 1 million euros, and 1.5% on net wealth above 5 million euros, would yield 8.1 billion euros annually according to Krenek and Schratzenstaller (2018). However, the underlying methodology is open to criticism. The authors use a Pareto approach to correct HFCS data with the Forbes rich list. As mentioned above, the reliability of the Forbes rich list for Belgium seems quite low.

2.4 Environmental effects of a wealth tax

There are at least four mechanisms through which a wealth tax could impact the environment. The first mechanism is based on the fact that a wealth tax normally reduces either wealth inequality or its increase over time. In turn, more equal societies may have a lower environmental impact through three causal pathways: (1) citizens in more unequal societies have a stronger desire to emulate the consumption patterns of those with a higher spot on the social hierarchy (the idea of "keeping up with the Joneses"), but the consumption patterns of citizens with the highest social status are environmentally unsustainable (Chancel et al., 2018; Otto et al., 2019); (2) unequal societies tend to be more polarised, which makes it more difficult to introduce environmental policy measures (Cushing et al., 2015); and (3) a concentration of wealth leads to a concentration of power. As the wealthy tend to benefit from environmental degradation while the poor suffer from it, power concentration in the hands of the wealthy will likely have a negative impact on the environment (Boyce, 2007; Downey and Strife, 2010).

There exist a number of empirical studies on the relationship between income inequality and the environment (e.g. Chancel and Piketty, 2015; Chancel, 2021), yet empirical studies which relate wealth inequality and environmental impact are lacking. A rare exception is provided by Knight et al. (2017), who find that consumption-based CO_2 emissions in high-income countries are positively related to wealth inequality.

The second mechanism through which a wealth tax and the environment are related hinges on the assumption that a wealth tax incentivises the wealthy to search for higher-yielding (i.e. more productive) investments, which could lead to higher economic growth. High economic growth in high-income countries is environmentally unsustainable, due to the difficulty of decoupling economic activity from its environmental impacts (Hickel and Kallis, 2019; Haberl et al., 2020). However, there is much debate about the magnitude of the growth-inducing effect of a wealth tax. For example, Piketty (2014) points out that the return on capital is not exclusively determined by the effort of investors, and that contextual variables play an important role.

A third mechanism arises from the observation that wealth taxes are considered in a certain policy context. In particular, there are policy alternatives to the introduction of a wealth tax. As these various policy alternatives could impact the environment as well, a wealth tax has an indirect environmental effect in that it potentially holds back the implementation of other policies. This indirect environmental effect could be positive or negative. For example, policymakers seeking additional revenues might consider either a wealth tax or a carbon tax. If a carbon tax reduced environmental impact more than a wealth tax, introducing a wealth tax could lead to a higher environmental impact compared to a plausible counterfactual scenario.

In the context of a Belgian one-off wealth tax to finance COVID-19 costs, the main policy alternative is likely to be an aggressive pro-growth economic policy. A number of prominent neoclassical economists have argued that strengthened growth of the Belgian economy would suffice to deal with the fiscal implications of the coronavirus crisis (Baert et al., 2020; Decoster, 2020). As mentioned previously, it is unlikely that a one-off wealth tax would be particularly growth-inducing, and as a result, an explicit pro-growth policy would likely lead to relatively more economic growth. If this were indeed the case, then the implementation of a one-off wealth tax could have a beneficial indirect environmental effect through the avoidance or moderation of aggressive pro-growth policies.

Austerity represents yet another possible alternative to a one-off wealth tax as a means to finance COVID-19 costs. A recent analysis has shown that at least some developing countries have responded to COVID-19 budget deficits by reducing spending on climate change related measures (Caldwell et al., 2021). However, given that Belgium's COVID-19 fiscal stimulus package is for 89% "green" activities — one of the highest figures in the world and in stark contrast to an EU average of only 10% (O'Callaghan et al., 2020) — it seems unlikely that potential austerity measures would cut climate change funding considerably. Moreover, there seems to be little support for immediate austerity measures in Belgium, especially given the pro-growth discourse (e.g. Baert et al., 2020; Decoster, 2020).

Finally, the fourth mechanism through which a wealth tax could impact the environment is more direct: a wealth tax would reduce the net wealth of the very rich, and a reduction in their wealth might lead wealthy households to decrease their consumption. Since the consumption patterns of the very wealthy are environmentally unsustainable (Otto et al., 2019), a reduction in the consumption of the very rich would likely have a beneficial environmental effect. We distinguish between this mechanism, which relates to the absolute consumption of the rich, and the first mechanism that we discussed, which relates to the degree of wealth inequality.

3. Data and methods

We estimate the Belgian wealth distribution, and the revenue potential, distributional impact, and environmental effect of three recently proposed configurations for a one-off Belgian wealth tax. Here we discuss the five distinct stages of our analysis (correcting the data, estimation of the wealth distribution, revenue potential, distributional impact, and environmental effect).

3.1 Data sources

This section presents the two main data sources used in the empirical analysis and the corrections applied to them.

Household Finance and Consumption Survey. Survey-based approaches require survey data. Only one reliable wealth survey exists for Belgium (Kuypers, 2018). The ECB's Household Finance and Consumption Survey (HFCS) has been conducted in 2010, 2014, and

2017, and assembles detailed microdata on economic characteristics, including net wealth, of households in most EU countries (HFCN, 2020a). Our empirical analysis is based on the Belgian component of the 2017 survey wave. An in-depth explanation of the HFCS estimation method is provided in the methodological report for the 2017 wave (HFCN, 2020a).

De Rijkste Belgen rich list. Given the occurrence of differential unit non-responsiveness, survey-based approaches often rely on rich lists. One of the contributions of this article is that it uses a high-quality national rich list for Belgium for the first time. De Rijkste Belgen (DRB) is a continuously updated and publicly available list of the wealthiest Belgian citizens (De Rijkste Belgen, 2020). Since its foundation in 2000 by a journalist, it has been cited by or printed in numerous high-quality Belgian newspapers (e.g. Lemmens, 2020).

Unfortunately, only the top 63 entries of a 2017 version of DRB could be retrieved using online archive tools, and the list redactors could not provide a complete 2017 version of the list. Hence, following Krenek and Schratzenstaller (2018), who combined 2014 HFCS data with the 2016 Forbes rich list, we combined a 2020 version of the DRB list with 2017 HFCS data. Unlike Krenek and Schratzenstaller (2018), we corrected the 2020 entries by dividing by nominal growth, which captures inflation and real economic growth.

The DRB rich list has a number of important characteristics. While the list contains over 500 observations, the bottom part of a rich list is less reliable because journalists are likely to miss individuals with relatively low wealth (Blanchet, 2016). Hence, only the top 150 observations were used, resulting in a value of approximately 150 million euros for the last included data point.

Moreover, the DRB inclusion criterion is Belgian citizenship rather than residency, although the DRB list reports on "implantation" for each entry, which can be considered as a proxy for residency (De Rijkste Belgen, 2020). To correct for this issue, all entries with implantation outside of Belgium were dropped.

Lastly, the DRB rich list is mostly based on publicly available information regarding shareholding (De Rijkste Belgen, 2020). Such shareholding information is often only available at the family — rather than the household — level. For some family entries, the DRB list includes information on the number of individual households. In these cases, the original entry was divided by the number of households, which is a conservative assumption in that it assumes that wealth is equally distributed between households of the same family. Of these new observations, data points with a value lower than the original lowest observation of 150 million euros were dropped. However, for most family entries, information on the number of households was not available, and this issue was corrected by dividing each of these entries by four, which is a conservative assumption compared to the literature (see Supplementary Information). Once more, data points with a value of less than 150 million euros were dropped. See Supplementary Information for an exploration of the robustness of this correction method.

3.2 Wealth distribution

We corrected the HFCS survey for (1) differential unit non-responsiveness, and (2) the mismatch between wealth surveys and the national accounts.

To correct for differential unit non-responsiveness, we replaced the upper part of the HFCS data with an estimated Pareto distribution. A Pareto distribution is determined by a Pareto parameter and a wealth threshold (i.e. the cut-off point between the lower part of a wealth survey and the estimated Pareto distribution). To decide on the wealth threshold, we applied the Kolmogorov-Smirnov procedure (e.g. Dalitz, 2016). The Kolmogornov-Smirnov procedure estimates the wealth threshold that leads to an estimated Pareto distribution which best resembles a theoretical Pareto distribution. Once a suitable wealth threshold has been identified, it is possible to estimate the Pareto parameter. For our estimation of the Pareto parameter, we have relied on Vermeulen's (2014, 2016, 2018) econometric specification. See Supplementary Information for a more formal treatment of our correction for differential unit non-responsiveness.

To correct for the mismatch between the aggregate net wealth of surveys and national statistics, we applied the rescaling estimation procedure developed by Vermeulen (2016). We have incorporated several of the adjustments to Vermeulen's procedure proposed by Krenek and Schratzenstaller (2018). The rescaling procedure is a reiterative process (see Fig. 2) and includes the correction for differential unit non-responsiveness explained above. Note that we did not rescale real assets. Real assets in the national accounts exclude durable consumer goods such as vehicles, whose aggregate value is likely substantial (Waltl, 2020). Moreover, household self-evaluation of the value of their real assets is likely more accurate than the macro estimate produced by the central bank (Albers et al., 2020; Krenek and Schratzensteller, 2018; Waltl, 2020). See Supplementary Information for an estimation run where real assets are also rescaled to the national accounts aggregate. For the variance calculation, we used 100 bootstrap weights provided in the HFCS dataset and followed the procedure outlined by the HFCN (2020a).

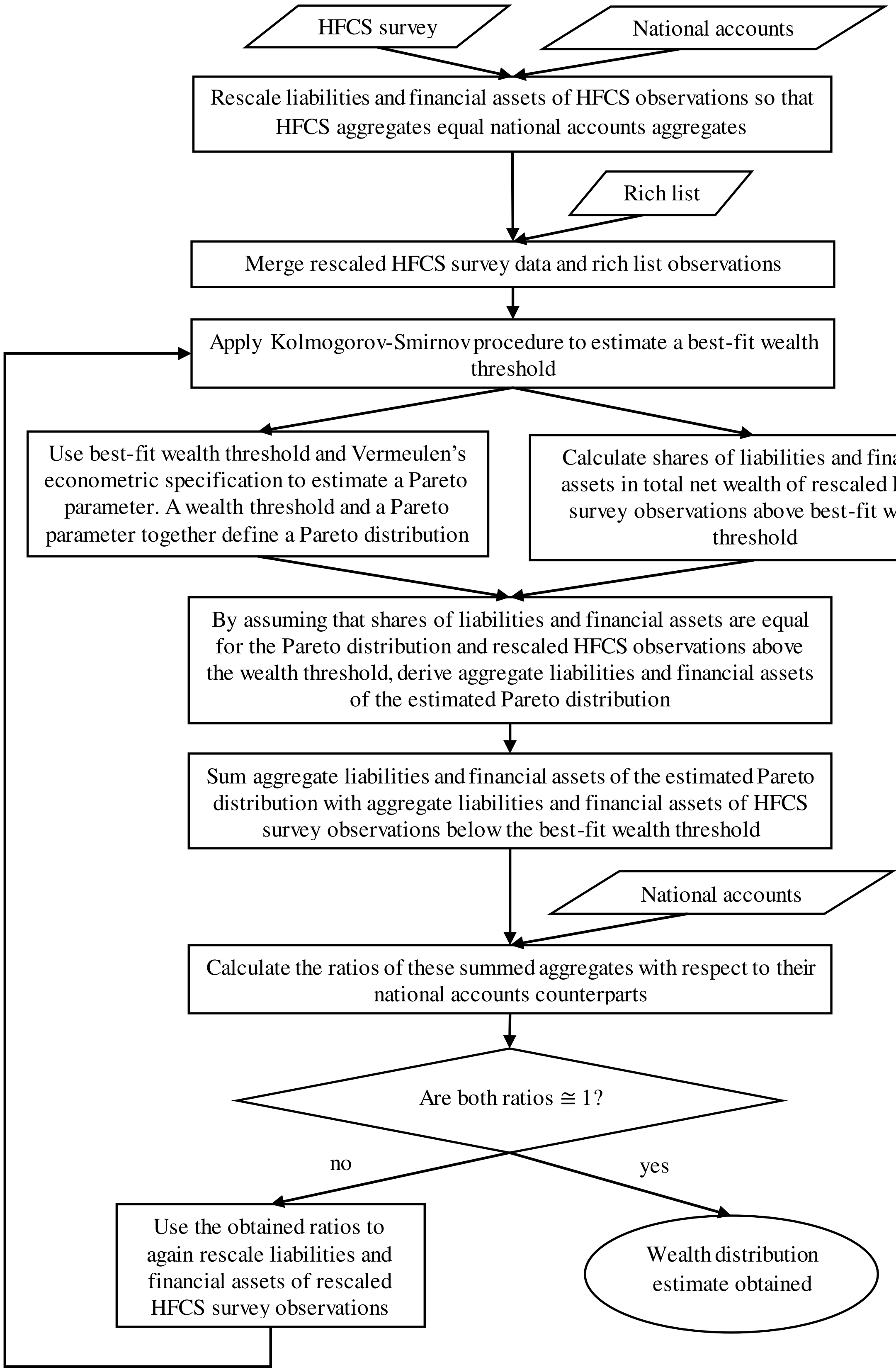


Fig. 2. Graphical representation of our wealth distribution estimation method. Ratios of liabilities and financial assets within the range [0.998;1.002] were accepted as sufficiently equal to 1.

3.3 Revenue potential

Revenue potential was calculated by summing up net wealth in different wealth ranges and then multiplying by the applicable tax rate. To take into account tax avoidance, tax evasion, and real effects on the tax base, net wealth aggregates were reduced using (net of) tax rate elasticity estimates.

To capture the uncertainty in the available estimates, different wealth tax elasticities were used (Table 3). For their study of Denmark, Jakobsen et al. (2020) employ a variety of empirical strategies to derive net-of-tax elasticities. For our estimation runs, we used their highest and lowest elasticity estimates and the average of both. We also included an estimation run where the introduction of a wealth tax does not change the tax base. We did not rely on the elasticities estimated by Seim et al. (2017) and Brülhart et al. (2016), given their methodological deficiencies (see Section 2.2).

If the Danish context differs considerably from the Belgian context, then the Jakobsen et al. (2020) estimates might not be applicable to Belgium. However, the fact that both Denmark and Belgium are high-income European countries with broadly similar wealth distribution structures suggests to us that the elasticities are applicable. Nonetheless, it is worth noting that the Danish tax system includes third party reporting of wealth, which might decrease behavioural responses to wealth taxation.

Table 3. Net-of-tax elasticities used in estimation

Justification	Net-of-tax rate elasticity		
	Top 1%	Top 2-3%	Rest
No effects on tax base, upper limit	0	0	0
Jakobsen et al. (2020), lowest estimates	6.36	1.09	1.09*
Jakobsen et al. (2020), average	8.85	4.98	4.98*
Jakobsen et al. (2020), highest estimates	11.33	8.86	8.86*

Note: Net-of-tax rate equals 1 - marginal tax rate. The net-of-tax rate elasticity is defined as the proportional change in wealth relative to a proportional change of one percent in the net-of-tax rate.
* Jakobsen et al. (2020) do not provide estimates for households below the top 3%. We assume that the net-of-tax rate elasticities of the top 2–3% apply to them, which likely overestimates the actual elasticity.

It is also worth noting that De Grauwe's wealth tax proposal is for a progressive wealth tax. Hence, multiple tax brackets apply to the same household and thus to the same wealth range. This issue is taken into account by dividing aggregate net wealth of a certain wealth range between the applicable tax brackets. We have also conservatively assumed that tax avoidance and tax evasion are determined by the highest tax rate experienced by a household.

3.4 Distributional impact

To estimate the distributional impact of a wealth tax, changes in the wealth share held by the richest 1%, 5%, and 10% of households were calculated. To obtain these estimates, we calculated before-tax and after-tax wealth shares and subtracted the former from the latter. After-tax wealth shares were calculated by subtracting wealth tax revenues from before-tax aggregated net wealth and dividing by total after-tax net wealth.

3.5 Environmental effects

Environmental effects were estimated by quantifying the effect that a wealth tax would have on CO_2 emissions. Our focus is on the effect that a one-off wealth tax would have on the environment by reducing inequality. Hence, we did not attempt to capture any environmental effects that a one-off Belgian wealth tax might have through its influence on GDP or its direct effect on the consumption of the very rich (see Section 2.4).

To estimate the environmental effect of reduced wealth inequality due to a one-off wealth tax, we multiplied our estimates of distributional impact (see Section 3.4) with the wealth inequality elasticity of CO_2 emissions. Only one empirical study estimates the wealth inequality elasticity of consumption-based CO_2 emissions (Knight et al., 2017). The authors report a value of 0.795 (with a variance 0.09). In the Knight et al. (2017) study, wealth inequality was measured as the wealth share held by the top 10%, while consumption-based CO_2 emissions data were obtained from the online Global Carbon Atlas database.

It is important to examine whether the Knight et al. (2017) elasticity estimate, derived using data for 26 high-income countries, is applicable to Belgium. Our estimate of the Belgian wealth distribution (see Section 5.1) suggests that Belgian wealth inequality is comparable to other high-income European countries such as France and Germany. Moreover, there seems to be no apparent reason why any of the theoretical mechanisms through which wealth inequality could influence environmental impact (status competition, polarisation, and concentration of power) would work differently in Belgium compared to other high-income countries. Therefore, it seems plausible that the elasticity estimate from Knight et al. (2017) is applicable to Belgium.

Each step in our analysis builds on the results of the previous step (Fig. 3). Not only does the estimation of environmental effects require the estimation of distributional impact, these linkages imply that the uncertainty around, say, revenue potential leads to uncertainty around environmental impact.

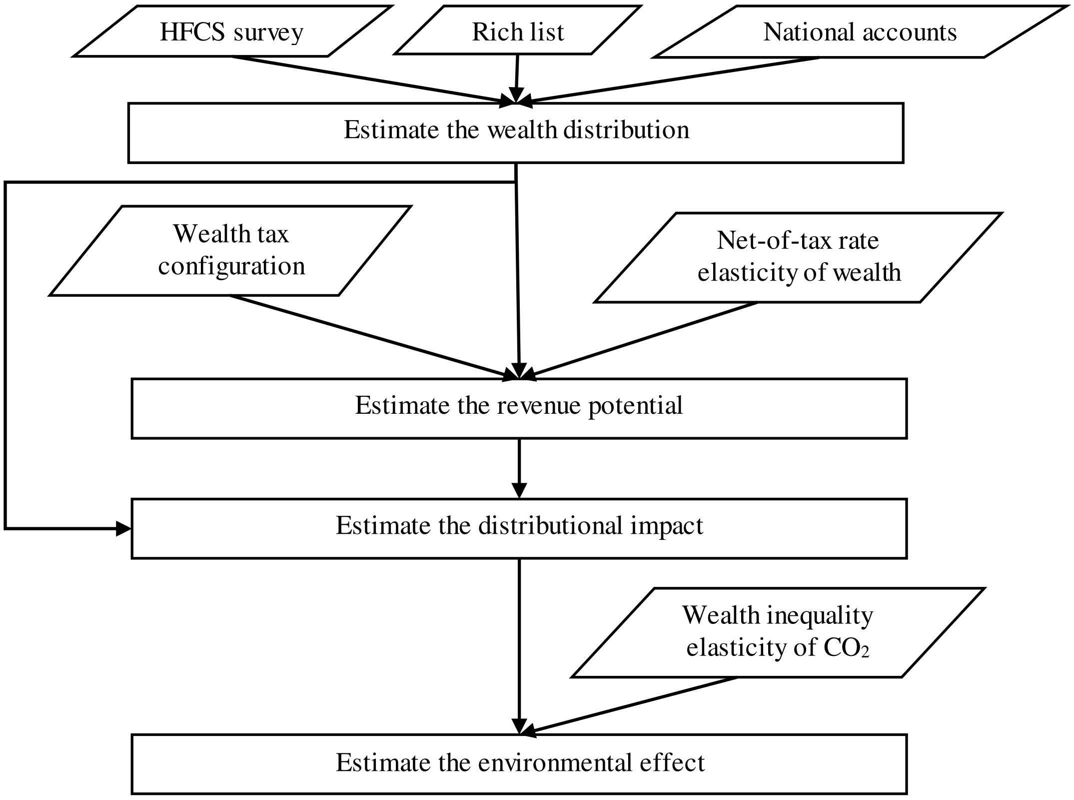


Fig. 3. High-level graphical representation of our estimation method and the main data inputs.

4. Results

Overall, we estimate that the richest 1% of Belgian households possess around 24% of total net wealth. The revenue potential of the three one-off wealth tax proposals considered in our analysis ranges from 5.9 to 43.1 billion euros, depending on the proposal and the severity of tax avoidance, tax evasion, and real effects. All three proposals would lead to only small reductions in wealth inequality and environmental impact. We discuss each of these findings in more detail below.

4.1 Wealth distribution

After using the DRB rich list to correct the HFCS survey data for differential unit non-responsiveness and the mismatch between survey and national statistics aggregates, we find that the wealthiest 1% of Belgian households possess around 24% of total net wealth (Table 4) or about as much as the poorest 75% of households combined (Fig. 4). Moreover, the wealthiest 10% of households own more than the poorest 90% of Belgian households (Fig. 4).

Table 4. Top 1%, 5%, and 10% net wealth share (in %) and lower bound (in million euros) for two input datasets

Input dataset	1%		5%		10%	
	%	Bound	%	Bound	%	Bound
HFCS	15.6 (*0.6*)	3.0 (*0.1*)	34.2 (*0.5*)	1.1 (*0.1*)	46.4 (*0.5*)	0.8 (*0.0*)
Rescaled HFCS + Pareto DRB	23.9 (*1.2*)	4.8 (*0.3*)	42.4 (*1.5*)	1.7 (*0.1*)	54.4 (*1.5*)	1.1 (*0.1*)

Note: Own calculations based on HFCN (2020b), De Rijkste Belgen (2020), and ECB (2020). Reported values are averages of the results of the five HFCS implicate datasets. Brackets indicate standard deviation.

A correction of the HFCS data with the DRB rich list leads to considerably higher wealth inequality figures than those retrieved using uncorrected HFCS survey data (Table 4), showcasing the extent to which the HFCS survey may underestimate wealth inequality in Belgium. Furthermore, the estimated lower bounds indicate that even De Grauwe's wealth tax configuration, with the lowest tax bracket starting at one million euros, would leave around 90% of the population unaffected (Table 4).

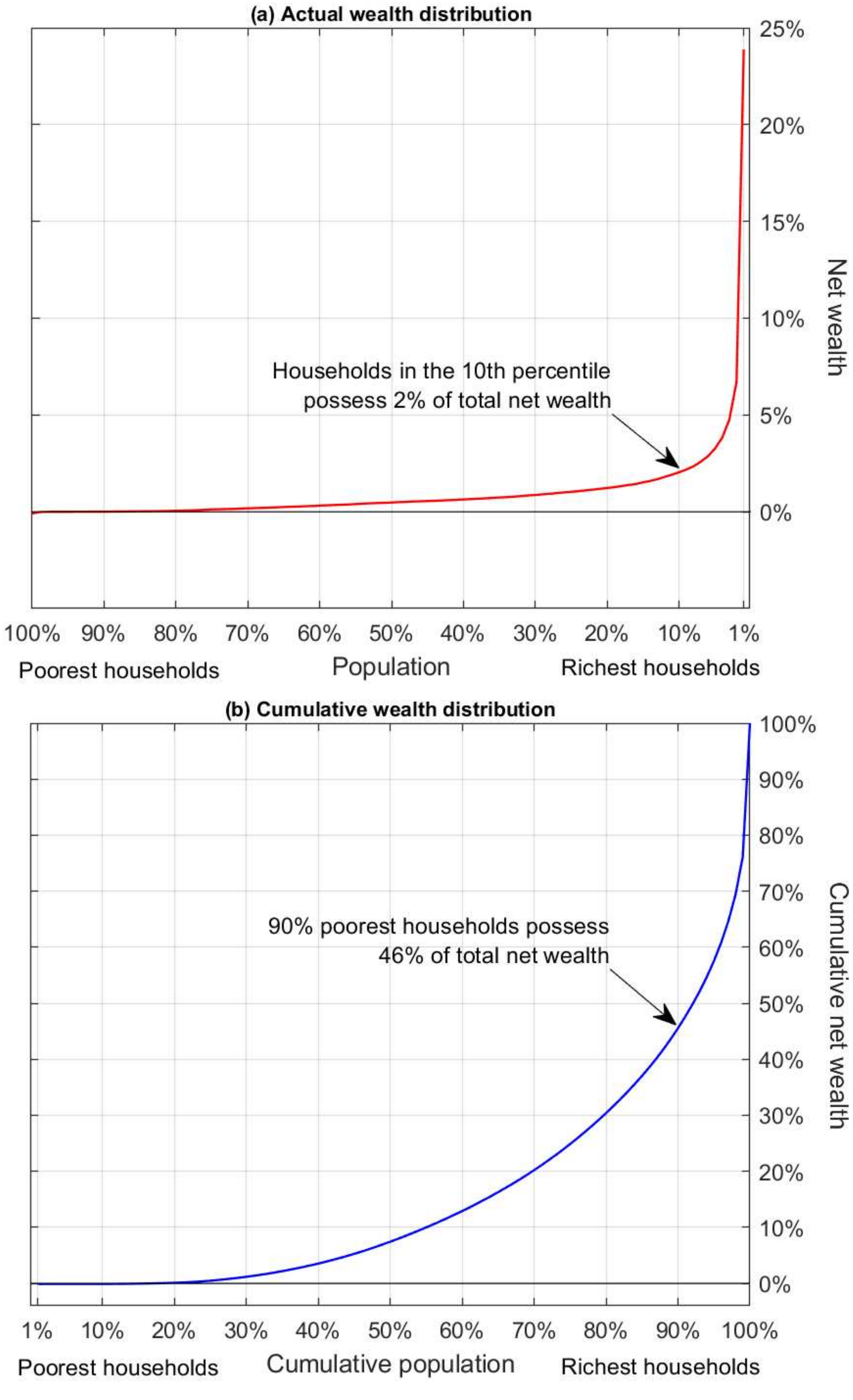


Fig. 4. Rescaled HFCS-DRB Pareto-corrected estimate of the Belgian wealth distribution. **(a)** Actual wealth distribution. **(b)** Cumulative wealth distribution. Own calculations based on HFCN (2020b), De Rijkste Belgen (2020), and ECB (2020). Reported values are averages of the results of the five HFCS implicate datasets. Arrows illustrate how the graphs should be interpreted.

4.2 Revenue potential of three wealth tax proposals

The results of our analysis suggest actual revenue potential could be substantially higher than the rough estimates of revenue potential put forward by the proponents of a one-off Belgian wealth tax (Table 5). Recall that the Groen configuration consists of a 1% tax on the wealthiest 1%, while PVDA wants to apply a 5% tax to households with a net wealth of over 3 million euros. De Grauwe proposes a wealth tax with several tax brackets, starting at 1% for net wealth between 1 and 10 million euros, over 2% for net wealth between 10 and 100 million euros, to 3% for household wealth in the 100 million to 1 billion euro range, and 4% for household net wealth exceeding 1 billion euros (Table 1).

Table 5. Revenue potential estimates (in billion euros, nominal 2017 value) of three wealth tax configurations

Tax avoidance and evasion*	Groen	PVDA	De Grauwe
None	6.6 (*0.4*)	43.1 (*4.0*)	24.2 (*1.6*)
Low	6.2 (*0.4*)	32.0 (*3.3*)	22.3 (*1.5*)
Moderate	6.0 (*0.4*)	26.0 (*2.7*)	21.3 (*1.4*)
High	5.9 (*0.4*)	19.8 (*2.0*)	20.3 (*1.3*)
Rough estimate provided by proponents	5	15	10

Note: Own calculations based on HFCN (2020b), De Rijkste Belgen (2020), and ECB (2020). Reported values are averages of the results for the five HFCS implicate datasets. Brackets indicate standard deviation. Rough estimates of revenue potential are from Groen (2020), PVDA (2020), and De Grauwe (2020).
* For the net-of-tax elasticities used, see Table 3.

4.3 Distributional impact

The distributional impact of the wealth tax proposals is limited relative to the inequality of the net wealth distribution (Table 6). Interestingly, while De Grauwe's proposal leads to slightly higher estimated revenues than the PVDA proposal under the assumption of high tax avoidance and evasion (see Table 5), it has a lower distributional impact for the same behavioural scenario (Table 6). The reason for this is that a larger share of the population is subjected to a wealth tax in De Grauwe's proposal.

Given the static nature of our analysis, the rate of return on wealth is not taken into account in the estimates presented in this section. This is important because there is growing evidence that the rate of return and net wealth are positively correlated (Fagereng et al., 2020). According to Piketty (2014), the very wealthy tend to earn rate of returns of around 6–7% annually. Hence, a one-off wealth tax with a maximum rate of at most 5% (even ignoring tax avoidance and evasion effects) might not be enough to counteract the higher-than-average rate of return achieved by the very wealthy. Thus wealth inequality could still increase even if a one-off wealth tax were introduced.

Table 6. Estimated percentage point change in wealth share of the 1% and 5% caused by three wealth tax configurations

Tax avoidance and evasion*	Groen		PVDA		De Grauwe	
	1%	5%	1%	5%	1%	5%
None	-0.18% (*0.01*)	-0.14% (*0.00*)	-0.84% (*0.03*)	-0.91% (*0.04*)	-0.33% (*0.02*)	-0.35% (*0.02*)
Low	-0.17% (*0.01*)	-0.13% (*0.00*)	-0.54% (*0.02*)	-0.67% (*0.04*)	-0.28% (*0.02*)	-0.32% (*0.02*)
Moderate	-0.17% (*0.01*)	-0.13% (*0.00*)	-0.45% (*0.02*)	-0.54% (*0.03*)	-0.27% (*0.02*)	-0.30% (*0.01*)
High	-0.16% (*0.01*)	-0.12% (*0.00*)	-0.35% (*0.01*)	-0.42% (*0.02*)	-0.25% (*0.02*)	-0.28% (*0.01*)

Note: Own calculations based on HFCN (2020b), De Rijkste Belgen (2020), and ECB (2020). Reported values are averages of the results for the five HFCS implicate datasets. Brackets indicate standard deviation.
* For the net-of-tax elasticities used, see Table 3.

4.4 Environmental effect

The estimated percentage change in consumption-based CO_2 emissions for all three wealth tax configurations suggests that the environmental effect of a one-off wealth tax would be beneficial but relatively minor, reducing CO_2 emissions by only 0.1–0.6% (Table 7). As mentioned previously, these estimates are the results of a static analysis. When considering the dynamics of wealth accumulation, it is possible that wealth inequality could still increase even if a one-off wealth tax were introduced.

Table 7. Estimated percentage change in consumption-based CO_2 emissions caused by three wealth tax configurations

Tax avoidance and evasion*	Groen	PVDA	De Grauwe
None	-0.09% (*0.00*)	-0.57% (*0.02*)	-0.29% (*0.01*)
Low	-0.08% (*0.00*)	-0.42% (*0.02*)	-0.27% (*0.01*)
Moderate	-0.08% (*0.00*)	-0.34% (*0.02*)	-0.26% (*0.01*)
High	-0.08% (*0.00*)	-0.26% (*0.01*)	-0.24% (*0.01*)

Note: Own calculations based on HFCN (2020b), De Rijkste Belgen (2020), ECB (2020), and Knight et al. (2017). Reported values are averages of the results for the five HFCS implicate datasets. Brackets indicate standard deviation.
* For the net-of-tax elasticities used, see Table 3.

5. Discussion

Our estimate of the Belgian wealth distribution suggests net wealth shares of around 24% for the richest 1% of households, and around 42% for the richest 5%. The revenue potential estimates of the three one-off wealth tax proposals are considerably higher than the estimates by wealth tax advocates, even under conservative assumptions. Nonetheless, the distributional impact of one-off wealth tax proposals under consideration in Belgium seems limited, while a one-off wealth tax would likely have a beneficial yet minor environmental effect.

5.1 Contextualisation of results

The Belgian wealth distribution may be considerably more unequal than previous studies suggest, given that our analysis indicates a top 1% wealth share of around 24%. Vermeulen (2014, 2018) corrects 2010 HFCS data for differential unit non-response and obtains a wealth share held by the top 1% of around 16%. Vermeulen (2016) additionally corrects for the HFCS/national accounts mismatch, leading to a top 1% wealth share of 18–20% in 2010. Rademaekers and Vuchelen (1999) find a top 1% wealth share of 20% for 1994 and 18% for 1984. Since Frank et al. (1978) find a top 1% share of 25% for 1969, our results are within the range of previous studies. As all of these previous studies have important methodological deficiencies, it is difficult to say whether our results are a correction of previous estimates or if they reflect a rise in Belgian wealth inequality.

Belgian wealth inequality seems average in a European context (Table 8), but there are important comparability issues. For example, Bach et al. (2019) do not correct the French and Spanish national rich list they use for family size, which would likely reduce the top 1% wealth share. Assuming the general picture arising from other studies is nonetheless roughly comparable with our results, it seems that wealth inequality in Belgium is approximately equal to the situation in France and Spain but probably lower than in Austria and Germany.

Table 8. Estimates of top 1% wealth share in selected European countries

Study	Year	Austria	France	Germany	Spain
Bach et al. (2014)	2010	-	-	23%	-
Bach et al. (2019)	2013-14	-	25%	34%	23%
Chakraborty and Waltl (2018)	2013-14	43%	-	36%	-
Eckerstrofer et al. (2016)	2010-11	38%	-	-	-
Vermeulen (2014)*	2009-11	33-36%	20-19%	32-33%	15-16%
Vermeulen (2016)*	2009-11	31-34%	20-22%	30-31%	16-18%
Vermeulen (2018)*	2009-11	31-32%	19%	34%	16%
Waltl (2020)**	2012-14	-	26%	-	23%

* Vermeulen (2014, 2016, 2018) calculates top wealth using a variety of approaches, but shows that some approaches lead to biased estimates. Only unbiased estimates are reported in this table.
** Waltl (2020) calculates top wealth using a variety of approaches, but does not always report wealth share of the 1%. The figures presented here are based on tax data extended with off-shore wealth estimates.

We find that a one-off wealth tax could finance more than half of the 2020 COVID-19 budgetary cost. The National Bank of Belgium (2021) has estimated that the coronavirus crisis increased government debt by 36 billion euros in 2020. Our results suggest that a one-off wealth tax as proposed by PVDA and De Grauwe would suffice to finance over half of this amount, even under the assumption of severe tax avoidance and evasion.

It should be noted that our estimates for revenue potential do not include all revenue effects associated with a one-off wealth levy. Our revenue estimates do not take into account the cost of assessing citizens' wealth, and while the empirical evidence is limited, there are indications that the cost-to-revenue ratio of wealth taxes has been relatively high in the past (Krenek and Schratzenstaller, 2018). However, modern information technologies and econometric techniques make it much easier for tax authorities to gather or establish market values for most kinds of household assets, reducing valuation costs (Piketty, 2014; Saez and Zucman, 2019). Research for the UK has estimated that a one-off wealth tax with a 5% rate would lead to administration costs of about 1% of wealth tax revenues (Advani et al., 2020). Overall, it seems unlikely that wealth valuation costs would be substantial in comparison to potential wealth tax revenue.

Our revenue estimates do not attempt to quantify the uncertainty associated with potential long-term revenue effects. For example, wealthy company owners could decide to pay for a wealth tax by selling shares of their company, reducing investment, or by laying off staff. A change in company ownership could have unpredictable effects, while a decrease in company investment could lead to lower future corporate tax revenues, and heightened unemployment could lead to higher government expenditure. However, as Piketty (2014) argues, the opposite could also occur: a wealth tax might incentivise the wealthy to look for higher-yielding assets, which could lead to higher corporate tax revenues or increased employment. Overall, given the one-off nature of a non-recurrent wealth tax and the relatively low tax rates considered in our analysis, it seems likely that any long-term revenue effects would be relatively minor.

Lastly, while we have estimated the effects of three proposals for a one-off wealth tax, our results are also highly relevant to the idea of recurrent wealth taxation in Belgium. We provide an estimate of the Belgian wealth distribution and our estimates of revenue potential could also be interpreted as reflecting the short-term revenue potential of a recurrent wealth tax.

5.2 Policy implications

An important consideration is how well a one-off wealth contributes to the policy goals of ecological economics, in particular fair distribution and sustainable scale (Daly, 1992). The most straightforward effect of a one-off wealth tax is on fair distribution. However, according to our research, even the most ambitious one-off wealth tax proposal would have fairly limited redistributive consequences, while a one-off wealth tax would reduce CO_2 emissions only slightly. That being said, there could still be an indirect environmental effect if introducing a wealth tax held back the implementation of an aggressive pro-growth policy.

Overall, it seems that a one-off wealth tax would make only a modest contribution to the achievement of the policy goals of ecological economics. Similar to proposals such as local currencies (Marshall and O'Neill, 2018), a one-off wealth tax is not a silver bullet. While higher tax rates might increase redistributive potential somewhat, tax avoidance and evasion act as a limiting factor. Moving away from the one-off nature of the proposed wealth taxes towards recurrent taxation would arguably increase revenue potential and lead to a fairer distribution, although the prospect of future wealth taxation is likely to increase tax evasion and avoidance as well.

Tax avoidance mainly takes place through the exploitation of tax exemptions and expatriation, while tax evasion predominantly consists of the underreporting of assets and hiding of wealth in tax havens (Saez and Zucman, 2019). Tax exemptions must be written into law before they can be exploited. Expatriation is less attractive when the tax is applied on the basis of citizenship rather than residency, as is already the case for certain US taxes (Piketty, 2014). Alternatively, expatriation can be discouraged by applying the wealth tax to citizens who migrate between the policy announcement and tax implementation.[3] Underreporting of within-country assets could be countered by requiring national financial institutions to report wealth directly to tax authorities through automatic data sharing, as is already the case in Denmark (Jakobsen et al., 2020).

It is more difficult to deal with the underreporting of assets held outside the country and wealth hidden in tax havens. Nonetheless, the large majority of Belgian wealth in tax havens consists of wealth in European countries such as Switzerland and Luxembourg (Alstadsaeter et al., 2018) and a recent OECD initiative already ensures automatic data sharing for tax purposes among more than 100 countries, including all EU member states (OECD, 2020).

Ultimately, humanity's impact on the earth system needs to be urgently reduced to avoid catastrophic global change (Steffen et al., 2015). Rapid economic growth in high-income countries has been shown to be incompatible with the required reduction in environmental impact (Hickel and Kallis, 2019; Haberl et al., 2020; Schröder and Storm, 2020). Hence, many ecological economists argue that high-income countries need to abandon the pursuit of economic growth in order to achieve sustainable scale (Jackson, 2017; Victor, 2019; Kallis et al., 2020; Fanning et al., 2021).

The boundaries imposed by sustainable scale have implications for policy instruments aimed at fair distribution such as wealth taxes. Merely reducing the rate at which the very wealthy could potentially become even wealthier, as our analysis for Belgium suggests a one-off wealth tax would do, are unlikely to suffice. If sustainable scale puts a hard limit on the resources available to an economy, then a highly unequal distribution of those fixed resources could be expected to lead to exploitative relationships among people (Stratford, 2020). The introduction of a wealth cap (i.e. a 100% levy on wealth above a certain threshold) might then become necessary. A wealth cap would have the additional benefit of encouraging a reduction in status competition, polarisation, and the concentration of power — thereby rendering the achievement of sustainable scale more feasible (Daly and Farley, 2011).

5.3 Contributions and limitations

This article makes several contributions to the literature. First, a novel national rich list was adopted to correct the Belgian wealth distribution. Earlier survey-based studies rely on the Forbes list, which has few datapoints for Belgium and is likely not representative for the top of

[3] This idea is based on a very similar proposal by Saez and Zucman (2019).

the Belgian wealth distribution. Moreover, this article provides rigorous estimates of the revenue potential, distributional impact, and environmental effect of recent proposals for a Belgian wealth tax. Such estimates have not been available previously. Lastly, it is — to the best of our knowledge — the first study that has tried to estimate the environmental effect of a wealth tax. While our results are for a single country, they inform the broader discussion in ecological economics of what are effective policies to achieve fair distribution and sustainable scale.

Our results are subject to two important limitations. First, HFCS data were rescaled using national accounts aggregates. However, the definition of certain wealth components differs across both sources, and some wealth components are only included in one of the two. Recent studies on the construction of distributional national accounts such as Waltl (2020) have made progress regarding the comparability of wealth surveys and national accounts. However, there might simply be no good solution for the mismatch issue. Rescaling using aggregates consisting exclusively of wealth components that are strictly comparable across both sources would likely underestimate total net wealth and thus wealth tax revenue potential.

Second, we have relied on the DRB rich list to estimate the wealth distribution. As with other national rich lists, there are lingering issues. On the one hand, national rich lists are based on publicly available information, which tends to be limited with respect to personal wealth (e.g. privately-owned cars or real estate). Hence rich lists may underestimate the actual net wealth of the super rich (Brzezinski et al., 2020). On the other hand, many of the households on the DRB rich list store their wealth in corporations with highly concentrated ownership, and valuation of these entities is challenging. Standard valuation methods may not take into account the fact that illiquidity and potential lack of control lower the value of these assets by ~10–50% according to accepted US legal practice (Ransome and Satchit, 2009). As a result, rich lists could potentially overestimate net wealth.

There seems to be no good way of establishing whether rich lists underestimate or overestimate actual net wealth. In the US, estate tax returns suggest that net wealth is on average half of what the Forbes list reports (Raub et al., 2010). While much of this mismatch can be explained by a variety of technical reasons and legal reasons (e.g. tax avoidance), at least some of the mismatch seems due to valuation difficulties. Nonetheless, Raub et al. (2010, p. 134) note that valuation of entities with highly concentrated ownership “can involve more art than science” and are hesitant to suggest that the mismatch between tax returns and Forbes list entries invalidates the Forbes list.

Regarding the limitations of national rich lists, we believe it is worth quoting Waltl (2020, p. 18) at length: "In the future, rich lists may become obsolete due to increased information on top wealth shares from more reliable sources. In the meantime, top tail adjustments based on rich lists appear to be a reasonably trustworthy approach to make survey data more comparable and better suited for measuring wealth inequality." In fact, as Piketty (2014) notes, tax data from a wealth levy might be one of the more reliable sources of information on the wealth distribution in the future.

5.4 Future research suggestions

The literature on the net-of-tax elasticity of wealth taxes is extremely limited, and the range of estimates differs widely due to methodological and contextual reasons (see Section 2.2). Additionally, no net-of-tax elasticity estimate for a one-off wealth tax is available. Further research on net-of-tax elasticities could enhance confidence in the net-of-tax elasticity used for this study.

Moreover, there is almost no empirical literature on the relationship between wealth inequality and environmental impact. Only one facet of environmental impact, consumption-based CO_2 emissions, has been investigated empirically (Knight et al., 2017). Future research would benefit from exploring the relationship between wealth inequality and additional environmental indicators such as the material footprint (Wiedmann et al., 2015) or ecological footprint (Lin et al., 2018). Furthermore, despite the contributions of the present study, there remains a need for further research on the environmental effects of introducing a wealth tax.

6. Conclusion

The fair distribution of a society's resources is one of the main themes of ecological economics (Daly, 1977; Costanza, 1987; Daly and Farley, 2011). However, surprisingly little empirical research has been done on wealth taxation and the links between wealth distribution and environmental impact. Moreover, in the case of Belgium, the distribution of wealth and the effects of a wealth tax have been severely understudied. This article aimed to address these research gaps by estimating the Belgian wealth distribution and the revenue potential, distributional impact, and environmental effect of three recent proposals for a one-off Belgian wealth tax. Important results were obtained in three key areas:

Wealth distribution. Only a few studies have estimated the Belgian wealth distribution, and all of them can be criticised based on either input data or methodology. We estimated the Belgian wealth distribution by extending the 2017 HFCS data with a top tail Pareto distribution based on the never-before-used DRB rich list. The richest 1% of Belgian households possess around 24% of total net wealth. Hence, the Belgian wealth distribution is likely substantially more unequal than previous studies suggest, but is average compared to other European countries.

Revenue potential and distributional impact. The revenue potential of a wealth tax depends on tax avoidance, tax evasion, and real effects. The empirical literature on the net-of-tax elasticity of wealth is extremely limited, and several studies have methodological flaws. We used the most reliable net-of-tax elasticity estimate available and combined this with our estimate of the Belgian wealth distribution and three proposed one-off wealth tax configurations. Our results indicate a revenue potential of 5.9 to 43.1 billion euros, meaning that the revenue potential reported by advocates of a one-off Belgian wealth tax likely underestimates actual revenue potential by anywhere from 18 to 187%. Nonetheless, the distributional impact of a one-off wealth tax seems minimal, with the richest 1% of households still possessing at least 23% of total net wealth under all scenarios and tax configurations considered.

Environmental effect. There are at least four mechanisms through which a wealth tax could potentially have an environmental effect: (1) a reduction in wealth inequality could reduce environmental impact by reducing status competition, polarisation, and the concentration of power; (2) a wealth tax could increase environmental impact by encouraging investments that lead to higher economic growth; (3) a wealth tax could reduce environmental impact by providing a policy alternative to an aggressive pro-growth policy; and (4) a wealth tax could lead to a direct reduction in the consumption of the very rich. We only attempted to quantify the first mechanism, finding small reductions in consumption-based CO_2 emissions of 0.1 to 0.6%. The other three mechanisms remain important areas for future research.

Although we find that a one-off wealth tax could raise significant revenue to deal with unexpected budgetary deficits (such as those caused by the COVID-19 crisis), such a tax would contribute only modestly to the ecological economics policy goal of fair distribution, and even less so to the achievement of sustainable scale. Stronger policies, such as a recurrent wealth tax or a wealth cap, may be needed.

Acknowledgments

We are grateful to Sarah Kuypers and Philip Vermeulen for their advice at various stages of the research project. We would also like to thank Lina Lefstad, Michiel Vandenberghe, and three anonymous reviewers for their helpful comments.

References

Advani, A., Chamberlain, E. and Summers, A., 2020. A Wealth Tax for the UK. Wealth Tax Commission, UK. https://www.wealthandpolicy.com/wp/WealthTaxFinalReport.pdf

Albers, T. N. H., Bartels, C. and Schularick, M., 2020. The distribution of wealth in Germany, 1895-2018. ECONtribute, Germany. https://www.econtribute.de/RePEc/ajk/ajkpbs/ECONtribute_PB_001_2020.pdf

Bach, S., Beznoska, M. and Steiner, V., 2014. A wealth tax on the rich to bring down public debt: revenue and distributional effects of a capital levy in Germany. *Fiscal Studies* 35 (1), 67-89.

Bach, S., Thiemann, A. and Zucco, A., 2019. Looking for the missing rich: tracing the top tail of the wealth distribution. *International Tax and Public Finance* 26, 1234-1258.

Baert, S., Cockx, B., Heylen, F., Peersman, G., 2020. Economisch beleid in tijden van corona. UGent, Ghent, Belgium. https://www.ugent.be/eb/economics/en/research/gei

Blanchet, T., 2016. Wealth inequality in Europe and in the United States: estimations from surveys, national accounts and wealth rankings. Paris School of Economics, Paris. http://piketty.pse.ens.fr/files/Blanchet2016.pdf

Boadway, R. and Pestieau, P., 2018. The tenuous case for an annual wealth tax. Institut d'Economia de Barcelona, Barcelona. https://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID3123835_code2131795.pdf?abstractid=3123835&mirid=1

Boyce, J. K., 2007. Is inequality bad for the environment. *Equity and the Environment* 15, 267-288.

Brülhart, M., Gruber, J., Krapf, M. and Schmidheiny, K., 2016. Taxing wealth: evidence from Switzerland. National Bureau of Economic Research, Cambridge, US. http://www.nber.org/papers/w22376

Brzezinski, M., 2014. Do wealth distribution follow power laws: evidence from rich lists. *Physica A* 406, 155-162.

Brzezinski, M., Salach, K. and Wronski, M., 2020. Wealth inequality in Central and Eastern Europe: Evidence from Household Survey and Rich Lists' Data Combined. *Economics of Transition and Institutional Change* 28 (4), 637-660.

Caldwell, M., Alayza, N. and Larsen, G., 2021. How Domestic Budget Shortfalls Due to COVID-19 Impact Climate Action. [Online]. [Accessed 20 August 2021]. https://www.wri.org/insights/how-domestic-budget-shortfalls-due-covid-19-impact-climate-action

Chakraborty, R. and Waltl, S., 2018. Missing the wealthy in the HFCS: micro problems with macro implications. European Central Bank, Frankfurt. https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2163.en.pdf

Chakraborty, R., Kavonius, I. K., Pérez-Duarte, S. and Vermeulen, P., 2018. Is the top tail of the wealth distribution the missing link between the Household Finance and Consumption Survey and national accounts. European Central Bank, Frankfurt. https://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID3269146_code485639.pdf?abstractid=3269146&mirid=1

Chancel, L., 2021. Global Carbon Inequality, 1990-2019. Working Paper No. 2021/21, World Inequality Lab, Paris. https://wid.world/wp-content/uploads/2021/10/Chancel2021CarbonInequality2210-1837.pdf

Chancel, L. and Piketty, T., 2015. Carbon and inequality: from Kyoto to Paris. Paris School of Economics, Paris. http://piketty.pse.ens.fr/files/ChancelPiketty2015.pdf

Chancel, L., Hough, A. and Voituriez, T., 2018. Reducing inequalities within countries: assessing the potential of the sustainable development goals. *Global Policy* 9 (1), 5-16.

Clauset, A., Shalizi, C. R. and Newan, M. E. J., 2009. Power-law distributions in empirical data. *SIAM Review* 51, 661-703.

Cosme, I., Santos, R. and O'Neill, D. W., 2017. Assessing the degrowth discourse: a review and analysis of academic degrowth proposals. *Journal of Cleaner Production* 149, 321-334.

Costanza, R., 1989. What is ecological economics? *Ecological Economics* 1, 1-7.

Cushing, L. Morello-Frosch, R., Wander, M. and Pastor, M., 2015. The haves, the have-nots, and the health of everyone: the relationship between social inequality and environmental quality. *Annual Review of Public Health* 36, 193-209.

Dalitz, C., 2016. Estimating wealth distribution: top tail and inequality. Hochschule Niederrhein, Krefeld, Germany. https://d-nb.info/1082353930/34

Daly, H.E., 1977. *Steady-State Economics: The Economics of Biophysical Equilibrium and Moral Growth*. W.H. Freeman, San Fransisco.

Daly, H.E., 1992. Allocation, distribution, and scale: towards an economics that is efficient, just, and sustainable. *Ecological Economics* 6, 185-193.

Daly, H. E. and Farley, J., 2011. *Ecological economics: principles and applications*. 2nd ed. Island Press, Washington.

Decoster, A., 2020. Hoe fel besmet COVID-19 onze overheidsfinanciën. KU Leuven, Leuven, Belgium. https://feb.kuleuven.be/research/les/pdf/LES%202020%20-%20176%20COVID-19.pdf

De Grauwe, P., 2020. De grote vermogens lopen heus niet weg voor een coronabelasting. *De Morgen*. [Online]. 13 July. [Accessed 20 August 2020]. https://www.demorgen.be/meningen/de-grote-vermogens-lopen-heus-niet-weg-voor-een-coronabelasting~bd774820/

De Rijkste Belgen, 2020. DRB rich list website. [Online]. [Accessed 20 August 2020]. https://derijkstebelgen.be/

Downey, L. and Strife, S., 2010. Inequality, democracy, and the environment. *Organization and Environment* 23 (2), 155-188.

ECB, 2011. The Euro-area Household Finance and Consumption Survey: survey mode, oversampling wealthy households and other methods to reduce non-response bias. Conference of European Statisticians, Geneva, Switzerland. https://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/2011/48.e.pdf

ECB, 2020. Financial accounts. European Central Bank, Frankfurt. https://sdw.ecb.europa.eu/browse.do?node=9698154

Eckerstorfer, P., Halak, J., Kapeller, J., Schütz, B., Springholz, F. and Wildauer, R., 2016. Correcting for the missing rich: an application to wealth survey data. *Review of Income and Wealth* 62 (4), 605-627.

Fagereng, A., Guiso, L., Malacrino, D. and Pistaferri, L., 2020. Heterogeneity and persistence in returns to wealth. *Econometrica* 88 (1), 115-170.

Fanning, A.L., O'Neill, D.W., Hickel, J., Roux, N., 2021. The social shortfall and ecological overshoot of nations. *Nature Sustainability*, in press. doi: 10.1038/s41893-021-00799-z.

Frank, M., Praet, P., Vuchelen, J. en Walravens, J., 1978. La distribution du patrimoine des particuliers en Belgique (1969). *Cahiers Economiques de Bruxelles* 79, 341-389.

Georgieva, K., 2020. Reduce inequality to create opportunity. [Online]. [Accessed 20 August 2020]. https://blogs-imf-org.eur.idm.oclc.org/2020/01/07/reduce-inequality-to-create-opportunity/?utm_medium=email&utm_source=govdelivery

Groen, 2020. De goede kant op: vijf voorstellen voor een eerlijkere samenleving. [Online]. [Accessed 20 August 2020]. https://www.groen.be/de_goede_kant_op_vijf_voorstellen_voor_een_eerlijkere_samenleving

Haberl, H., Wiedenhofer, D., Virág, D., Kalt, G., Plank, B., Brockway, P., Fishman, T., Hausknost, D., Krausmann, F.P., Leon-Gruchalski, B., Mayer, A., Pichler, M., Schaffartzik, A., Sousa, T., Streeck, J., Creutzig, F., 2020. A systematic review of the evidence on decoupling of GDP, resource use and GHG emissions, part II: synthesizing the insights. *Environmental Research Letters* 15, 065003.

HFCN, 2020a. The Household Finance and Consumption Survey: methodological report for the 2017 wave. European Central Bank, Germany. https://www.ecb.europa.eu/pub/pdf/scpsps/ecb.sps35~b9b07dc66d.en.pdf

HFCN, 2020b. Household Finance and Consumption Survey dataset. European Central Bank, Germany.

Hickel, J. and Kallis, G., 2019. Is green growth possible. *New Political Economy* 25 (4), 469-486.

IMF, 2021. Fiscal Monitor Update. International Monetary Fund, Washington. https://www-imf-org.eur.idm.oclc.org/en/Publications/FM/Issues/2021/01/20/fiscal-monitor-update-january-2021

Jackson, T., 2017. *Prosperity Without Growth: Foundations for the Economy of Tomorrow*, 2nd. ed. Routledge, London.

Jakobsen, K., Jakobsen, K., Kleven, H. and Zucman, G., 2020. Wealth taxation and wealth accumulation: theory and evidence from Denmark. *The Quarterly Journal of Economics* 135 (1), 329-388.

Kallis, G., Paulson, S., D'Alisa, G., Demaria, F., 2020. *The Case for Degrowth*. Polity, Cambridge, UK.

Kleven, H. J. and Schultz, E.A., 2014. Estimating taxable income responses using Danish tax reforms. *American Economic Journal: Economic Policy* 6 (4), 271-301.

Knight, K. W., Schor, J. B. and Jorgenson, A. K, 2017. Wealth inequality and carbon emissions in high-income countries. *Social Currents* 4 (5), 403-412.

Kopczuk, W., 2015. What do we know about the evolution of top wealth shares in the United States. *Journal of Economic Perspectives* 29 (1), 47-66.

Krenek, A. and Schratzenstaller, M., 2018. A European net wealth tax. WIFO, Vienna, Austria. https://www.wifo.ac.at/wwa/pubid/61040

Kuypers, S., 2018. Onze vermogensverdeling: alles kan beter. *Samenleving & Politiek* 25 (4), 35-40.

Lemmens, K., 2020. België telt 29 miljardairs. *De Standaard*. [Online]. 2 January. [Accessed 20 August 2020]. https://www.standaard.be/cnt/dmf20200102_04789294

Lin, D., Hanscom, L., Murthy, A., Galli, A., Evans, M., Neill, E., Mancini, M.S., Martindill, J., Medouar, F.-Z., Huang, S., Wackernagel, M., 2018. Ecological footprint accounting for countries: Updates and results of the National Footprint Accounts, 2012–2018. *Resources* 7 (3), 58.

Marshall, A.P., O'Neill, D.W., 2018. The Bristol Pound: A tool for localisation? *Ecological Economics* 146, 273-281.

National Bank of Belgium, 2020. Financial accounts. National Bank of Belgium, Brussels. https://stat.nbb.be/

National Bank of Belgium, 2021. *Rapport annuel 2020*. National Bank of Belgium, Brussels. https://www.nbb.be/fr/articles/rapport-2020-developpements-economiques-et-financiers-0

O'Callaghan, B., Yau, N., Murdock, E., Tritsch, D., Janz, A., Blackwood, A., Purroy Sanchez, L., Sadler, A., Wen, E., Kope, H., Flodell, H., Tillman-Morris, L., Ostrovsky, N., Kitsberg, A., Lee, T., Hristov, D., Didarali, Z., Chowdhry, K., Karlubik, M., Shewry, A., Bialek, F., Wang, M., Rosenbaum, N., Gupta, S., Hazell, T., Angell, Z., and Hepburn, C., 2020. Global Recovery Observatory. Oxford University Economic Recovery Project, Oxford.

OECD, 2020. *Automatic exchange: commitment and monitoring process.* [Online]. [Accessed 3 September 2020]. https://www.oecd.org/tax/automatic-exchange/commitment-and-monitoring-process/

Osier, G., 2016. Unit non-response in household wealth surveys. European Central Bank, Frankfurt. https://www.ecb.europa.eu//pub/pdf/scpsps/ecbsp15.en.pdf

Piketty, T., 2014. *Capital in the Twenty-First Century*. Harvard University Press, Cambridge, US.

Piketty, T. and Zucman, G., 2014. Capital is back: wealth-income ratios in rich countries 1700-2010. *Quarterly Journal of Economics* 129 (3), 1255-1310.

PVDA. 2020. *PVDA wil inkomensbehoud voor iedereen via een coronataks op de grote vermogens.* [Online]. [Accessed 20 August 2020]. https://www.pvda.be/pvda_wil_inkomensbehoud_voor_iedereen_via_een_coronataks_op_de_grote_vermogens

Rademaekers, K. and Vuchelen, J., 1999. De verdeling van het Belgisch gezinsvermogen. *Cahiers Economiques de Bruxelles* 164, 375-429.

Saez, E. and Zucman, G., 2019. Progressive Wealth Taxation. *Brookings Papers on Economic Activity* Fall 2019, 437-511.

Schneider, F., Kallis, G., Martínez-Alier, J., 2010. Crisis or opportunity? Economic degrowth for social equity and ecological sustainability. Introduction to this special issue. *Journal of Cleaner Production* 18 (6), 511-518.

Schröder, E. and Storm, S., 2020. Economic Growth and Carbon Emissions: The Road to "Hothouse Earth" is Paved with Good Intentions. *International Journal of Political Economy.* 49 (2), 153-173.

Seim, D., 2017. Behavioral responses to wealth taxes: evidence from Sweden. *American Economic Journal: Economic Policy* 9 (4), 395-421.

Steffen, W., Rockström, J., Richardson, K., Lenton, T., Folke, C., Liverman, D., Summerhayes, C., Barnosky, A., Cornell, S., Crucifix, M., Donges, F., Fetzer, I., Lade, S., Scheffer, M., Winkelmann, M., Winkelmann, R. and Schellnhuber, H., 2015. Trajectories of the earth system in the Anthropocene. *Proceedings of the National Academy of Sciences* 115 (33), 8252-8259.

Stratford, B., 2020. The threat of rent extraction in a resource-constrained future. *Ecological Economics* 169, 106524.

Vermeulen, P., 2014. How fat is the top tail of the wealth distribution. European Central Bank, Frankfurt. https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1692.pdf

Vermeulen, P., 2016. Estimating the top tail wealth distribution. *American Economic Review: Papers & Proceedings* 106 (5), 646-650.

Vermeulen, P., 2018. How fat is the top tail of the wealth distribution. *Review of Income and Wealth* 64 (2), 358-387.

Victor, P.A., 2019. *Managing without Growth: Slower by Design, not Disaster*, 2nd ed. Edward Elgar, Cheltenham, UK.

Waltl, S., 2020. Multidimensional wealth inequality: a hybrid approach toward distributional national accounts in Europe. WU Vienna University of Economics and Business, Vienna. https://epub.wu.ac.at/7560

Wiedmann, T.O., Schandl, H., Lenzen, M., Moran, D., Suh, S., West, J., Kanemoto, K., 2015. The material footprint of nations. *Proceedings of the National Academy of Sciences* 112 (20), 6271-6276.

Wilkinson, R., Pickett, K., 2009. *The Spirit Level: Why More Equal Societies Almost Always Do Better*. Allen Lane, London.

A one-off wealth tax for Belgium: Revenue potential, distributional impact, and environmental effects

Arthur Apostel and Daniel W. O'Neill

Supplementary Information

Functional form of the Pareto distribution

Consider a Pareto distribution with the following density function:

$$f(w) = \begin{cases} \alpha \frac{w_{\min}^{\alpha}}{w^{\alpha+1}} & \alpha > 0;\ \forall w \in [w_{min}, +\infty[\\ 0 & \forall w \in]-\infty, w_{min}] \end{cases} \quad \text{(S1)}$$

where w represents an observation of household net wealth, w_{min} indicates the wealth threshold or the lower bound of the Pareto distribution, and α is the Pareto parameter or the tail index which is inversely related to the fatness of the top tail of the wealth distribution (i.e. a low value of α leads to a fatter tail, and vice versa). So, the Pareto distribution is determined by a Pareto parameter α and a wealth threshold w_{min}.

Estimation of the Pareto parameter

Following Vermeulen (2018), we estimated the Pareto parameter α with OLS based on the following equation suitable for weighted datasets such as the DRB-extended HFCS dataset on which we relied:

$$\ln\left((N(w_i) - 0.5) \frac{\bar{G}_{N(w_i)}}{\bar{G}} \right) \cong \gamma - \alpha \ln(w_i) \quad \text{(S2)}$$

where $N(w_i)$ indicates the number of households in the sample with a net household wealth of w_i or above, $\bar{G}$ represents the average weight of an observation, $\bar{G}_{N(w_i)}$ represents the average weight of observations with a net household wealth of w_i or above, and γ is a constant term.

For a rigorous mathematical derivation of Equation S2, we refer the reader to Vermeulen (2018).

Estimation of the wealth threshold

The wealth threshold w_{min} needs to be established before an OLS regression based on Equation S2 can be executed. A too-high value for w_{min} disregards useful information, while a too-low value for w_{min} includes observations which might not be approximately Pareto distributed (Eckerstorfer et al., 2016). Although most researchers tend to set w_{min} manually (e.g. Vermeulen, 2018), we followed Krenek and Schratzenstaller (2018) in applying a Kolmogorov-Smirnov (KS) procedure based on the KS criterion:

$$max_{w \geq w_{min}} \left| CCD_{estimated} - CCD_{empirical} \right| = max_{w \geq w_{min}} \left| \left(\frac{w_{min}}{w_i} \right)^{\alpha} - \frac{N(w_i)}{N(w_{min})} \right| \quad \text{(S3)}$$

In words, Equation S3 gives the maximum difference between the estimated and empirical complementary cumulative distribution. The KS procedure consists of estimating Pareto distributions for a discrete range of w_{min} values, and recording the results of Equation S3 for each of these distributions. Then, the Pareto distribution corresponding to the w_{min} value which yields the highest goodness-of-fit as measured by Equation S3 is selected. We applied the KS procedure with a range of w_{min} values from 500,000 to 2 million euros (in steps of 5,000 euros), which led to a best fit w_{min} value.

Robustness of family size correction

National rich lists tend to consist of family entries, as disaggregation at the household level is usually not possible based on publicly available information. Hence, it seems necessary to correct national rich lists for family size. We corrected family entries on the DRB list where family size was not publicly available by dividing them by four, which is a conservative choice compared to the literature (see Table S1). Note that dividing by a certain number of households implicitly assumes that the intra-family wealth distribution is completely equal, which is also a conservative assumption.

Table S1. Corrections for family size found in the literature

Study	Households per family entry	Note
Bach et al. (2014)	4	-
Bach et al. (2019)	1	No correction for France and Spain, correction for Germany using publicly available data, robustness check for family size going from 1 to 4 households
Chakraborty and Waltl (2018)	1	Robustness check for family size going from 1 to 4 households
Waltl (2020)	2-4	Family entries are randomly split in 2 to 4 households

We tested the robustness of our correction by estimating the wealth distribution using different assumptions for family size. The estimation procedure is relatively sensitive to family size (see Table S2). Nonetheless, even very conservative assumptions still lead to a higher top 1% wealth share than previous studies. Moreover, even a very conservative assumption around family size leads to substantially higher estimates of revenue potential than reported by the advocates of a one-off wealth tax (see Table S3).

Table S2. Top 1%, 5%, and 10% net wealth share (in %) and lower bound (in million euros) for different family size assumptions

Input dataset	1%		5%		10%	
	%	Bound	%	Bound	%	Bound
HFCS	15.6	3.0	34.2	1.1	46.4	0.8
Households per family entry = 1						
Rescaled HFCS + Pareto DRB	26.0	5.0	44.2	1.7	55.8	1.1
Households per family entry = 2						
Rescaled HFCS + Pareto DRB	25.5	4.9	43.9	1.7	55.6	1.1
Households per family entry = 3						
Rescaled HFCS + Pareto DRB	25.1	4.9	43.4	1.7	55.2	1.1
Households per family entry = 4						
Rescaled HFCS + Pareto DRB	23.9	4.8	42.4	1.7	54.4	1.1
Households per family entry = 5						
Rescaled HFCS + Pareto DRB	23.4	4.8	42.0	1.7	54.1	1.1
Households per family entry = 6						
Rescaled HFCS + Pareto DRB	23.2	4.8	41.9	1.7	54.0	1.1
Households per family entry = 7						
Rescaled HFCS + Pareto DRB	22.7	4.8	41.5	1.7	53.7	1.1
Households per family entry = 8						
Rescaled HFCS + Pareto DRB	22.3	4.8	41.2	1.7	53.5	1.1
Households per family entry = 9						
Rescaled HFCS + Pareto DRB	22.6	4.8	41.5	1.7	53.7	1.1
Households per family entry = 10						
Rescaled HFCS + Pareto DRB	22.2	4.8	41.1	1.7	53.4	1.1

Note: Own calculations based on HFCN (2020), De Rijkste Belgen (2020), and ECB (2020). Reported values are averages of the results of the five HFCS implicate datasets.

Table S3. Revenue potential estimates (in billion euros, nominal 2017 value), for households per family entry = 10

Tax avoidance and evasion*	Groen	PVDA	De Grauwe
No	6.1	40.3	22.5
Low	5.7	30.2	20.9
Moderate	5.5	24.4	20.0
High	5.4	18.7	19.0
Self-reported	5	15	10

Note: Own calculations based on HFCN (2020), De Rijkste Belgen (2020), and ECB (2020). Reported values are averages of the results for the five HFCS implicate datasets. Brackets indicate standard deviation.
* For the net-of-tax elasticities used, see Table 3.

Results with rescaled real assets

This section presents the results for an HFCS-DRB Pareto-corrected estimation run where real assets were also rescaled. Tables S4 and S5 additionally show the results of other estimation runs to make comparison easier.

Table S4. Top 1%, 5%, and 10% net wealth share (in %) and lower bound (in million euro)

Input dataset	1%		5%		10%	
	%	Bound	%	Bound	%	Bound
HFCS	15.6 (*0.6*)	3.0 (*0.1*)	34.2 (*0.5*)	1.1 (*0.1*)	46.4 (*0.5*)	0.8 (*0.0*)
Rescaled HFCS + Pareto DRB	23.9 (*1.2*)	4.8 (*0.3*)	42.4 (*1.5*)	1.7 (*0.1*)	54.4 (*1.5*)	1.1 (*0.1*)
Rescaled HFCS + Pareto DRB, incl. rescaled real assets	26.4 (*1.5*)	4.6 (*0.2*)	45.5 (*2.0*)	1.6 (*0.1*)	57.4 (*2.0*)	1.0 (*0.0*)

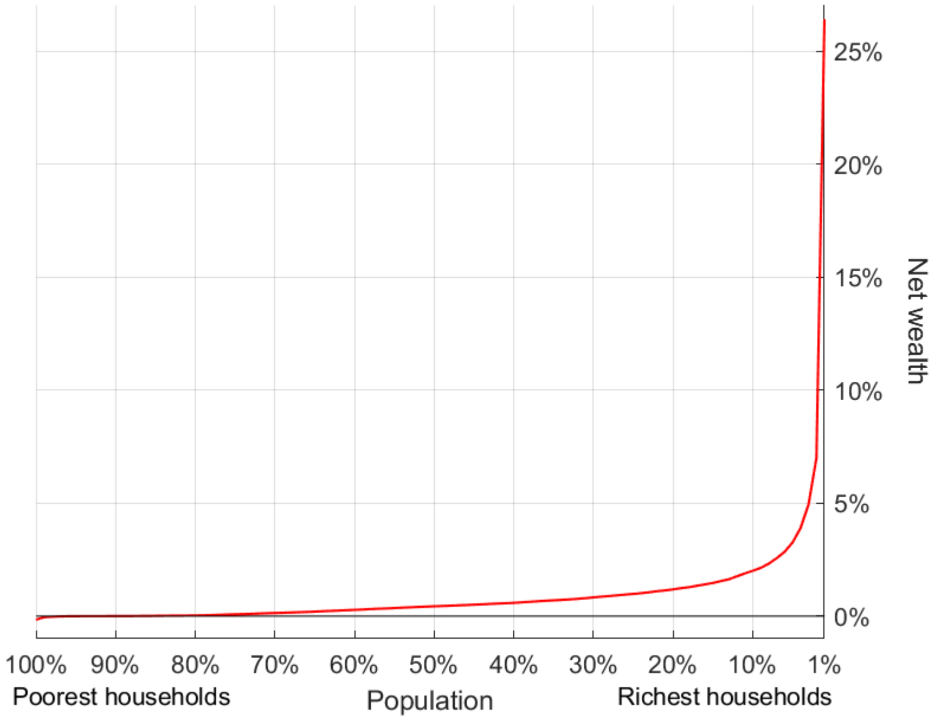
Note: Own calculations based on HFCN (2020), De Rijkste Belgen (2020), and ECB (2020). Reported values are averages of the results of the five HFCS implicate datasets. Brackets indicate standard deviation.

Table S5. Main wealth aggregates with respect to national accounts

Input dataset	Real assets	Financial assets	Liabilities
HFCS	108%	33%	84%
Rescaled HFCS + Pareto DRB	118%	100%	100%
Rescaled HFCS + Pareto DRB, incl. rescaled real assets	100%	100%	100%

Note: Own calculations based on HFCN (2020), De Rijkste Belgen (2020), ECB (2020), and National Bank of Belgium (2020b). Reported values are averages of the results of the five HFCS implicate datasets. National accounts data are averages of quarterly data over the period of HFCS data collection.

Part A - Actual wealth distribution



Part B - Cumulative wealth distribution

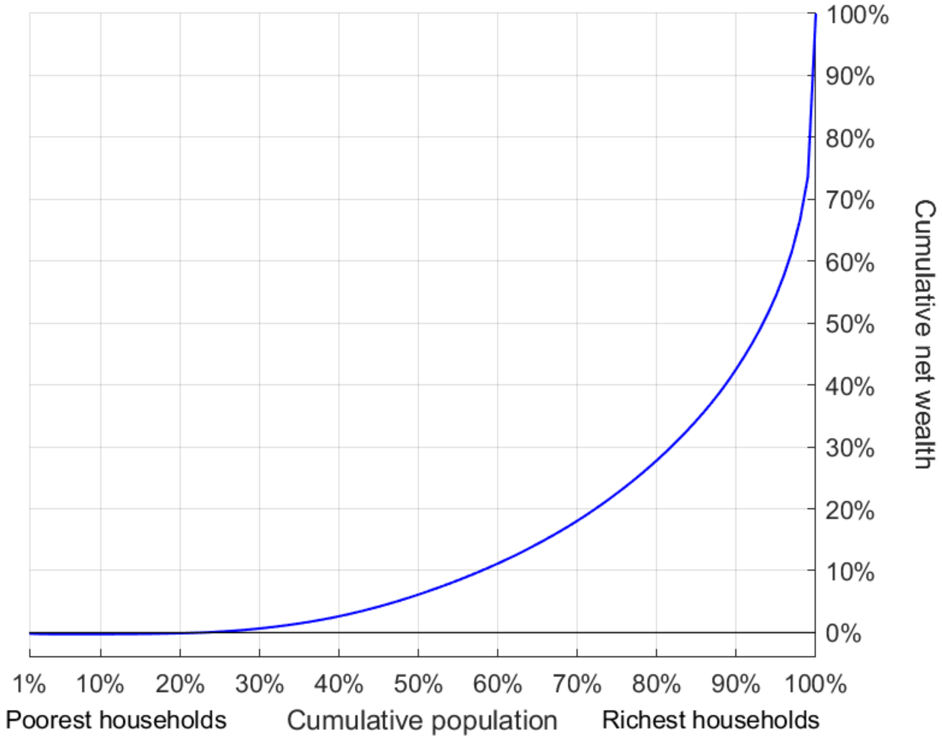


Figure S1. Estimate of the Belgian wealth distribution based on Rescaled HFCS-DRB Pareto-corrected input data including rescaled real assets. Own calculations based on HFCN (2020), De Rijkste Belgen (2020) and ECB (2020). Reported values are averages of the results of the five HFCS implicate datasets. See the guidance given in Figure 4 of the main text if in doubt about how to interpret the graphs.

Table S6. Revenue potential estimates (in billion euros, nominal 2017 value)

Tax avoidance and evasion*	Groen	PVDA	De Grauwe
No	6.6 (*0.4*)	41.2 (*2.9*)	22.9 (*1.3*)
Low	6.2 (*0.4*)	30.3 (*2.3*)	21.0 (*1.1*)
Moderate	6.0 (*0.4*)	24.6 (*1.9*)	20.0 (*1.0*)
High	5.9 (*0.4*)	19.0 (*1.4*)	19.0 (*1.0*)
Self-reported	5	15	10

Note: Own calculations based on HFCN (2020), De Rijkste Belgen (2020), and ECB (2020). Reported values are averages of the results for the five HFCS implicate datasets. Brackets indicate standard deviation.
* For the net-of-tax elasticities used, see Table 3.

Table S7. Percentage point change in wealth share of the 1% and 5%

Tax avoidance and evasion*	Groen		PVDA		De Grauwe	
	1%	**5%**	**1%**	**5%**	**1%**	**5%**
No	-0.20% (*0.01*)	-0.14% (*0.00*)	-0.90% (*0.03*)	-0.91% (*0.03*)	-0.37% (*0.03*)	-0.39% (*0.02*)
Low	-0.18% (*0.01*)	-0.14% (*0.00*)	-0.59% (*0.02*)	-0.67% (*0.03*)	-0.31% (*0.02*)	-0.34% (*0.02*)
Moderate	-0.18% (*0.01*)	-0.13% (*0.00*)	-0.48% (*0.02*)	-0.54% (*0.02*)	-0.29% (*0.02*)	-0.33% (*0.02*)
High	-0.17% (*0.01*)	-0.13% (*0.00*)	-0.38% (*0.01*)	-0.41% (*0.02*)	-0.28% (*0.02*)	-0.31% (*0.01*)

Note: Own calculations based on HFCN (2020), De Rijkste Belgen (2020), and ECB (2020). Reported values are averages of the results for the five HFCS implicate datasets. Brackets indicate standard deviation.
* For the net-of-tax elasticities used, see Table 3.

Table S8. Percentage point change in consumption-based CO_2 emissions

Tax avoidance and evasion*	Groen	PVDA	De Grauwe
No	-0.09% (*0.00*)	-0.57% (*0.02*)	-0.31% (*0.01*)
Low	-0.08% (*0.00*)	-0.41% (*0.01*)	-0.29% (*0.01*)
Moderate	-0.08% (*0.00*)	-0.34% (*0.01*)	-0.27% (*0.01*)
High	-0.08% (*0.00*)	-0.26% (*0.01*)	-0.26% (*0.01*)

Note: Own calculations based on HFCN (2020), De Rijkste Belgen (2020), ECB (2020), and Knight et al. (2017). Reported values are averages of the results for the five HFCS implicate datasets. Brackets indicate standard deviation.
* For the net-of-tax elasticities used, see Table 3.

Table S9. Top 1%, 5%, and 10% net wealth share (in %) and lower bound (in million euro) for different family size assumptions

Input dataset	1%		5%		10%	
	%	**Bound**	**%**	**Bound**	**%**	**Bound**
Households per family entry = 1						
Rescaled HFCS + Pareto DRB, incl. rescaled real assets	29.4	4.6	47.9	1.5	59.3	1.0
Households per family entry = 2						
Rescaled HFCS + Pareto DRB, incl. rescaled real assets	29.0	4.6	47.6	1.5	59.0	1.0
Households per family entry = 3						
Rescaled HFCS + Pareto DRB, incl. rescaled real assets	27.9	4.6	46.7	1.5	58.4	1.0
Households per family entry = 4						
Rescaled HFCS + Pareto DRB, incl. rescaled real assets	26.4	4.6	45.5	1.6	57.4	1.0
Households per family entry = 5						
Rescaled HFCS + Pareto DRB, incl. rescaled real assets	25.6	4.6	44.8	1.6	56.8	1.0
Households per family entry = 6						
Rescaled HFCS + Pareto DRB, incl. rescaled real assets	25.2	4.6	44.4	1.6	56.5	1.0
Households per family entry = 7						
Rescaled HFCS + Pareto DRB, incl. rescaled real assets	24.5	4.5	43.7	1.6	56.0	1.0
Households per family entry = 8						
Rescaled HFCS + Pareto DRB, incl. rescaled real assets	23.9	4.5	43.2	1.6	55.6	1.0
Households per family entry = 9						
Rescaled HFCS + Pareto DRB, incl. rescaled real assets	24.1	4.5	43.4	1.6	55.8	1.0
Households per family entry = 10						
Rescaled HFCS + Pareto DRB, incl. rescaled real assets	23.8	4.5	43.1	1.6	55.5	1.0

Note: Own calculations based on HFCN (2020), De Rijkste Belgen (2020), and ECB (2020). Reported values are averages of the results of the five HFCS implicate datasets.

Table S10. Revenue potential estimates (in billion euros, nominal 2017 value), for households per family entry = 10

Tax avoidance and evasion*	Groen	PVDA	De Grauwe
None	6.0	37.9	21.0
Low	5.6	28.0	19.5
Moderate	5.4	22.7	18.6
High	5.3	17.4	17.7
Self-reported	5	15	10

Note: Own calculations based on HFCN (2020), De Rijkste Belgen (2020), and ECB (2020). Reported values are averages of the results for the five HFCS implicate datasets. Brackets indicate standard deviation.
* For the net-of-tax elasticities used, see Table 3.

References

Bach, S., Beznoska, M. and Steiner, V., 2014. A wealth tax on the rich to bring down public debt: revenue and distributional effects of a capital levy in Germany. *Fiscal Studies* 35 (1), 67-89.

Bach, S., Thiemann, A. and Zucco, A., 2019. Looking for the missing rich: tracing the top tail of the wealth distribution. *International Tax and Public Finance* 26, 1234-1258.

Chakraborty, R. and Waltl, S., 2018. Missing the wealthy in the HFCS: micro problems with macro implications. European Central Bank, Frankfurt. https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2163.en.pdf

De Rijkste Belgen, 2020. DRB rich list website. [Online]. [Accessed 20 August 2020]. https://derijkstebelgen.be/

ECB, 2020. Financial accounts. European Central Bank, Frankfurt. https://sdw.ecb.europa.eu/browse.do?node=9698154

Eckerstorfer, P., Halak, J., Kapeller, J., Schütz, B., Springholz, F. and Wildauer, R., 2016. Correcting for the missing rich: an application to wealth survey data. *Review of Income and Wealth* 62 (4), 605-627.

HFCN, 2020. Household Finance and Consumption Survey dataset. European Central Bank, Germany.

Krenek, A. and Schratzenstaller, M., 2018. A European net wealth tax. WIFO, Vienna, Austria. https://www.wifo.ac.at/wwa/pubid/61040

National Bank of Belgium, 2020. Financial Accounts. National Bank of Belgium, Brussels.

Vermeulen, P., 2018. How fat is the top tail of the wealth distribution. *Review of Income and Wealth* 64 (2), 358-387.

Waltl, S., 2020. Multidimensional wealth inequality: a hybrid approach toward distributional national accounts in Europe. WU Vienna University of Economics and Business, Vienna. https://epub.wu.ac.at/7560